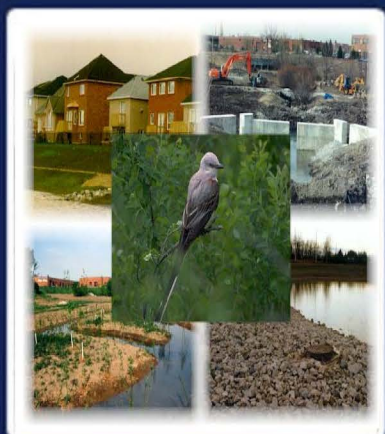
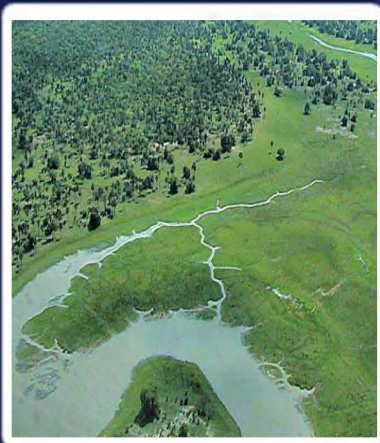
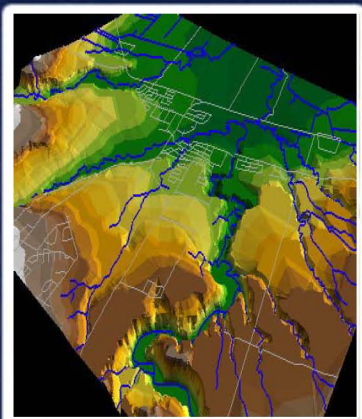




Prepared For:  
The Township of  
Adjala-Tosorontio  
January, 2013



# Everett Secondary Plan Master Servicing Plan Class Environmental Assessment Study Report

## VOLUME 3 (Parts 3&4)

### Master Servicing Studies



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**VOLUME 3: MASTER SERVING STUDIES**  
**Part 3 – Water Servicing Master Plan Study Report**



**Everett Secondary Plan  
Township of Adjala-Tosorontio  
Water Servicing Master Plan Study Report  
December 2012  
Greenland Project No. 12-G-2804**

**FINAL REPORT**

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## 1.0 INTRODUCTION

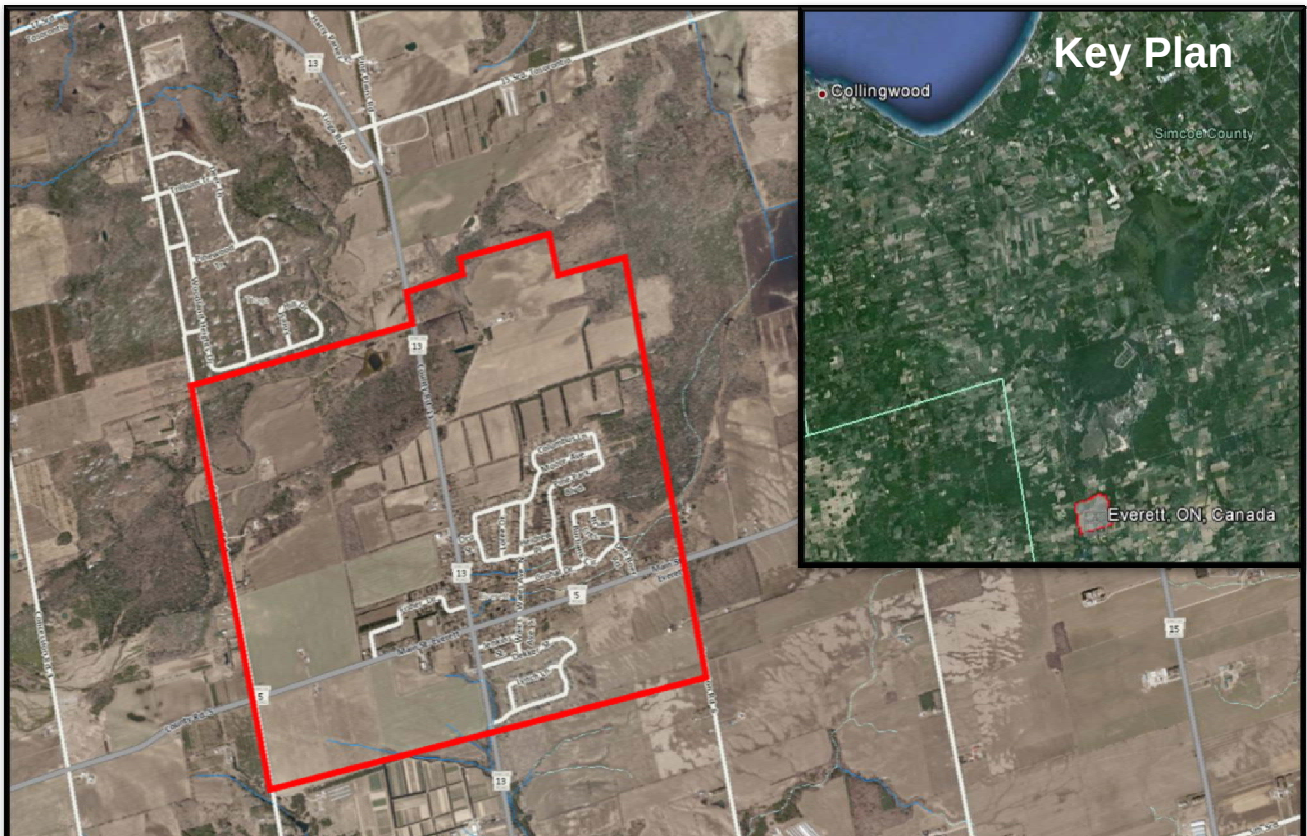
### 1.1 GENERAL

Greenland Consulting Engineers (GRN) has been retained by the Township of Adjala-Tosorontio (Township) to prepare a Master Servicing Plan which includes a Water Servicing Master Plan Study Report for the Community of Everett.

### 1.2 SITE LOCATIONS AND CHARACTERISTICS

The Community of Everett was located in the Township of Adjala-Tosorontio, northwest of the Town of Alliston. A location map was included as **Figure 1.1**.

**Figure 1.1 Location Map: Community of Everett Secondary Plan**



The existing land use in the Study Area includes a combination of agricultural land, floodplain; natural areas; existing residential development; and vacant or fallow agricultural land.

The Community of Everett (Study Area) is serviced by a municipal well system. The Everett water system is classified as a Large Municipal Residential water system that currently serves approximately 643 homes. Water is supplied via three (3) municipal wells, two (2) pump houses and an in ground reservoir (Ontario Clean Water Agency, 2009).

The proposed R&M Homes development (R&M) is located in the northern region of the Everett Secondary Plan development area. The R&M development area has received municipal Draft Plan Approval as of the date of this report. As such, the proposed infrastructure for the subdivision has been considered as existing development for the purposes of this study.

### 1.3 SECONDARY PLAN POPULATION AND LAND USE

Concept Level land-use plans were developed at the outset of this study by the Planning Partnership. Technical inputs were provided and used to develop population projections and servicing requirements for this Master Servicing Study. As part of this concept plan development, the undeveloped portions of the Secondary Plan Area was categorized into three (3) phases and four (4) future development parcels.

Land use for future development areas was determined by designating 5% of the parcel area each for storm water management (SWM) and parkland, and then assigning parcel specific “concept level” commercial and institutional uses. All remaining lands were designated as residential, with a density of 12 units per ha. The concept land use plan is provided in **Figure A-1 (Appendix WS-A)**.

With respect to the in-process parcels, land uses for the R&M Homes and Walton Developments were determined by using “as submitted” values (i.e. for park and storm water management areas, total number of residential units, designated commercial blocks) based on the submitted draft plan applications. Land use for the Barzo Development was calculated by applying the same methodology with assumption of future development areas.

Equivalent population for each area were derived on a parcel specific basis using the projected land uses within each parcel to calculate sewage flows and water demands, at a unit population of 2.87 person per unit, and a flow/demand rate of 250L/c/d, based on the average sanitary flow as measured in the existing community of Everett sanitary system at the New Horizon WWTP (round up from 246 L/c/d). The sanitary flow is greater than the current municipal water demand rates of approximately 201 L/c/d. Commercial and institutional flow/demand rates were derived from MOE guidelines, and total average sewage flow rates were calculated for each parcel for all contributing land use areas. This net flow value for commercial and institutional (CI) land uses was then divided by 250 L/c/d to arrive at an equivalent population for each CI and land use. A summary of equivalent population calculations for each of the three (3) in process and four (4) future development parcels (and a lumped value for existing areas) is provided in **Table 1.1**. Detailed population and water demand calculations are included in **Appendix WS-B**.

**Table 1. 1 SECONDARY PLAN AREA POPULATION BY PARCEL**

| In Process Population |        |       | Future Development Population |       |     |       | Existing | Total  |
|-----------------------|--------|-------|-------------------------------|-------|-----|-------|----------|--------|
| R&M Homes             | Walton | Barzo | 1                             | 2     | 3   | 4     |          |        |
| 1,466                 | 684    | 1,357 | 2,681                         | 1,127 | 341 | 1,084 | 1,929    | 10,669 |

## 1.4 STUDY PURPOSE AND REPORT STRUCTURE

The objective of this Study is to present a summary of existing sanitary infrastructure within the Study Area in order to provide a framework for development decisions within the municipality, and to then identify a detailed list of servicing options for additional development within the Community of Everett, i.e. within the Everett Community Secondary Plan Area. Summary analysis of all servicing options will be provided, and feasible options will be selected, analyzed in detail, and ranked in order of their adherence to criteria determined as part of this Study, to ultimately arrive at a preferred master sanitary servicing plan option for the Community of Everett.

The Secondary Plan Boundaries are presented in **Figure 1.1**, and a concept level future land use plan for the Study Area can be found in **Appendix WS-A (Figure A-1)**.

This Sanitary Servicing Master Plan Study Report is structured in the following manner:

- **Chapter 1.0:** Introduction
- **Chapter 2.0:** Discussion of existing (and In Process) water supply, storage and distribution infrastructure, including demands and residual capacity of current systems;
- **Chapter 3.0:** Presentation and analysis of Master Servicing Alternatives for water treatment, storage and distribution systems;
- **Chapter 4.0:** Comparison of shortlisted Master Servicing Alternatives;
- **Chapter 5.0:** Conclusions and recommendations drawn from the aforementioned analyses.



## 2.0 WATER SERVICING

### 2.1 EXISTING FLOWS & PROJECTIONS FOR THE STUDY AREA

Potable water demands were determined for the purpose of this study using historical water use data provided by the Township of Adjala-Tosorontio. Average Daily Demands (ADD), Maximum Daily Demands (MDD) and Peak Hourly Demands (PHD) were developed and modeled for different design scenarios to identify any deficiencies within the existing water system.

Water demands were developed for the existing population of 1,929 persons, and for a population of approximately 3,405 persons (Phase 1) which would represent existing conditions plus full build-out of the Draft Plan Approved R&M Homes Subdivision ( $1,929 + 1,466 \approx 3,405$ ).

For assessing residual capacity in the existing water infrastructure, the existing population was assumed to continue to require the measured 201 L/c/d per-capita demand (2010-2011 average daily demand). For future populations (e.g. R & M Homes Draft Plan Approved Subdivision), the value used was 275 L/c/d which is approximately equal to 110% of the average per capita sewage flows measured in the New Horizon Development. Peaking factors for MDD and PHD were adjusted based on the Study Area population.

Water demands utilized in water system modeling and determination of supply well capacities are summarized in **Table 2.1** below.

**Table 2. 1 Existing and Projected Water Demands**

| Development Phase                | Total Equivalent Population | ADD (m <sup>3</sup> /d) | MDD (m <sup>3</sup> /d) | PHD (m <sup>3</sup> /d) |
|----------------------------------|-----------------------------|-------------------------|-------------------------|-------------------------|
| Existing Pop.                    | 1,929                       | 387                     | 939                     | 1,452                   |
| Phase 1 (Ex. + In Process (R&M)) | 3,405                       | 793                     | 1,773                   | 2,664                   |

A detailed breakdown of water demand used in this Study, and to develop future projections is provided in **Appendix WS-A**.

### 2.2 EXISTING WATER SUPPLY

The Everett water supply system is classified as a large municipal residential water system that currently services an equivalent population of 1,929 people (or 643 units using 3.0 persons/household). The system consists of three (3) active groundwater wells with a maximum combined hydraulic rated capacity of 4,870 m<sup>3</sup>/day based on the facility's Permit-to-Take-Water (the Ballpark Supply Well, and The Grohal Supply and Stand-By Wells).

A Preliminary Hydrogeological Investigation was completed by Golder Associates in 2012 (Golder Study – **Appendix WS-C**) in order to determine the existing operating flow rates of

the Everett water supply system. A summary of the results of this study is provided herein. **Table 2.2** represents the operating capacity of the current well systems in Everett.

**Table 2. 2 Everett Well Capacity**

| Well Name      | Operating Capacity - L/s | Operating Capacity - m <sup>3</sup> /d |
|----------------|--------------------------|----------------------------------------|
| Grohal Main    | 21.7                     | 1,875                                  |
| Grohal Back-up | 11                       | 950                                    |
| Ball Park      | 22.7                     | 1,961                                  |
| <b>Total:</b>  | <b>55.4</b>              | <b>4,787</b>                           |

From the information presented in **Table 2.2**, a “Firm Capacity” was calculated. Firm Capacity as defined by the MOE, is as the operating capacity of the water system when the largest pump is out of service. In this case, the Firm Capacity of the Everett water supply system would be approximately **2,826 m<sup>3</sup>/d** (or 4,787 m<sup>3</sup>/d total, less 1,961 m<sup>3</sup>/d capacity of the largest pump).

Subtracting the existing Maximum Day demand (939 m<sup>3</sup>/day) from this value leaves a residual firm capacity of **1,887 m<sup>3</sup>/day**. This equates to an equivalent population of **3,430** persons at 275 L/capita/day with a maximum day peaking factor of 2.0. When added to the existing population of 1,929 persons, a new well and pump system would be required prior to the Town reaching a total equivalent population of **5,359 persons** to satisfy maximum daily water demands.

It should also be noted that the Golder Study concluded that the existing Everett well system groundwater aquifer average day capacity is **2,500 m<sup>3</sup>/d**. As such, once the ADD exceeds 2,500 m<sup>3</sup>/d, a new water source will need to be explored to supplement the existing facilities. Based on interpolation of the demand projections using 275 L/c/d as presented herein, this would represent an equivalent population of **9,613** equivalent persons. It should be noted, that at the current average daily demand of 201 L/c/d, the aquifer could support a population of **12,437** equivalent persons.

Please refer to the Golder & Associates *Preliminary Hydrogeological Investigation* (Golder Associates, 2012) included in **Appendix WS-C** for more information.

#### The Ballpark Well

The Ballpark well is a 250mm (10 inch) diameter overburden well installed across the lower coarse sand confined aquifer. The surface of the well is at an elevation of 246.11 m with the base of the well screen installed at an elevation of 185.25. The MOE “Permit to Take Water”, municipal pumping test records, and planning documents for the community of Everett were reviewed as part of the revised work plan.

The Ballpark well can supply water at a capacity of 1,961 m<sup>3</sup>/day with a dedicated water treatment system consisting of one 200L capacity sodium hyperchlorite solution tank and

one 20,400 L chlorine contact tank with a dedicated watermain loop for increased chlorine contact time. The chlorination system includes a pump with a capacity of 3.8 L/h.

### The Grohal Well

The Grohal well also has a theoretical supply capacity of 1,875 m<sup>3</sup>/day with a dedicated water treatment system consisting of one 200L capacity sodium hyperchlorite solution tank and one 20,400 L chlorine contact tank with a dedicated watermain loop for increased chlorine contact time. The chlorination system includes a pump with a capacity of 3.8 L/h.

The Grohal water supply also has a standby well with a capacity of 950 m<sup>3</sup>/day which is not included in original capacity of 1,875 m<sup>3</sup>/day.

### Water Treatment

The existing treatment system consists of chlorination (sodium hyperchlorite) at each of the Grohal Wells and the Ballpark Well prior to distribution throughout the community of Everett.

Based on the current treatment and distribution configuration of 20.4 m<sup>3</sup>, tanks with injected sodium hypochlorite, and a 1,962 m<sup>3</sup>/d maximum rate of pumping (1,875 m<sup>3</sup>/d for Grohal), the Everett wells will provide sufficient minimum contact time (15 minutes in accordance with MOE Standards) to meet the average, and maximum daily demands, until an equivalent population of **5,359 persons** is reached. Once higher demand rates (i.e. pump upgrades) are required to satisfy increased water demands, additional treatment upgrades will also need to be considered.

Township staff indicated the current water chlorination treatment system capacity could be increased, as needed by partial expansion of the Grohal and/or Ballpark pump houses; including, installing a larger chlorine treatment storage tank(s) and an additional watermain loop(s) in order to increase chlorine contact time.

## **2.3 WATER DISTRIBUTION SYSTEM**

The existing distribution system is comprised of approximately 13 kilometers of watermain which are supplied with flow from the Ballpark and Grohal well pumps with static pressure being maintained by the 1,600m<sup>3</sup> water storage facility located at the southeast end of the Secondary Plan Area.

### Reservoir Capacity

The water storage facility is located 600m south of County Road 5 on the west side of Concession Road 6 and was constructed in the early 1990's, at approximately the same time as the Ballpark and Grohal Wells. The top of the facility is 3m above grade (282.5m), and includes two (2) 15m x 15m x 3.6m storage cells. Water is pumped to this facility from the supply wells and system pressure is sustained by the storage reservoir. An automated control system triggers the well pumps based on water elevations in the tank, as summarized in **Table 2.3**.

**Table 2. 3 Reservoir Automation**

| Water Level in Elevated Storage (m) | Actual Elevation (m) | Trigger Description |
|-------------------------------------|----------------------|---------------------|
| 3.3                                 | 282.5                | Pumps Stop          |
| 3.0                                 | 282.2                | Normal Pump Start   |
| 2.7                                 | 281.9                | Second Pump Start   |
| 2.0                                 | 281.6                | Low Level Alarm     |

The total storage available at this facility has been assessed checked against MOE requirements for the current population, using the following formula:

$$\text{Total Storage Required} = A+B+C$$

Where, A=Fire Storage;

B=Equalization Storage (25% of Maximum Day); and

C=Emergency Storage (25% (A+B)).

**Table 2.4** summarizes the storage requirements for the current population of 1,929 people.

**Table 2. 4 Fire Storage**

| Fire Flow (L/s)    | Maximum Daily Demand (m <sup>3</sup> /d) | "A" Fire Storage | "B" Equalization Storage (m <sup>3</sup> ) | "C" Emergency Storage (m <sup>3</sup> ) | Total (m <sup>3</sup> ) | Total Storage Available (m <sup>3</sup> ) |
|--------------------|------------------------------------------|------------------|--------------------------------------------|-----------------------------------------|-------------------------|-------------------------------------------|
| 30.0 <sup>1</sup>  | 939                                      | 216              | 235                                        | 113                                     | 563                     | 1,600                                     |
| 92.7 <sup>2</sup>  | 939                                      | 667              | 235                                        | 226                                     | 1,128                   | 1,600                                     |
| 116.1 <sup>3</sup> | 939                                      | 836              | 443                                        | 319                                     | 1,598                   | 1,600                                     |

**GENERAL NOTES:**

- 1) Minimum MOE Design Standard Fire Flow
- 2) MOE Standard Recommended for Population of 1,929
- 3) MOE Standard Recommended for Population of 3,405

Under existing conditions, the residual storage available is 472 m<sup>3</sup>. Using the MOE minimum requirements for fire storage, based on population, there is sufficient capacity in the existing water storage system in Everett to accommodate the existing and Draft Plan Approved development in the community, i.e. 3,405 equivalent population.

It is recommended that expansion requirements be investigated in more detail for any development scenarios beyond the existing and in process R&M Homes populations.

### Water Distribution Network

As part of this analysis, a water distribution system model was created for the existing Everett community using the hydraulic modeling software WaterCAD V8 XM.

Multiple scenarios were completed to determine water system functionality and to identify any deficiencies which may exist in the current infrastructure, or under conditions proposed for the near future.

Scenarios were run under numerous water demand regimes, with and without full build-out of the R&M Homes development (Approved Draft Plan – in Process). Availability of minimum and recommended fire flows were also checked. System pressures at all nodes were checked against the following MOE system pressure guidelines for each flow scenario:

**Table 2. 5 MOE Pressure Guideline (2008)**

| Demand Scenario | Pressure Guidelines (kPa) |      |
|-----------------|---------------------------|------|
|                 | Min.                      | Max. |
| Average Day     | 350                       | 480  |
| Maximum Day     | 350                       | 480  |
| Peak Hour       | 275                       | 700  |
| Max Day + Fire  | 140                       | 700  |

Model Results for the various scenarios, both with and without fire flow calculations are presented in **Table 2.6** and **Table 2.7**. Results of the average day, maximum day, and peak hourly demand scenarios are presented in **Table 2.6**, and results of the minimum fire flow analyses are present in **Table 2.7**:

**Table 2. 6 Existing Conditions Model Results - No Fire Flows**

| Demand Scenario           | Satisfies Demands | Meets Pressure Constraints | Areas of Concern (Junctions) |
|---------------------------|-------------------|----------------------------|------------------------------|
| Existing Buildout - ADD   | YES               | Low                        | 72                           |
| Existing Buildout - MDD   | YES               | Low                        | 72                           |
| Existing Buildout - PHD   | YES               | Low                        | 72                           |
| Ex. BO + In Process - ADD | YES               | Low                        | 72                           |
| Ex. BO + In Process - MDD | YES               | Low                        | 72                           |
| Ex. BO + In Process - PHD | YES               | Low                        | 72                           |

As such, the existing distribution system is able to provide sufficient pressure under various demand scenarios in nearly all areas of the Community of Everett, both under current conditions, and under “in process” conditions (R&M Homes). The only area which showed pressures below recommended values was Node 72, which is located within the New Horizons development. This node is both at a higher elevation than most of the other nodes in the distribution system, and it is located at the south eastern extremity of the distribution system. Upgrades should be considered to improve water pressure in this area. A nodal diagram of the existing distribution system model has been provided in **Appendix WS-D**. As shown in **Table 2.7**, current water distribution system provides sufficient storage and pressure to satisfy all demand conditions at MOE pressure requirements, including MDD plus a 30 L/s minimum MOE fire (at 140 kPa throughout the existing community including the in progress R&M Homes development).



**Table 2. 7 Existing Conditions Model Result - With Fire Flows**

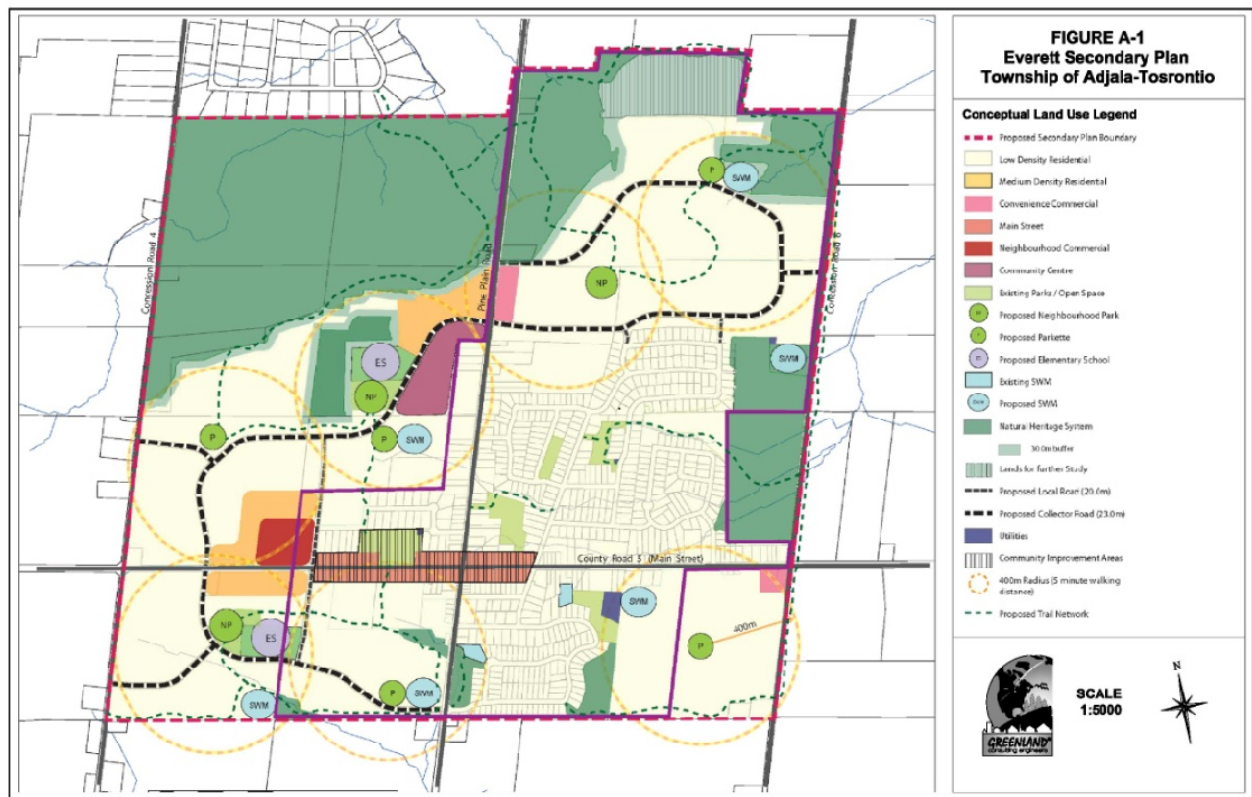
| Fire Flow Scenario                    | Meets Fire Flow | Areas of Concern (Junctions) |
|---------------------------------------|-----------------|------------------------------|
| Existing Buildout - MDD + 30 L/s FF   | YES             | NONE                         |
| Ex. BO + In Process - MDD + 30 L/s FF | YES             | NONE                         |

## 3.0 ALTERNATIVE WATER SERVICING SOLUTIONS

### 3.1 BACKGROUND

Based on preferred Everett Secondary Plan Land Use Map (See **Figure 3.1** and **Appendix WS-A**) from Township of Adjala-Tosoronto, a proposed equivalent population of 10,669 was estimated (See **Appendix WS-B** for details). As detailed in **Chapter 2.0**, the Study of the existing aquifer (**Appendix WS-C**) has shown to be adequate to service the ultimate proposed development.

**Figure 3. 1 Preferred Everett Secondary Plan Land Use Map**



However, based on the results presented in **Chapter 2**, the following improvements will be required to the water system to service the ultimate Everett Secondary Plan community (See **Table 3.1**).

**Table 3. 1: Existing Water System General Improvements to Service Everett Secondary Plan Area**

| Water System Element       | Limitations                                                                                                                                                       | Conclusion                                                                                                                                     |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Aquifer                    | Limited to Average Daily Demand of 2,500 m <sup>3</sup> /d.                                                                                                       | No Improvements Required to Service Ultimate Development.                                                                                      |
| Water Supply and Treatment | Grohal and Ballpark Wells and Treatment limited to a Maximum Daily Demand of 2,826 m <sup>3</sup> /d or Equivalent Residential Population (ERP) of 5,359 Persons. | New Supply Well and Treatment Required to Supply Water to Equivalent Residential Population (ERP) is Greater than 5,359 Persons.               |
| Water Storage              | Existing Storage Facility Capacity is Limited to 1,600 m <sup>3</sup> or an ERP of 3,405 persons.                                                                 | Improvements to Water Distribution Storage System Required to Meet MOE Volumetric Storage Requirements once ERP is Greater than 3,405 persons. |
| Distribution System        | Limited to Existing Service Area.                                                                                                                                 | Expansion of Water Distribution and System Pressure Head Required Service New Community Growth.                                                |

In order to evaluate the proposed alternative solutions, the above referenced deficiencies, each of the options was assessed with respect to their strengths and weaknesses in terms of the following general criteria:

- Natural Environment Impacts:
  - o Impacts of the option to vegetation, wildlife and surface/groundwater quality.
- Social / Cultural Environment Impacts:
  - o Existing/future land use impacts of the option;
  - o Traffic impacts of the option;
  - o Archaeological considerations associated with the option; and,
  - o Visual landscape/aesthetic impacts of the option.
- Economic Impacts:
  - o Capital/construction costs associated with the option;
  - o Long term/operational costs for the option; and,
  - o Payment structure and responsibility for the costs associated with the option.
- Technical/Operational Considerations:

- o Impacts of the option to existing wastewater treatment activities;
- o Efficiency of the Option from an operations and maintenance perspective; and
- o Difficulty to construct or implement the Option relative to other alternatives.

### 3.2 WATER SUPPLY AND TREATMENT ALTERNATIVES

Based upon the existing conditions analysis completed in **Chapter 2.0** and summarized in **Table 3.1**, improvements will be required to the existing well, well pump and treatment systems. For the ultimate serving population of 10,669 ERPs, a maximum daily demand of 5,575 m<sup>3</sup>/d (**See Appendix WS-B**) has been estimated. As such, to achieve a capacity equivalent to the MDD, the improvements in **Table 3.2** are required.

**Table 3. 2 Well and Pump System Required Improvements**

| Well +Well Pump    | Ex. Capacity (m <sup>3</sup> /d) | Ultimate Capacity (m <sup>3</sup> /d) | Comment                    |
|--------------------|----------------------------------|---------------------------------------|----------------------------|
| Ballpark           | 1,951                            | 1,951                                 | -                          |
| Grohal             | 1,873                            | 1,875                                 | -                          |
| Grohal Alternate   | 950                              | 950                                   | -                          |
| New Well and Pump  | -                                | 1,380                                 | Requires New Well and Pump |
| New Well Alternate | -                                | 1,380                                 |                            |
| Firm Capacity      | 2,826                            | 5,585                                 | -                          |

Based on the foregoing a new well, well pump and treatment system are required in Everett to service the ultimate community in the Everett Secondary Plan.

A long list of alternative water supply and treatment alternative solutions were developed as part of this study and are presented in **Table 3.3**.

**Table 3. 3 Community of Everett Water Supply and Treatment Alternative**

| Alternative                                                | Description                                                                                                                  |
|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| WST-1 Do Nothing                                           | Maintain the status quo.                                                                                                     |
| WST-2 Water Conservation                                   | Reducing existing conditions water use to create additional system capacity for new development                              |
| WST-3 Increase Existing Capacity                           | This option would involve improve the existing well pumps and treatment system capacities.                                   |
| WST-4: New Well and Treatment System                       | Construct new well, well pump and treatment system to service the new area.                                                  |
| WST-5 Transport Water from Neighboring Source Municipality | Construct a water main system between Everett and another municipality and import water from another source or municipality. |

### 3.2.1 WST-1 Do Nothing

This option represents the status quo with respect to water supply and treatment. Under this alternative solution, supply and treatment would be limited to an ultimate service population of 5,359 persons and would not satisfy the growth goals of Everett Secondary Plan. As such, this option was not considered further in the evaluation of alternative solutions.

### 3.2.2 WST-2 Water Conservation

In some cases, water conservation measures can reduce water demand on existing supply and treatment facilities and increase available capacity. Given the scope of proposed development within the Secondary Plan Area and the already low existing water usage rates, this would not be a viable alternative solution for the ultimate development of the Everett Secondary Plan. However, it could be considered a complementary solution to the recommended preferred water servicing alternative in the Community of Everett.

### 3.2.3 WST-3 Increase Existing Capacity

This option would involve increasing the capacity of the existing well pump and water treatment systems to supply additional water demand to new community growth. Based on the hydrogeological investigation completed for this Study (**Appendix WS-B**), the existing wells are at capacity (due to well screen capacity) operating at 75%-85% of their theoretical capacity. This Study recommends that the operating (MOE PTTW) capacities should not be exceeded. As such, this option cannot achieve the required Secondary Plan ultimate water demand and it is not considered further in this Study.

### 3.2.4 WST-4 New Well and Treatment System

The solution under option WST-4 would include the following:

- A new primary 200 mm diameter well and pumping station, chlorination system and contact chamber with a capacity of 1,380 m<sup>3</sup>/d;
- An alternate 200 mm diameter well and well pump with a capacity of 1,380 m<sup>3</sup>/d.

With the commissioning of the proposed system under this option, the firm capacity of the Everett well system would be 5,585 m<sup>3</sup>/d which is greater than the ultimate M.D.D. for the Everett Secondary Plan of 5,575 m<sup>3</sup>/d. Two (2) locations have been identified for the new wells per the recommendations of the Golder Associates (November 2012) Preliminary Hydrogeological Study (**See Appendix WS-B**).

Location WST-4a - Within a 100 m radius of the existing Grohal well; and,

Location WST-4b - Block 315 within the R&M Homes Subdivision Draft Plan, at the north end of Secondary Study Area.

### 3.2.5 WST-5 Transport Water from Neighboring source Municipality

This option would involve transporting water from another municipality to fulfill the needs of ultimate development. Under this option, significant length of the watermain would need to

be installed. Significant costs are associated with installing and maintaining a watermain system. Therefore, it is not a feasible option to pursue this financially.

Moreover, there is no need for this option, as the Township can continue to develop the aquifer in Everett to supply its current and future water demand needs. This option was not shortlisted for future consideration in this Study.

### 3.2.6 Summary

Based upon the foregoing options WST-4a AND WST-4b were shortlisted for future evaluation in **Chapter 4**.

## 3.3 WATER STORAGE ALTERNATIVES

The Everett Water Master Servicing Report considered planning options to provide additional storage for a design population 10,669. As presented herein, additional water storage is required once population reaches 3,405 equivalent population persons (ERPs). Based on the MOE water service requirements for an ERP of 10,669 persons, a total of 4,321 m<sup>3</sup> of water storage is required. A summary of water storage alternatives considered in this Study are described in the following subsections.

### 3.3.1 Do Nothing

This option represented the status quo with respect to water distribution and water storage if the other alternative solutions were not implemented. As existing servicing capacity is limited by water storage, this option would not allow for future development above 3,405 ERPs and its selection would not satisfy the growth goals of the Everett Secondary Plan. As such, this option would not be a viable alternative and was not considered further in the evaluation of alternatives solutions.

### 3.3.2 WS-1 Expand Existing Storage

Homes in the Community of Everett are currently serviced by an existing in-ground water storage facility located at the south east end of the Secondary Plan Area. This option represents expanding the existing water storage system to meet the water storage requirements for future development conditions. This option would provide the most economical solution for water storage upgrades. **Figure A-2** in **Appendix WS-A** presents the location of the existing storage facility.

However, the current storage operating elevation is at 281.4 m, and comprehensive hydraulic modeling undertaken as part of this study indicates that the majority of community would not meet MOE pressure requirements with a hydraulic operating head at this level under the ultimate development of the Secondary Plan. Therefore, this option was eliminated from further consideration in this Study.

### 3.3.3 WS-2/WS-3 New Storage or Expanded Storage at Existing Location

This alternative was based on retrofitting the existing system to meet MOE volumetric storage requirements. As existing storage was operated under grade elevation, water



storage pressure could be increased by elevating and expanding the storage tank/facility to increase pressure head and storage volume. This would be achieved by constructing a new elevated storage facility (WS-2) or expanding existing in-ground storage complete with booster pumping (WS-3).

MOE standards and guidelines require that storage facility be increased to a total of 4,321 m<sup>3</sup> from the existing 1,600 m<sup>3</sup> to satisfy the storage requirement. Comprehensive hydraulic model was undertaken to represent the aforementioned scenarios. Simulations indicate when storage facility operated at initial hydraulic grade elevation of 292.2 m (**See Appendix WS-D**), water pressure for all demand scenarios and 30 L/s Fire + MDD can be achieved throughout the ultimate water distribution system. Due to the high ground elevation, water pressure of the ADD and MDD for Junction nodes J-154 and J-155 were not able to be achieved, i.e. undeveloped land adjacent to the storage facility.

Operating parameters for the storage facility under this option are summarized in **Table 3.4**.

| <b>Table 3. 4 Elevated Storage Facility Operating Elevation Summary</b> |                 |
|-------------------------------------------------------------------------|-----------------|
| <b>Option WS-2</b>                                                      |                 |
| Bottom Elevation                                                        | 289.62 m        |
| Initial Operating Elevation                                             | 292.20 m        |
| Top Elevation                                                           | 301.81 m        |
| Ground Elevation                                                        | 282.00 m        |
| Diameter of the Tank                                                    | 22.86 m         |
| Head Range                                                              | 12.20 m         |
| Pedestal Diameter                                                       | 11.60 – 12.80 m |

### 3.3.4 WS-4 Elevated storage at new location (NW)

This option represents the alternative solution of maintaining the existing storage facility and constructing a new storage facility to meet the remaining storage volume requirements as well as hydraulic requirements at a new location.

The projected storage requirement for the Everett Community is 4,321 m<sup>3</sup>. The existing storage facility has an approximately 1,600 m<sup>3</sup> of useable capacity; therefore a new storage facility with a total capacity of 2,721 m<sup>3</sup> would be required. The area to the southeast of County Road 5 and Concession Road 4 was proposed for the location. See **Figure A-3, Appendix WS-A** for the proposed location. Simulations generated from hydraulic model indicate when the storage facility operated at initial operating hydraulic grade elevation of 304.3 m, water pressure for all demand scenarios and 30 L/s Fire + MDD can be achieved throughout the system. The ground elevation was 254 m, which is the highest elevation in the area.

The operating elevation parameters for the existing storage facility under this option are summarized in **Table 3.5**.

| <b>Table 3. 5 Storage Facility Operating Elevation Summary<br/>Option WS-4</b> |                 |
|--------------------------------------------------------------------------------|-----------------|
| Bottom Elevation                                                               | 296.66m         |
| Initial Operating Elevation                                                    | 304.30 m        |
| Top Elevation                                                                  | 308.86 m        |
| Ground Elevation                                                               | 254.00 m        |
| Diameter of the Tank                                                           | 22.86 m         |
| Head Range                                                                     | 12.20 m         |
| Pedestal Diameter                                                              | 11.60 – 12.80 m |

### 3.3.5 Summary

Based upon the forgoing Options WS-2, WS-3 and WS-4 were shortlisted for detailed evaluation in **Chapter 4**.

## 3.4 WATER DISTRIBUTION SYSTEM ALTERNATIVES

The existing water distribution system does not provide water main service to the new growth areas identified in the Everett Secondary Plan. Therefore, new trunk watermain on local streets will be required to provide sufficient water demand and pressure. A summary evaluation of alternatives for water distribution are presented in the following subsections and shown graphically in **Figure 3.2** and **Figure 3.3**, as well as **Appendix WS-A**.

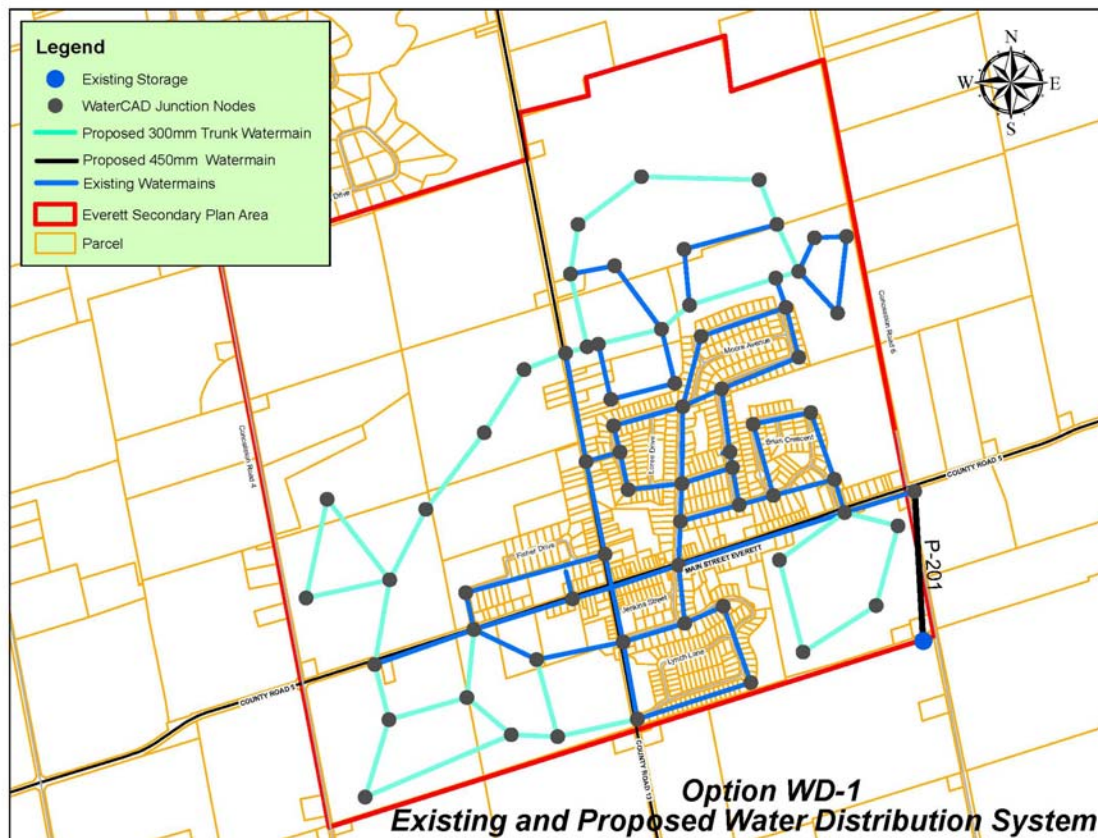
### 3.4.1 Do Nothing

This option represents the status quo but does not satisfy the study objectives and was not considered for further in this study.

### 3.4.2 WD--1 New Trunk 300 mm Watermain with 450 mm Upgrade to Ex. Watermain from Ex. Storage to County Road 5

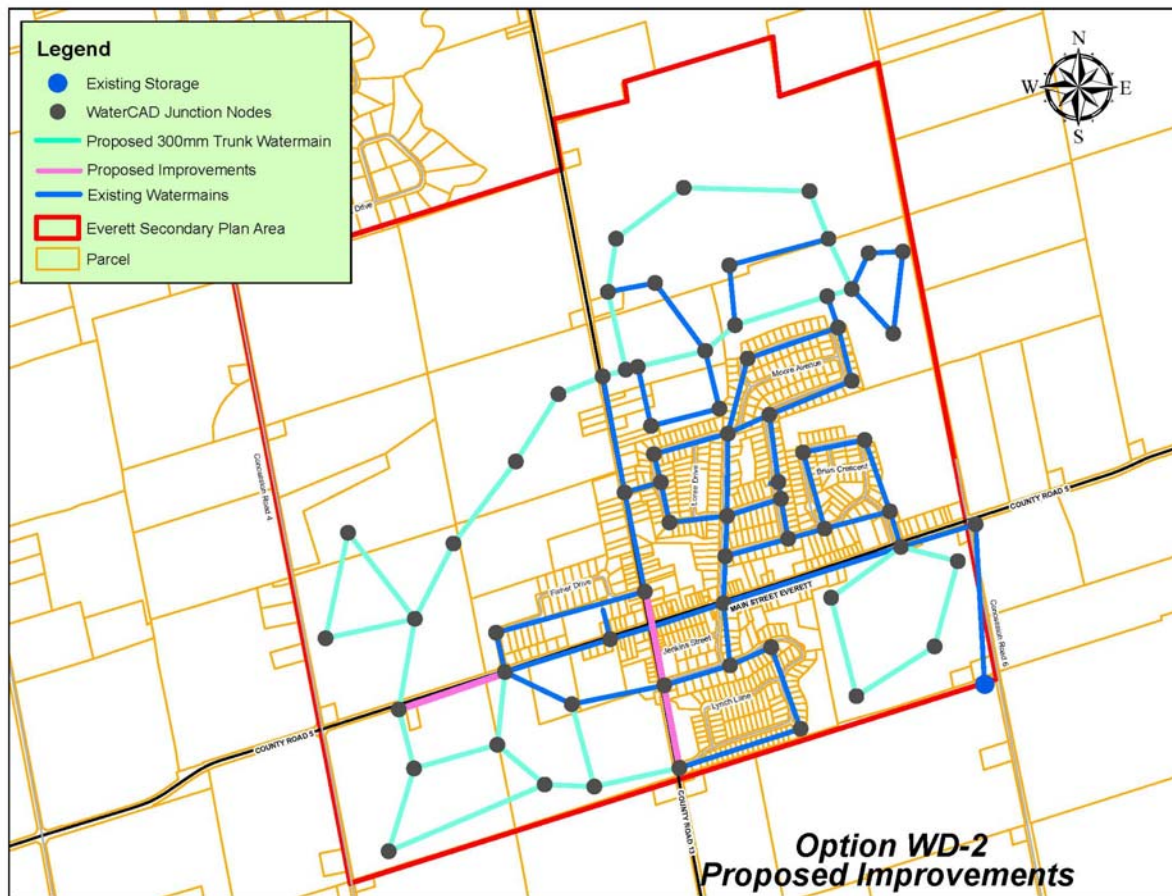
Under this option all new trunk watermain in the Community of Everett will be a minimum 300 mm diameter, and the existing watermain (Pipe ID: P-201) from the existing storage facility and County Road 5 will be upgrade to a 450 mm diameter water main for both water storage options considered in **Section 3.3**. This option is presented in **Table 3.6** and **Figure 3.2**.

| <b>Table 3. 6 Upgrade on Existing Watermain<br/>Option WD-1</b> |                        |                        |            |
|-----------------------------------------------------------------|------------------------|------------------------|------------|
| Watermain ID                                                    | Existing Diameter (mm) | Proposed Diameter (mm) | Length (m) |
| P-201                                                           | 300                    | 450                    | 614        |

**Figure 3. 2 Existing and Proposed Water Distribution System - Option WD-1**

### 3.4.3 WD-2 New 300 mm Trunk Watermain with 300 MM Upgrades to Ex. Watermain on County Road 5 and County Road 13

Option WD2 is same as option WD1 except watermain on County Road 5 and County Road 13 are upgraded to 300 mm diameter as shown in **Figure 3.3** to provide a 300 mm diameter trunk watermain loop for the ultimate Everett Secondary Plan. Based on the hydraulic assessment completed for both water storage and distribution options, option WD2 provides no hydraulic advantage over option WD1.

**Figure 3.3 Proposed Improvements – Option WD-2**

### 3.4.4 Summary

Based upon the foregoing, both water distribution system option improvements WD-1 and WD-2 were considered and evaluated in additional detail in **Chapter 4**.

## 4.0 SELECTION OF RECOMMENDED SOLUTION (FINAL EVALUATION OF ALTERNATIVES)

### 4.1 EVALUATION CRITERIA FOR RECOMMENDED SOLUTIONS

As part of the final solution selection process, two (2) supply and treatment solutions, three (3) water storage alternatives solutions and two (2) water distribution alternative solutions were assessed in terms of the evaluation criteria presented in **Chapter 3**.

Criteria highlighted in “green” represent the most preferred alternative, while “yellow” criteria represent less preferred alternatives and criteria in “red” represent the least preferred alternative.

The evaluation criteria used to select the recommended solution are as follows:

- Natural Environment Impacts:
  - o Impacts of the option to vegetation, wildlife & the Natural Environment; and
  - o Surface/groundwater quality and quantity implications;
- Social/Cultural Environment Impacts:
  - o Land Use & Archaeological Considerations (Including First Nations);
  - o Traffic impacts & interruption to residents; and
  - o Visual landscape/Aesthetic impacts;
- Technical/Operational Considerations
  - o Difficulty to construct or implement the Option relative to other alternatives; and
  - o Operation & Maintenance Efficiency;
- Economic Impacts
  - o Capital/construction costs;
  - o Long term/operation & maintenance cost burden; and
  - o Payment structure, cost recovery options for Municipality, Phasing Flexibility.

| Table 4.1 - Water Supply and Treatment Options & Rankings               |                                                                                                                                                                                                                                                                                    |                                                                                                                                                                    |
|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Evaluation Criteria                                                     | Alternative WST-4a                                                                                                                                                                                                                                                                 | Alternative WST-4b                                                                                                                                                 |
|                                                                         | New Well to be Constructed 100 m Away from Ex. Grohal Well                                                                                                                                                                                                                         | R&M Home Subdivision - Block 315 North End of Secondary Plan Area                                                                                                  |
| <b>Natural Environment Impacts</b>                                      |                                                                                                                                                                                                                                                                                    |                                                                                                                                                                    |
| Impacts of the option to vegetation, wildlife & the Natural Environment | Additional land is required for the new well, treatment facility and pumping station; Possible impact on vegetation and tree removal for the construction area.                                                                                                                    | Additional land is required for the new well, treatment facility and pumping station; Possible impact on vegetation and tree removal for the construction area.    |
| Surface/groundwater quality implications                                | Minimum impacts. However, a greater distance from existing well is preferred to widen capture zone.                                                                                                                                                                                | This location would help to widen the zone of capture for the wells and increase the recharge area for the Everett water supply system.                            |
| <b>Natural Environment Overall Rating</b>                               |                                                                                                                                                                                                                                                                                    |                                                                                                                                                                    |
| <b>Social / Cultural Environment Impacts</b>                            |                                                                                                                                                                                                                                                                                    |                                                                                                                                                                    |
| Land Use & Archaeological Considerations (Including First Nations)      | The property has previously been disturbed for the construction of existing well and treatment facility. Features are considered to be non-existent. However, additional land areas is required for new well and treatment facility. It will increase additional impact potential. | The property is located in a residential subdivision which is draft plan approved. Proposed location is sited in a low potential area for archaeological features. |
| Traffic impacts & interruption to residents                             | Some impacts to existing residents, as construction traffic will be in residential areas.                                                                                                                                                                                          | Some impacts to existing residents, as construction traffic will be in residential areas.                                                                          |
| Visual landscape/Aesthetic impacts                                      | Minimal visual impact as the construction will be below grade, except the well house.                                                                                                                                                                                              | Minimal visual impact as the construction will be below grade, except the well house.                                                                              |
| <b>Social / Cultural Environment Overall Rating</b>                     |                                                                                                                                                                                                                                                                                    |                                                                                                                                                                    |



| <b>Table 4.1 - Water Supply and Treatment Options &amp; Rankings</b>           |                                                                                                                                                                       |                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Evaluation Criteria</b>                                                     | <b><u>Alternative WST-4a</u></b><br>New Well to be Constructed 100 m Away from Ex. Grohal Well                                                                        | <b><u>Alternative WST-4b</u></b><br>R&M Home Subdivision - Block 315 North End of Secondary Plan Area                                                                                                                                          |
| <b>Technical/Operational Considerations</b>                                    |                                                                                                                                                                       |                                                                                                                                                                                                                                                |
| Difficulty to construct or implement the Option relative to other alternatives | Based on existing Grohal well, the aquifer is relatively uniform, thickness of aquifer is approximately 8.9 m                                                         | The aquifer appears to thicken toward the north (approximately 20 m).                                                                                                                                                                          |
| Operation & Maintenance Efficiency                                             | The aquifer is relatively uniform; thickness of aquifer is approximately 8.9 m, less efficient than Option WST-4b.                                                    | The location of a well offset from the existing wells toward the north would widen the zone of capture for the wells and increase the recharge area for the Everett water supply system. Thicker aquifer presents better operation efficiency. |
| <b>Technical/Operational Considerations</b>                                    |                                                                                                                                                                       |                                                                                                                                                                                                                                                |
| <b>Economic Impacts</b>                                                        |                                                                                                                                                                       |                                                                                                                                                                                                                                                |
| Capital/construction costs                                                     | Will require a new 200 mm diameter well and pumping station with chlorination treatment system. Minimum contact chamber capacity of 1,380 m <sup>3</sup> /d (16 L/s). | Will require a new 200 mm diameter well and pumping station with chlorination treatment system. Minimum contact chamber capacity of 1,380 m <sup>3</sup> /d (16 L/s).                                                                          |
| Long term/operation & maintenance cost burden                                  | This option requires more operation and maintenance cost in long term compared to Option WST-4b.                                                                      | This option requires less operation and maintenance cost in long term as this location could increase the recharge area of Everett water supply system. Thicker aquifer presents better operation efficiency.                                  |
| Payment structure, cost recovery options for Municipality, Phasing Flexibility | Cost will be distributed to future developers; New well and treatment are required when population is greater than 5,359 equivalent persons.                          | Cost will be distributed to future developers; New well and treatment are required when population is greater than 5,359 equivalent persons.                                                                                                   |
| <b>Economic Ranking</b>                                                        |                                                                                                                                                                       |                                                                                                                                                                                                                                                |
| <b><u>Overall Ranking:</u></b>                                                 |                                                                                                                                                                       |                                                                                                                                                                                                                                                |

**Table 4.2 - Water Storage Options & Rankings**

| <b>Evaluation Criteria</b>                                              | <b><u>Alternative WS-2</u></b><br>Elevated Storage at Ex. Location                                                                                                              | <b><u>Alternative WS-3</u></b><br>Expanded Existing In-ground Storage<br>with Pumping                                                                                                                                                                                  | <b><u>Alternative WS-4</u></b><br>Elevated Storage at New Location                                                                                                                         |
|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Natural Environment Impacts</b>                                      |                                                                                                                                                                                 |                                                                                                                                                                                                                                                                        |                                                                                                                                                                                            |
| Impacts of the option to vegetation, wildlife & the Natural Environment | Minimum impact, as the area has already been disturbed.                                                                                                                         | Additional land is required for storage and pumping station; extensive electricity usage; deepest excavations.                                                                                                                                                         | Additional land is required for the new facility; Possible impact on vegetation and tree removal for the construction area.                                                                |
| Surface/groundwater quality implications                                | Minimum impact expected.                                                                                                                                                        | Creates pollution and impacts to groundwater due to new in-ground storage upgrades.                                                                                                                                                                                    | Minimum impact expected.                                                                                                                                                                   |
| <b>Natural Environment Overall Rating</b>                               |                                                                                                                                                                                 |                                                                                                                                                                                                                                                                        |                                                                                                                                                                                            |
| <b>Social / Cultural Environment Impacts</b>                            |                                                                                                                                                                                 |                                                                                                                                                                                                                                                                        |                                                                                                                                                                                            |
| Land Use & Archaeological Considerations (Including First Nations)      | The property has previously been disturbed for the construction of existing water storage facility thus archaeological features are considered to be non-existent at this site. | The property has previously been disturbed for the construction of existing water storage facility thus archaeological features are considered to be non-existent at this site; Additional land area will be required to facilitate the expansion and pumping station. | Archaeological features unknown – proposed location is sited in a low potential area for archaeological features; However, additional land area will be required for new elevated storage. |
| Traffic impacts & interruption to residents                             | Minimal construction impacts to existing residents, as construction traffic will be 4 km from residential areas.                                                                | Minimal construction impacts to existing residents, as construction traffic will be 4 km from residential areas.                                                                                                                                                       | Minimal construction impacts to existing residents, as construction traffic will be 2 km from residential areas.                                                                           |
| Visual landscape/<br>Aesthetic impacts                                  | Visual impact as the location is approximately 4 km from the existing and proposed residences, but elevated above existing grade.                                               | Lowest visual impact as the location is approximately 4 km from the existing and proposed residences and it is largely below grade.                                                                                                                                    | Visual impact on adjacent residents is highest of all options as this is the tallest proposed facility.                                                                                    |
| <b>Social / Cultural Environment Overall Rating</b>                     |                                                                                                                                                                                 |                                                                                                                                                                                                                                                                        |                                                                                                                                                                                            |

Table 4.2 - Water Storage Options &amp; Rankings

| Evaluation Criteria                                                            | <u>Alternative WS-2</u><br>Elevated Storage at Ex. Location                                                                                                                                                                                        | <u>Alternative WS-3</u><br>Expanded Existing In-ground Storage with Pumping                                                                                                                                                                                                                           | <u>Alternative WS-4</u><br>Elevated Storage at New Location                                                                                                                                                                                                                                      |
|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Technical/Operational Considerations</b>                                    |                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                  |
| Difficulty to construct or implement the Option relative to other alternatives | Elevated storage will be 19 meters in height. Phasing not possible.                                                                                                                                                                                | Expansion of existing in-ground storage is less difficult compared to new elevated storage, but will require additional land area to facilitate.                                                                                                                                                      | Elevated storage will be minimum 56 meters in height.                                                                                                                                                                                                                                            |
| Operation & Maintenance Efficiency                                             | Single storage facility.                                                                                                                                                                                                                           | Single storage facility with pumping and back-up generator.                                                                                                                                                                                                                                           | Maintenance efforts are increased as two water storage facilities will be operated at same time for this option.                                                                                                                                                                                 |
| <b>Technical/Operational Considerations Rating</b>                             |                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                  |
| <b>Economic Impacts</b>                                                        |                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                  |
| Capital/construction costs                                                     | Will require a new elevated water storage facility at existing water storage facility site. The cost of the elevated storage tower is 8.2 million dollars. The operating and maintenance cost is minimal. The cost is fairly close to Option WS-3. | Will require an expansion to existing in-ground water storage facility; new booster station is required to be built; additional land may be required. The cost of expanded in-ground storage with pumping will be 7.9 million dollars. This option requires additional operating and maintenance cost | Will require a new elevated storage facility at central west of the study area; additional land may be required to be purchased; the facility will cost much more than building the elevated storage at existing site. The cost of elevated storage at new location will be 8.3 million dollars. |
| Long term/operation & maintenance cost burden                                  | Single storage facility.                                                                                                                                                                                                                           | Additional budget will be needed towards to booster station/pump maintenance cost, electricity, human resources and etc.                                                                                                                                                                              | Maintenance efforts are increased as two water storage facilities will be operated at same time for this option.                                                                                                                                                                                 |
| Payment structure, cost recovery options for Municipality, Phasing Flexibility | Cost will be distributed to future developers; new storage facility will be required when population reaches 3,405.                                                                                                                                | Cost will be distributed to future developers; new storage facility will be required when population reaches 3,405.                                                                                                                                                                                   | Cost will be distributed to future developers in a longer term; new storage facility will be required when population reaches 3,405; Potentially complicated by higher cost.                                                                                                                     |
| <b>Economic Ranking</b>                                                        |                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                  |
| <b><u>Overall Ranking:</u></b>                                                 |                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                  |

Table 4.3 Water Distribution Options &amp; Rankings

| Evaluation Criteria                                                     | <u>Alternative WD-1</u><br>New 300 mm Trunk Watermain with 450 mm Upgrade to Ex. Watermain from Ex. Storage to County Road 5                                                   | <u>Alternative WD-2</u><br>New 300 mm Trunk Watermain with Looping 300mm Upgrade to Ex. Watermain on County Road 5 and County Road 13                                                                                                                                  |
|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Natural Environment Impacts</b>                                      |                                                                                                                                                                                |                                                                                                                                                                                                                                                                        |
| Impacts of the option to vegetation, wildlife & the Natural Environment | Minimum impact, smaller construction area.                                                                                                                                     | Minimum impact, larger construction area.                                                                                                                                                                                                                              |
| Surface/groundwater quality implications                                | Watermain is above groundwater level, de-watering may not be required.                                                                                                         | Watermain is above groundwater level, de-watering may not be required.                                                                                                                                                                                                 |
| <b>Natural Environment Overall Rating</b>                               |                                                                                                                                                                                |                                                                                                                                                                                                                                                                        |
| <b>Social / Cultural Environment Impacts</b>                            |                                                                                                                                                                                |                                                                                                                                                                                                                                                                        |
| Land Use & Archaeological Considerations (Including First Nations)      | The property has previously been disturbed for the construction of existing water storage facility thus archaeological features is considered to be non-existent at this site. | The property has previously been disturbed for the construction of existing water storage facility. Features are considered to be non-existent at this site of the 450 mm watermain. However, County Road watermain improvements increase additional impact potential. |
| Traffic impacts & interruption to residents                             | Minimal construction impacts to existing residents, as construction traffic will be 4 km from residential areas.                                                               | Some impacts to existing residents, as construction traffic will be in residential areas on County roads.                                                                                                                                                              |
| Visual landscape/Aesthetic impacts                                      | Minimal visual impact as the location is approximately 4 km from the existing and proposed residences.                                                                         | Minimum permanent visual impact similar to Option WD-1.                                                                                                                                                                                                                |
| <b>Social / Cultural Environment Overall Rating</b>                     |                                                                                                                                                                                |                                                                                                                                                                                                                                                                        |

**Table 4.3 - Water Distribution Options & Rankings**

| Evaluation Criteria                                                            | <u>Alternative WD-1</u>                                                                                                                          | <u>Alternative WD-2</u>                                                                                                                          |
|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                | <u>New 300 mm Trunk Watermain with 450 mm Upgrade to Ex. Watermain from Ex. Storage to County Road 5</u>                                         | <u>New 300 mm Trunk Watermain with Looping 300mm Upgrade to Ex. Watermain on County Road 5 and County Road 13</u>                                |
| <b>Technical/Operational Considerations</b>                                    |                                                                                                                                                  |                                                                                                                                                  |
| Difficulty to construct or implement the Option relative to other alternatives | Will require a new trunk water main with an upgrade to existing water main in rural areas, approximately 600 m.                                  | Will require a trunk water main with an upgrade to existing water main in urban areas, approximately 1,200 m.                                    |
| Operation & Maintenance Efficiency                                             | Minimum additional water costs for replacement fittings etc, and water for flushing.                                                             | No additional maintenance is required.                                                                                                           |
| <b>Technical/Operational Considerations Rating</b>                             |                                                                                                                                                  |                                                                                                                                                  |
| <b>Economic Impacts</b>                                                        |                                                                                                                                                  |                                                                                                                                                  |
| Capital/construction costs                                                     | Will require a new 300 mm trunk water main with an upgrade to existing water main in rural areas, approximately 600 m.                           | Will require a new 300 mm trunk water main with an upgrade to existing water main in urban areas, approximately 1,200 m.                         |
| Long term/operation & maintenance cost burden                                  | Looping of watermain exists at watermain size less than 300 mm diameter.                                                                         | No impact to system water pressures. No additional maintenance is required.                                                                      |
| Payment structure, cost recovery options for Municipality, Phasing Flexibility | Cost will be distributed to future developers; Expansion of water distribution and system pressure head required to service new community growth | Cost will be distributed to future developers; Expansion of water distribution and system pressure head required to service new community growth |
| <b>Economic Ranking</b>                                                        |                                                                                                                                                  |                                                                                                                                                  |
| <b><u>Overall Ranking:</u></b>                                                 |                                                                                                                                                  |                                                                                                                                                  |

## 5.0 CONCLUSIONS

### 5.1 SELECTION OF RECOMMENDED PREFERRED SOLUTION

Based on the evaluation of Water Servicing Options presented in **Chapter 4**, the recommended preferred alternative was determined to be **Option WST-4, WS-3 and WD-1**, respectively for Water Supply and Treatment, Water Storage and Water Distribution. These preferred options provide the most cost effective long term servicing solution, while also offering phasing options for development within the Secondary Plan Area.

The recommended preferred alternative option for Water Servicing Master Plan for the Everett South Secondary Plan Area has the following characteristics:

- Construct a new primary well (200 mm diameter) and pumping station chlorination system and contact chamber with a minimum capacity of 1,380 m<sup>3</sup>/d prior the equivalent population exceeding approximately 5,000 people;
- Construct a new alternate well (200 mm diameter) and well pump with a minimum capacity of 1,380 m<sup>3</sup>/d prior the equivalent population exceeding approximately 5,000 people;
- Preferred location for the water supply and treatment system is at R&M Home Subdivision – Block 315, north end of Secondary Plan Area;
- In-ground storage facility to be expanded (minimum initial hydraulic grade elevation of 292.2 m) and a minimum volumetric storage of 4,321 m<sup>3</sup> to provide required pressure head;
- Construct a new trunk 300 mm watermain to provide trunk looping to service the ultimate servicing population of 10,669 persons; and,
- Twin the existing 300 mm watermain from the existing storage facility to County Road 5 with a 450 mm diameter water main.

### 5.2 MITIGATION AND MONITORING MEASURES

The impacts of Recommended Preferred Solutions can be minimized through implementation of mitigation and monitoring.

#### 5.2.1 Water Supply and Treatment

Option WS-4 offers the advantage of higher long-term operation and maintenance efficiency. The proposed location would help to widen the zone of capture for the wells and increase the recharge area for the Everett water supply system, with minimal disruption to existing residents. **Table 5.1** summarizes the potential impacts and methods of mitigation.





**Table 5.1 Water Supply and Treatment System Impacts and Mitigation**

| Potential Impact                            | Mitigation                                                                                                                                                                                                                                                                                                |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Traffic and Interruption to Local Residents | <ul style="list-style-type: none"> <li>Affected property owners will be notified in advanced as to construction schedule and duration.</li> <li>Consultation with MTO, the County of Simcoe, local utilities, local school boards and the Township may be required during construction period.</li> </ul> |
| Dust, Noise and Vibration                   | <ul style="list-style-type: none"> <li>Construction operations will be restricted to the day time period; in addition, the contractor will be required to meet local noise by-laws.</li> <li>Dust control will be implemented throughout construction.</li> </ul>                                         |
| Sediment & Erosion Control                  | <ul style="list-style-type: none"> <li>Sedimentation and erosion control strategies will be developed for each individual site prior to construction.</li> </ul>                                                                                                                                          |
| Removal of Vegetation                       | <ul style="list-style-type: none"> <li>Recommended solution minimized vegetation/tree removal.</li> </ul>                                                                                                                                                                                                 |

### 5.2.2 Expand Existing In-ground Water Storage

The implementation of Option WS-3 will have minimal impacts to the Community of Everett, as the existing site was previously disturbed. **Table 5.2** summarizes the potential impacts and methods of mitigation.

**Table 5.2 Elevated Water Storage Impacts and Mitigation**

| Potential Impact           | Mitigation                                                                                                                                                                                                                                                                                                                     |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Visual Impact              | <ul style="list-style-type: none"> <li>The expanded storage is located in the same location as the existing storage tanks, thereby minimizing visual impacts.</li> </ul>                                                                                                                                                       |
| Dust, Noise and Vibration  | <ul style="list-style-type: none"> <li>Construction operations will be restricted to the day time period; in addition, the contractor will be required to meet local noise by-laws.</li> <li>Dust control will be implemented throughout construction.</li> <li>The site is 4 km away from existing residents areas</li> </ul> |
| Sediment & Erosion Control | <ul style="list-style-type: none"> <li>Sedimentation and erosion control strategies will be developed for each individual site prior to construction.</li> </ul>                                                                                                                                                               |

### 5.2.3 Water Distribution

Implementation of Option WD-1 will have minimal impacts to the Community of Everett, as the new 300mm trunk watermain will be constructed within the Draft Plan approved areas

which are currently approved. The upgrade to the existing watermain between the existing storage facility and County Road 5 will have minimal impacts on residents as construction activities will be four (4) kilometers from residential areas. **Table 5.3** summarizes the potential impacts and methods of mitigation.

**Table 5.3 Water Distribution Impacts and Mitigation**

| Potential Impact                            | Mitigation                                                                                                                                                                                                                                                                   |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Traffic and Interruption to Local Residents | <ul style="list-style-type: none"><li>• Affected property owners will be notified in advanced as to construction schedule and duration.</li><li>• Consultation with MTO, local utilities, local school boards and the Township by-laws during construction period.</li></ul> |
| Dust, Noise and Vibration                   | <ul style="list-style-type: none"><li>• Construction operations will be restricted to the day time period; in addition, the contractor will be required to meet local noise by-laws.</li><li>• Dust control will be implemented throughout construction.</li></ul>           |
| Sediment & Erosion Control                  | <ul style="list-style-type: none"><li>• Sedimentation and erosion control strategies will be developed for each individual site prior to construction.</li></ul>                                                                                                             |
| Removal of Vegetation                       | <ul style="list-style-type: none"><li>• Recommended solution minimized vegetation/tree removal.</li></ul>                                                                                                                                                                    |

### 5.3 CLOSING REMARKS

We trust that the foregoing Water Servicing Master Plan Study report meets with the requirements and the goals for the Township's Everett Secondary Plan Area.

We look forward to working with the Township to implement the strategies outlined herein.

Sincerely,

**GREENLAND INTERNATIONAL CONSULTING LTD.**

Jim Hartman, P.Eng.  
Senior Associate



## **APPENDIX 'WS-A'**

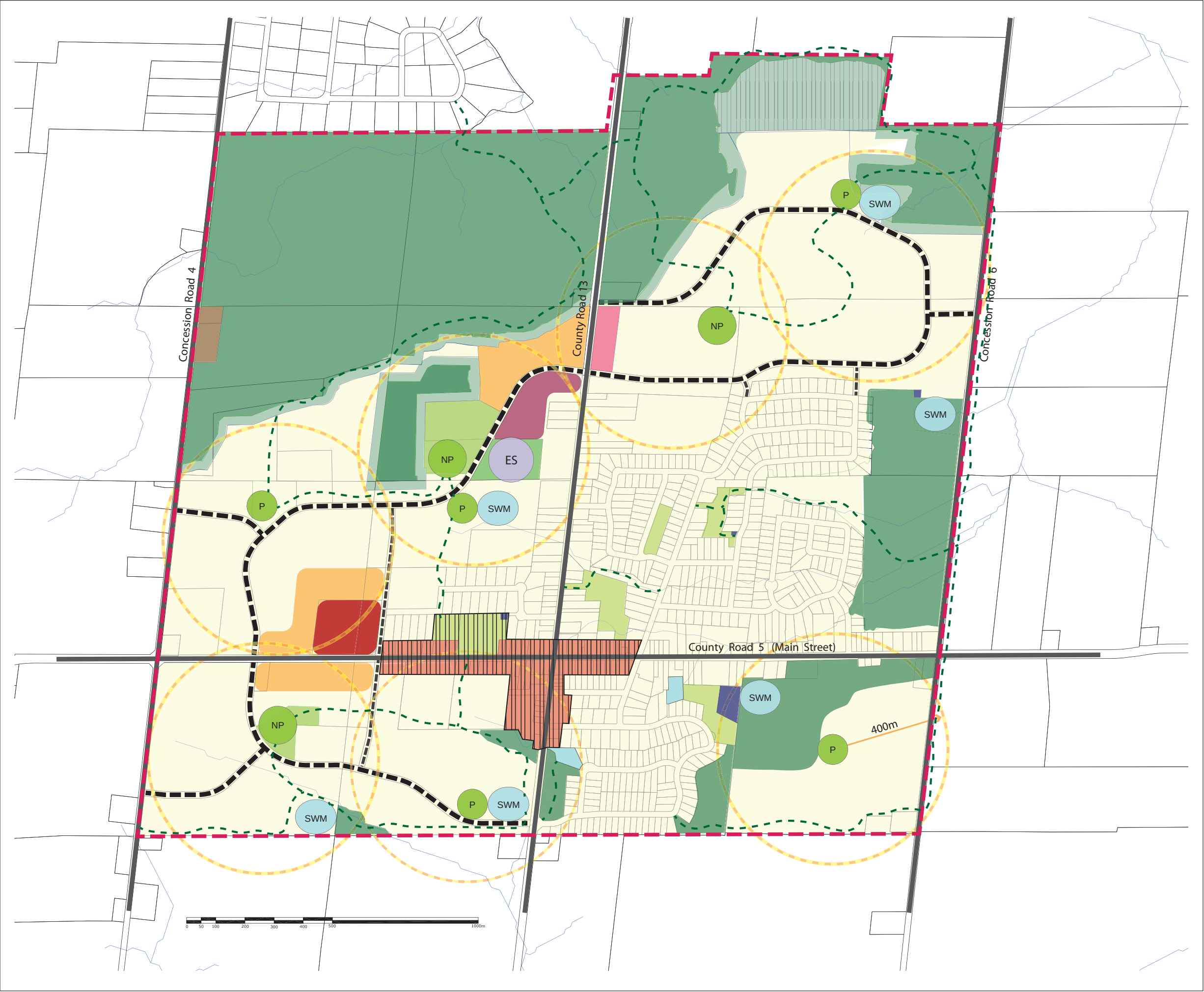
### **1) Report Figures**



Legend

- Proposed Secondary Plan Boundary
- Low Density Residential
- Medium Density Residential
- Rural Residential (previously approved)
- Convenience Commercial
- Main Street Mixed Use Area
- Neighbourhood Commercial
- Community Centre
- Existing Parks / Open Space
- Proposed Neighbourhood Park (NP)
- Proposed Parkette (P)
- Proposed Elementary School (ES)
- Existing SWM
- Proposed SWM
- Natural Heritage System
- 30.0m buffer
- Lands for further Study
- Proposed Local Road (20.0m)
- Proposed Collector Road (23.0m)
- Utilities
- Community Improvement Areas
- 400m Radius (5 minute walking distance)
- Proposed Trail Network

Everett Secondary  
Plan Study

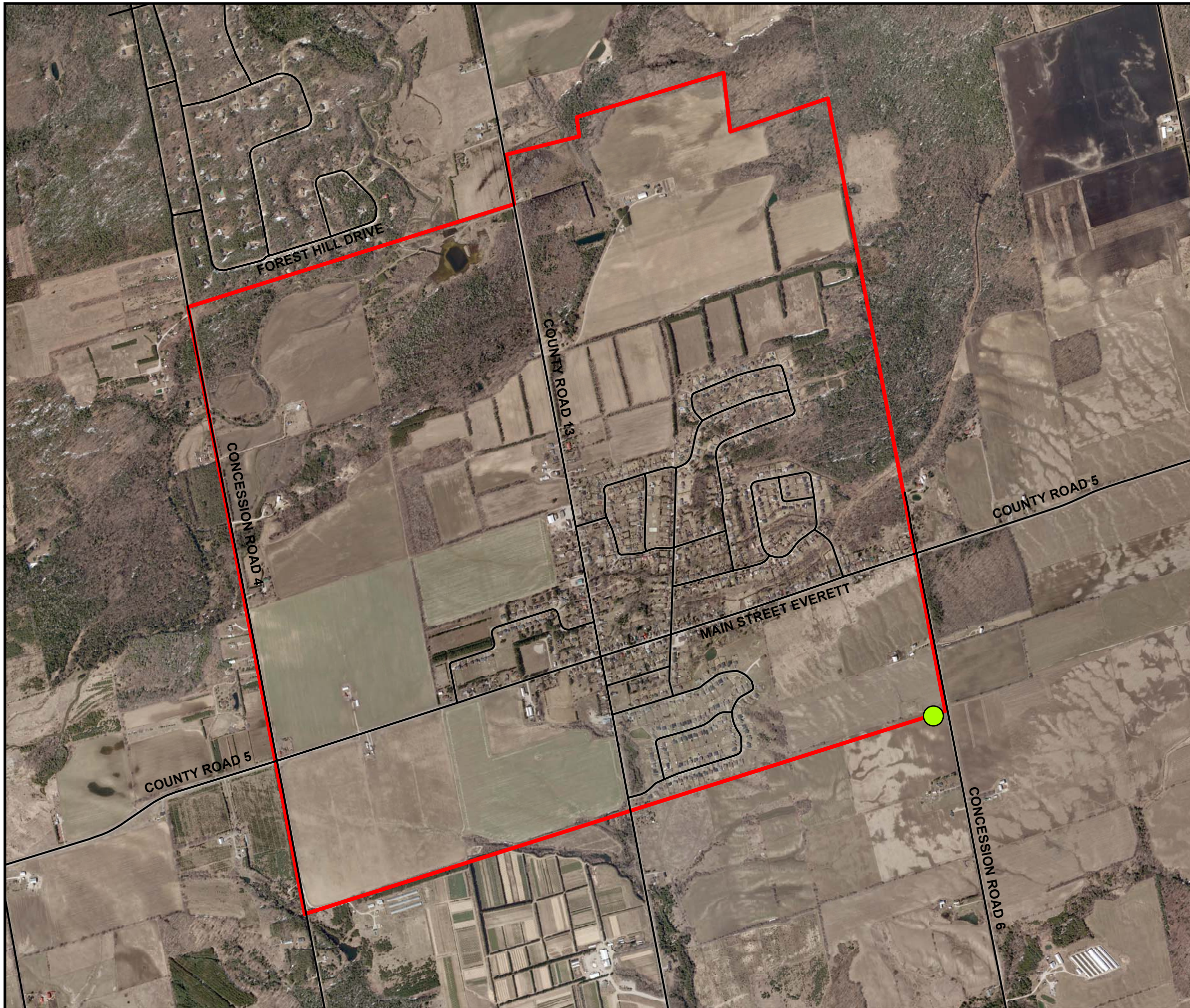




**Figure A-2**  
**Location of Existing**  
**In-Ground Water Storage**

**Legend**

-  Secondary Plan Study Area
-  Existing In-Ground Storage
-  Roads



1:15,000



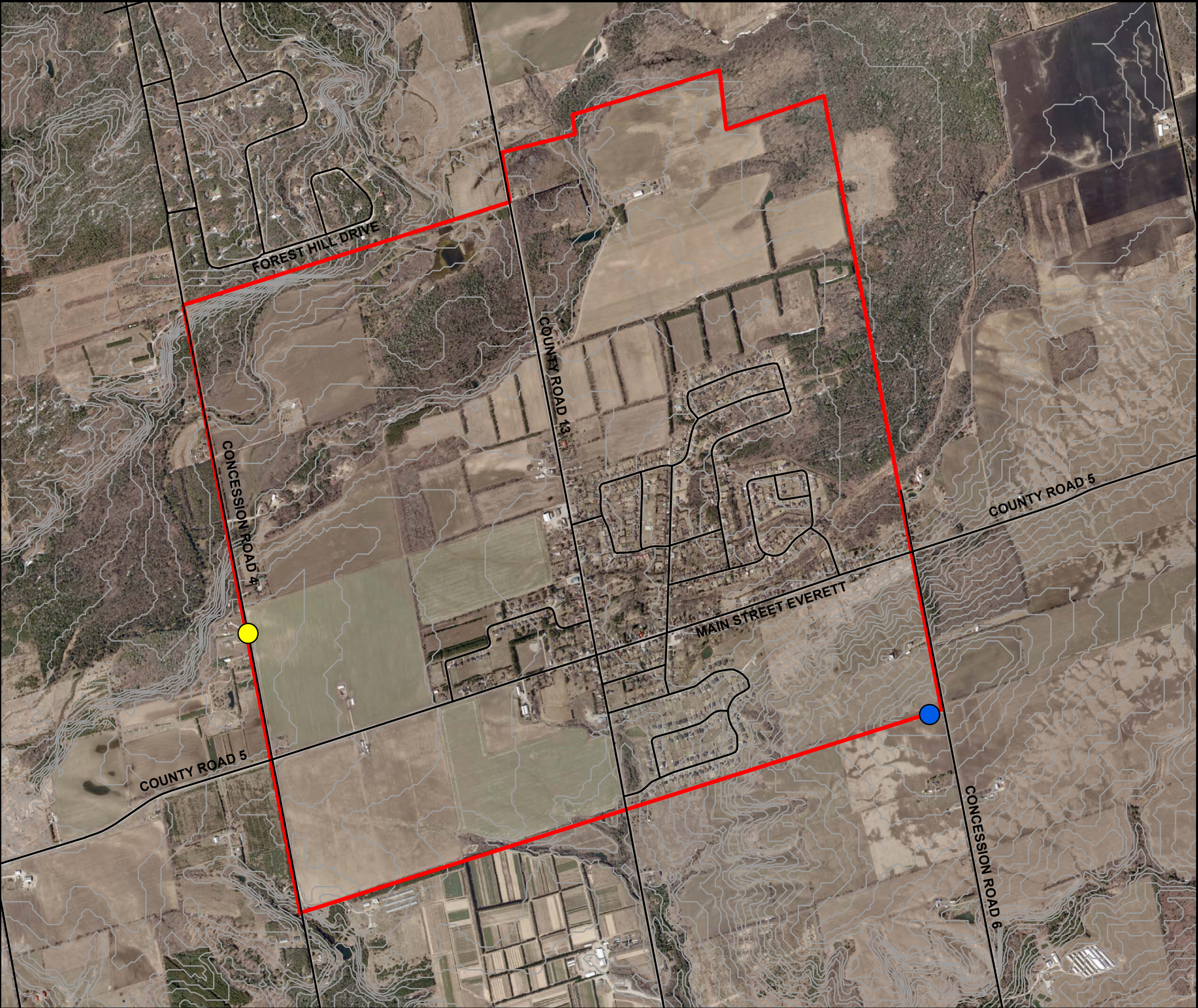
Notes:



**Figure A-3**  
**Proposed Location**  
**for Water Storage Options**

**Legend**

-  Option WS-4 - Proposed Elevated Water Storage at New Location
-  Option WS-2/WS-3 - New Storage or Expanded Storage at Existing Location
-  Secondary Plan Study Area
-  2 m Contour
-  Roads



1:15,000



Notes:



**Figure A-4  
Option WD-1**

**New Trunk Watermain with  
450mm Upgrade to Ex. Watermain  
from Ex. Storage to County Road 5**

**Legend**

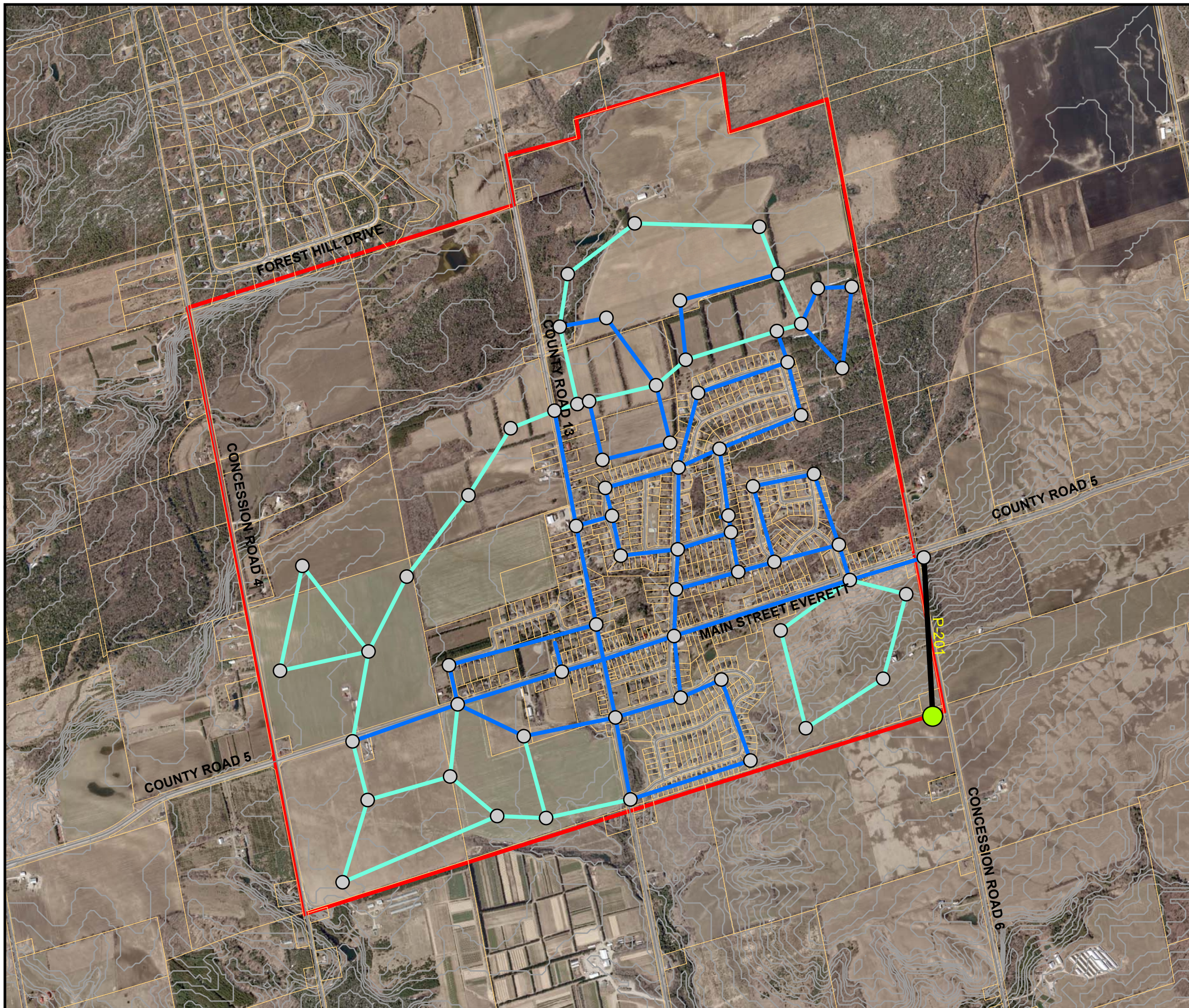
- WaterCAD Junction Nodes
- Existing In-Ground Storage
- Proposed 450mm Watermain
- Existing Watermain
- Proposed 300mm Trunk Watermain
- Parcel
- ▭ Secondary Plan Study Area
- Roads
- 2 m Contour



1:15,000



Notes:





**Figure A-5**  
**Option WD-2**

**New Trunk Watermain with  
300mm Upgrade to Ex. Watermain  
on County Road 5 and County Road 13**

**Legend**

- WaterCAD Junction Nodes
- Existing In-Ground Storage
- Existing Watermain
- Proposed 300mm Trunk Watermain
- Proposed Improvements
- ▭ Secondary Plan Study Area
- ▭ Parcel
- Roads
- 2 m Contour



1:15,000



Notes:



## **APPENDIX 'WS-B'**

### **1) Detailed Population and Demand Calculations**



| Parcel 1                       |                           | Area<br>(in hectares) | Units                                                                                                              | Population<br>(2.67 ppl/unit) | Sewage Flow<br>Factor | Units      | Source                                 | Avg. Sewage<br>Flow (L) per day | Equivalent<br>Population | Total E.<br>Pop. |
|--------------------------------|---------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------|------------|----------------------------------------|---------------------------------|--------------------------|------------------|
|                                | Parcel Area               | 88.92                 |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Retail                    |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Convenience Commercial    | 4.40                  |                                                                                                                    |                               | 2225                  | L per 1000 | sq .m - MOE Guidelines                 | 97900                           | 392                      |                  |
|                                | Main Street               | —                     |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Neighbourhood Commercial  | —                     |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | School + Services         |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Community Centres         | 8.00                  |                                                                                                                    |                               | 18000                 | L per d    | cum/yr for 8 mths per 2 ice pad - IIHF | 18000                           | 72                       |                  |
|                                | Elementary Schools        | 2.80                  |                                                                                                                    | 500                           | 70                    | L/std/d    | std per school - MOE Guidelines        | 35000                           | 140                      |                  |
|                                | Environmental             |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Parkland (5%)             | 4.45                  |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | SWM (5%)                  | 4.45                  |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Net Residential           | 64.83                 |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Future Units              |                       | 778                                                                                                                |                               |                       |            |                                        |                                 |                          |                  |
|                                | Future Population         |                       |                                                                                                                    | 2,077                         |                       |            |                                        | 519315                          | 2077                     | 2681             |
| Parcel 2                       |                           |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Parcel Area               | 39.75                 |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Retail                    |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Convenience Commercial    | —                     |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Main Street               | —                     |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Neighbourhood Commercial  | —                     |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | School + Services         |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Community Centres         | —                     |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Elementary Schools        | 2.80                  |                                                                                                                    | 250                           | 70                    | L/std/d    | std per school - MOE Guidelines        | 17500                           | 70                       |                  |
|                                | Environmental             |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Parkland (5%)             | 1.99                  |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | SWM (5%)                  | 1.99                  |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Net Residential           | 32.98                 |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Future Units              |                       | 396                                                                                                                |                               |                       |            |                                        |                                 |                          |                  |
|                                | Future Population         |                       |                                                                                                                    | 1,057                         |                       |            |                                        | 264330                          | 1057                     | 1127             |
| Parcel 3                       |                           |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Parcel Area               | 9.31                  |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Retail                    |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Main Street               | 1.09                  |                                                                                                                    |                               | 25                    | cum /ha    | MOE Guidelines (commercial)            | 27250                           | 109                      |                  |
|                                | School + Services         |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Community Centres         | —                     |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Elementary Schools        | —                     |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Environmental             |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Parkland (5%)             | 0.47                  |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | SWM (5%)                  | 0.47                  |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Net Residential           | 7.29                  |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Future Units              |                       | 87                                                                                                                 |                               |                       |            |                                        |                                 |                          |                  |
|                                | Future Population         |                       |                                                                                                                    | 232                           |                       |            |                                        | 58073                           | 232                      | 341              |
| Parcel 4                       |                           |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Parcel Area               | 36.39                 |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Retail                    |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Convenience Commercial    | 0.60                  |                                                                                                                    |                               | 2225                  | L per 1000 | sq .m - MOE Guidelines (shop centre)   | 13350                           | 53                       |                  |
|                                | School + Services         |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Community Centres         | —                     |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Elementary Schools        | —                     |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Environmental             |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Parkland (5%)             | 1.82                  |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | SWM (5%)                  | 1.82                  |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Net Residential           | 32.15                 |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Future Units              |                       | 386                                                                                                                |                               |                       |            |                                        |                                 |                          |                  |
|                                | Future Population         |                       |                                                                                                                    | 1,031                         |                       |            |                                        | 257655                          | 1031                     | 1084             |
| In Process - R&M Homes         |                           |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Parcel Area               | 54.20                 | *Area/Unit Breakdown From Pearson McQuaig Report - R&M Homes Sanitary Servicing Report                             |                               |                       |            |                                        |                                 |                          |                  |
|                                | Retail                    |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | All Commercial            | 1.52                  |                                                                                                                    |                               | 25                    | cum /ha    | MOE Guidelines (commercial)            | 38000                           | 152                      |                  |
|                                | School + Services         |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Community Centres         | —                     |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Elementary Schools        | —                     |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Environmental (Estimated) |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Parkland (5%)             | 2.71                  |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | SWM (5%)                  | 2.71                  |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Net Residential           | 47.26                 | 492.00                                                                                                             | 10.41049513                   |                       |            |                                        |                                 |                          |                  |
|                                | Future Units              |                       | 492                                                                                                                |                               |                       |            |                                        |                                 |                          |                  |
|                                | Future Population         |                       |                                                                                                                    | 1,314                         |                       |            |                                        | 328410                          | 1314                     | 1466             |
| In Process - Barzo Development |                           |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Parcel Area               | 43.12                 | *Net Residential and Open Space Areas Measured from Most Recent Proposed Land Use Plan by the Planning Partnership |                               |                       |            |                                        |                                 |                          |                  |
|                                | Retail                    |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | All Commercial            | 2.00                  |                                                                                                                    |                               | 2225                  | L per 1000 | sq .m - MOE Guidelines (shop centre)   | 44500                           | 178                      |                  |
|                                | School + Services         |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Community Centres         | —                     |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Elementary Schools        | —                     |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Environmental             |                       |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Parkland/Open Space (5%)  | 2.16                  |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | SWM (5%)                  | 2.16                  |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Net Residential           | 36.81                 |                                                                                                                    |                               |                       |            |                                        |                                 |                          |                  |
|                                | Future Units              |                       | 442                                                                                                                |                               |                       |            |                                        |                                 |                          |                  |
|                                | Future Population         |                       |                                                                                                                    | 1,179                         |                       |            |                                        | 294832                          | 1179                     | 1357             |



| Parcel 1                                                                             | Area<br>(in hectares) | Units                                                                                       | Population<br>(2.67 ppl/unit) | Sewage Flow<br>Factor                                                                   | Units      | Source                               | Avg. Sewage<br>Flow (L) per day | Equivalent<br>Population | Total E.<br>Pop. |
|--------------------------------------------------------------------------------------|-----------------------|---------------------------------------------------------------------------------------------|-------------------------------|-----------------------------------------------------------------------------------------|------------|--------------------------------------|---------------------------------|--------------------------|------------------|
| <b>In Process - Walton</b>                                                           |                       |                                                                                             |                               |                                                                                         |            |                                      |                                 |                          |                  |
| Parcel Area                                                                          | 27.34                 | *Area/Unit Breakdown From Stantec Report - Beausart Subdivision Functional Servicing Report |                               |                                                                                         |            |                                      |                                 |                          |                  |
| Retail                                                                               |                       |                                                                                             |                               |                                                                                         |            |                                      |                                 |                          |                  |
| Convenience Commercial                                                               | 0.66                  |                                                                                             |                               | 2225                                                                                    | L per 1000 | sq .m - MOE Guidelines (shop centre) | 14685                           | 59                       |                  |
| School + Services                                                                    |                       |                                                                                             |                               |                                                                                         |            |                                      |                                 |                          |                  |
| Community Centres                                                                    | —                     |                                                                                             |                               |                                                                                         |            |                                      |                                 |                          |                  |
| Elementary Schools                                                                   | —                     |                                                                                             |                               |                                                                                         |            |                                      |                                 |                          |                  |
| Environmental                                                                        |                       |                                                                                             |                               |                                                                                         |            |                                      |                                 |                          |                  |
| Parkland/Open Space                                                                  | 4.31                  |                                                                                             |                               |                                                                                         |            |                                      |                                 |                          |                  |
| SWM                                                                                  | 1.78                  |                                                                                             |                               |                                                                                         |            |                                      |                                 |                          |                  |
| Net Residential                                                                      | 14.75                 | 234.00                                                                                      | 15.86440678                   |                                                                                         |            |                                      |                                 |                          |                  |
| Future Units                                                                         |                       | 234                                                                                         |                               |                                                                                         |            |                                      |                                 |                          |                  |
| Future Population                                                                    |                       |                                                                                             | 625                           |                                                                                         |            |                                      | 156195                          | 625                      | 684              |
| <b>Units &amp; Populatsion (Excluding Commercial/Service Population Equivalents)</b> |                       |                                                                                             |                               | <b>Units &amp; Population<br/>(Including Commercial/Service Population Equivalents)</b> |            |                                      |                                 |                          |                  |
| Existing Units                                                                       |                       | 672                                                                                         |                               |                                                                                         |            |                                      |                                 |                          |                  |
| Existing Population                                                                  |                       |                                                                                             | 1,929                         |                                                                                         |            |                                      |                                 |                          |                  |
| In Process Units                                                                     |                       | 1,168                                                                                       |                               |                                                                                         |            |                                      |                                 |                          |                  |
| In Process Population                                                                |                       |                                                                                             | 3,118                         |                                                                                         |            |                                      |                                 |                          |                  |
| Future Units                                                                         |                       | 1,647                                                                                       |                               |                                                                                         |            |                                      |                                 |                          |                  |
| Future Population                                                                    |                       |                                                                                             | 4,397                         |                                                                                         |            |                                      |                                 |                          |                  |
| <b>Total</b>                                                                         |                       | 3,487                                                                                       | 9,444                         | <b>Total Equivalent Population</b>                                                      |            |                                      |                                 |                          |                  |

\*\*Projected Residential Sewage Flows are based on 250 L/d/capita

\*\*2.67 people per unit has been applied to the average of 10 units/hectare and 15 units/hectare that includes single detached houses to townhouses. Please note that the person per unit calculation will vary per unit type. They will have to be adjusted to anticipate the range of units that are being suggested.

\*\*Net Residential calculations includes all residential land, local roads, and minor collector roads.

## **APPENDIX 'WS-C'**

### **1) Community of Everett Class EA: Water Supply Preliminary Hydrogeological Investigation**





November 2012

## COMMUNITY OF EVERETT CLASS EA: WATER SUPPLY

# Preliminary Hydrogeological Investigation

**Submitted to:**

Township of Adjala - Tosorontio  
C/O Greenland Consulting Engineers  
120 Hume Street,  
Collingwood, ON L9Y 1V5

REPORT



**Report Number:** 12-1170-0033

**Distribution:**

2 copies - Greenland Consulting Engineers  
1 copy - Golder Associates Ltd.







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- Figure 6 – Pumping Rates Map

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- Table 1 – Water Well Records
- Table 2 – Combined Interference Among Municipal Wells

### APPENDIX A

Water and Sewage: Demands/Flows

From Greenland Consulting Engineers, 2012.



### 1.0 INTRODUCTION

The purpose of this letter report is to provide a hydrogeological basis for the selection of the preferred alternative for an expansion of the existing groundwater supply in the Community of Everett (Everett). Everett currently obtains potable water supplies from two deep wells located within the Community boundaries. Wastewater servicing is currently via private on-site sewage waste disposal systems. Everett is located approximately four kilometers north west of the Community of Alliston and approximately 20 km south west of the City of Barrie.

Golder Associates Ltd (Golder) has been retained by Greenland Consulting Engineers (Greenland) to provide an assessment of the existing water supply, the potential for additional water supplies, the location of additional water supply wells, and to comment on the Source Water Protection issues.

#### 1.1 Water Supply Requirements

Greenland has prepared an assessment of water supply demand for Everett (Attached in Appendix A). The population of Everett is currently 1,929. Their Maximum Day Demand (MDD) for the past three years was 939 m<sup>3</sup>/day and the MDD peaking factor is 2.43 times the Average Day Demand (ADD).

The future water demand is divided into three phases with population thresholds of 3,500, 7,000 and 10,000 people. The future ADD and MDD are as follows:

| Phase   | Population | ADD (m <sup>3</sup> /day) | MDD (m <sup>3</sup> /day) |
|---------|------------|---------------------------|---------------------------|
| Phase 1 | 3,500      | 819                       | 1,829                     |
| Phase 2 | 7,000      | 1,782                     | 3,755                     |
| Phase 3 | 10,000     | 2,607                     | 5,214                     |

The MDD is typically required from the water supply source, while the Peak Hour Demand is provided from storage.

### 2.0 EXISTING WATER SUPPLIES

Everett is currently supplied by three wells constructed in a confined artesian aquifer and are located within the developed area of Everett (Figure 1). Two of the wells are located on Pine Park Blvd (Well 1 and Well 3) and one well is located on Main Street (Well 2). The well records are attached as Figures 2, 3 and 4. The former production wells (PWs 1-78 and 2-78) were constructed in the upper aquifer and have been abandoned due to elevated nitrate concentrations. The shallow aquifer is found in Everett at an elevation range of approximately 220 to 240 masl, which is at a maximum depth of approximately 20 metres below the ground surface.

**Well 1** was constructed by Northern Well Drilling (License # 3903) in 1989. The well has a diameter of 254 mm and an overall depth of 62.2 m. The well is equipped with nominal 254 mm diameter telescoping well screen with 16 slot screen installed between 56 and 62.5 mbgl (metres below ground level). The 6.1 m long well screen has a theoretical transmitting capacity of approximately 25 L/sec. Well 1 was originally tested at a rate of 27.3 L/sec for a period of 24 hours, during which time water levels declined from 7.74 mbgl to 35.1 mbgl. A specific capacity of 1.0 L/sec per metre of drawdown is calculated from the original testing.



Testing done in 2011 by Stantec (2011) resulted in a specific capacity of 1.4 L/sec per metre of drawdown. The 2011 testing was done at a rate of 21.1 L/sec which accounts for the slightly higher specific capacity. The recent testing indicates that the performance of the well is similar to that noted during the original testing.

The primary limitations for higher well yields from all of the wells in Everett are the limited aquifer thickness and the relatively fine textured nature of the aquifer. The transmitting capacity of the well screen in Well 1 is relatively low at 25 L/sec. The transmitting capacity of a well screen is the pumping rate at which water passes through the well screen at a velocity of 3 cm/sec under ideal conditions. In naturally developed water wells a significant portion of the well screen is blocked by the aquifer materials; therefore the velocity of water across the well screen is greater than 3 cm/sec. For this reason, many well designers consider the safe yield for a well to be half of the theoretical transmitting capacity of the well screen.

Pumping wells at rates that result in water passing through the screen at velocities higher than 3 cm/sec can cause an increase in the rate of encrustation of the screen by carbonate minerals and an increased rate of corrosion of the well screen. Encrustation of the well screen will result in increased maintenance costs and corrosion of the well screen will reduce the well's useful life. Well 1 is currently operating at 21 L/sec and the well losses are similar to those recorded during the original construction of the well. The current yield of Well 1 is 84% of the maximum theoretical yield for the well screen. The well yield should not be increased over the permitted amount.

**Well 2** was constructed by Lunny Well Drilling (License # 3406) in 1990. The well has a diameter of 254 mm and an overall depth of 61.0 m, including a 0.91 m sump at the base of the screen. The well is equipped with nominal 254 mm diameter telescoping well screen with 16, 30 and 50 slot well screen installed between 54.3 and 60.0 mbgl (Figure 3). The 5.5 m long screen has a theoretical transmitting capacity of approximately 30.5 L/sec. The well was originally tested at a rate of 22.7 L/sec for a period of 24 hours, during which time water levels declined from 12.94 m to 39.51 m. A specific capacity of 0.86 L/sec per metre of drawdown was calculated from the original test data.

Well 2 has similar limitations to Well 1, in that the limited aquifer thickness and fine texture of the aquifer limited results in small unit well yields. The transmitting capacity of the screen is approximately 30.5 L/sec and the current yield of Well 2 is 75% of the theoretical transmitting capacity of the well screen. Pumping wells close to or above their theoretical capacities can result in encrustation of the well resulting in increased maintenance and corrosion of the screen results in a shortened well life. Currently Well 2 is operating at approximately 22.7 L/sec, which appears to be acceptable; however the well yield should not be increased over the permitted amount.

**Well 3** was constructed as a test well by Snider Well Drilling of Craighurst (License # 4816) in 1978. The well has a diameter of 152 mm and an overall depth of 57.9 m. The well is equipped with nominal 152 mm diameter telescoping well screen with 16 slot screen installed between 56 and 62.5 mbgl. The 4.6 m long well screen has a theoretical transmitting capacity of approximately 11.7 L/sec. The well was originally tested at a rate of 11.2 L/sec for a period of 24 hours, during which time water levels declined from 7.44 mbgl to 18.1 mbgl. A specific capacity of 1.1 L/sec per metre of drawdown is calculated from the original testing.

Well 3 has similar limitations to Wells 1 and 2 with respect to the limited aquifer thickness and fine texture of the aquifer plus the added limitation of a smaller casing diameter than the other two wells. The transmitting capacity of the screen is approximately 12.9 L/sec. Well 3 is currently permitted to take 11 L/sec, which is 85% of the theoretical transmitting capacity of the well screen. Operation of the well at this rate would result in screen





entrance velocities in excess of 3 cm/sec, which as described above, could result in an increased rate of encrustation of the screen by carbonate minerals and an increased rate of corrosion of the well screen resulting in a shortened useful life for the well.

### 2.1 Existing and Future Aquifer Yield

The wells operate under PTTW 93-P-3011 and conditions included in the PTTW include the measuring of non-pumping water levels in production wells on a monthly basis. Golder has reviewed these data for the past three years and compared them to the as-built static water levels. The current non-pumping water levels in the production wells are within 0.5 m of the original water levels during low demand periods and within 2 m of the original static water levels during high water demand periods. It should be recognized that the water level monitoring is done manually and pumps are turned off for a relatively short period of time prior to measuring the static water level. These water levels may represent partially recovered water levels. It is therefore reasonable to conclude that there has been no significant reduction in the static water level in the aquifer at the Everett municipal water supply wells since their construction. The water use at Everett has been 368 to 400 m<sup>3</sup>/day over the past three years with maximum day demands of 797 to 1045 m<sup>3</sup>/day.

Golder and Waterloo Hydrogeologic conducted well head protection mapping in 2004 (Golder, 2004). This work involved the preparation of a ModFlow 3-D groundwater flow model. This modelling work indicated that an average day water demand of 2,500 m<sup>3</sup>/day is available from groundwater resources in the area. The future average day water demand for the area is 2,607 m<sup>3</sup>/day, which is expected to be available from the lower aquifer system.

Further work to develop water supplies that will increase the water supply above the current permit to take water maximums will be required. It is expected that this work will include the construction of an additional water supply that will be capable of providing a minimum of 16 L/sec.

## 3.0 FUTURE WATER SUPPLIES

### 3.1 Options for water:

There are limited options for additional water supplies in or near Everett. As noted earlier the upper aquifer in the Everett area currently has elevated nitrate concentrations and is unsuitable as a water supply source for municipal purposes. The source of the nitrate is not completely certain, however a combination of the application of agricultural fertilizer and private on-site sewage disposal systems are the likely sources.

The confined artesian aquifer that is being used to supply water to the Everett municipal water distribution system is currently unaffected by the elevated nitrate concentrations in the upper aquifer. This source of water supply continues to be the only viable groundwater source in the area of Everett.

### 3.2 Groundwater Supply Options

Golder has prepared a series of draft cross sections in the Everett area and two of these have been presented here as Figures 4 and 5. They were prepared using the Ontario Water Well Record database that is compiled and maintained by the Ontario Ministry of the Environment. The database that was used to prepare the maps and cross sections appearing herein was updated at the initiation of this study.

Figure 4 is oriented in an east – west orientation with the line of section along County Road 5 through Everett. The cross section shows the presence of a thick unconfined aquifer in the Everett area. This aquifer was



intersected at Everett Wells 1 and 3, where it is approximately 20 m thick. In most areas there is a confined artesian aquifer with a limited thickness that is found at an elevation of approximately 200 metres above sea level (masl) in the Everett area. This aquifer is used by individuals as a source of water supply. The middle aquifer is relatively thin and as a result not useful as a municipal water supply aquifer. The confining layer between the middle and lower aquifer is 5 to 10 m thick in the Everett area.

The Municipal water supply in Everett is likely a lateral equivalent to Regional Aquifer A3 as identified in the Barrie Borden area. This aquifer is generally protected from contamination of surface activities. The area of Everett is similar to other areas in Simcoe County where the Regional A3 Aquifer has little evidence of the impact from surface activities, such as low nitrate concentrations.

The extent of Aquifer A3 is shown on Figures 4 and 5 as the shaded yellow pattern between the elevations of 175 and 190 masl. Aquifer A3 is found throughout the area and to the west of Everett in the Mansfield area. Aquifer A3 may be hydraulically connected to Aquifer A2. Aquifer A3 appears to be thicker toward the north and east of Everett.

Figure 6 is a compilation of the well yields of wells within a 10 km radius of Everett. The pumping rates are represented as circles around the water well and are proportional to the yield of the well. High capacity municipal wells are present in Everett, Lisle and Alliston, while high capacity irrigation wells are found between Alliston and Everett, to the east of Everett and to the west of Lisle.

### 3.3 Future Water Well Drilling

The detailed data from the original testing for Well 1 (Grohal #2) and Well 2 (Ballpark) are not available; however it is clear from the water well records that the wells have similar drawdown and yield characteristics. The interference resulting from the pumping of these wells is not documented in the reports; therefore the Theis equation has been used to estimate the mutual interference among the wells.

The aquifer at Well 1 was intersected between 53.6 and 62.4 mbgl, resulting in 8.9 m of aquifer. The aquifer was relatively uniform and a 16 slot screen was installed in the well. The aquifer at Well 2 was intersected between 55.2 and 61.6 mbgl, resulting in 6.37 m of aquifer, which is 2.5 m thinner than at Well 1. On the basis of a slightly higher specific yield from Well 1 and a greater aquifer thickness, the site of Well 1 has been assessed for a new water supply well with a yield of 15.8 L/sec. Assuming Well 1 and Well 2 each yield 1,964 m<sup>3</sup>/day, a well yield of approximately 15.8 L/sec would be required from a third well.

The zone of influenced may be governed by the lateral groundwater flow through the granular soils, based on the reported transmissivity from aquifer testing (Trow, 1990) of 205 m<sup>2</sup>/day.

Applying the Theis analytical solution, the lateral extent of groundwater level drawdown can be estimated as follows:

$$s(r, t) = \frac{Q}{4\pi T} W\left(\frac{r^2 S}{4Tt}\right)$$

where  $s(r, t)$  = drawdown at distance (r) and time (t) after the start of pumping,

$Q$  = pumping rate required to supply the ADD potable water supply (2,600 m<sup>3</sup>/day),

$T$  = aquifer transmissivity (205 m<sup>2</sup>/day – based on field study results),



$S$  = aquifer storativity ( $1 \times 10^{-4}$  – assumed for confined aquifer conditions), and,

$W$  = Theis well function.

It is assumed that a new well would be constructed 100 m from Well 1 and would yield 15.8 L/sec (approximately 1,300 m<sup>3</sup>/day). In combination with Well 1 and Well 3, the MDD well yield would be 5,214 m<sup>3</sup>/day and the pumping levels following 90 days of pumping at the wells is calculated to be between 15 and 23 m above the well screens. Under ADD water demand of 2,606 m<sup>3</sup>/day for 20 years, the pumping levels in the wells are calculated to be between 19 and 26 m above the well screens. The calculations are shown in Table 2 for both MDD conditions and ADD conditions. These calculations would have to be confirmed with the construction and testing of a 203 mm diameter well.

If an alternative location for a new water supply well is contemplated, sites to the north of Everett would be preferred. The aquifer appears to thicken toward the north and the location of a well offset from the existing wells toward the north would widen the zone of capture for the wells and increase the recharge area for the Everett water supply system. Locating a new well to the south is possible; however the potential for competing for water with the Alliston groundwater supply system increases.

#### 4.0 SOURCE WATER PROTECTION

There are three Storm Water Management (SWM) ponds proposed in Everett (Figure 3). None of the SWM ponds is proposed for lands that fall within an area of high vulnerability or within WHPA-A or WHPA-B, as defined by Burnside (2010). One of the proposed SWM ponds is at the 25 year Time of Travel (ToT), a second pond is on the 10-year ToT, and a third SWM pond is located near between the 2-year and 10-year ToT (Figure 3).

Since the SWM ponds are located outside vulnerable areas in the WHPA for Everett, the potential vulnerability scores for pathogens, or chemical parameters do not represent a significant threat to the water supply system for Everett. If the SWM ponds are expected to hold water they will likely have to be lined, since the surficial soils are sandy and the water table is two to six metres below the ground surface.

#### 5.0 SUMMARY AND CONCLUSION

The existing wells are currently being operated at or near their maximum well yields based on their construction.

A new source of water supply to augment the existing Everett municipal water supply could be obtained from a groundwater source in Everett. The Regional A3 aquifer provides the adequate unit well yields; good quality water, and a source water that is protection from direct contamination from surface activities.

Additional water supplies could be obtained either from twinning one of the existing wells or drilling a new well on a different property. Well construction and testing would be required to confirm the well yield and interference among wells.

The aquifer at Well 1 appears to be a slightly coarser and has a greater thickness than at Well 2. The Well 1 site would be the preferred site for water supply development, barring other site or pump house restrictions.

The construction of SWM ponds at the locations shown on Figure 3 should not pose a significant threat to the on-going operation of municipal water supply wells in Everett.





## **Report Signature Page**

**GOLDER ASSOCIATES LTD.**

John Easton, M.Sc., P.Geo.  
Senior Hydrogeologist, Associate

JAE/plc

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### 6.0 REFERENCES

Burnside Associates, 2010.

Nottawasaga Valley Source Protection Area Approved Assessment Report. Chapter 8: The Township of Adjala -Tosorontio.

Golder Associates, 2004.

South Simcoe Municipal Groundwater Study. Golder Associates Ltd., Barrie.

Stantec, 2011.

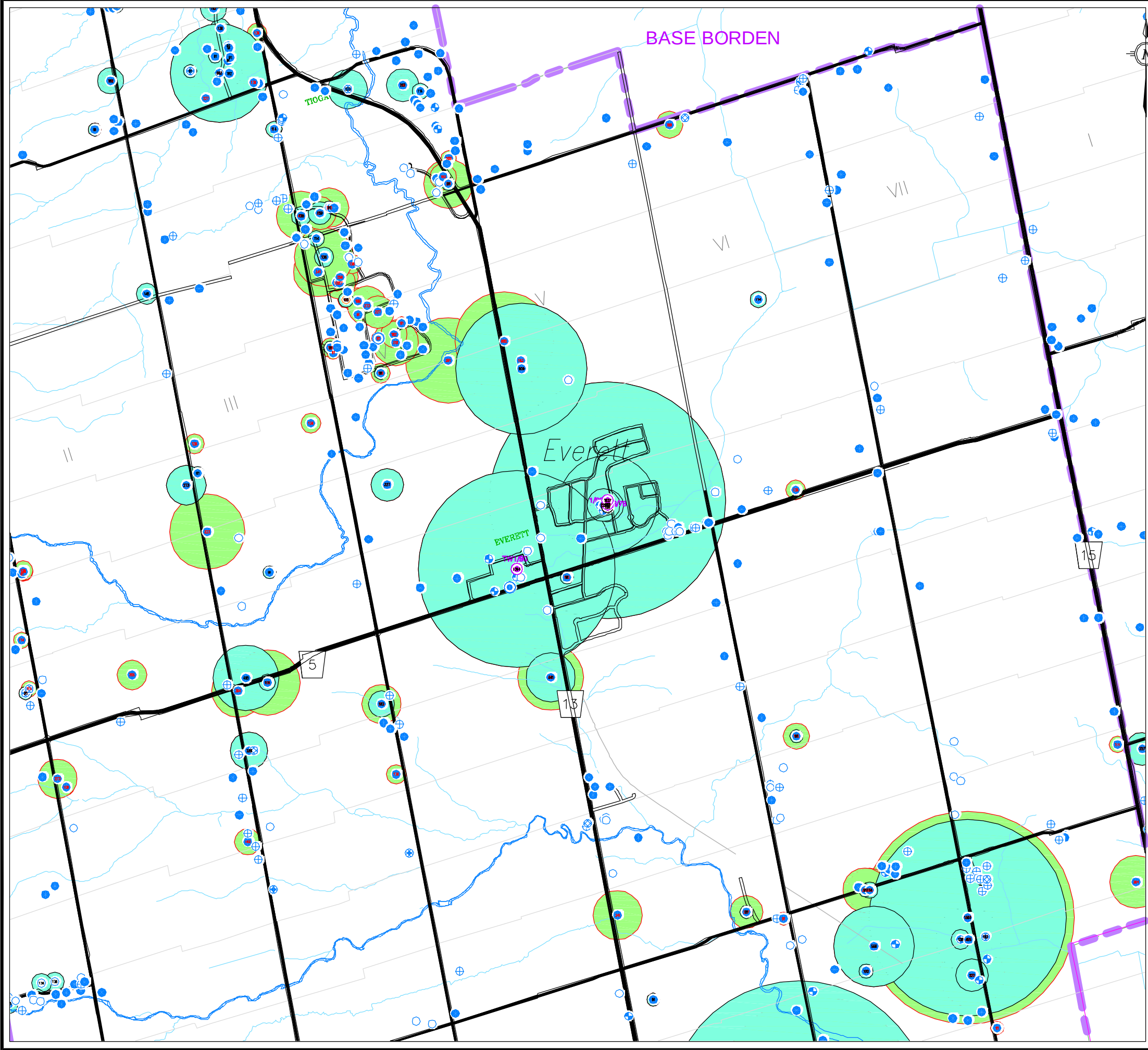
Walton- Everett Phase 1 Lands- PW1/90 Municipal Well Pumping Test. Draft Plan of Subdivision Application – 254 Units, Township of Adjala-Tosorontio, County of Simcoe. Letter to Louise Foster, September 27, 2011, Stantec File: 1606-21773/02.



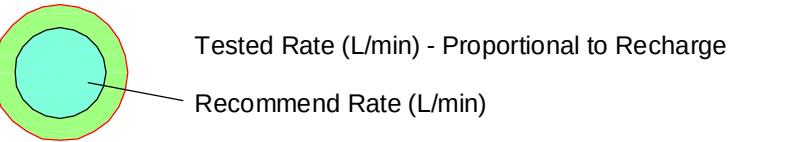
## FIGURES



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FILENAME: T:\Projects\2012\12-1170-0033 (Everett, Class EA - Greenland)\-AB-1211700033ABRATE.dwg1211700033ABRATE.dwg: [Figure 6]

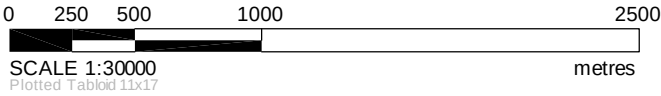


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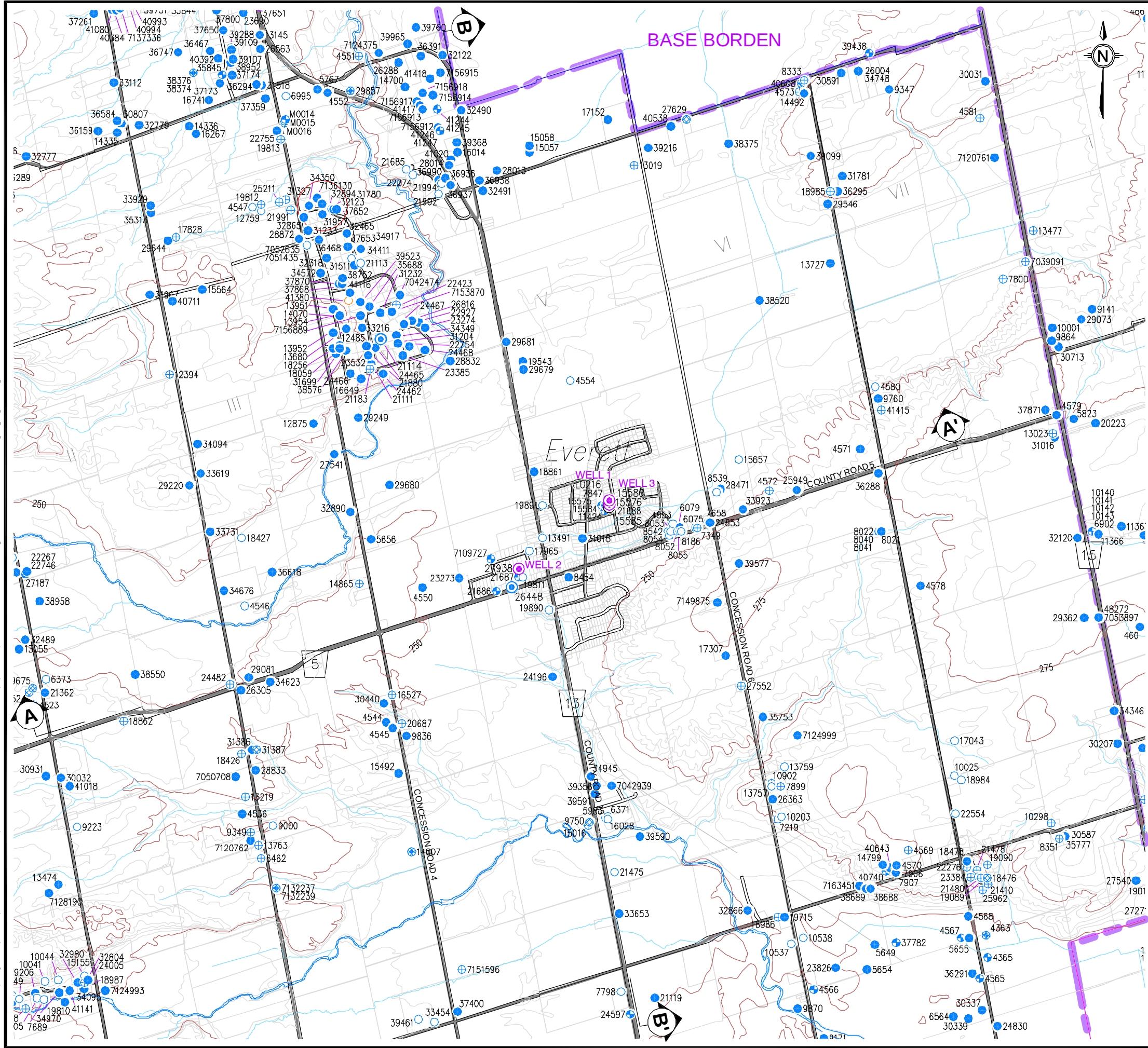
REFERENCES:

MAPPING BASED ON MOE WATER WELL RECORDS, QUEEN'S PRINTER  
DATUM IS UTM NAD 83 ZONE 17



|                                                                                                                                          |                  |       |        |
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| TITLE                                                                                                                                    |                  |       |        |
| PUMPING RATES MAP                                                                                                                        |                  |       |        |
| EVERETT CLASS EA: WATER SUPPLY                                                                                                           |                  |       |        |
| <br>Golder<br>Associates<br>Barrie, Ontario, Canada | SCALE AS SHOWN   |       |        |
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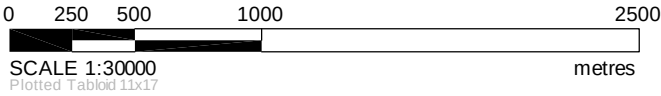




- LEGEND:**
- Shallow Dug or Bored <10 m
  - ⊕ Deep Bored Well >10 m
  - Drilled Overburden Well
  - ⊗ Test or Observation Well
  - ⊕ Drilled Bedrock Well
  - ⊕ Sandpoint
  - ⊕ Municipal / Public Supply

**REFERENCES:**

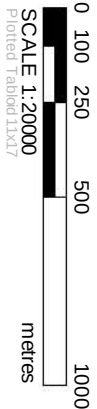
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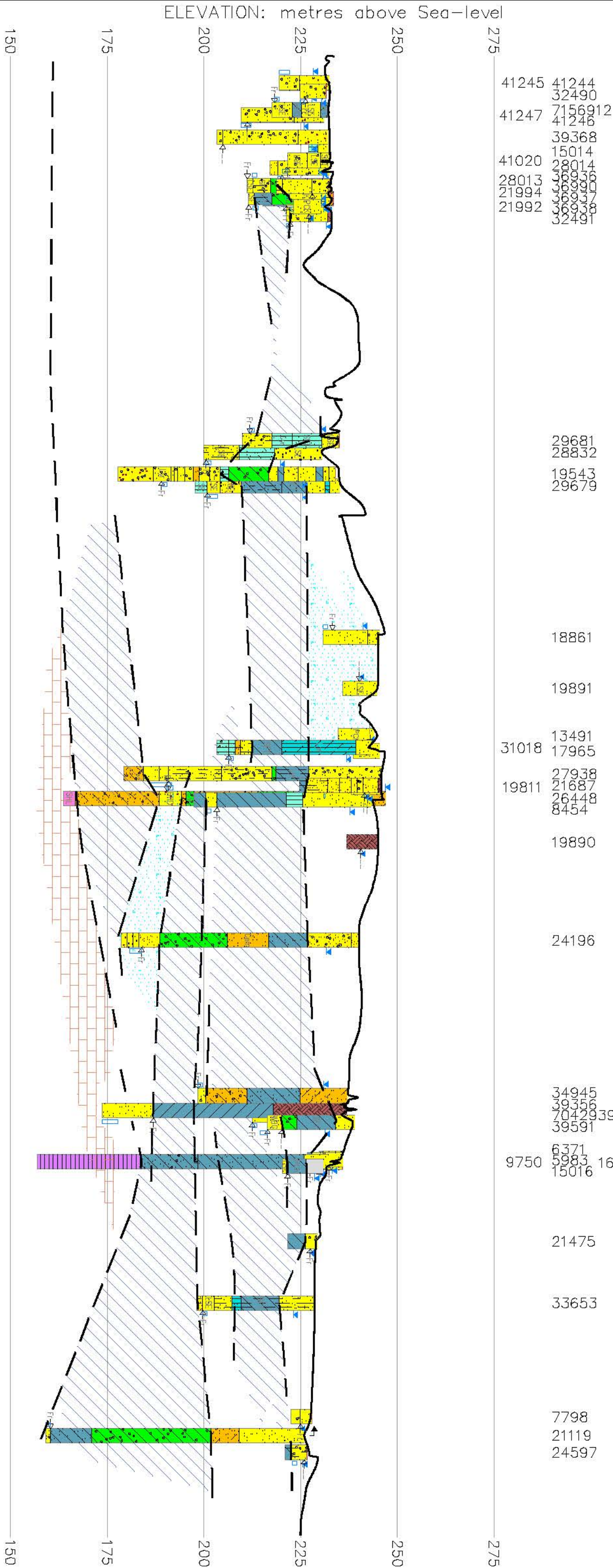
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| TITLE                                                                                                                                    |                     |             |        |
| AREA LOCATION MAP                                                                                                                        |                     |             |        |
| EVERETT CLASS EA: WATER SUPPLY                                                                                                           |                     |             |        |
| <br>Golder<br>Associates<br>Barrie, Ontario, Canada | SCALE               | AS SHOWN    |        |
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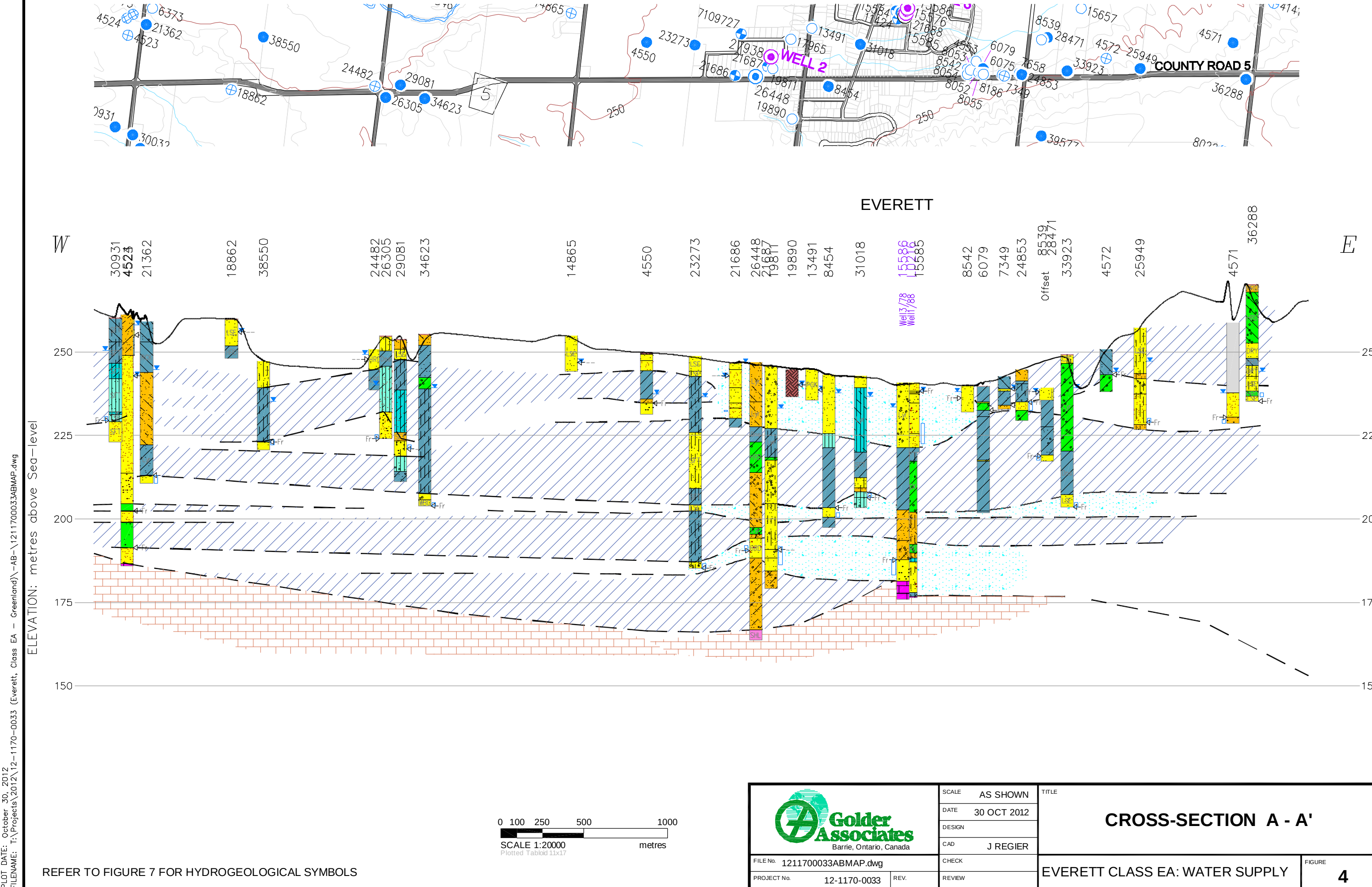
REFER TO FIGURE 7 FOR HYDROGEOLOGICAL SYMBOLS



|                                                                                                                                     |        |             |                                                                                |
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| <br>Golder Associates<br>Barrie, Ontario, Canada | SCALE  | AS SHOWN    | TITLE<br><br><b>CROSS-SECTION B - B'</b><br><br>EVERETT CLASS EA: WATER SUPPLY |
|                                                                                                                                     | DATE   | 30 OCT 2012 |                                                                                |
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|                                                                                                                                     | REVIEW |             | FIGURE<br><b>5</b>                                                             |

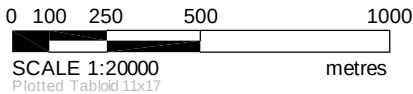






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REFER TO FIGURE 7 FOR HYDROGEOLOGICAL SYMBOLS



|                                                                                                                  |  |        |             |                                |  |
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| <br>Barrie, Ontario, Canada |  | SCALE  | AS SHOWN    | <b>CROSS-SECTION A - A'</b>    |  |
|                                                                                                                  |  | DATE   | 30 OCT 2012 |                                |  |
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| PROJECT No. 12-1170-0033                                                                                         |  | REV.   |             |                                |  |
|                                                                                                                  |  | REVIEW |             |                                |  |



## STRATIGRAPHIC PATTERN

|  |                                                       |  |                  |
|--|-------------------------------------------------------|--|------------------|
|  | Unoxidized CLAY, Blue, Grey, White, or Undefined CLAY |  | BOULDER          |
|  | Oxidized CLAY, Brown, Red, Yellow                     |  | TILL             |
|  | SILT                                                  |  | SHALE            |
|  | SAND                                                  |  | DOLOSTONE        |
|  | GRAVEL                                                |  | LIMESTONE        |
|  | STONES, Rounded GRAVEL, PEBBLES                       |  | CRYSTALLINE ROCK |

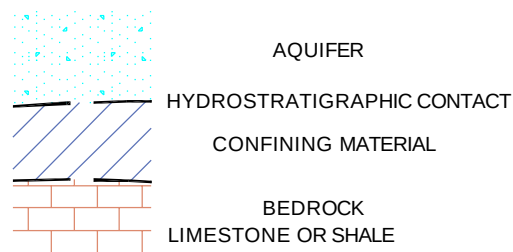
## GENERIC MATERIALS

|  |                           |
|--|---------------------------|
|  | UNKNOWN OR PREVIOUSLY DUG |
|  | PEAT/LOAM                 |
|  | SANDS & GRAVELS           |
|  | GRANULAR TILL             |
|  | SILT                      |
|  | SILT CLAYEY               |
|  | CLAY                      |
|  | TILL                      |
|  | LIMESTONES                |
|  | SHALES                    |

|        | SECONDARY/<br>SOME | TRACE | MINOR |          |
|--------|--------------------|-------|-------|----------|
| Clayey |                    |       |       | Clay     |
| Silty  |                    |       |       | Silt     |
| Sandy  |                    |       |       | Granular |

|  |                             |
|--|-----------------------------|
|  | Screen                      |
|  | Recorded Static Water Level |
|  | Water Producing Zone        |
|  | Flowing Well                |
|  | MOE Recorded Private Well   |

## STRATIGRAPHY (see Notes)



## MAP SYMBOLS

|  |                            |
|--|----------------------------|
|  | Shallow Dug or Bored <10 m |
|  | Deep Bored Well >10 m      |
|  | Drilled Overburden Well    |
|  | Test or Observation Well   |
|  | Test Pit                   |
|  | Drilled Bedrock Well       |
|  | Sandpoint                  |
|  | Municipal / Public Supply  |

## NOTES

On all sections, boundaries between soil strata have been determined only at well and test well locations. Between the wells and test wells, boundaries are not proven but are assumed from geological evidence.

Wells are located to MOE Water Well Bulletin Data. Locations and elevations are subject to field verification.



|        |             |
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## HYDROGEOLOGICAL SYMBOLS

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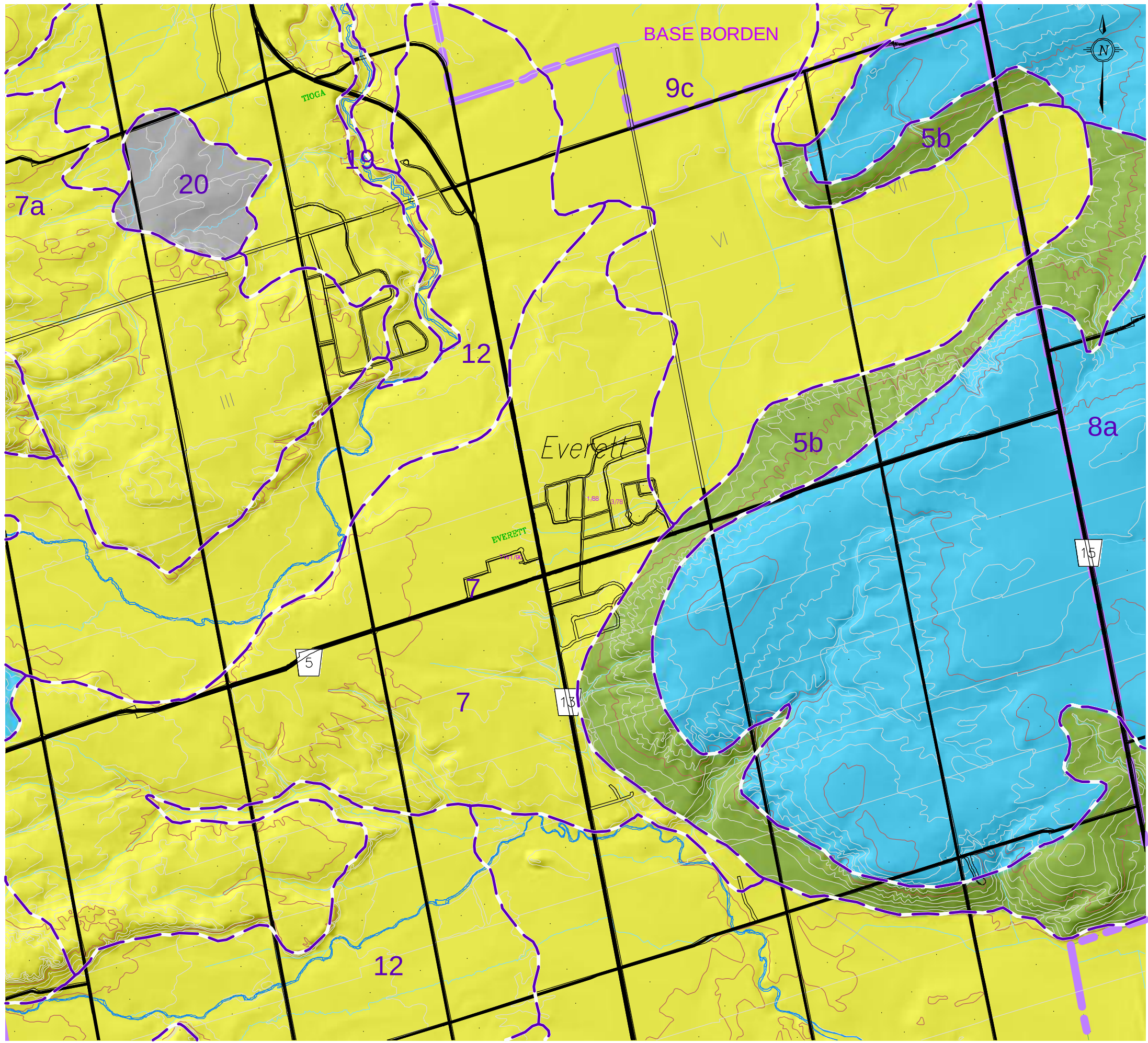
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EVERETT CLASS EA : WATER SUPPLY

FIGURE

7

PLOT DATE: October 30, 2012  
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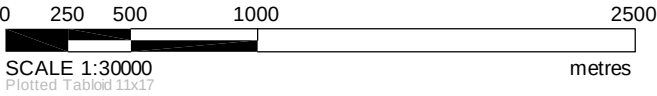


**LEGEND:**

- 20 Organic Deposits
- 19 Fluvial Silt, Sand, Gravel
- 12 Fluvial Sand
- 9c Glaciolacustrine Silt & Sand Deposits
- 8a Glaciolacustrine Deep Water Deposits
- 7 Glaciofluvial Outwash Sand & Gravel
- 7a Distal Sand & Gravel
- 5b Ablation Till

**REFERENCES:**

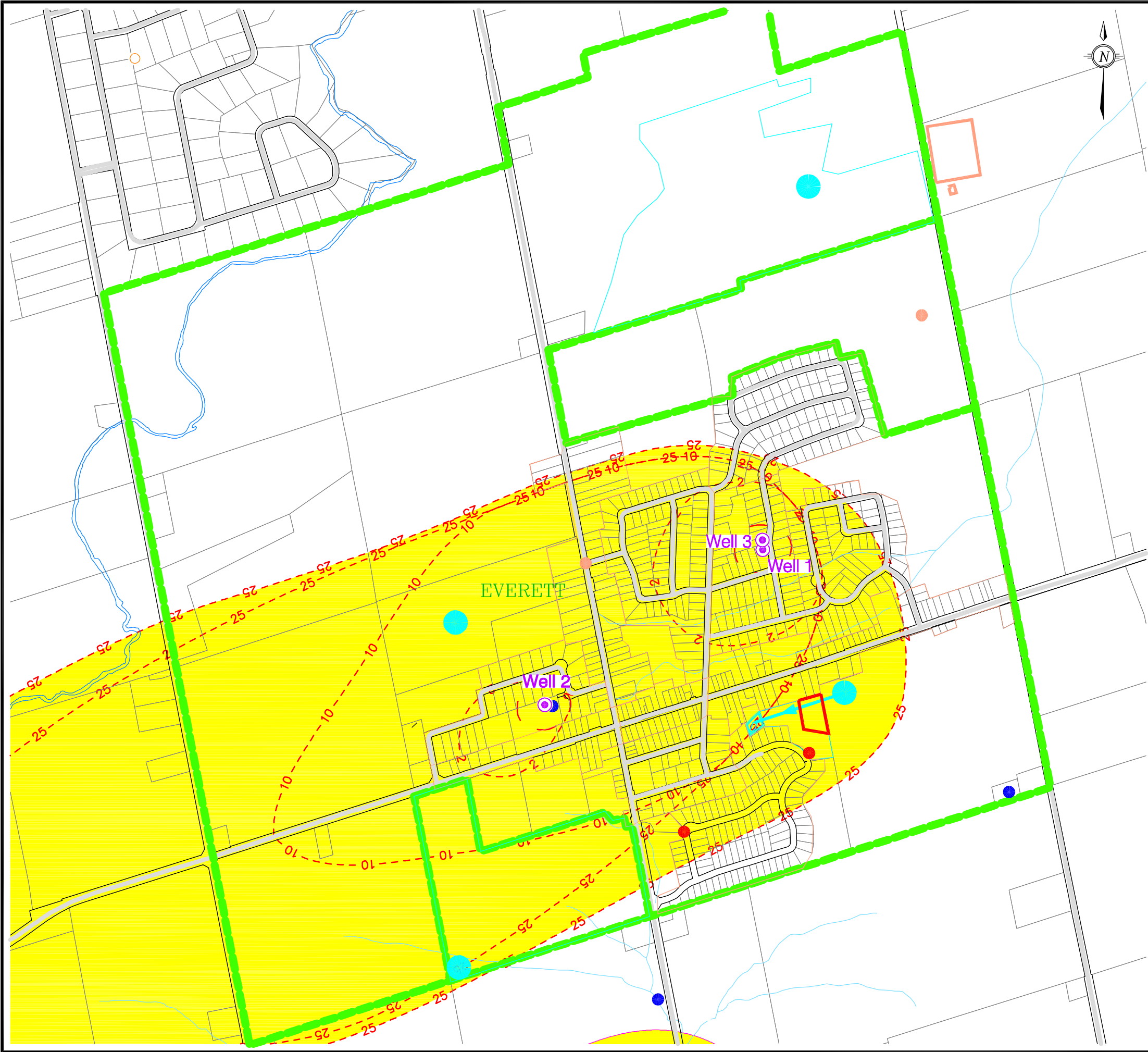
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| TITLE                                                                                                                                 |                  |        |        |
| QUATERNARY GEOLOGY MAP                                                                                                                |                  |        |        |
| EVERETT CLASS EA: WATER SUPPLY                                                                                                        |                  |        |        |
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|                                                                                                                                       | DATE 30 OCT 2012 |        |        |
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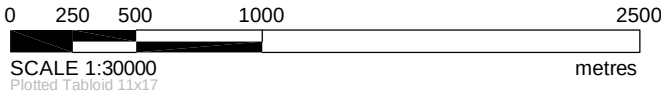
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- LEGEND:**
- Secondary Plan Boundary
  - Proposed WWTP & Tile Bed
  - Proposed Pumping Station
  - Proposed Stormwater Pond
  - Existing Municipal Water Well / Infrastructure
  - Existing Septic Treatment Infrastructure
  - Municipal Water Well Capture Zone, Time of Travel

**REFERENCES:**

MAPPING BASED ON ESSA TOWNSHIP, PLANNING DEPARTMENT  
CAPTURE ZONES, SIMCOE COUNTY GROUNDWATER STUDY, 2005  
DATUM IS UTM NAD 83 ZONE 17



|                                                                                       |  |  |                  |                                    |   |
|---------------------------------------------------------------------------------------|--|--|------------------|------------------------------------|---|
| TITLE                                                                                 |  |  |                  | SITE LOCATION MAP<br>CAPTURE ZONES |   |
| EVERETT CLASS EA: WATER SUPPLY                                                        |  |  |                  |                                    |   |
|  |  |  | SCALE AS SHOWN   |                                    |   |
|                                                                                       |  |  | DATE 30 OCT 2012 |                                    |   |
|                                                                                       |  |  | DESIGN           |                                    |   |
|                                                                                       |  |  | CAD J REGIER     |                                    |   |
|                                                                                       |  |  | CHECK            |                                    |   |
| FILE No. 1211700033ABPLAN.dwg                                                         |  |  | REVIEW           |                                    |   |
| PROJECT No. 12-1170-0033                                                              |  |  | REV.             |                                    | 3 |





# TABLES

Table 2  
Township of Adjala - Tosorontio, Everett Water Supply  
Combined Interference Among Municipal Well

THEIS EQUATION:  $s = (Q/(4\pi T)) \ln ((2.25Tt)/(r^2S))$

|                       |                        |        |                                       |
|-----------------------|------------------------|--------|---------------------------------------|
| Q m <sup>3</sup> /day | Well discharge         | s m    | Drawdown at distance r                |
| T m <sup>2</sup> /day | Aquifer Transmissivity | t days | Time since pumping started or stopped |
| S                     | Aquifer storativity    | r m    | Distance from well                    |

| Maximum Day Demand              |                            |               |             |                                  |        |        |                       |                            |                                |
|---------------------------------|----------------------------|---------------|-------------|----------------------------------|--------|--------|-----------------------|----------------------------|--------------------------------|
| Q<br>(m <sup>3</sup> /day)      | T<br>(m <sup>2</sup> /day) | S             | t<br>(days) | INTERFERENCE AT RADIUS SHOWN (m) |        |        |                       |                            |                                |
|                                 |                            |               |             | r (m) =                          | 0.3    | 100    | 750                   | 1000                       | 2000                           |
| Well 1 - (Grohal #1)            |                            |               |             |                                  |        |        |                       |                            |                                |
| 1960                            | 205                        | 1.E-04        | 90          |                                  | 16.9   | 8.1    | 5.0                   | 4.6                        | 3.5                            |
| New Well 2 (Grohal #2)          |                            |               |             |                                  |        |        |                       |                            |                                |
| 1294                            | 205                        | 1.E-04        | 90          |                                  | 11.2   | 5.3    | 3.3                   | 3.0                        | 2.3                            |
| Well 3 (Ballpark)               |                            |               |             |                                  |        |        |                       |                            |                                |
| 1960                            | 205                        | 1.E-04        | 90          |                                  | 16.9   | 8.1    | 5.0                   | 4.6                        | 3.5                            |
|                                 |                            |               |             |                                  |        |        |                       |                            |                                |
| MDD = 5,214 m <sup>3</sup> /day |                            | Pumping Level |             | Interference From                |        |        | Combined interference |                            |                                |
|                                 |                            |               |             |                                  |        |        | Pumping Level (m)     | Depth to Top of Screen (m) | Pumping Level above Screen (m) |
|                                 |                            | (m)           |             | Well 1                           | Well 2 | Well 3 |                       |                            |                                |
| Well 1 - (Grohal #1)            |                            | 27.4          |             | 0                                | 8.1    | 5.0    | 40.5                  | 56.0                       | 15.5                           |
| New Well 2 (Grohal #2)          |                            | 18.3          |             | 8.1                              | 0      | 5.0    | 31.4                  | 54.0                       | 22.6                           |
| Well 3 (Ballpark)               |                            | 26.5          |             | 5.0                              | 3.3    | 0      | 34.8                  | 56.0                       | 21.2                           |

| Average Day Demand              |                            |               |             |                                  |        |        |                       |                            |                                |
|---------------------------------|----------------------------|---------------|-------------|----------------------------------|--------|--------|-----------------------|----------------------------|--------------------------------|
| Q<br>(m <sup>3</sup> /day)      | T<br>(m <sup>2</sup> /day) | S             | t<br>(days) | INTERFERENCE AT RADIUS SHOWN (m) |        |        |                       |                            |                                |
|                                 |                            |               |             | r (m) =                          | 0.3    | 100    | 750                   | 1000                       | 2000                           |
| Well 1 - (Grohal #1)            |                            |               |             |                                  |        |        |                       |                            |                                |
| 980                             | 205                        | 1.E-04        | 3650        |                                  | 9.9    | 5.5    | 3.9                   | 3.7                        | 3.2                            |
| New Well 2 (Grohal #2)          |                            |               |             |                                  |        |        |                       |                            |                                |
| 647                             | 205                        | 1.E-04        | 3650        |                                  | 6.5    | 3.6    | 2.6                   | 2.4                        | 2.1                            |
| Well 3 (Ballpark)               |                            |               |             |                                  |        |        |                       |                            |                                |
| 980                             | 205                        | 1.E-04        | 3650        |                                  | 9.9    | 5.5    | 3.9                   | 3.7                        | 3.2                            |
|                                 |                            |               |             |                                  |        |        |                       |                            |                                |
| ADD = 2,606 m <sup>3</sup> /day |                            | Pumping Level |             | Interference From                |        |        | Combined interference |                            |                                |
|                                 |                            |               |             |                                  |        |        | Pumping Level (m)     | Depth to Top of Screen (m) | Pumping Level above Screen (m) |
|                                 |                            | (m)           |             | Well 1                           | Well 2 | Well 3 |                       |                            |                                |
| Well 1 - (Grohal #1)            |                            | 27.4          |             | 0                                | 5.5    | 3.9    | 36.8                  | 56.0                       | 19.2                           |
| New Well 2 (Grohal #2)          |                            | 18.3          |             | 5.5                              | 0      | 3.9    | 27.7                  | 54.0                       | 26.3                           |
| Well 3 (Ballpark)               |                            | 26.5          |             | 3.9                              | 2.6    | 0      | 33.0                  | 56.0                       | 23.0                           |



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## WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED  
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P.W.#1---1988.

PW1-88 (TW2-88)

|                                                 |                                                                                   |                                    |
|-------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------|
| COUNTY OR DISTRICT<br>County of Simcoe          | TOWNSHIP, RIDEAU, FISH, TOWN, VILLAGE<br>Township of Tosorontio(Everett) Conc # 5 | LOT<br>11                          |
| OWNER - SURNAME FIRST<br>Township of Tosorontio | ADDRESS<br>R.R. # 3 Everett, Ontario..                                            | DATE COMPLETED<br>DEC 31 NO Jan 89 |

| LOG OF OVERBURDEN AND BEDROCK MATERIALS - SEE INSTRUCTIONS |                      |                     |                     |            |     |
|------------------------------------------------------------|----------------------|---------------------|---------------------|------------|-----|
| GENERAL COLOUR                                             | MOST COMMON MATERIAL | OTHER MATERIALS     | GENERAL DESCRIPTION | DEPTH FEET |     |
|                                                            |                      |                     |                     | FROM       | TO  |
| Brown                                                      | sand                 | clay streaks        | layered             | 0          | 44  |
| Brown                                                      | sand(silty)          | clay seams          | layered             | 44         | 63  |
| Grey                                                       | clay                 | slit                | soft                | 63         | 76  |
| Grey                                                       | clay                 | stones gravel seams | hardpacked          | 76         | 127 |
| Brown                                                      | sand(silty)          | gravel, clay seams  | layered             | 127        | 158 |
| Grey                                                       | clay                 | stones              | hard                | 158        | 167 |
| Grey                                                       | sand                 | silty clay          | layered             | 167        | 172 |
| Grey                                                       | silt                 | sandy clay          | layered             | 172        | 176 |
| Brown                                                      | sand                 | fine gravel silt    | layered             | 176        | 205 |
| Grey                                                       | clay(sandy)          | silt stones         | hardpacked          | 205        | 210 |
| Grey                                                       | rock                 | fractured           | layered             | 210        | 216 |

K packer + header 5'-10"

|                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                             |                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>WATER RECORD</b><br>WATER FOUND AT FEET<br>184-204<br>KIND OF WATER<br><input checked="" type="checkbox"/> FRESH<br><input type="checkbox"/> SALT<br><input type="checkbox"/> FRESH<br><input type="checkbox"/> SALT<br><input type="checkbox"/> FRESH<br><input type="checkbox"/> SALT<br><input type="checkbox"/> FRESH<br><input type="checkbox"/> SALT<br><input type="checkbox"/> FRESH<br><input type="checkbox"/> SALT | <b>CASING &amp; OPEN HOLE RECORD</b><br>WATER<br>10<br>MATERIALS<br><input checked="" type="checkbox"/> STEEL<br><input type="checkbox"/> GALVANIZED<br><input type="checkbox"/> CONCRETE<br><input type="checkbox"/> OTHER<br>DEPTH HOIST<br>375<br>DEPTH TEST<br>184 +2.4 | <b>SCREEN</b><br>SIZE 5/8" OPENING<br>9 1/2<br>LENGTH<br>20<br>MATERIAL AND TYPE<br>S.S. wire wd<br>DEPTH HOIST<br>184 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|

|                                      |    |                |
|--------------------------------------|----|----------------|
| <b>PLUGGING &amp; SEALING RECORD</b> |    |                |
| 184                                  | 91 | drill cuttings |
| 91                                   | 5  | cement grout   |
| 5                                    | 0  | backfill       |

|                                                                                                                                                                                                                                                                |                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| <b>PUMPING TEST</b><br>PUMPING TEST METHOD<br><input checked="" type="checkbox"/> FLOW<br><input type="checkbox"/> PRESSURE<br>WATER LEVEL DIPPING<br>25.40<br>115<br>PUMPING TEST RATE<br>160<br>RECOMMENDED PUMP RATE<br>150<br>RECOMMENDED PUMP RATE<br>350 | <b>LOCATION OF WELL</b><br>IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.<br>50493 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|

|                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FINAL STATUS OF WELL</b><br><input checked="" type="checkbox"/> WATER SUPPLY<br><input type="checkbox"/> OBSERVATION WELL<br><input type="checkbox"/> TEST HOLE<br><input type="checkbox"/> RECHARGE WELL                                                       | <input type="checkbox"/> APARTMENT INLET WATER SUPPLY<br><input type="checkbox"/> APARTMENT PUMP QUALITY<br><input type="checkbox"/> LINE & WELL<br><input type="checkbox"/> DISTURBING                         |
| <b>WATER USE</b><br><input type="checkbox"/> DOMESTIC<br><input type="checkbox"/> IRRIGATION<br><input type="checkbox"/> INDUSTRIAL<br><input type="checkbox"/> OTHER                                                                                              | <input type="checkbox"/> COMMERCIAL<br><input type="checkbox"/> PUBLIC USE<br><input type="checkbox"/> LOGGING OR AIR CONDITIONING<br><input type="checkbox"/> NOT USED                                         |
| <b>METHOD OF CONSTRUCTION</b><br><input checked="" type="checkbox"/> CABLE TOOL<br><input type="checkbox"/> ROCKET (CONVENTIONAL)<br><input type="checkbox"/> ROCKET (INVERSE)<br><input type="checkbox"/> ROCKET (AIR)<br><input type="checkbox"/> AIR PERCUSSION | <input type="checkbox"/> ACROW<br><input type="checkbox"/> JAWING<br><input type="checkbox"/> SETTING<br><input type="checkbox"/> COLLING<br><input type="checkbox"/> DISCING<br><input type="checkbox"/> OTHER |

|                                                                                                                                                                                                                                           |                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| <b>CONTRACTOR</b><br>NAME OF WELL CONTRACTOR<br>Northern Well Drilling Limited 3903<br>ADDRESS<br>P.O. Box 358 Unionville, Ont.<br>NAME OF WELL TECHNICIAN<br>Garry W. Perwick<br>SIGNATURE OF TECHNICIAN/CONTRACTOR<br>DATE<br>31 MAR 89 | <b>OFFICE USE ONLY</b><br>WELL CONTRACTOR'S LICENSE NUMBER<br>1-0001 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|

CONTRACTOR'S COPY

FORM NO. 0001-11 M. FORM 9



Project: Q86-0005B

7.



TABLE C

Geologic Units at Borehole 5 (Everett Ball Park Well)

| <u>Geologic Unit</u> | <u>Depth<br/>(m)</u> | <u>Elevation<br/>(m a.m.s.l.)</u> | <u>Description</u> |
|----------------------|----------------------|-----------------------------------|--------------------|
| Sand                 | 0-17.1               | 247.4-230.3                       | Shallow aquifer    |
| Clay                 | 17.1-22.0            | 230.3-225.4                       |                    |
| Clayey gravel        | 22.0-28.1            | 225.4-219.3                       |                    |
| Sand and gravel      | 28.1-44.2            | 219.3-203.2                       | Middle aquifer     |
| Clay                 | 44.2-47.3            | 203.2-200.1                       |                    |
| Silty sand           | 47.3-49.7            | 200.1-197.7                       |                    |
| Clay                 | 49.7-51.5            | 197.7-195.9                       | Deep aquifer       |
| Sand                 | 51.5-57.3            | 195.9-190.1                       |                    |
| Clay                 | 57.3-58.0            | 190.1-189.4                       |                    |
| Sand with silt       | 58.0-69.5            | 189.4-177.9                       | Deep aquifer       |
| Clay                 | 69.5-74.7            | 177.9-172.7                       |                    |



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# WATER WELL RECORD

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2 CHECK ☒ CORRECT SOL WHERE APPLICABLE

|                       |  |                                   |  |                            |  |     |
|-----------------------|--|-----------------------------------|--|----------------------------|--|-----|
| COUNTY OR DISTRICT    |  | TOWNSHIP ROAD OR CITY TOWN & LAKE |  | CON BLOCK TRACT SURVEY ETC |  | LOT |
| Simcoe                |  | Toscoronto                        |  | V                          |  | 11  |
| OWNER (SURNAME FIRST) |  | ADDRESS                           |  | DATE COMPLETED             |  |     |
| Twp. of Toscoronto    |  | Everett, R. R. #3                 |  | DAY 28 MO 08 YA 78         |  |     |

## LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

| GENERAL COLOUR | MOST COMMON MATERIAL | OTHER MATERIALS   | GENERAL DESCRIPTION | DEPTH - FEET |     |
|----------------|----------------------|-------------------|---------------------|--------------|-----|
|                |                      |                   |                     | FROM         | TO  |
|                | sand                 | streaks of gravel |                     | 0            | 64  |
|                | clay                 |                   |                     | 64           | 125 |
|                | sand                 | clay              |                     | 125          | 155 |
|                | sand                 | gravel, clay      |                     | 155          | 174 |
|                | coarse sand          |                   |                     | 174          | 195 |
|                | limestone            |                   | broken              | 196          | 207 |
|                | limestone            |                   |                     | 207          | 213 |
|                |                      |                   |                     |              |     |
|                |                      |                   |                     |              |     |
|                |                      |                   |                     |              |     |

| WATER RECORD        |                                           |                                  |
|---------------------|-------------------------------------------|----------------------------------|
| WATER FOUND AT FEET | KIND OF WATER                             |                                  |
| 174-195             | <input checked="" type="checkbox"/> FRESH | <input type="checkbox"/> SULPHUR |
|                     | <input type="checkbox"/> SALTY            | <input type="checkbox"/> MINERAL |
|                     | <input type="checkbox"/> FRESH            | <input type="checkbox"/> SULPHUR |
|                     | <input type="checkbox"/> SALTY            | <input type="checkbox"/> MINERAL |
|                     | <input type="checkbox"/> FRESH            | <input type="checkbox"/> SULPHUR |
|                     | <input type="checkbox"/> SALTY            | <input type="checkbox"/> MINERAL |
|                     | <input type="checkbox"/> FRESH            | <input type="checkbox"/> SULPHUR |
|                     | <input type="checkbox"/> SALTY            | <input type="checkbox"/> MINERAL |
|                     | <input type="checkbox"/> FRESH            | <input type="checkbox"/> SULPHUR |
|                     | <input type="checkbox"/> SALTY            | <input type="checkbox"/> MINERAL |

| CASING & OPEN HOLE RECORD          |                                           |                              |              |     |
|------------------------------------|-------------------------------------------|------------------------------|--------------|-----|
| INSIDE<br>DIAM.<br>INCHES          | MATERIAL                                  | WELL<br>(SPEECHES)<br>INCHES | DEPTH - FEET |     |
|                                    |                                           |                              | FROM         | TO  |
| 6                                  | <input checked="" type="checkbox"/> STEEL | 0.189                        | + 1          | 178 |
|                                    | <input type="checkbox"/> GALVANIZED       |                              |              |     |
|                                    | <input type="checkbox"/> CONCRETE         |                              |              |     |
|                                    | <input type="checkbox"/> OPEN HOLE        |                              |              |     |
|                                    | <input type="checkbox"/> STEEL            |                              |              |     |
|                                    | <input type="checkbox"/> GALVANIZED       |                              |              |     |
|                                    | <input type="checkbox"/> CONCRETE         |                              |              |     |
|                                    | <input type="checkbox"/> OPEN HOLE        |                              |              |     |
|                                    | <input type="checkbox"/> STEEL            |                              |              |     |
|                                    | <input type="checkbox"/> GALVANIZED       |                              |              |     |
| <input type="checkbox"/> CONCRETE  |                                           |                              |              |     |
| <input type="checkbox"/> OPEN HOLE |                                           |                              |              |     |

|               |                                   |                          |               |
|---------------|-----------------------------------|--------------------------|---------------|
| <b>SCREEN</b> | <b>LETTER OPENING</b>             | <b>DIMETER</b>           | <b>LENGTH</b> |
|               | 10fr. x 14 slot<br>5fr. x 16 slot | 6 inches                 | 15 feet       |
|               | <b>MATERIAL AND TYPE</b>          | <b>DRYING OF PACKER:</b> |               |
|               | stainless steel<br>wire wound     | 174 feet                 |               |

| PLUGGING & SEALING RECORD |    |      |                                    |
|---------------------------|----|------|------------------------------------|
| DEPTH SET AT              |    | FEET | MATERIAL AND TYPE                  |
| FROM                      | TO |      |                                    |
|                           |    |      | (SHEATH - BOW)<br>LEAD PACER, ETC. |
|                           |    |      |                                    |
|                           |    |      |                                    |
|                           |    |      |                                    |
|                           |    |      |                                    |
|                           |    |      |                                    |

|                                                                           |                                          |                                 |                                                                               |                          |                       |                       |
|---------------------------------------------------------------------------|------------------------------------------|---------------------------------|-------------------------------------------------------------------------------|--------------------------|-----------------------|-----------------------|
| PUMPING TEST                                                              | PUMPING TEST METHOD                      |                                 | PUMPING RATE                                                                  |                          | CAPACITY OF PUMP NG   |                       |
|                                                                           | <input checked="" type="checkbox"/> PUMP | <input type="checkbox"/> BAILER | 148 GPM                                                                       |                          | 24 INCHES             |                       |
|                                                                           | STATIC LEVEL                             | WATER LEVEL 140 FT. PUMPING     | WATER LEVELS DURING                                                           |                          |                       |                       |
|                                                                           |                                          |                                 | <input checked="" type="checkbox"/> PUMPING <input type="checkbox"/> RECOVERY |                          |                       |                       |
|                                                                           | 24.42 FEET                               | 59.27 FEET                      | 15 MINUTES 45.64 FEET                                                         | 30 MINUTES 46.28 FEET    | 45 MINUTES 46.56 FEET | 60 MINUTES 46.76 FEET |
|                                                                           | IF FLOWING GIVE RATE                     |                                 | PUMP INITIAL SET AT 154 FEET                                                  |                          | WATER AT END OF TEST  |                       |
| RECOMMENDED PUMP TYPE                                                     |                                          | RECOMMENDED PUMPING RATE        |                                                                               | RECOMMENDED PUMPING RATE |                       |                       |
| <input type="checkbox"/> SHALLOW <input checked="" type="checkbox"/> DEEP |                                          | SETTING 100 FEET                |                                                                               | 150 GPM                  |                       |                       |

|                                            |                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                            |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>FINAL<br/>STATUS<br/>OF WELL</b></p> | <p><input checked="" type="checkbox"/> WATER SUPPLY<br/> <input type="checkbox"/> OBSERVATION WELL<br/> <input type="checkbox"/> TEST HOLE<br/> <input type="checkbox"/> RECHARGE WELL</p>                                                       | <p><input type="checkbox"/> ABANDONED - INSUFFICIENT SUPPLY<br/> <input type="checkbox"/> ABANDONED - POOR QUALITY<br/> <input type="checkbox"/> UNFINISHED</p>                                                                            |
| <p><b>WATER<br/>USE</b></p>                | <p><input type="checkbox"/> DOMESTIC<br/> <input type="checkbox"/> STOCK<br/> <input type="checkbox"/> IRRIGATION<br/> <input type="checkbox"/> INDUSTRIAL<br/> <input type="checkbox"/> OTHER</p>                                               | <p><input type="checkbox"/> COMMERCIAL<br/> <input type="checkbox"/> MUNICIPAL<br/> <input type="checkbox"/> PUBLIC SUPPLY<br/> <input type="checkbox"/> COOLING OR AIR CONDITIONING<br/> <input checked="" type="checkbox"/> NOT USED</p> |
| <p><b>METHOD<br/>OF<br/>DRILLING</b></p>   | <p><input type="checkbox"/> CABLE TOOL<br/> <input checked="" type="checkbox"/> ROTARY - CONVENTIONAL<br/> <input type="checkbox"/> ROTARY - REVERSE<br/> <input type="checkbox"/> ROTARY - AIR<br/> <input type="checkbox"/> AIR PERCUSSION</p> | <p><input type="checkbox"/> BORING<br/> <input type="checkbox"/> DIAMOND<br/> <input type="checkbox"/> JETTING<br/> <input type="checkbox"/> DRILLING</p>                                                                                  |

**LOCATION OF WELL**

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE INDICATE NORTH BY ARROW

WELL

48 feet

270 feet

HEIDEN PLACE

PINE ST. N. E. & V.L.

(47)

|            |                          |                |
|------------|--------------------------|----------------|
| CONTRACTOR | NAME OF WELL CONTRACTOR  | SCIENCE NUMBER |
|            | Snider Drilling Limited, | 4816           |
|            | ADDRESS                  |                |
|            | Colchester, Ontario.     |                |
|            | NAME OF WELTER OR PUBLIC | SCIENCE NUMBER |
|            | Phillip Brown.           |                |
|            | SIGNATURE OF CONTRACTOR  | SUBMIT ON DATE |
|            | Ralph Snider.            | DAY MONTH YEAR |

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FORM NO. 1500-4



# APPENDIX A

## Water and Sewage: Demands/Flows

From Greenland Consulting Engineers, 2012.



## Water and Sewage Demands/Flows

### A. Historical Water Demands, Peaking Factors and Per Capita Daily Demands

| Year                          | *Average Daily Demand<br>(m <sup>3</sup> /d) | *Maximum Daily Demand<br>(m <sup>3</sup> /d) | Maximum Daily Demand<br>Peaking Factor | **Peak Hour Peaking Factor<br>(For Population 2,000) |
|-------------------------------|----------------------------------------------|----------------------------------------------|----------------------------------------|------------------------------------------------------|
| 2009                          | 399.50                                       | 1,044.90                                     | 2.62                                   | 3.75                                                 |
| 2010                          | 394.20                                       | 976.30                                       | 2.48                                   | 3.75                                                 |
| 2011                          | 368.20                                       | 796.80                                       | 2.16                                   | 3.75                                                 |
| Total                         | 1,161.90                                     | 2,818.00                                     |                                        |                                                      |
| <b>Average</b>                | <b>387.30</b>                                | <b>939.33</b>                                | <b>2.43</b>                            | <b>3.75</b>                                          |
| Connections                   | 643.00                                       |                                              |                                        |                                                      |
| Persons Per Unit              | 3.00                                         |                                              |                                        |                                                      |
| Population                    | 1,929.00                                     |                                              |                                        |                                                      |
| Per Capita Day Demand (L/c/d) | 200.78                                       | 486.95                                       |                                        |                                                      |

\*Source: Burnside Technical Memorandum (16 August 2011) re. R&M Homes Subdivision Review

\*\* Source: Peak Hour Peaking Factor from MOE Guidelines

### B. Historical Sewage Flow

New Horizons is the only Subdivision in Everett with existing municipal sewage collection/treatment. Remaining existing areas serviced by septic systems.

|                               |        |                   |
|-------------------------------|--------|-------------------|
| Historical Average Daily Flow | 74.00  | m <sup>3</sup> /d |
| Service Population            | 300.00 | persons           |
| Average Flow Per Capita       | 246.67 | L/c/d             |

\*Source: County Simcoe Visioning Strategy

### C. Future Water Distribution and Treatment Data

Since the historical per capita average daily demand is low when compared with MOE values, future development per capita flow is based on the following (for average daily demand)

|        |                                                        |
|--------|--------------------------------------------------------|
| 246.67 | L/c/d average sewage flow in New Horizon Sewage Plant  |
| 10.00  | % Increase for Water Use over Sewage Use               |
| 271.33 | L/c/d average daily water usage                        |
| 275.00 | L/c/d average daily water usage (rounded)              |
| Varies | Maximum Daily Demand Peaking Factor Per MOE Guidelines |

For existing areas the historical average daily demand water data will be used.

As such the following presents water demands for future existing and future growth scenarios:

Average Daily Demand

|          | Population | Maximum Daily Demand<br>Peaking Factor | Maximum Daily Demand<br>Existing Areas<br>(m <sup>3</sup> /d) | Maximum Daily Demand<br>Future Areas<br>(m <sup>3</sup> /d) | Total<br>(m <sup>3</sup> /d) |
|----------|------------|----------------------------------------|---------------------------------------------------------------|-------------------------------------------------------------|------------------------------|
| Existing | 1,929.00   | 1.00                                   | 387.30                                                        | 0.00                                                        | 387.30                       |
| Phase 1  | 3,500.00   | 1.00                                   | 387.30                                                        | 432.03                                                      | 819.33                       |
| Phase 2  | 7,000.00   | 1.00                                   | 387.30                                                        | 1,394.53                                                    | 1,781.83                     |
| Phase 3  | 10,000.00  | 1.00                                   | 387.30                                                        | 2,219.53                                                    | 2,606.83                     |

|  | Population | Maximum Daily Demand<br>Peaking Factor | Maximum Daily Demand<br>Existing Areas<br>(m <sup>3</sup> /d) | Maximum Daily Demand<br>Future Areas<br>(m <sup>3</sup> /d) | Total<br>(m <sup>3</sup> /d) |
|--|------------|----------------------------------------|---------------------------------------------------------------|-------------------------------------------------------------|------------------------------|
|--|------------|----------------------------------------|---------------------------------------------------------------|-------------------------------------------------------------|------------------------------|

Maximum Daily Demand

|          |           |      |        |          |          |
|----------|-----------|------|--------|----------|----------|
| Existing | 1,929.00  | 2.43 | 939.33 | 0.00     | 939.33   |
| Phase 1  | 3,500.00  | 2.23 | 864.51 | 964.34   | 1,828.85 |
| Phase 2  | 7,000.00  | 2.11 | 816.10 | 2,938.46 | 3,754.56 |
| Phase 3  | 10,000.00 | 2.00 | 774.60 | 4,439.05 | 5,213.65 |

|  | Population | Maximum Daily Demand<br>Peaking Factor | Maximum Daily Demand<br>Existing Areas<br>(m <sup>3</sup> /d) | Maximum Daily Demand<br>Future Areas<br>(m <sup>3</sup> /d) | Total<br>(m <sup>3</sup> /d) |
|--|------------|----------------------------------------|---------------------------------------------------------------|-------------------------------------------------------------|------------------------------|
|--|------------|----------------------------------------|---------------------------------------------------------------|-------------------------------------------------------------|------------------------------|

Peak Hour Demand

|          |           |      |          |          |          |
|----------|-----------|------|----------|----------|----------|
| Existing | 1,929.00  | 3.75 | 1,452.38 | 0.00     | 1,452.38 |
| Phase 1  | 3,500.00  | 3.35 | 1,298.56 | 1,448.52 | 2,747.08 |
| Phase 2  | 7,000.00  | 3.16 | 1,224.97 | 4,410.68 | 5,635.66 |
| Phase 3  | 10,000.00 | 3.00 | 1,161.90 | 6,658.58 | 7,820.48 |

**D. Future Sewage Collection and Treatment Data**

Sewage Collection for New and Existing Areas Based Upon

450 L/c/d average daily flow \* Harmon Peaking Factor + I/I Allowance

Sewage Treatment Existing Per Capita Avg. Flow

246 L/c/d average daily flow from New Horizon Subdivision  
248 L/c/d average daily flow (90% Water Average Daily Demand)  
247 Average L/c/d  
90 L/c/d extraneous flow allowance  
337 Total L/c/d  
340 Total L/c/d - to be used in Study.

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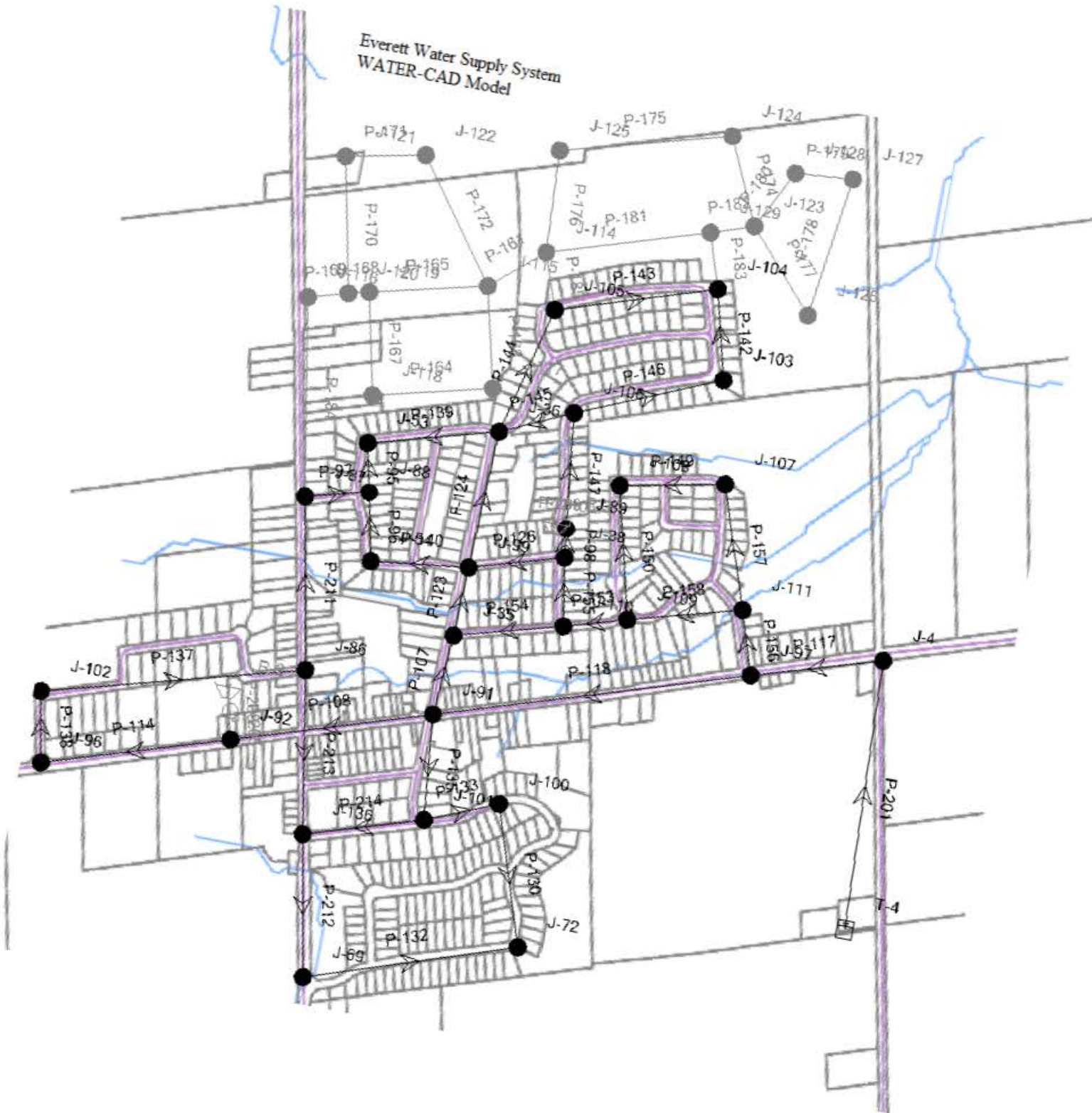


## **APPENDIX 'WS-D'**

### **1) Community of Everett WaterCAD Model Nodal Diagram**



Everett Water Supply System  
WATER-CAD Model



## **APPENDIX 'WS-E'**

### **1) Comprehensive Hydraulic Modeling Results WaterCAD V8 XM**



**Water Storage Option WS2/WS3 –  
Elevated Storage or Expanded Storage with Pumping**

**Water Distribution Option WD1-  
New Trunk Watermain 300 mm**

**Scenario: Average Daily Demand (A.D.D.)**





## Junction Report



| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 27  | J-4   | 246           | <None> | 14.44         | 290.7               | 437.1          |
| 85  | J-35  | 241           | <None> | 15.35         | 290.2               | 481.3          |
| 87  | J-36  | 241           | <None> | 17.57         | 290                 | 479.7          |
| 90  | J-38  | 240           | <None> | 17.57         | 290.1               | 490.7          |
| 119 | J-53  | 243.2         | <None> | 18            | 290                 | 458.1          |
| 121 | J-54  | 242.1         | <None> | 16            | 290                 | 469.3          |
| 151 | J-69  | 241           | <None> | 25.56         | 290                 | 479.6          |
| 159 | J-72  | 254           | <None> | 25.56         | 290                 | 352.4          |
| 199 | J-86  | 244           | <None> | 14            | 290                 | 450.3          |
| 203 | J-87  | 244.2         | <None> | 15.35         | 290                 | 448.2          |
| 208 | J-88  | 243.2         | <None> | 18            | 290                 | 458.2          |
| 212 | J-89  | 240           | <None> | 17.57         | 290.1               | 490.4          |
| 220 | J-91  | 242.2         | <None> | 26.85         | 290.2               | 469.6          |
| 225 | J-92  | 244.1         | <None> | 13.08         | 290.1               | 450.2          |
| 235 | J-96  | 246.1         | <None> | 13.08         | 290                 | 429.9          |
| 239 | J-97  | 242           | <None> | 14.44         | 290.4               | 473.7          |
| 247 | J-99  | 241           | <None> | 17.57         | 290.1               | 480.6          |
| 266 | J-100 | 242           | <None> | 25.56         | 290                 | 470            |
| 270 | J-101 | 242.2         | <None> | 16.65         | 290                 | 468.1          |
| 275 | J-102 | 247           | <None> | 13.08         | 290                 | 421            |
| 280 | J-103 | 242           | <None> | 17.32         | 289.9               | 469            |
| 282 | J-104 | 241           | <None> | 17.32         | 289.9               | 478.4          |
| 284 | J-105 | 241           | <None> | 17.32         | 289.9               | 478.4          |
| 287 | J-106 | 240           | <None> | 17.32         | 290                 | 489.5          |
| 291 | J-107 | 242           | <None> | 21.71         | 290.3               | 473.1          |
| 293 | J-108 | 240           | <None> | 21.71         | 290.3               | 492.6          |
| 295 | J-109 | 240           | <None> | 16.45         | 290.3               | 492.5          |
| 299 | J-110 | 240           | <None> | 16.45         | 290.3               | 492.2          |
| 303 | J-111 | 242           | <None> | 16.45         | 290.4               | 473.4          |
| 311 | J-114 | 240           | <None> | 32.06         | 289.8               | 487.9          |
| 313 | J-115 | 242           | <None> | 26.48         | 289.8               | 468.1          |
| 315 | J-116 | 244           | <None> | 0             | 290                 | 449.8          |
| 317 | J-117 | 241           | <None> | 29.24         | 289.8               | 477.8          |
| 319 | J-118 | 243           | <None> | 29.24         | 289.8               | 458.2          |
| 321 | J-119 | 243           | <None> | 29.24         | 289.8               | 458.2          |
| 325 | J-120 | 244           | <None> | 26.48         | 289.9               | 449.5          |
| 328 | J-121 | 242           | <None> | 26.48         | 289.8               | 468.1          |
| 330 | J-122 | 242           | <None> | 26.48         | 289.8               | 468.1          |
| 333 | J-123 | 238           | <None> | 32.06         | 289.8               | 507.3          |
| 335 | J-124 | 239           | <None> | 32.06         | 289.8               | 497.5          |
| 337 | J-125 | 240           | <None> | 32.06         | 289.8               | 487.8          |
| 340 | J-126 | 237           | <None> | 27.02         | 289.8               | 517            |
| 342 | J-127 | 236           | <None> | 27.02         | 289.8               | 526.8          |
| 344 | J-128 | 238           | <None> | 27.02         | 289.8               | 507.3          |
| 347 | J-129 | 239           | <None> | 32.06         | 289.8               | 497.7          |
| 398 | J-135 | 243           | <None> | 16            | 290                 | 460.1          |

| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 405 | J-136 | 245.8         | <None> | 94            | 290                 | 432.6          |
| 408 | J-137 | 242.5         | <None> | 100.15        | 290                 | 464.9          |
| 411 | J-140 | 247.2         | <None> | 104           | 290                 | 418.9          |
| 415 | J-141 | 250.1         | <None> | 0             | 290                 | 390.4          |
| 416 | J-142 | 249.5         | <None> | 104           | 290                 | 396.3          |
| 417 | J-143 | 249.1         | <None> | 104           | 290                 | 400.3          |
| 422 | J-144 | 249.8         | <None> | 119.5         | 290                 | 393.1          |
| 423 | J-145 | 248.5         | <None> | 119.5         | 290                 | 405.8          |
| 424 | J-146 | 253.9         | <None> | 119.5         | 290                 | 353            |
| 430 | J-147 | 247.9         | <None> | 119.5         | 290                 | 411.6          |
| 431 | J-148 | 245.3         | <None> | 119.5         | 290                 | 437.1          |
| 435 | J-149 | 238.2         | <None> | 120           | 289.8               | 505.3          |
| 436 | J-150 | 240.2         | <None> | 120           | 289.8               | 485.7          |
| 437 | J-151 | 238.5         | <None> | 120           | 289.8               | 502.4          |
| 442 | J-152 | 243.8         | <None> | 70.75         | 290.4               | 456.1          |
| 443 | J-153 | 252.2         | <None> | 70.75         | 290.4               | 373.9          |
| 444 | J-154 | 266.5         | <None> | 70.75         | 290.4               | 234            |
| 445 | J-155 | 272.5         | <None> | 70.75         | 290.4               | 175.2          |
| 451 | J-156 | 251.5         | <None> | 119.5         | 290                 | 376.5          |
| 456 | J-157 | 246.1         | <None> | 100.15        | 290                 | 429.7          |

## Pipe Report





| Id | Label     | Scaled Length (m) | Start Node | Stop Node  | Diameter (mm) | Material     | Hazen-Williams C |                  |               | Flow (m³/d) | Velocity (ft/s) | Headloss Gradient<br>(mm/m (V:H)) | Has User Defined<br>Length? |       |
|----|-----------|-------------------|------------|------------|---------------|--------------|------------------|------------------|---------------|-------------|-----------------|-----------------------------------|-----------------------------|-------|
|    |           |                   |            |            |               |              | ()               | Has Check Valve? | Minor Loss () |             |                 |                                   |                             |       |
|    | 322 P-165 | 269               | 313: J-115 | 321: J-119 | 150           | Ductile Iron | 150              | FALSE            |               | 0 (N/A)     | (N/A)           | (N/A)                             | FALSE                       |       |
|    | 326 P-168 | 47                | 321: J-119 | 325: J-120 | 150           | Ductile Iron | 130              | FALSE            |               | 0 (N/A)     | (N/A)           | (N/A)                             | FALSE                       |       |
|    | 396 P-204 | 50                | 167: R-2   | 379: PMP-4 | 200           | Ductile Iron | 130              | FALSE            |               | 0 (N/A)     | (N/A)           | (N/A)                             | FALSE                       |       |
|    | 397 P-205 | 60                | 379: PMP-4 | 225: J-92  | 200           | Ductile Iron | 130              | FALSE            |               | 0 (N/A)     | (N/A)           | (N/A)                             | FALSE                       |       |
|    | 403 P-210 | 11                | 168: R-3   | 382: PMP-5 | 200           | Ductile Iron | 130              | FALSE            |               | 0 (N/A)     | (N/A)           | (N/A)                             | FALSE                       |       |
|    | 404 P-211 | 14                | 382: PMP-5 | 212: J-89  | 200           | Ductile Iron | 130              | FALSE            |               | 0 (N/A)     | (N/A)           | (N/A)                             | FALSE                       |       |
|    | 434 P-228 | 187               | 431: J-148 | 315: J-116 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | 3.29            | 0                                 | 0                           | FALSE |
|    | 440 P-231 | 483               | 436: J-150 | 437: J-151 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | 0.89            | 0                                 | 0                           | FALSE |
|    | 453 P-239 | 424               | 424: J-146 | 451: J-156 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | 5.2             | 0                                 | 0                           | FALSE |
|    | 446 P-233 | 359               | 444: J-154 | 445: J-155 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | -9.8            | 0.01                              | 0                           | FALSE |
|    | 331 P-171 | 181               | 328: J-121 | 330: J-122 | 150           | Ductile Iron | 130              | FALSE            |               | 0           | -1.86           | 0                                 | 0                           | FALSE |
|    | 450 P-237 | 392               | 442: J-152 | 444: J-154 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | 60.95           | 0.03                              | 0.001                       | FALSE |
|    | 343 P-178 | 325               | 340: J-126 | 342: J-127 | 150           | Ductile Iron | 200              | FALSE            |               | 0           | 16.11           | 0.03                              | 0.001                       | FALSE |
|    | 348 P-181 | 374               | 311: J-114 | 347: J-129 | 150           | Ductile Iron | 130              | FALSE            |               | 0           | -11.26          | 0.02                              | 0.001                       | FALSE |
|    | 345 P-179 | 131               | 342: J-127 | 344: J-128 | 150           | Ductile Iron | 130              | FALSE            |               | 0           | -10.91          | 0.02                              | 0.001                       | FALSE |
|    | 447 P-234 | 343               | 445: J-155 | 443: J-153 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | -80.55          | 0.04                              | 0.001                       | FALSE |
|    | 413 P-215 | 330               | 405: J-136 | 408: J-137 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | 82.5            | 0.04                              | 0.001                       | FALSE |
|    | 336 P-174 | 210               | 333: J-123 | 335: J-124 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | 89.13           | 0.05                              | 0.001                       | FALSE |
|    | 454 P-240 | 416               | 451: J-156 | 422: J-144 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | -114.3          | 0.06                              | 0.002                       | FALSE |
|    | 441 P-232 | 196               | 437: J-151 | 335: J-124 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | -119.11         | 0.06                              | 0.002                       | FALSE |
|    | 439 P-230 | 328               | 435: J-149 | 436: J-150 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | 120.89          | 0.06                              | 0.002                       | FALSE |
|    | 433 P-227 | 309               | 430: J-147 | 431: J-148 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | 122.79          | 0.07                              | 0.002                       | FALSE |
|    | 457 P-242 | 192               | 408: J-137 | 456: J-157 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | 123.99          | 0.07                              | 0.003                       | FALSE |
|    | 452 P-238 | 353               | 422: J-144 | 424: J-146 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | 124.7           | 0.07                              | 0.003                       | FALSE |
|    | 449 P-236 | 338               | 239: J-97  | 442: J-152 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | 131.7           | 0.07                              | 0.003                       | FALSE |
|    | 420 P-219 | 336               | 416: J-142 | 417: J-143 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | -132.4          | 0.07                              | 0.003                       | FALSE |
|    | 412 P-214 | 337               | 408: J-137 | 151: J-69  | 300           | Ductile Iron | 130              | FALSE            |               | 0           | -141.64         | 0.08                              | 0.003                       | FALSE |
|    | 448 P-235 | 225               | 443: J-153 | 239: J-97  | 300           | Ductile Iron | 130              | FALSE            |               | 0           | -151.3          | 0.08                              | 0.004                       | FALSE |
|    | 341 P-177 | 235               | 333: J-123 | 340: J-126 | 150           | Ductile Iron | 200              | FALSE            |               | 0           | 43.13           | 0.09                              | 0.005                       | FALSE |
|    | 332 P-172 | 328               | 330: J-122 | 313: J-115 | 150           | Ductile Iron | 130              | FALSE            |               | 0           | -28.34          | 0.06                              | 0.005                       | FALSE |
|    | 224 P-107 | 184               | 220: J-91  | 85: J-35   | 150           | Ductile Iron | 130              | FALSE            |               | 0           | 28.37           | 0.06                              | 0.005                       | FALSE |
|    | 324 P-167 | 234               | 319: J-118 | 321: J-119 | 150           | Ductile Iron | 130              | FALSE            |               | 0           | 29.24           | 0.06                              | 0.005                       | FALSE |
|    | 278 P-139 | 299               | 87: J-36   | 119: J-53  | 150           | Ductile Iron | 130              | FALSE            |               | 0           | -31.52          | 0.07                              | 0.006                       | FALSE |
|    | 458 P-243 | 233               | 456: J-157 | 411: J-140 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | -212.55         | 0.11                              | 0.007                       | FALSE |
|    | 346 P-180 | 151               | 344: J-128 | 333: J-123 | 150           | Ductile Iron | 130              | FALSE            |               | 0           | -37.93          | 0.08                              | 0.008                       | FALSE |
|    | 462 P-245 | 663               | 456: J-157 | 417: J-143 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | 236.4           | 0.13                              | 0.008                       | FALSE |
|    | 288 P-145 | 175               | 87: J-36   | 287: J-106 | 150           | Ductile Iron | 130              | FALSE            |               | 0           | -38.76          | 0.08                              | 0.008                       | FALSE |
|    | 438 P-229 | 211               | 328: J-121 | 435: J-149 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | 240.89          | 0.13                              | 0.008                       | FALSE |
|    | 432 P-226 | 394               | 423: J-145 | 430: J-147 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | 242.29          | 0.13                              | 0.009                       | FALSE |
|    | 285 P-143 | 372               | 282: J-104 | 284: J-105 | 150           | Ductile Iron | 130              | FALSE            |               | 0           | -40.77          | 0.09                              | 0.009                       | FALSE |
|    | 400 P-207 | 368               | 398: J-135 | 199: J-86  | 200           | Ductile Iron | 130              | FALSE            |               | 0           | 96.29           | 0.12                              | 0.011                       | FALSE |
|    | 209 P-95  | 113               | 119: J-53  | 208: J-88  | 150           | Ductile Iron | 130              | FALSE            |               | 0           | -49.52          | 0.11                              | 0.013                       | FALSE |
|    | 269 P-132 | 491               | 151: J-69  | 159: J-72  | 200           | Ductile Iron | 130              | FALSE            |               | 0           | -112.37         | 0.14                              | 0.015                       | FALSE |
|    | 399 P-206 | 327               | 151: J-69  | 398: J-135 | 150           | Ductile Iron | 130              | FALSE            |               | 0           | -54.83          | 0.12                              | 0.016                       | FALSE |
|    | 406 P-212 | 365               | 398: J-135 | 405: J-136 | 150           | Ductile Iron | 130              | FALSE            |               | 0           | 55.21           | 0.12                              | 0.016                       | FALSE |
|    | 455 P-241 | 341               | 422: J-144 | 423: J-145 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | 361.79          | 0.19                              | 0.018                       | FALSE |
|    | 320 P-164 | 273               | 317: J-117 | 319: J-118 | 150           | Ductile Iron | 130              | FALSE            |               | 0           | 58.48           | 0.13                              | 0.018                       | FALSE |
|    | 338 P-175 | 392               | 335: J-124 | 337: J-125 | 150           | Ductile Iron | 130              | FALSE            |               | 0           | -62.04          | 0.13                              | 0.02                        | FALSE |
|    | 276 P-137 | 601               | 199: J-86  | 275: J-102 | 150           | Ductile Iron | 130              | FALSE            |               | 0           | -64.28          | 0.14                              | 0.021                       | FALSE |
|    | 267 P-130 | 327               | 159: J-72  | 266: J-100 | 200           | Ductile Iron | 130              | FALSE            |               | 0           | -137.93         | 0.17                              | 0.022                       | FALSE |
|    | 418 P-217 | 337               | 411: J-140 | 416: J-142 | 300           | Ductile Iron | 130              | FALSE            |               | 0           | 418.43          | 0.22                              | 0.024                       | FALSE |

| Id | Label     | Scaled Length (m) | Start Node | Stop Node  | Diameter (mm) | Material     | Hazen-Williams C |                  |                | Flow (m³/d) | Velocity (ft/s) | Headloss Gradient |         | Has User Defined |  |
|----|-----------|-------------------|------------|------------|---------------|--------------|------------------|------------------|----------------|-------------|-----------------|-------------------|---------|------------------|--|
|    |           |                   |            |            |               |              | ()               | Has Check Valve? | Minor Loss (') |             |                 | (mm/m (V:H))      | Length? |                  |  |
|    | 402 P-209 | 393               | 203: J-87  | 199: J-86  | 200           | Ductile Iron | 130              | FALSE            |                | 0           | -146.58         | 0.18              | 0.024   | FALSE            |  |
|    | 419 P-218 | 235               | 416: J-142 | 415: J-141 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 446.82          | 0.24              | 0.027   | FALSE            |  |
|    | 271 P-133 | 174               | 266: J-100 | 270: J-101 | 200           | Ductile Iron | 130              | FALSE            |                | 0           | -163.49         | 0.2               | 0.03    | FALSE            |  |
|    | 277 P-138 | 162               | 275: J-102 | 235: J-96  | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -77.36          | 0.17              | 0.03    | FALSE            |  |
|    | 296 P-150 | 306               | 293: J-108 | 295: J-109 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 86.95           | 0.19              | 0.038   | FALSE            |  |
|    | 318 P-163 | 232               | 313: J-115 | 317: J-117 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 87.72           | 0.19              | 0.038   | FALSE            |  |
|    | 339 P-176 | 233               | 337: J-125 | 311: J-114 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -94.1           | 0.2               | 0.044   | FALSE            |  |
|    | 401 P-208 | 273               | 270: J-101 | 398: J-135 | 200           | Ductile Iron | 130              | FALSE            |                | 0           | 222.33          | 0.27              | 0.053   | FALSE            |  |
|    | 294 P-149 | 238               | 291: J-107 | 293: J-108 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 108.66          | 0.23              | 0.057   | FALSE            |  |
|    | 425 P-221 | 353               | 415: J-141 | 422: J-144 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 720.29          | 0.39              | 0.065   | FALSE            |  |
|    | 461 P-244 | 282               | 235: J-96  | 411: J-140 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 734.98          | 0.39              | 0.067   | FALSE            |  |
|    | 407 P-213 | 282               | 405: J-136 | 235: J-96  | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -121.3          | 0.26              | 0.07    | FALSE            |  |
|    | 421 P-220 | 428               | 415: J-141 | 235: J-96  | 200           | Ductile Iron | 130              | FALSE            |                | 0           | -273.47         | 0.33              | 0.077   | FALSE            |  |
|    | 305 P-157 | 290               | 303: J-111 | 291: J-107 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 130.37          | 0.28              | 0.08    | FALSE            |  |
|    | 351 P-184 | 454               | 315: J-116 | 203: J-87  | 200           | Ductile Iron | 130              | FALSE            |                | 0           | -288.69         | 0.35              | 0.085   | FALSE            |  |
|    | 314 P-161 | 153               | 311: J-114 | 313: J-115 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 142.54          | 0.31              | 0.094   | FALSE            |  |
|    | 211 P-97  | 146               | 203: J-87  | 208: J-88  | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -157.47         | 0.34              | 0.113   | FALSE            |  |
|    | 251 P-126 | 219               | 247: J-99  | 90: J-38   | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -178.69         | 0.38              | 0.143   | FALSE            |  |
|    | 236 P-114 | 432               | 225: J-92  | 235: J-96  | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 1220.19         | 0.66              | 0.171   | FALSE            |  |
|    | 226 P-108 | 462               | 220: J-91  | 225: J-92  | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 1233.27         | 0.66              | 0.175   | FALSE            |  |
|    | 349 P-182 | 101               | 347: J-129 | 333: J-123 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 202.25          | 0.43              | 0.18    | FALSE            |  |
|    | 306 P-158 | 262               | 295: J-109 | 303: J-111 | 250           | Ductile Iron | 130              | FALSE            |                | 0           | -784.98         | 0.61              | 0.184   | FALSE            |  |
|    | 283 P-142 | 206               | 280: J-103 | 282: J-104 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 222.12          | 0.48              | 0.214   | FALSE            |  |
|    | 300 P-153 | 145               | 295: J-109 | 299: J-110 | 250           | Ductile Iron | 130              | FALSE            |                | 0           | 855.48          | 0.66              | 0.216   | FALSE            |  |
|    | 210 P-96  | 157               | 208: J-88  | 121: J-54  | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -224.99         | 0.48              | 0.219   | FALSE            |  |
|    | 289 P-146 | 346               | 287: J-106 | 280: J-103 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 239.44          | 0.51              | 0.246   | FALSE            |  |
|    | 279 P-140 | 222               | 247: J-99  | 121: J-54  | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 240.99          | 0.52              | 0.248   | FALSE            |  |
|    | 304 P-156 | 149               | 239: J-97  | 303: J-111 | 250           | Ductile Iron | 130              | FALSE            |                | 0           | 931.8           | 0.72              | 0.253   | FALSE            |  |
|    | 350 P-183 | 129               | 347: J-129 | 282: J-104 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -245.57         | 0.53              | 0.257   | FALSE            |  |
|    | 352 P-185 | 132               | 311: J-114 | 284: J-105 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -257.44         | 0.55              | 0.281   | FALSE            |  |
|    | 249 P-124 | 318               | 247: J-99  | 87: J-36   | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 262.81          | 0.56              | 0.292   | FALSE            |  |
|    | 329 P-170 | 310               | 325: J-120 | 328: J-121 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 265.5           | 0.57              | 0.297   | FALSE            |  |
|    | 241 P-118 | 725               | 239: J-97  | 220: J-91  | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 1690.95         | 0.91              | 0.313   | FALSE            |  |
|    | 327 P-169 | 92                | 325: J-120 | 315: J-116 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -291.98         | 0.63              | 0.355   | FALSE            |  |
|    | 290 P-147 | 264               | 287: J-106 | 212: J-89  | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -295.53         | 0.64              | 0.363   | FALSE            |  |
|    | 213 P-98  | 66                | 90: J-38   | 212: J-89  | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 313.1           | 0.67              | 0.403   | FALSE            |  |
|    | 286 P-144 | 303               | 284: J-105 | 87: J-36   | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -315.53         | 0.68              | 0.409   | FALSE            |  |
|    | 301 P-154 | 250               | 299: J-110 | 85: J-35   | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 329.66          | 0.71              | 0.444   | FALSE            |  |
|    | 248 P-123 | 158               | 85: J-35   | 247: J-99  | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 342.68          | 0.74              | 0.477   | FALSE            |  |
|    | 273 P-135 | 240               | 220: J-91  | 270: J-101 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 402.47          | 0.86              | 0.642   | FALSE            |  |
|    | 240 P-117 | 302               | 27: J-4    | 239: J-97  | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 2920.19         | 1.57              | 0.862   | FALSE            |  |
|    | 389 P-201 | 614               | 27: J-4    | 388: T-4   | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -2934.63        | 1.58              | 0.87    | FALSE            |  |
|    | 302 P-155 | 156               | 90: J-38   | 299: J-110 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -509.36         | 1.09              | 0.994   | FALSE            |  |

## Tank Report



| Id  | Label | Zone   | Base Elevation (m) | Minimum Elevation (m) | Initial Elevation (m) | Maximum Elevation (m) | Inactive Volume (m?) | Diameter (ft) | Outflow (m?/d) | Hydraulic Grade (m) |
|-----|-------|--------|--------------------|-----------------------|-----------------------|-----------------------|----------------------|---------------|----------------|---------------------|
| 388 | T-4   | <None> | 285                | 285.1                 | 291.2                 | 291.4                 | 1600                 | 97.95         | 2934.63        | 291.2               |



## Reservoir Report



| Id  | Label | Elevation (m) | Zone   | Outflow (m3/d) | Hydraulic Grade (m) |
|-----|-------|---------------|--------|----------------|---------------------|
| 167 | R-2   | 332           | <None> | (N/A)          | (N/A)               |
| 168 | R-3   | 351           | <None> | (N/A)          | (N/A)               |

**Water Storage Option WS2/WS3 –  
Elevated Storage or Expanded Storage with Pumping**

**Water Distribution Option WD1-  
New Trunk Watermain 300 mm**

**Scenario: Maximum Daily Demand (M.D.D.)**



## Junction Report





| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 27  | J-4   | 246           | <None> | 27.37         | 294.3               | 472.3          |
| 85  | J-35  | 241           | <None> | 29.1          | 292.7               | 505.6          |
| 87  | J-36  | 241           | <None> | 33.3          | 292.1               | 500.2          |
| 90  | J-38  | 240           | <None> | 33.3          | 292.5               | 514            |
| 119 | J-53  | 243.2         | <None> | 34.12         | 292.1               | 478.7          |
| 121 | J-54  | 242.1         | <None> | 30.33         | 292.2               | 490.7          |
| 151 | J-69  | 241           | <None> | 48.45         | 292.1               | 500            |
| 159 | J-72  | 254           | <None> | 48.45         | 292.1               | 373.1          |
| 199 | J-86  | 244           | <None> | 26.54         | 292.1               | 470.7          |
| 203 | J-87  | 244.2         | <None> | 29.1          | 292.1               | 468.5          |
| 208 | J-88  | 243.2         | <None> | 34.12         | 292.1               | 478.8          |
| 212 | J-89  | 240           | <None> | 33.3          | 292.4               | 513.1          |
| 220 | J-91  | 242.2         | <None> | 50.89         | 292.7               | 493.9          |
| 225 | J-92  | 244.1         | <None> | 24.79         | 292.4               | 472.7          |
| 235 | J-96  | 246.1         | <None> | 24.79         | 292.2               | 450.7          |
| 239 | J-97  | 242           | <None> | 27.37         | 293.4               | 503.1          |
| 247 | J-99  | 241           | <None> | 33.3          | 292.4               | 503.2          |
| 266 | J-100 | 242           | <None> | 48.45         | 292.1               | 490.7          |
| 270 | J-101 | 242.2         | <None> | 31.56         | 292.2               | 488.9          |
| 275 | J-102 | 247           | <None> | 24.79         | 292.1               | 441.8          |
| 280 | J-103 | 242           | <None> | 32.83         | 291.8               | 487.8          |
| 282 | J-104 | 241           | <None> | 32.83         | 291.7               | 496.2          |
| 284 | J-105 | 241           | <None> | 32.83         | 291.7               | 496.3          |
| 287 | J-106 | 240           | <None> | 32.83         | 292.1               | 510.1          |
| 291 | J-107 | 242           | <None> | 41.15         | 293.2               | 501.1          |
| 293 | J-108 | 240           | <None> | 41.15         | 293.2               | 520.3          |
| 295 | J-109 | 240           | <None> | 31.18         | 293.1               | 519.9          |
| 299 | J-110 | 240           | <None> | 31.18         | 293                 | 518.9          |
| 303 | J-111 | 242           | <None> | 31.18         | 293.3               | 501.9          |
| 311 | J-114 | 240           | <None> | 60.77         | 291.6               | 504.9          |
| 313 | J-115 | 242           | <None> | 50.19         | 291.5               | 484.8          |
| 315 | J-116 | 244           | <None> | 0             | 291.9               | 469.2          |
| 317 | J-117 | 241           | <None> | 55.42         | 291.5               | 494.3          |
| 319 | J-118 | 243           | <None> | 55.42         | 291.5               | 474.6          |
| 321 | J-119 | 243           | <None> | 55.42         | 291.5               | 474.5          |
| 325 | J-120 | 244           | <None> | 50.19         | 291.8               | 468.1          |
| 328 | J-121 | 242           | <None> | 50.19         | 291.5               | 484.7          |
| 330 | J-122 | 242           | <None> | 50.19         | 291.5               | 484.7          |
| 333 | J-123 | 238           | <None> | 60.77         | 291.5               | 524            |
| 335 | J-124 | 239           | <None> | 60.77         | 291.5               | 514            |
| 337 | J-125 | 240           | <None> | 60.77         | 291.5               | 504.5          |
| 340 | J-126 | 237           | <None> | 51.22         | 291.5               | 533.7          |
| 342 | J-127 | 236           | <None> | 51.22         | 291.5               | 543.5          |
| 344 | J-128 | 238           | <None> | 51.22         | 291.5               | 523.9          |
| 347 | J-129 | 239           | <None> | 60.77         | 291.6               | 514.7          |
| 398 | J-135 | 243           | <None> | 30.33         | 292.1               | 480.6          |

| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 405 | J-136 | 245.8         | <None> | 178.18        | 292.1               | 453.1          |
| 408 | J-137 | 242.5         | <None> | 189.83        | 292.1               | 485.3          |
| 411 | J-140 | 247.2         | <None> | 197.13        | 292.1               | 439.4          |
| 415 | J-141 | 250.1         | <None> | 0             | 292                 | 410.5          |
| 416 | J-142 | 249.5         | <None> | 197.13        | 292.1               | 416.6          |
| 417 | J-143 | 249.1         | <None> | 197.13        | 292.1               | 420.6          |
| 422 | J-144 | 249.8         | <None> | 226.51        | 292                 | 412.7          |
| 423 | J-145 | 248.5         | <None> | 226.51        | 292                 | 425.3          |
| 424 | J-146 | 253.9         | <None> | 226.51        | 292                 | 372.5          |
| 430 | J-147 | 247.9         | <None> | 226.51        | 291.9               | 431            |
| 431 | J-148 | 245.3         | <None> | 226.51        | 291.9               | 456.5          |
| 435 | J-149 | 238.2         | <None> | 227.46        | 291.5               | 521.8          |
| 436 | J-150 | 240.2         | <None> | 227.46        | 291.5               | 502.2          |
| 437 | J-151 | 238.5         | <None> | 227.46        | 291.5               | 518.9          |
| 442 | J-152 | 243.8         | <None> | 134.11        | 293.4               | 485.4          |
| 443 | J-153 | 252.2         | <None> | 134.11        | 293.4               | 403.2          |
| 444 | J-154 | 266.5         | <None> | 134.11        | 293.4               | 263.3          |
| 445 | J-155 | 272.5         | <None> | 134.11        | 293.4               | 204.5          |
| 451 | J-156 | 251.5         | <None> | 226.51        | 292                 | 396            |
| 456 | J-157 | 246.1         | <None> | 189.83        | 292.1               | 450.1          |

## Pipe Report



| Id  | Label | Scaled Length (m) | Start Node | Stop Node  | Diameter (mm) | Material     | Hazen-Williams C |                  |                | Headloss    |                 | Has User Defined Length? |                       |       |
|-----|-------|-------------------|------------|------------|---------------|--------------|------------------|------------------|----------------|-------------|-----------------|--------------------------|-----------------------|-------|
|     |       |                   |            |            |               |              | ()               | Has Check Valve? | Minor Loss (l) | Flow (m³/d) | Velocity (ft/s) |                          | Gradient (mm/m (V:H)) |       |
| 322 | P-165 | 269               | 313: J-115 | 321: J-119 | 150           | Ductile Iron | 130              | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                    | FALSE                 |       |
| 326 | P-168 | 47                | 321: J-119 | 325: J-120 | 150           | Ductile Iron | 130              | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                    | FALSE                 |       |
| 396 | P-204 | 50                | 167: R-2   | 379: PMP-4 | 200           | Ductile Iron | 130              | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                    | FALSE                 |       |
| 397 | P-205 | 60                | 379: PMP-4 | 225: J-92  | 200           | Ductile Iron | 130              | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                    | FALSE                 |       |
| 403 | P-210 | 11                | 168: R-3   | 382: PMP-5 | 200           | Ductile Iron | 130              | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                    | FALSE                 |       |
| 404 | P-211 | 14                | 382: PMP-5 | 212: J-89  | 200           | Ductile Iron | 130              | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                    | FALSE                 |       |
| 434 | P-228 | 187               | 431: J-148 | 315: J-116 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 7.65            | 0                        | FALSE                 |       |
| 440 | P-231 | 483               | 436: J-150 | 437: J-151 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 17.94           | 0.01                     | FALSE                 |       |
| 446 | P-233 | 359               | 444: J-154 | 445: J-155 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -18.58          | 0.01                     | FALSE                 |       |
| 331 | P-171 | 181               | 328: J-121 | 330: J-122 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -16.93          | 0.04                     | 0.002                 | FALSE |
| 450 | P-237 | 392               | 442: J-152 | 444: J-154 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 115.53          | 0.06                     | 0.002                 | FALSE |
| 343 | P-178 | 325               | 340: J-126 | 342: J-127 | 150           | Ductile Iron | 200              | FALSE            |                | 0           | 30.54           | 0.07                     | 0.002                 | FALSE |
| 345 | P-179 | 131               | 342: J-127 | 344: J-128 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -20.68          | 0.04                     | 0.003                 | FALSE |
| 447 | P-234 | 343               | 445: J-155 | 443: J-153 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -152.69         | 0.08                     | 0.004                 | FALSE |
| 453 | P-239 | 424               | 424: J-146 | 451: J-156 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -152.95         | 0.08                     | 0.004                 | FALSE |
| 413 | P-215 | 330               | 405: J-136 | 408: J-137 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 156.63          | 0.08                     | 0.004                 | FALSE |
| 441 | P-232 | 196               | 437: J-151 | 335: J-124 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -209.52         | 0.11                     | 0.007                 | FALSE |
| 433 | P-227 | 309               | 430: J-147 | 431: J-148 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 234.16          | 0.13                     | 0.008                 | FALSE |
| 457 | P-242 | 192               | 408: J-137 | 456: J-157 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 235.63          | 0.13                     | 0.008                 | FALSE |
| 439 | P-230 | 328               | 435: J-149 | 436: J-150 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 245.4           | 0.13                     | 0.009                 | FALSE |
| 449 | P-236 | 338               | 239: J-97  | 442: J-152 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 249.63          | 0.13                     | 0.009                 | FALSE |
| 420 | P-219 | 336               | 416: J-142 | 417: J-143 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -251.4          | 0.14                     | 0.009                 | FALSE |
| 412 | P-214 | 337               | 408: J-137 | 151: J-69  | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -268.84         | 0.14                     | 0.01                  | FALSE |
| 348 | P-181 | 374               | 311: J-114 | 347: J-129 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -44.22          | 0.1                      | 0.011                 | FALSE |
| 448 | P-235 | 225               | 443: J-153 | 239: J-97  | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -286.79         | 0.15                     | 0.012                 | FALSE |
| 224 | P-107 | 184               | 220: J-91  | 85: J-35   | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 53.05           | 0.11                     | 0.015                 | FALSE |
| 341 | P-177 | 235               | 333: J-123 | 340: J-126 | 150           | Ductile Iron | 200              | FALSE            |                | 0           | 81.75           | 0.18                     | 0.015                 | FALSE |
| 324 | P-167 | 234               | 319: J-118 | 321: J-119 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 55.42           | 0.12                     | 0.016                 | FALSE |
| 278 | P-139 | 299               | 87: J-36   | 119: J-53  | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -57.83          | 0.12                     | 0.018                 | FALSE |
| 454 | P-240 | 416               | 451: J-156 | 422: J-144 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -379.46         | 0.2                      | 0.02                  | FALSE |
| 458 | P-243 | 233               | 456: J-157 | 411: J-140 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -402.74         | 0.22                     | 0.022                 | FALSE |
| 332 | P-172 | 328               | 330: J-122 | 313: J-115 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -67.12          | 0.14                     | 0.023                 | FALSE |
| 346 | P-180 | 151               | 344: J-128 | 333: J-123 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -71.9           | 0.15                     | 0.027                 | FALSE |
| 462 | P-245 | 663               | 456: J-157 | 417: J-143 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 448.54          | 0.24                     | 0.027                 | FALSE |
| 452 | P-238 | 353               | 422: J-144 | 424: J-146 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 73.57           | 0.16                     | 0.028                 | FALSE |
| 288 | P-145 | 175               | 87: J-36   | 287: J-106 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -74.4           | 0.16                     | 0.028                 | FALSE |
| 432 | P-226 | 394               | 423: J-145 | 430: J-147 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 460.67          | 0.25                     | 0.028                 | FALSE |
| 285 | P-143 | 372               | 282: J-104 | 284: J-105 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -74.62          | 0.16                     | 0.028                 | FALSE |
| 438 | P-229 | 211               | 328: J-121 | 435: J-149 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 472.86          | 0.25                     | 0.03                  | FALSE |
| 400 | P-207 | 368               | 398: J-135 | 199: J-86  | 200           | Ductile Iron | 130              | FALSE            |                | 0           | 182.17          | 0.22                     | 0.036                 | FALSE |
| 209 | P-95  | 113               | 119: J-53  | 208: J-88  | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -91.95          | 0.2                      | 0.042                 | FALSE |
| 269 | P-132 | 491               | 151: J-69  | 159: J-72  | 200           | Ductile Iron | 130              | FALSE            |                | 0           | -213.15         | 0.26                     | 0.049                 | FALSE |
| 399 | P-206 | 327               | 151: J-69  | 398: J-135 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -104.13         | 0.22                     | 0.053                 | FALSE |
| 406 | P-212 | 365               | 398: J-135 | 405: J-136 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 104.84          | 0.23                     | 0.053                 | FALSE |
| 320 | P-164 | 273               | 317: J-117 | 319: J-118 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 110.85          | 0.24                     | 0.059                 | FALSE |
| 455 | P-241 | 341               | 422: J-144 | 423: J-145 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 687.19          | 0.37                     | 0.059                 | FALSE |
| 276 | P-137 | 601               | 199: J-86  | 275: J-102 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -121.74         | 0.26                     | 0.07                  | FALSE |
| 267 | P-130 | 327               | 159: J-72  | 266: J-100 | 200           | Ductile Iron | 130              | FALSE            |                | 0           | -261.6          | 0.32                     | 0.071                 | FALSE |
| 418 | P-217 | 337               | 411: J-140 | 416: J-142 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 793.77          | 0.43                     | 0.077                 | FALSE |
| 338 | P-175 | 392               | 335: J-124 | 337: J-125 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -128.25         | 0.28                     | 0.077                 | FALSE |
| 402 | P-209 | 393               | 203: J-87  | 199: J-86  | 200           | Ductile Iron | 130              | FALSE            |                | 0           | -277.38         | 0.34                     | 0.079                 | FALSE |
| 419 | P-218 | 235               | 416: J-142 | 415: J-141 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 848.04          | 0.46                     | 0.087                 | FALSE |



| Id  | Label | Scaled Length (m) | Start Node | Stop Node  | Diameter (mm) | Material     | Hazen-Williams C |                  |                | Flow (m³/d) | Velocity (ft/s) | Headloss              |       | Has User Defined Length? |
|-----|-------|-------------------|------------|------------|---------------|--------------|------------------|------------------|----------------|-------------|-----------------|-----------------------|-------|--------------------------|
|     |       |                   |            |            |               |              | ( )              | Has Check Valve? | Minor Loss ( ) |             |                 | Gradient (mm/m (V:H)) |       |                          |
| 336 | P-174 | 210               | 333: J-123 | 335: J-124 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 142.04          | 0.31                  | 0.093 | FALSE                    |
| 271 | P-133 | 174               | 266: J-100 | 270: J-101 | 200           | Ductile Iron | 130              | FALSE            |                | 0           | -310.05         | 0.37                  | 0.098 | FALSE                    |
| 277 | P-138 | 162               | 275: J-102 | 235: J-96  | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -146.54         | 0.31                  | 0.099 | FALSE                    |
| 296 | P-150 | 306               | 293: J-108 | 295: J-109 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 164.78          | 0.35                  | 0.123 | FALSE                    |
| 318 | P-163 | 232               | 313: J-115 | 317: J-117 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 166.27          | 0.36                  | 0.125 | FALSE                    |
| 339 | P-176 | 233               | 337: J-125 | 311: J-114 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -189.02         | 0.41                  | 0.158 | FALSE                    |
| 401 | P-208 | 273               | 270: J-101 | 398: J-135 | 200           | Ductile Iron | 130              | FALSE            |                | 0           | 421.48          | 0.51                  | 0.172 | FALSE                    |
| 294 | P-149 | 238               | 291: J-107 | 293: J-108 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 205.93          | 0.44                  | 0.186 | FALSE                    |
| 425 | P-221 | 353               | 415: J-141 | 422: J-144 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 1366.72         | 0.73                  | 0.211 | FALSE                    |
| 461 | P-244 | 282               | 235: J-96  | 411: J-140 | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 1393.64         | 0.75                  | 0.219 | FALSE                    |
| 407 | P-213 | 282               | 405: J-136 | 235: J-96  | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -229.97         | 0.49                  | 0.228 | FALSE                    |
| 421 | P-220 | 428               | 415: J-141 | 235: J-96  | 200           | Ductile Iron | 130              | FALSE            |                | 0           | -518.68         | 0.63                  | 0.253 | FALSE                    |
| 305 | P-157 | 290               | 303: J-111 | 291: J-107 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 247.08          | 0.53                  | 0.26  | FALSE                    |
| 351 | P-184 | 454               | 315: J-116 | 203: J-87  | 200           | Ductile Iron | 130              | FALSE            |                | 0           | -548.67         | 0.66                  | 0.281 | FALSE                    |
| 314 | P-161 | 153               | 311: J-114 | 313: J-115 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 283.59          | 0.61                  | 0.336 | FALSE                    |
| 211 | P-97  | 146               | 203: J-87  | 208: J-88  | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -300.38         | 0.65                  | 0.374 | FALSE                    |
| 251 | P-126 | 219               | 247: J-99  | 90: J-38   | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -338.81         | 0.73                  | 0.467 | FALSE                    |
| 349 | P-182 | 101               | 347: J-129 | 333: J-123 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 356.46          | 0.77                  | 0.513 | FALSE                    |
| 236 | P-114 | 432               | 225: J-92  | 235: J-96  | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 2313.62         | 1.24                  | 0.56  | FALSE                    |
| 226 | P-108 | 462               | 220: J-91  | 225: J-92  | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 2338.41         | 1.26                  | 0.571 | FALSE                    |
| 306 | P-158 | 262               | 295: J-109 | 303: J-111 | 250           | Ductile Iron | 130              | FALSE            |                | 0           | -1487.72        | 1.15                  | 0.601 | FALSE                    |
| 283 | P-142 | 206               | 280: J-103 | 282: J-104 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 419.65          | 0.9                   | 0.694 | FALSE                    |
| 300 | P-153 | 145               | 295: J-109 | 299: J-110 | 250           | Ductile Iron | 130              | FALSE            |                | 0           | 1621.32         | 1.25                  | 0.705 | FALSE                    |
| 210 | P-96  | 157               | 208: J-88  | 121: J-54  | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -426.45         | 0.92                  | 0.715 | FALSE                    |
| 289 | P-146 | 346               | 287: J-106 | 280: J-103 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 452.48          | 0.97                  | 0.798 | FALSE                    |
| 279 | P-140 | 222               | 247: J-99  | 121: J-54  | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 456.78          | 0.98                  | 0.812 | FALSE                    |
| 304 | P-156 | 149               | 239: J-97  | 303: J-111 | 250           | Ductile Iron | 130              | FALSE            |                | 0           | 1765.98         | 1.37                  | 0.825 | FALSE                    |
| 350 | P-183 | 129               | 347: J-129 | 282: J-104 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -461.45         | 0.99                  | 0.827 | FALSE                    |
| 352 | P-185 | 132               | 311: J-114 | 284: J-105 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -489.16         | 1.05                  | 0.922 | FALSE                    |
| 249 | P-124 | 318               | 247: J-99  | 87: J-36   | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 497.69          | 1.07                  | 0.952 | FALSE                    |
| 329 | P-170 | 310               | 325: J-120 | 328: J-121 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 506.12          | 1.09                  | 0.982 | FALSE                    |
| 241 | P-118 | 725               | 239: J-97  | 220: J-91  | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 3205.44         | 1.72                  | 1.024 | FALSE                    |
| 327 | P-169 | 92                | 325: J-120 | 315: J-116 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -556.32         | 1.2                   | 1.17  | FALSE                    |
| 290 | P-147 | 264               | 287: J-106 | 212: J-89  | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -559.71         | 1.2                   | 1.183 | FALSE                    |
| 213 | P-98  | 66                | 90: J-38   | 212: J-89  | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 593.02          | 1.27                  | 1.317 | FALSE                    |
| 286 | P-144 | 303               | 284: J-105 | 87: J-36   | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -596.61         | 1.28                  | 1.332 | FALSE                    |
| 301 | P-154 | 250               | 299: J-110 | 85: J-35   | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 625             | 1.34                  | 1.451 | FALSE                    |
| 248 | P-123 | 158               | 85: J-35   | 247: J-99  | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 648.96          | 1.39                  | 1.556 | FALSE                    |
| 273 | P-135 | 240               | 220: J-91  | 270: J-101 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 763.09          | 1.64                  | 2.101 | FALSE                    |
| 240 | P-117 | 302               | 27: J-4    | 239: J-97  | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 5535.22         | 2.97                  | 2.817 | FALSE                    |
| 389 | P-201 | 614               | 27: J-4    | 388: T-4   | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -5562.59        | 2.99                  | 2.843 | FALSE                    |
| 302 | P-155 | 156               | 90: J-38   | 299: J-110 | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -965.14         | 2.07                  | 3.246 | FALSE                    |

## Tank Report



| Id  | Label | Zone   | Base Elevation (m) | Minimum Elevation (m) | Initial Elevation (m) | Maximum Elevation (m) | Inactive Volume (m?) | Diameter (ft) | Outflow (m?/d) | Hydraulic Grade (m) |
|-----|-------|--------|--------------------|-----------------------|-----------------------|-----------------------|----------------------|---------------|----------------|---------------------|
| 388 | T-4   | <None> | 285                | 285.1                 | 296                   | 296.2                 | 0                    | 74.04         | 5562.59        | 296                 |

## Reservoir Report





| Id  | Label | Elevation (m) | Zone   | Outflow (m3/d) | Hydraulic Grade (m) |
|-----|-------|---------------|--------|----------------|---------------------|
| 167 | R-2   | 332           | <None> | (N/A)          | (N/A)               |
| 168 | R-3   | 351           | <None> | (N/A)          | (N/A)               |

**Water Storage Option WS2/WS3 –  
Elevated Storage or Expanded Storage with Pumping**

**Water Distribution Option WD1-  
New Trunk Watermain 300 mm**

**Scenario: Maximum Daily Demand with Fire Storage (M.D.D.+Fire)**



## Fire Flow Report



| Label | Fire Flow Iterations | Satisfies Fire Flow Constraints? | Fire Flow (Needed) (m³/d) | Fire Flow (Available) (m³/d) | Flow (Total Needed) (m³/d) | Flow (Total Available) (m³/d) | Pressure (Residual Lower Limit) (kPa) |                            | Pressure (Zone Lower Limit) (kPa) | Calculated Minimum Zone Pressure (kPa) | Junction w/Minimum Pressure (Zone) | Pressure (System Lower Limit) (kPa) |       | Pressure (Calculated System Lower Limit) (kPa) |
|-------|----------------------|----------------------------------|---------------------------|------------------------------|----------------------------|-------------------------------|---------------------------------------|----------------------------|-----------------------------------|----------------------------------------|------------------------------------|-------------------------------------|-------|------------------------------------------------|
|       |                      |                                  |                           |                              |                            |                               | Pressure (Residual Lower Limit) (kPa) | Residual Lower Limit (kPa) |                                   |                                        |                                    |                                     |       |                                                |
| J-4   | 15                   | TRUE                             | 2592                      | 3901.44                      | 2633.06                    | 3942.5                        | 137.9                                 | 415.5                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-35  | 8                    | TRUE                             | 2592                      | 2750.47                      | 2635.64                    | 2794.12                       | 137.9                                 | 409.3                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-36  | 10                   | TRUE                             | 2592                      | 2750.49                      | 2641.96                    | 2800.45                       | 137.9                                 | 381.1                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-38  | 8                    | TRUE                             | 2592                      | 2750.47                      | 2641.96                    | 2800.43                       | 137.9                                 | 409.6                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-53  | 10                   | TRUE                             | 2592                      | 2750.55                      | 2643.18                    | 2801.73                       | 137.9                                 | 358.1                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-54  | 10                   | TRUE                             | 2592                      | 2750.54                      | 2637.49                    | 2796.04                       | 137.9                                 | 374.1                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-69  | 8                    | TRUE                             | 2592                      | 2750.5                       | 2664.67                    | 2823.17                       | 137.9                                 | 393                        | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-72  | 17                   | TRUE                             | 2592                      | 2747.11                      | 2664.67                    | 2819.78                       | 137.9                                 | 259.6                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-86  | 9                    | TRUE                             | 2592                      | 2750.48                      | 2631.81                    | 2790.28                       | 137.9                                 | 360.4                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-87  | 9                    | TRUE                             | 2592                      | 2750.47                      | 2635.64                    | 2794.12                       | 137.9                                 | 357.6                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-88  | 10                   | TRUE                             | 2592                      | 2750.51                      | 2643.18                    | 2801.69                       | 137.9                                 | 366.3                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-89  | 9                    | TRUE                             | 2592                      | 2750.47                      | 2641.96                    | 2800.43                       | 137.9                                 | 399.6                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-91  | 8                    | TRUE                             | 2592                      | 2750.49                      | 2668.34                    | 2826.83                       | 137.9                                 | 405.7                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-92  | 8                    | TRUE                             | 2592                      | 2750.48                      | 2629.19                    | 2787.67                       | 137.9                                 | 374.6                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-96  | 9                    | TRUE                             | 2592                      | 2750.46                      | 2629.19                    | 2787.65                       | 137.9                                 | 346.7                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-97  | 7                    | TRUE                             | 2592                      | 2750.48                      | 2633.06                    | 2791.53                       | 137.9                                 | 437.1                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-99  | 8                    | TRUE                             | 2592                      | 2750.47                      | 2641.96                    | 2800.43                       | 137.9                                 | 398.4                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-100 | 9                    | TRUE                             | 2592                      | 2750.5                       | 2664.67                    | 2823.17                       | 137.9                                 | 379.9                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-101 | 8                    | TRUE                             | 2592                      | 2750.47                      | 2639.34                    | 2797.81                       | 137.9                                 | 382.2                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-102 | 18                   | TRUE                             | 2592                      | 2749.47                      | 2629.19                    | 2786.66                       | 137.9                                 | 320.4                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-103 | 17                   | TRUE                             | 2592                      | 2746.91                      | 2641.24                    | 2796.16                       | 137.9                                 | 340.6                      | 137.9                             | 138                                    | 445                                | 137.9                               | 138   | 138                                            |
| J-104 | 18                   | TRUE                             | 2592                      | 2749.41                      | 2641.24                    | 2798.66                       | 137.9                                 | 349.4                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-105 | 18                   | TRUE                             | 2592                      | 2749.5                       | 2641.24                    | 2798.75                       | 137.9                                 | 351.7                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-106 | 10                   | TRUE                             | 2592                      | 2750.52                      | 2641.24                    | 2799.77                       | 137.9                                 | 386.2                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-107 | 10                   | TRUE                             | 2592                      | 2750.54                      | 2653.73                    | 2812.27                       | 137.9                                 | 401                        | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-108 | 10                   | TRUE                             | 2592                      | 2750.53                      | 2653.73                    | 2812.25                       | 137.9                                 | 418.6                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-109 | 8                    | TRUE                             | 2592                      | 2750.48                      | 2638.77                    | 2797.25                       | 137.9                                 | 439.1                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-110 | 8                    | TRUE                             | 2592                      | 2750.48                      | 2638.77                    | 2797.25                       | 137.9                                 | 434.3                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-111 | 8                    | TRUE                             | 2592                      | 2750.48                      | 2638.77                    | 2797.25                       | 137.9                                 | 428.5                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-114 | 18                   | TRUE                             | 2592                      | 2749.31                      | 2683.15                    | 2840.46                       | 137.9                                 | 353.8                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-115 | 16                   | TRUE                             | 2592                      | 2747.84                      | 2667.29                    | 2823.13                       | 137.9                                 | 317.5                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-116 | 10                   | TRUE                             | 2592                      | 2750.45                      | 2592                       | 2750.45                       | 137.9                                 | 354.3                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-117 | 16                   | TRUE                             | 2592                      | 2749.57                      | 2675.14                    | 2832.7                        | 137.9                                 | 266.9                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-118 | 6                    | TRUE                             | 2592                      | 2750.62                      | 2675.14                    | 2833.76                       | 137.9                                 | 179.9                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-119 | 3                    | TRUE                             | 2592                      | 2675.63                      | 2675.14                    | 2758.77                       | 137.9                                 | 137.9                      | 137.9                             | 139                                    | 445                                | 137.9                               | 139   | 139                                            |
| J-120 | 10                   | TRUE                             | 2592                      | 2750.57                      | 2667.29                    | 2825.86                       | 137.9                                 | 337.6                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-121 | 17                   | TRUE                             | 2592                      | 2746.83                      | 2667.29                    | 2822.12                       | 137.9                                 | 333.1                      | 137.9                             | 138                                    | 445                                | 137.9                               | 138   | 138                                            |
| J-122 | 16                   | TRUE                             | 2592                      | 2747.86                      | 2667.29                    | 2823.15                       | 137.9                                 | 317.5                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-123 | 18                   | TRUE                             | 2592                      | 2749.41                      | 2683.15                    | 2840.56                       | 137.9                                 | 370.7                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-124 | 18                   | TRUE                             | 2592                      | 2749.35                      | 2683.15                    | 2840.5                        | 137.9                                 | 361.1                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-125 | 16                   | TRUE                             | 2592                      | 2747.62                      | 2683.15                    | 2838.77                       | 137.9                                 | 336.8                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-126 | 17                   | TRUE                             | 2592                      | 2746.98                      | 2668.82                    | 2823.81                       | 137.9                                 | 367.9                      | 137.9                             | 138                                    | 445                                | 137.9                               | 138   | 138                                            |
| J-127 | 17                   | TRUE                             | 2592                      | 2747.14                      | 2668.82                    | 2823.96                       | 137.9                                 | 372.3                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-128 | 17                   | TRUE                             | 2592                      | 2747.27                      | 2668.82                    | 2824.09                       | 137.9                                 | 355.4                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-129 | 18                   | TRUE                             | 2592                      | 2749.38                      | 2683.15                    | 2840.53                       | 137.9                                 | 364.2                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-135 | 8                    | TRUE                             | 2592                      | 2750.47                      | 2637.49                    | 2795.97                       | 137.9                                 | 373.2                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-136 | 9                    | TRUE                             | 2592                      | 2750.55                      | 2859.27                    | 3017.82                       | 137.9                                 | 345.7                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-137 | 8                    | TRUE                             | 2592                      | 2750.55                      | 2876.75                    | 3035.3                        | 137.9                                 | 378.9                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-140 | 9                    | TRUE                             | 2592                      | 2750.56                      | 2887.7                     | 3046.25                       | 137.9                                 | 333.3                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |
| J-141 | 10                   | TRUE                             | 2592                      | 2750.52                      | 2592                       | 2750.52                       | 137.9                                 | 302.2                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9 | 137.9                                          |

| Label | Fire Flow Iterations | Satisfies Fire Flow Constraints? | Fire Flow (Needed) (m³/d) | Fire Flow (Available) (m³/d) | Flow (Total Needed) (m³/d) | Flow (Total Available) (m³/d) | Pressure (Calculated)                 |                            | Pressure (Zone Lower Limit) (kPa) | Calculated Minimum Zone Pressure (kPa) | Junction w/Minimum Pressure (Zone) | Pressure                            |                                                |
|-------|----------------------|----------------------------------|---------------------------|------------------------------|----------------------------|-------------------------------|---------------------------------------|----------------------------|-----------------------------------|----------------------------------------|------------------------------------|-------------------------------------|------------------------------------------------|
|       |                      |                                  |                           |                              |                            |                               | Pressure (Residual Lower Limit) (kPa) | Residual Lower Limit (kPa) |                                   |                                        |                                    | Pressure (System Lower Limit) (kPa) | Pressure (Calculated System Lower Limit) (kPa) |
|       |                      |                                  |                           |                              |                            |                               |                                       |                            |                                   |                                        |                                    |                                     |                                                |
| J-142 | 10                   | TRUE                             | 2592                      | 2750.56                      | 2887.7                     | 3046.26                       | 137.9                                 | 309.3                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9                                          |
| J-143 | 10                   | TRUE                             | 2592                      | 2750.57                      | 2887.7                     | 3046.27                       | 137.9                                 | 312.9                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9                                          |
| J-144 | 18                   | TRUE                             | 2592                      | 2749.11                      | 2931.77                    | 3088.88                       | 137.9                                 | 301.2                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9                                          |
| J-145 | 18                   | TRUE                             | 2592                      | 2749.18                      | 2931.77                    | 3088.95                       | 137.9                                 | 312.2                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9                                          |
| J-146 | 17                   | TRUE                             | 2592                      | 2747.06                      | 2931.77                    | 3086.83                       | 137.9                                 | 259.6                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9                                          |
| J-147 | 18                   | TRUE                             | 2592                      | 2749.19                      | 2931.77                    | 3088.96                       | 137.9                                 | 316.8                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9                                          |
| J-148 | 10                   | TRUE                             | 2592                      | 2750.56                      | 2931.77                    | 3090.33                       | 137.9                                 | 341.7                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9                                          |
| J-149 | 17                   | TRUE                             | 2592                      | 2746.62                      | 2933.19                    | 3087.81                       | 137.9                                 | 369.7                      | 137.9                             | 138                                    | 445                                | 137.9                               | 138                                            |
| J-150 | 17                   | TRUE                             | 2592                      | 2746.97                      | 2933.19                    | 3088.16                       | 137.9                                 | 349.5                      | 137.9                             | 138                                    | 445                                | 137.9                               | 138                                            |
| J-151 | 17                   | TRUE                             | 2592                      | 2746.71                      | 2933.19                    | 3087.9                        | 137.9                                 | 366                        | 137.9                             | 138                                    | 445                                | 137.9                               | 138                                            |
| J-152 | 7                    | TRUE                             | 2592                      | 2692.2                       | 2793.16                    | 2893.36                       | 137.9                                 | 418.7                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9                                          |
| J-153 | 8                    | TRUE                             | 2592                      | 2681.05                      | 2793.16                    | 2882.21                       | 137.9                                 | 336.8                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9                                          |
| J-154 | 17                   | TRUE                             | 2592                      | 2653.25                      | 2793.16                    | 2854.41                       | 137.9                                 | 196.1                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9                                          |
| J-155 | 3                    | TRUE                             | 2592                      | 2623.53                      | 2793.16                    | 2824.69                       | 137.9                                 | 137.9                      | 137.9                             | 197.2                                  | 444                                | 137.9                               | 197.2                                          |
| J-156 | 18                   | TRUE                             | 2592                      | 2749.02                      | 2931.77                    | 3088.79                       | 137.9                                 | 282.9                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9                                          |
| J-157 | 9                    | TRUE                             | 2592                      | 2750.55                      | 2876.75                    | 3035.3                        | 137.9                                 | 343.8                      | 137.9                             | 137.9                                  | 445                                | 137.9                               | 137.9                                          |



| Label | Junction                       |                               |
|-------|--------------------------------|-------------------------------|
|       | w/Minimum<br>Pressure (System) | Is Fire Flow Run<br>Balanced? |
| J-4   | 445                            | TRUE                          |
| J-35  | 445                            | TRUE                          |
| J-36  | 445                            | TRUE                          |
| J-38  | 445                            | TRUE                          |
| J-53  | 445                            | TRUE                          |
| J-54  | 445                            | TRUE                          |
| J-69  | 445                            | TRUE                          |
| J-72  | 445                            | TRUE                          |
| J-86  | 445                            | TRUE                          |
| J-87  | 445                            | TRUE                          |
| J-88  | 445                            | TRUE                          |
| J-89  | 445                            | TRUE                          |
| J-91  | 445                            | TRUE                          |
| J-92  | 445                            | TRUE                          |
| J-96  | 445                            | TRUE                          |
| J-97  | 445                            | TRUE                          |
| J-99  | 445                            | TRUE                          |
| J-100 | 445                            | TRUE                          |
| J-101 | 445                            | TRUE                          |
| J-102 | 445                            | TRUE                          |
| J-103 | 445                            | TRUE                          |
| J-104 | 445                            | TRUE                          |
| J-105 | 445                            | TRUE                          |
| J-106 | 445                            | TRUE                          |
| J-107 | 445                            | TRUE                          |
| J-108 | 445                            | TRUE                          |
| J-109 | 445                            | TRUE                          |
| J-110 | 445                            | TRUE                          |
| J-111 | 445                            | TRUE                          |
| J-114 | 445                            | TRUE                          |
| J-115 | 445                            | TRUE                          |
| J-116 | 445                            | TRUE                          |
| J-117 | 445                            | TRUE                          |
| J-118 | 445                            | TRUE                          |
| J-119 | 445                            | TRUE                          |
| J-120 | 445                            | TRUE                          |
| J-121 | 445                            | TRUE                          |
| J-122 | 445                            | TRUE                          |
| J-123 | 445                            | TRUE                          |
| J-124 | 445                            | TRUE                          |
| J-125 | 445                            | TRUE                          |
| J-126 | 445                            | TRUE                          |
| J-127 | 445                            | TRUE                          |
| J-128 | 445                            | TRUE                          |
| J-129 | 445                            | TRUE                          |
| J-135 | 445                            | TRUE                          |
| J-136 | 445                            | TRUE                          |
| J-137 | 445                            | TRUE                          |
| J-140 | 445                            | TRUE                          |
| J-141 | 445                            | TRUE                          |

| Label | Junction                       | Is Fire Flow Run |
|-------|--------------------------------|------------------|
|       | w/Minimum<br>Pressure (System) |                  |
| J-142 | 445                            | TRUE             |
| J-143 | 445                            | TRUE             |
| J-144 | 445                            | TRUE             |
| J-145 | 445                            | TRUE             |
| J-146 | 445                            | TRUE             |
| J-147 | 445                            | TRUE             |
| J-148 | 445                            | TRUE             |
| J-149 | 445                            | TRUE             |
| J-150 | 445                            | TRUE             |
| J-151 | 445                            | TRUE             |
| J-152 | 445                            | TRUE             |
| J-153 | 445                            | TRUE             |
| J-154 | 445                            | TRUE             |
| J-155 | 444                            | TRUE             |
| J-156 | 445                            | TRUE             |
| J-157 | 445                            | TRUE             |

## Junction Report



| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 27  | J-4   | 246           | <None> | 41.06         | 292.2               | 452.2          |
| 85  | J-35  | 241           | <None> | 43.64         | 288.8               | 468            |
| 87  | J-36  | 241           | <None> | 49.96         | 287.7               | 456.6          |
| 90  | J-38  | 240           | <None> | 49.96         | 288.5               | 474.8          |
| 119 | J-53  | 243.2         | <None> | 51.18         | 287.7               | 435.2          |
| 121 | J-54  | 242.1         | <None> | 45.49         | 287.9               | 448.4          |
| 151 | J-69  | 241           | <None> | 72.67         | 287.6               | 456.3          |
| 159 | J-72  | 254           | <None> | 72.67         | 287.7               | 329.6          |
| 199 | J-86  | 244           | <None> | 39.81         | 287.6               | 427            |
| 203 | J-87  | 244.2         | <None> | 43.64         | 287.6               | 424.4          |
| 208 | J-88  | 243.2         | <None> | 51.18         | 287.7               | 435.3          |
| 212 | J-89  | 240           | <None> | 49.96         | 288.3               | 473            |
| 220 | J-91  | 242.2         | <None> | 76.34         | 288.8               | 456.3          |
| 225 | J-92  | 244.1         | <None> | 37.19         | 288.3               | 432.3          |
| 235 | J-96  | 246.1         | <None> | 37.19         | 287.8               | 407.7          |
| 239 | J-97  | 242           | <None> | 41.06         | 290.4               | 473.7          |
| 247 | J-99  | 241           | <None> | 49.96         | 288.3               | 462.9          |
| 266 | J-100 | 242           | <None> | 72.67         | 287.7               | 447.5          |
| 270 | J-101 | 242.2         | <None> | 47.34         | 287.8               | 445.9          |
| 275 | J-102 | 247           | <None> | 37.19         | 287.7               | 398.5          |
| 280 | J-103 | 242           | <None> | 49.25         | 287.1               | 441.2          |
| 282 | J-104 | 241           | <None> | 49.25         | 286.8               | 448            |
| 284 | J-105 | 241           | <None> | 49.25         | 286.8               | 448.2          |
| 287 | J-106 | 240           | <None> | 49.25         | 287.7               | 466.5          |
| 291 | J-107 | 242           | <None> | 61.73         | 290                 | 469.6          |
| 293 | J-108 | 240           | <None> | 61.73         | 289.9               | 488.2          |
| 295 | J-109 | 240           | <None> | 46.77         | 289.8               | 487.4          |
| 299 | J-110 | 240           | <None> | 46.77         | 289.6               | 485.3          |
| 303 | J-111 | 242           | <None> | 46.77         | 290.1               | 471.1          |
| 311 | J-114 | 240           | <None> | 91.15         | 286.5               | 455.5          |
| 313 | J-115 | 242           | <None> | 75.29         | 286.4               | 435            |
| 315 | J-116 | 244           | <None> | 0             | 287.3               | 423.7          |
| 317 | J-117 | 241           | <None> | 83.14         | 286.4               | 444.1          |
| 319 | J-118 | 243           | <None> | 83.14         | 286.3               | 424.2          |
| 321 | J-119 | 243           | <None> | 83.14         | 286.3               | 424.2          |
| 325 | J-120 | 244           | <None> | 75.29         | 287.1               | 421.5          |
| 328 | J-121 | 242           | <None> | 75.29         | 286.4               | 434.9          |
| 330 | J-122 | 242           | <None> | 75.29         | 286.4               | 434.9          |
| 333 | J-123 | 238           | <None> | 91.15         | 286.4               | 473.9          |
| 335 | J-124 | 239           | <None> | 91.15         | 286.4               | 464.1          |
| 337 | J-125 | 240           | <None> | 91.15         | 286.5               | 454.8          |
| 340 | J-126 | 237           | <None> | 76.82         | 286.4               | 483.6          |
| 342 | J-127 | 236           | <None> | 76.82         | 286.4               | 493.4          |
| 344 | J-128 | 238           | <None> | 76.82         | 286.4               | 473.8          |
| 347 | J-129 | 239           | <None> | 91.15         | 286.5               | 465.3          |
| 398 | J-135 | 243           | <None> | 45.49         | 287.7               | 437.1          |
| 405 | J-136 | 245.8         | <None> | 267.27        | 287.6               | 409.3          |
| 408 | J-137 | 242.5         | <None> | 284.75        | 287.6               | 441.6          |

| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 411 | J-140 | 247.2         | <None> | 295.7         | 287.6               | 395.6          |
| 415 | J-141 | 250.1         | <None> | 0             | 287.5               | 366.3          |
| 416 | J-142 | 249.5         | <None> | 295.7         | 287.6               | 372.6          |
| 417 | J-143 | 249.1         | <None> | 295.7         | 287.6               | 376.6          |
| 422 | J-144 | 249.8         | <None> | 339.77        | 287.4               | 367.7          |
| 423 | J-145 | 248.5         | <None> | 339.77        | 287.3               | 380            |
| 424 | J-146 | 253.9         | <None> | 339.77        | 287.4               | 327.5          |
| 430 | J-147 | 247.9         | <None> | 339.77        | 287.3               | 385.6          |
| 431 | J-148 | 245.3         | <None> | 339.77        | 287.3               | 411            |
| 435 | J-149 | 238.2         | <None> | 341.19        | 286.4               | 471.9          |
| 436 | J-150 | 240.2         | <None> | 341.19        | 286.4               | 452.3          |
| 437 | J-151 | 238.5         | <None> | 341.19        | 286.4               | 468.9          |
| 442 | J-152 | 243.8         | <None> | 201.16        | 290.4               | 456            |
| 443 | J-153 | 252.2         | <None> | 201.16        | 290.4               | 373.8          |
| 444 | J-154 | 266.5         | <None> | 201.16        | 290.4               | 233.8          |
| 445 | J-155 | 272.5         | <None> | 201.16        | 290.4               | 175.1          |
| 451 | J-156 | 251.5         | <None> | 339.77        | 287.4               | 351            |
| 456 | J-157 | 246.1         | <None> | 284.75        | 287.6               | 406.3          |



## Pipe Report



| Id | Label     | Scaled Length |            | Start Node | Stop Node | Diameter (mm) | Material     | Hazen-Williams C |                  |                | Headloss    |                 |                       | Has User Defined Length? |       |
|----|-----------|---------------|------------|------------|-----------|---------------|--------------|------------------|------------------|----------------|-------------|-----------------|-----------------------|--------------------------|-------|
|    |           | (m)           | (m)        |            |           |               |              | ()               | Has Check Valve? | Minor Loss (l) | Flow (m³/d) | Velocity (ft/s) | Gradient (mm/m (V:H)) |                          |       |
|    | 322 P-165 | 269           | 313: J-115 | 321: J-119 |           | 150           | Ductile Iron | 130              | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                 | FALSE                    |       |
|    | 326 P-168 | 47            | 321: J-119 | 325: J-120 |           | 150           | Ductile Iron | 130              | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                 | FALSE                    |       |
|    | 396 P-204 | 50            | 167: R-2   | 379: PMP-4 |           | 200           | Ductile Iron | 130              | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                 | FALSE                    |       |
|    | 397 P-205 | 60            | 379: PMP-4 | 225: J-92  |           | 200           | Ductile Iron | 130              | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                 | FALSE                    |       |
|    | 403 P-210 | 11            | 168: R-3   | 382: PMP-5 |           | 200           | Ductile Iron | 130              | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                 | FALSE                    |       |
|    | 404 P-211 | 14            | 382: PMP-5 | 212: J-89  |           | 200           | Ductile Iron | 130              | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                 | FALSE                    |       |
|    | 434 P-228 | 187           | 431: J-148 | 315: J-116 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 9.35            | 0.01                  | 0                        | FALSE |
|    | 440 P-231 | 483           | 436: J-150 | 437: J-151 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 2.52            | 0                     | 0                        | FALSE |
|    | 453 P-239 | 424           | 424: J-146 | 451: J-156 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 14.78           | 0.01                  | 0                        | FALSE |
|    | 446 P-233 | 359           | 444: J-154 | 445: J-155 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -27.87          | 0.01                  | 0                        | FALSE |
|    | 331 P-171 | 181           | 328: J-121 | 330: J-122 |           | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -5.3            | 0.01                  | 0                        | FALSE |
|    | 450 P-237 | 392           | 442: J-152 | 444: J-154 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 173.29          | 0.09                  | 0.005                    | FALSE |
|    | 343 P-178 | 325           | 340: J-126 | 342: J-127 |           | 150           | Ductile Iron | 200              | FALSE            |                | 0           | 45.81           | 0.1                   | 0.005                    | FALSE |
|    | 345 P-179 | 131           | 342: J-127 | 344: J-128 |           | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -31.02          | 0.07                  | 0.006                    | FALSE |
|    | 348 P-181 | 374           | 311: J-114 | 347: J-129 |           | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -32.02          | 0.07                  | 0.006                    | FALSE |
|    | 447 P-234 | 343           | 445: J-155 | 443: J-153 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -229.03         | 0.12                  | 0.008                    | FALSE |
|    | 413 P-215 | 330           | 405: J-136 | 408: J-137 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 234.58          | 0.13                  | 0.008                    | FALSE |
|    | 336 P-174 | 210           | 333: J-123 | 335: J-124 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 253.42          | 0.14                  | 0.009                    | FALSE |
|    | 454 P-240 | 416           | 451: J-156 | 422: J-144 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -324.99         | 0.17                  | 0.015                    | FALSE |
|    | 441 P-232 | 196           | 437: J-151 | 335: J-124 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -338.67         | 0.18                  | 0.016                    | FALSE |
|    | 439 P-230 | 328           | 435: J-149 | 436: J-150 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 343.71          | 0.18                  | 0.016                    | FALSE |
|    | 433 P-227 | 309           | 430: J-147 | 431: J-148 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 349.12          | 0.19                  | 0.017                    | FALSE |
|    | 457 P-242 | 192           | 408: J-137 | 456: J-157 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 352.55          | 0.19                  | 0.017                    | FALSE |
|    | 452 P-238 | 353           | 422: J-144 | 424: J-146 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 354.55          | 0.19                  | 0.017                    | FALSE |
|    | 449 P-236 | 338           | 239: J-97  | 442: J-152 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 374.45          | 0.2                   | 0.019                    | FALSE |
|    | 420 P-219 | 336           | 416: J-142 | 417: J-143 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -376.44         | 0.2                   | 0.019                    | FALSE |
|    | 412 P-214 | 337           | 408: J-137 | 151: J-69  |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -402.72         | 0.22                  | 0.022                    | FALSE |
|    | 448 P-235 | 225           | 443: J-153 | 239: J-97  |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -430.19         | 0.23                  | 0.025                    | FALSE |
|    | 341 P-177 | 235           | 333: J-123 | 340: J-126 |           | 150           | Ductile Iron | 200              | FALSE            |                | 0           | 122.63          | 0.26                  | 0.032                    | FALSE |
|    | 332 P-172 | 328           | 330: J-122 | 313: J-115 |           | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -80.59          | 0.17                  | 0.033                    | FALSE |
|    | 224 P-107 | 184           | 220: J-91  | 85: J-35   |           | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 80.66           | 0.17                  | 0.033                    | FALSE |
|    | 324 P-167 | 234           | 319: J-118 | 321: J-119 |           | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 83.14           | 0.18                  | 0.035                    | FALSE |
|    | 278 P-139 | 299           | 87: J-36   | 119: J-53  |           | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -89.63          | 0.19                  | 0.04                     | FALSE |
|    | 458 P-243 | 233           | 456: J-157 | 411: J-140 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | -604.34         | 0.32                  | 0.047                    | FALSE |
|    | 346 P-180 | 151           | 344: J-128 | 333: J-123 |           | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -107.84         | 0.23                  | 0.056                    | FALSE |
|    | 462 P-245 | 663           | 456: J-157 | 417: J-143 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 672.14          | 0.36                  | 0.057                    | FALSE |
|    | 288 P-145 | 175           | 87: J-36   | 287: J-106 |           | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -110.21         | 0.24                  | 0.058                    | FALSE |
|    | 438 P-229 | 211           | 328: J-121 | 435: J-149 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 684.9           | 0.37                  | 0.059                    | FALSE |
|    | 432 P-226 | 394           | 423: J-145 | 430: J-147 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 688.89          | 0.37                  | 0.059                    | FALSE |
|    | 285 P-143 | 372           | 282: J-104 | 284: J-105 |           | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -115.91         | 0.25                  | 0.064                    | FALSE |
|    | 400 P-207 | 368           | 398: J-135 | 199: J-86  |           | 200           | Ductile Iron | 130              | FALSE            |                | 0           | 273.78          | 0.33                  | 0.078                    | FALSE |
|    | 209 P-95  | 113           | 119: J-53  | 208: J-88  |           | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -140.81         | 0.3                   | 0.092                    | FALSE |
|    | 269 P-132 | 491           | 151: J-69  | 159: J-72  |           | 200           | Ductile Iron | 130              | FALSE            |                | 0           | -319.5          | 0.39                  | 0.103                    | FALSE |
|    | 399 P-206 | 327           | 151: J-69  | 398: J-135 |           | 150           | Ductile Iron | 130              | FALSE            |                | 0           | -155.9          | 0.33                  | 0.111                    | FALSE |
|    | 406 P-212 | 365           | 398: J-135 | 405: J-136 |           | 150           | Ductile Iron | 130              | FALSE            |                | 0           | 156.97          | 0.34                  | 0.112                    | FALSE |
|    | 455 P-241 | 341           | 422: J-144 | 423: J-145 |           | 300           | Ductile Iron | 130              | FALSE            |                | 0           | 1028.66         | 0.55                  | 0.125                    | FALSE |

| Id | Label     | Scaled Length |     | Start Node | Stop Node  | Diameter (mm) | Material     | Hazen-Williams C |                  |                | Headloss    |                 |                       |                          |
|----|-----------|---------------|-----|------------|------------|---------------|--------------|------------------|------------------|----------------|-------------|-----------------|-----------------------|--------------------------|
|    |           | (m)           |     |            |            |               |              | ()               | Has Check Valve? | Minor Loss (') | Flow (m³/d) | Velocity (ft/s) | Gradient (mm/m (V:H)) | Has User Defined Length? |
|    | 320 P-164 |               | 273 | 317: J-117 | 319: J-118 | 150           | Ductile Iron | 130              | FALSE            | 0              | 166.27      | 0.36            | 0.125                 | FALSE                    |
|    | 338 P-175 |               | 392 | 335: J-124 | 337: J-125 | 150           | Ductile Iron | 130              | FALSE            | 0              | -176.4      | 0.38            | 0.139                 | FALSE                    |
|    | 276 P-137 |               | 601 | 199: J-86  | 275: J-102 | 150           | Ductile Iron | 130              | FALSE            | 0              | -182.77     | 0.39            | 0.149                 | FALSE                    |
|    | 267 P-130 |               | 327 | 159: J-72  | 266: J-100 | 200           | Ductile Iron | 130              | FALSE            | 0              | -392.17     | 0.47            | 0.151                 | FALSE                    |
|    | 418 P-217 |               | 337 | 411: J-140 | 416: J-142 | 300           | Ductile Iron | 130              | FALSE            | 0              | 1189.69     | 0.64            | 0.163                 | FALSE                    |
|    | 402 P-209 |               | 393 | 203: J-87  | 199: J-86  | 200           | Ductile Iron | 130              | FALSE            | 0              | -416.75     | 0.5             | 0.169                 | FALSE                    |
|    | 419 P-218 |               | 235 | 416: J-142 | 415: J-141 | 300           | Ductile Iron | 130              | FALSE            | 0              | 1270.43     | 0.68            | 0.185                 | FALSE                    |
|    | 271 P-133 |               | 174 | 266: J-100 | 270: J-101 | 200           | Ductile Iron | 130              | FALSE            | 0              | -464.85     | 0.56            | 0.207                 | FALSE                    |
|    | 277 P-138 |               | 162 | 275: J-102 | 235: J-96  | 150           | Ductile Iron | 130              | FALSE            | 0              | -219.96     | 0.47            | 0.21                  | FALSE                    |
|    | 296 P-150 |               | 306 | 293: J-108 | 295: J-109 | 150           | Ductile Iron | 130              | FALSE            | 0              | 247.21      | 0.53            | 0.261                 | FALSE                    |
|    | 318 P-163 |               | 232 | 313: J-115 | 317: J-117 | 150           | Ductile Iron | 130              | FALSE            | 0              | 249.41      | 0.54            | 0.265                 | FALSE                    |
|    | 339 P-176 |               | 233 | 337: J-125 | 311: J-114 | 150           | Ductile Iron | 130              | FALSE            | 0              | -267.56     | 0.57            | 0.302                 | FALSE                    |
|    | 401 P-208 |               | 273 | 270: J-101 | 398: J-135 | 200           | Ductile Iron | 130              | FALSE            | 0              | 632.14      | 0.76            | 0.365                 | FALSE                    |
|    | 294 P-149 |               | 238 | 291: J-107 | 293: J-108 | 150           | Ductile Iron | 130              | FALSE            | 0              | 308.94      | 0.66            | 0.394                 | FALSE                    |
|    | 425 P-221 |               | 353 | 415: J-141 | 422: J-144 | 300           | Ductile Iron | 130              | FALSE            | 0              | 2047.96     | 1.1             | 0.447                 | FALSE                    |
|    | 461 P-244 |               | 282 | 235: J-96  | 411: J-140 | 300           | Ductile Iron | 130              | FALSE            | 0              | 2089.73     | 1.12            | 0.464                 | FALSE                    |
|    | 407 P-213 |               | 282 | 405: J-136 | 235: J-96  | 150           | Ductile Iron | 130              | FALSE            | 0              | -344.88     | 0.74            | 0.483                 | FALSE                    |
|    | 421 P-220 |               | 428 | 415: J-141 | 235: J-96  | 200           | Ductile Iron | 130              | FALSE            | 0              | -777.53     | 0.94            | 0.536                 | FALSE                    |
|    | 305 P-157 |               | 290 | 303: J-111 | 291: J-107 | 150           | Ductile Iron | 130              | FALSE            | 0              | 370.67      | 0.8             | 0.552                 | FALSE                    |
|    | 351 P-184 |               | 454 | 315: J-116 | 203: J-87  | 200           | Ductile Iron | 130              | FALSE            | 0              | -820.83     | 0.99            | 0.592                 | FALSE                    |
|    | 314 P-161 |               | 153 | 311: J-114 | 313: J-115 | 150           | Ductile Iron | 130              | FALSE            | 0              | 405.29      | 0.87            | 0.651                 | FALSE                    |
|    | 211 P-97  |               | 146 | 203: J-87  | 208: J-88  | 150           | Ductile Iron | 130              | FALSE            | 0              | -447.72     | 0.96            | 0.783                 | FALSE                    |
|    | 251 P-126 |               | 219 | 247: J-99  | 90: J-38   | 150           | Ductile Iron | 130              | FALSE            | 0              | -508.07     | 1.09            | 0.989                 | FALSE                    |
|    | 236 P-114 |               | 432 | 225: J-92  | 235: J-96  | 300           | Ductile Iron | 130              | FALSE            | 0              | 3469.29     | 1.86            | 1.186                 | FALSE                    |
|    | 226 P-108 |               | 462 | 220: J-91  | 225: J-92  | 300           | Ductile Iron | 130              | FALSE            | 0              | 3506.48     | 1.88            | 1.21                  | FALSE                    |
|    | 349 P-182 |               | 101 | 347: J-129 | 333: J-123 | 150           | Ductile Iron | 130              | FALSE            | 0              | 575.05      | 1.24            | 1.244                 | FALSE                    |
|    | 306 P-158 |               | 262 | 295: J-109 | 303: J-111 | 250           | Ductile Iron | 130              | FALSE            | 0              | -2231.89    | 1.73            | 1.273                 | FALSE                    |
|    | 283 P-142 |               | 206 | 280: J-103 | 282: J-104 | 150           | Ductile Iron | 130              | FALSE            | 0              | 631.56      | 1.36            | 1.48                  | FALSE                    |
|    | 300 P-153 |               | 145 | 295: J-109 | 299: J-110 | 250           | Ductile Iron | 130              | FALSE            | 0              | 2432.33     | 1.88            | 1.493                 | FALSE                    |
|    | 210 P-96  |               | 157 | 208: J-88  | 121: J-54  | 150           | Ductile Iron | 130              | FALSE            | 0              | -639.71     | 1.37            | 1.515                 | FALSE                    |
|    | 289 P-146 |               | 346 | 287: J-106 | 280: J-103 | 150           | Ductile Iron | 130              | FALSE            | 0              | 680.8       | 1.46            | 1.701                 | FALSE                    |
|    | 279 P-140 |               | 222 | 247: J-99  | 121: J-54  | 150           | Ductile Iron | 130              | FALSE            | 0              | 685.2       | 1.47            | 1.721                 | FALSE                    |
|    | 304 P-156 |               | 149 | 239: J-97  | 303: J-111 | 250           | Ductile Iron | 130              | FALSE            | 0              | 2649.33     | 2.05            | 1.749                 | FALSE                    |
|    | 350 P-183 |               | 129 | 347: J-129 | 282: J-104 | 150           | Ductile Iron | 130              | FALSE            | 0              | -698.22     | 1.5             | 1.782                 | FALSE                    |
|    | 352 P-185 |               | 132 | 311: J-114 | 284: J-105 | 150           | Ductile Iron | 130              | FALSE            | 0              | -731.98     | 1.57            | 1.945                 | FALSE                    |
|    | 249 P-124 |               | 318 | 247: J-99  | 87: J-36   | 150           | Ductile Iron | 130              | FALSE            | 0              | 747.25      | 1.61            | 2.021                 | FALSE                    |
|    | 329 P-170 |               | 310 | 325: J-120 | 328: J-121 | 150           | Ductile Iron | 130              | FALSE            | 0              | 754.89      | 1.62            | 2.059                 | FALSE                    |
|    | 241 P-118 |               | 725 | 239: J-97  | 220: J-91  | 300           | Ductile Iron | 130              | FALSE            | 0              | 4807.81     | 2.58            | 2.17                  | FALSE                    |
|    | 327 P-169 |               | 92  | 325: J-120 | 315: J-116 | 150           | Ductile Iron | 130              | FALSE            | 0              | -830.18     | 1.78            | 2.456                 | FALSE                    |
|    | 290 P-147 |               | 264 | 287: J-106 | 212: J-89  | 150           | Ductile Iron | 130              | FALSE            | 0              | -840.26     | 1.81            | 2.511                 | FALSE                    |
|    | 213 P-98  |               | 66  | 90: J-38   | 212: J-89  | 150           | Ductile Iron | 130              | FALSE            | 0              | 890.21      | 1.91            | 2.795                 | FALSE                    |
|    | 286 P-144 |               | 303 | 284: J-105 | 87: J-36   | 150           | Ductile Iron | 130              | FALSE            | 0              | -897.13     | 1.93            | 2.835                 | FALSE                    |
|    | 301 P-154 |               | 250 | 299: J-110 | 85: J-35   | 150           | Ductile Iron | 130              | FALSE            | 0              | 937.32      | 2.01            | 3.075                 | FALSE                    |
|    | 248 P-123 |               | 158 | 85: J-35   | 247: J-99  | 150           | Ductile Iron | 130              | FALSE            | 0              | 974.34      | 2.09            | 3.303                 | FALSE                    |
|    | 273 P-135 |               | 240 | 220: J-91  | 270: J-101 | 150           | Ductile Iron | 130              | FALSE            | 0              | 1144.32     | 2.46            | 4.449                 | FALSE                    |
|    | 240 P-117 |               | 302 | 27: J-4    | 239: J-97  | 300           | Ductile Iron | 130              | FALSE            | 0              | 8302.83     | 4.46            | 5.97                  | FALSE                    |

| Id  | Label | Scaled Length |          | Start Node | Stop Node | Diameter (mm) | Material     | Hazen-Williams C |                  | Minor Loss (') | Flow (m³/d) | Velocity (ft/s) | Headloss              |                          |
|-----|-------|---------------|----------|------------|-----------|---------------|--------------|------------------|------------------|----------------|-------------|-----------------|-----------------------|--------------------------|
|     |       | (m)           |          |            |           |               |              | (')              | Has Check Valve? |                |             |                 | Gradient (mm/m (V:H)) | Has User Defined Length? |
| 389 | P-201 | 614           | 27: J-4  | 388: T-4   |           | 300           | Ductile Iron | 130              | FALSE            | 0              | -8343.89    | 4.48            | 6.024                 | FALSE                    |
| 302 | P-155 | 156           | 90: J-38 | 299: J-110 |           | 150           | Ductile Iron | 130              | FALSE            | 0              | -1448.24    | 3.11            | 6.882                 | FALSE                    |

## Tank Report





| Id | Label | Zone | Base Elevation (m) | Minimum Elevation (m) | Initial Elevation (m) | Maximum Elevation (m) | Inactive Volume (m?) | Diameter (ft) | Outflow (m?/d) | Hydraulic Grade (m) |
|----|-------|------|--------------------|-----------------------|-----------------------|-----------------------|----------------------|---------------|----------------|---------------------|
|    |       |      | 285                | 285.1                 | 295.9                 | 296.1                 | 0                    | 74.04         | 8343.89        | 295.9               |

## Reservoir Report



| Id  | Label | Elevation (m) | Zone   | Outflow (m3/d) | Hydraulic Grade (m) |
|-----|-------|---------------|--------|----------------|---------------------|
| 167 | R-2   | 332           | <None> | (N/A)          | (N/A)               |
| 168 | R-3   | 351           | <None> | (N/A)          | (N/A)               |

**Water Storage Option WS2/WS3 –  
Elevated Storage or Expanded Storage with Pumping**

**Water Distribution Option WD2-  
New Trunk Watermain 300 mm with Improvements to Ex. System**

**Scenario: Average Daily Demand (A.D.D.)**



## Junction Report





| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 27  | J-4   | 246           | <None> | 14.44         | 290.4               | 434.8          |
| 85  | J-35  | 241           | <None> | 15.35         | 289.9               | 478.8          |
| 87  | J-36  | 241           | <None> | 17.57         | 289.8               | 477.7          |
| 90  | J-38  | 240           | <None> | 17.57         | 289.9               | 488.7          |
| 119 | J-53  | 243.2         | <None> | 18            | 289.8               | 456.1          |
| 121 | J-54  | 242.1         | <None> | 16            | 289.9               | 467.3          |
| 151 | J-69  | 241           | <None> | 25.56         | 289.8               | 477.3          |
| 159 | J-72  | 254           | <None> | 25.56         | 289.8               | 350.1          |
| 199 | J-86  | 244           | <None> | 14            | 289.8               | 448            |
| 203 | J-87  | 244.2         | <None> | 15.35         | 289.8               | 446            |
| 208 | J-88  | 243.2         | <None> | 18            | 289.8               | 456.1          |
| 212 | J-89  | 240           | <None> | 17.57         | 289.9               | 488.4          |
| 220 | J-91  | 242.2         | <None> | 26.85         | 289.9               | 467.1          |
| 225 | J-92  | 244.1         | <None> | 13.08         | 289.9               | 447.8          |
| 235 | J-96  | 246.1         | <None> | 13.08         | 289.8               | 427.5          |
| 239 | J-97  | 242           | <None> | 14.44         | 290.2               | 471.4          |
| 247 | J-99  | 241           | <None> | 17.57         | 289.9               | 478.8          |
| 266 | J-100 | 242           | <None> | 25.56         | 289.8               | 467.6          |
| 270 | J-101 | 242.2         | <None> | 16.65         | 289.8               | 465.7          |
| 275 | J-102 | 247           | <None> | 13.08         | 289.8               | 418.7          |
| 280 | J-103 | 242           | <None> | 17.32         | 289.7               | 467.2          |
| 282 | J-104 | 241           | <None> | 17.32         | 289.7               | 476.6          |
| 284 | J-105 | 241           | <None> | 17.32         | 289.7               | 476.7          |
| 287 | J-106 | 240           | <None> | 17.32         | 289.8               | 487.5          |
| 291 | J-107 | 242           | <None> | 21.71         | 290.1               | 470.8          |
| 293 | J-108 | 240           | <None> | 21.71         | 290.1               | 490.3          |
| 295 | J-109 | 240           | <None> | 16.45         | 290.1               | 490.2          |
| 299 | J-110 | 240           | <None> | 16.45         | 290.1               | 489.9          |
| 303 | J-111 | 242           | <None> | 16.45         | 290.1               | 471            |
| 311 | J-114 | 240           | <None> | 32.06         | 289.7               | 486.1          |
| 313 | J-115 | 242           | <None> | 26.48         | 289.7               | 466.6          |
| 315 | J-116 | 244           | <None> | 0             | 289.7               | 447.4          |
| 317 | J-117 | 241           | <None> | 29.24         | 289.7               | 476.3          |
| 319 | J-118 | 243           | <None> | 29.24         | 289.7               | 456.6          |
| 321 | J-119 | 243           | <None> | 29.24         | 289.7               | 456.6          |
| 325 | J-120 | 244           | <None> | 26.48         | 289.7               | 447            |
| 328 | J-121 | 242           | <None> | 26.48         | 289.7               | 466.6          |
| 330 | J-122 | 242           | <None> | 26.48         | 289.7               | 466.6          |
| 333 | J-123 | 238           | <None> | 32.06         | 289.7               | 505.7          |
| 335 | J-124 | 239           | <None> | 32.06         | 289.7               | 495.9          |
| 337 | J-125 | 240           | <None> | 32.06         | 289.7               | 486.1          |
| 340 | J-126 | 237           | <None> | 27.02         | 289.7               | 515.5          |
| 342 | J-127 | 236           | <None> | 27.02         | 289.7               | 525.3          |
| 344 | J-128 | 238           | <None> | 27.02         | 289.7               | 505.7          |
| 347 | J-129 | 239           | <None> | 32.06         | 289.7               | 495.9          |
| 398 | J-135 | 243           | <None> | 16            | 289.8               | 457.8          |

| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 405 | J-136 | 245.8         | <None> | 94            | 289.8               | 430.3          |
| 408 | J-137 | 242.5         | <None> | 100.15        | 289.8               | 462.6          |
| 411 | J-140 | 247.2         | <None> | 104           | 289.8               | 416.6          |
| 415 | J-141 | 250.1         | <None> | 0             | 289.8               | 388.1          |
| 416 | J-142 | 249.5         | <None> | 104           | 289.8               | 394            |
| 417 | J-143 | 249.1         | <None> | 104           | 289.8               | 397.9          |
| 422 | J-144 | 249.8         | <None> | 119.5         | 289.7               | 390.8          |
| 423 | J-145 | 248.5         | <None> | 119.5         | 289.7               | 403.4          |
| 424 | J-146 | 253.9         | <None> | 119.5         | 289.7               | 350.7          |
| 430 | J-147 | 247.9         | <None> | 119.5         | 289.7               | 409.3          |
| 431 | J-148 | 245.3         | <None> | 119.5         | 289.7               | 434.7          |
| 435 | J-149 | 238.2         | <None> | 120           | 289.7               | 503.7          |
| 436 | J-150 | 240.2         | <None> | 120           | 289.7               | 484.2          |
| 437 | J-151 | 238.5         | <None> | 120           | 289.7               | 500.8          |
| 442 | J-152 | 243.8         | <None> | 70.75         | 290.2               | 453.8          |
| 443 | J-153 | 252.2         | <None> | 70.75         | 290.2               | 371.6          |
| 444 | J-154 | 266.5         | <None> | 70.75         | 290.2               | 231.6          |
| 445 | J-155 | 272.5         | <None> | 70.75         | 290.2               | 172.9          |
| 451 | J-156 | 251.5         | <None> | 119.5         | 289.7               | 374.1          |
| 456 | J-157 | 246.1         | <None> | 100.15        | 289.8               | 427.3          |

## Pipe Report



| Id | Label     | Scaled Length (m) | Start Node | Stop Node  | Diameter (mm) | Material     | Hazen-Williams C (l) | Has Check Valve? | Minor Loss (l) | Flow (m3/d) | Velocity (ft/s) | Headloss Gradient (ft/ft) | Has User Defined Length? |
|----|-----------|-------------------|------------|------------|---------------|--------------|----------------------|------------------|----------------|-------------|-----------------|---------------------------|--------------------------|
|    | 322 P-165 | 269               | 313: J-115 | 321: J-119 | 150           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                     | FALSE                    |
|    | 326 P-168 | 47                | 321: J-119 | 325: J-120 | 150           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                     | FALSE                    |
|    | 396 P-204 | 50                | 167: R-2   | 379: PMP-4 | 200           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                     | FALSE                    |
|    | 397 P-205 | 60                | 379: PMP-4 | 225: J-92  | 200           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                     | FALSE                    |
|    | 403 P-210 | 11                | 168: R-3   | 382: PMP-5 | 200           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                     | FALSE                    |
|    | 404 P-211 | 14                | 382: PMP-5 | 212: J-89  | 200           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                     | FALSE                    |
|    | 446 P-233 | 400               | 444: J-154 | 445: J-155 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -19.29      | 0.01            | 0                         | FALSE                    |
|    | 343 P-178 | 325               | 340: J-126 | 342: J-127 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 17.38       | 0.04            | 0                         | FALSE                    |
|    | 450 P-237 | 417               | 442: J-152 | 444: J-154 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 114.82      | 0.06            | 0                         | FALSE                    |
|    | 447 P-234 | 346               | 445: J-155 | 443: J-153 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -153.39     | 0.08            | 0                         | FALSE                    |
|    | 345 P-179 | 131               | 342: J-127 | 344: J-128 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -33.84      | 0.07            | 0                         | FALSE                    |
|    | 449 P-236 | 338               | 239: J-97  | 442: J-152 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 248.93      | 0.13            | 0                         | FALSE                    |
|    | 448 P-235 | 225               | 443: J-153 | 239: J-97  | 300           | Ductile Iron | 130                  | FALSE            | 0              | -287.5      | 0.15            | 0                         | FALSE                    |
|    | 324 P-167 | 234               | 319: J-118 | 321: J-119 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 55.42       | 0.12            | 0                         | FALSE                    |
|    | 341 P-177 | 235               | 333: J-123 | 340: J-126 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 68.59       | 0.15            | 0                         | FALSE                    |
|    | 458 P-243 | 233               | 456: J-157 | 411: J-140 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -438.44     | 0.24            | 0                         | FALSE                    |
|    | 348 P-181 | 374               | 311: J-114 | 347: J-129 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 83.88       | 0.18            | 0                         | FALSE                    |
|    | 346 P-180 | 151               | 344: J-128 | 333: J-123 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -85.06      | 0.18            | 0                         | FALSE                    |
|    | 286 P-144 | 303               | 284: J-105 | 87: J-36   | 150           | Ductile Iron | 130                  | FALSE            | 0              | 95.47       | 0.21            | 0                         | FALSE                    |
|    | 285 P-143 | 372               | 282: J-104 | 284: J-105 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -95.8       | 0.21            | 0                         | FALSE                    |
|    | 320 P-164 | 273               | 317: J-117 | 319: J-118 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 110.85      | 0.24            | 0                         | FALSE                    |
|    | 276 P-137 | 601               | 199: J-86  | 275: J-102 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -111.8      | 0.24            | 0                         | FALSE                    |
|    | 402 P-209 | 393               | 203: J-87  | 199: J-86  | 200           | Ductile Iron | 130                  | FALSE            | 0              | 257.89      | 0.31            | 0                         | FALSE                    |
|    | 441 P-232 | 196               | 437: J-151 | 335: J-124 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 760.85      | 0.41            | 0                         | FALSE                    |
|    | 277 P-138 | 162               | 275: J-102 | 235: J-96  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -136.59     | 0.29            | 0                         | FALSE                    |
|    | 440 P-231 | 483               | 436: J-150 | 437: J-151 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 988.31      | 0.53            | 0                         | FALSE                    |
|    | 400 P-207 | 368               | 398: J-135 | 199: J-86  | 200           | Ductile Iron | 130                  | FALSE            | 0              | -343.15     | 0.41            | 0                         | FALSE                    |
|    | 314 P-161 | 153               | 311: J-114 | 313: J-115 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -162.04     | 0.35            | 0                         | FALSE                    |
|    | 413 P-215 | 330               | 405: J-136 | 408: J-137 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -1009.35    | 0.54            | 0                         | FALSE                    |
|    | 318 P-163 | 232               | 313: J-115 | 317: J-117 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 166.27      | 0.36            | 0                         | FALSE                    |
|    | 439 P-230 | 328               | 435: J-149 | 436: J-150 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 1215.77     | 0.65            | 0                         | FALSE                    |
|    | 339 P-176 | 233               | 337: J-125 | 311: J-114 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 206.71      | 0.44            | 0                         | FALSE                    |
|    | 412 P-214 | 337               | 408: J-137 | 151: J-69  | 300           | Ductile Iron | 130                  | FALSE            | 0              | 1316.53     | 0.71            | 0                         | FALSE                    |
|    | 349 P-182 | 101               | 347: J-129 | 333: J-123 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -218.18     | 0.47            | 0                         | FALSE                    |
|    | 352 P-185 | 132               | 311: J-114 | 284: J-105 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 224.1       | 0.48            | 0                         | FALSE                    |
|    | 438 P-229 | 211               | 328: J-121 | 435: J-149 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 1443.23     | 0.78            | 0                         | FALSE                    |
|    | 350 P-183 | 129               | 347: J-129 | 282: J-104 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 241.29      | 0.52            | 0                         | FALSE                    |
|    | 338 P-175 | 392               | 335: J-124 | 337: J-125 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 267.48      | 0.57            | 0                         | FALSE                    |
|    | 289 P-146 | 346               | 287: J-106 | 280: J-103 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -271.43     | 0.58            | 0                         | FALSE                    |
|    | 283 P-142 | 206               | 280: J-103 | 282: J-104 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -304.26     | 0.65            | 0                         | FALSE                    |
|    | 305 P-157 | 290               | 303: J-111 | 291: J-107 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -321.65     | 0.69            | 0                         | FALSE                    |
|    | 271 P-133 | 174               | 266: J-100 | 270: J-101 | 200           | Ductile Iron | 130                  | FALSE            | 0              | 735.84      | 0.89            | 0                         | FALSE                    |
|    | 294 P-149 | 238               | 291: J-107 | 293: J-108 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -362.8      | 0.78            | 0.001                     | FALSE                    |
|    | 462 P-245 | 663               | 456: J-157 | 417: J-143 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -2267.11    | 1.22            | 0.001                     | FALSE                    |
|    | 267 P-130 | 327               | 159: J-72  | 266: J-100 | 200           | Ductile Iron | 130                  | FALSE            | 0              | 784.29      | 0.95            | 0.001                     | FALSE                    |
|    | 332 P-172 | 328               | 330: J-122 | 313: J-115 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 378.5       | 0.81            | 0.001                     | FALSE                    |
|    | 269 P-132 | 491               | 151: J-69  | 159: J-72  | 200           | Ductile Iron | 130                  | FALSE            | 0              | 832.73      | 1.01            | 0.001                     | FALSE                    |
|    | 407 P-213 | 282               | 405: J-136 | 235: J-96  | 150           | Ductile Iron | 130                  | FALSE            | 0              | 397.25      | 0.85            | 0.001                     | FALSE                    |
|    | 420 P-219 | 336               | 416: J-142 | 417: J-143 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 2464.24     | 1.32            | 0.001                     | FALSE                    |
|    | 296 P-150 | 306               | 293: J-108 | 295: J-109 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -403.95     | 0.87            | 0.001                     | FALSE                    |
|    | 457 P-242 | 192               | 408: J-137 | 456: J-157 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -2515.71    | 1.35            | 0.001                     | FALSE                    |
|    | 331 P-171 | 181               | 328: J-121 | 330: J-122 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 428.7       | 0.92            | 0.001                     | FALSE                    |
|    | 336 P-174 | 210               | 333: J-123 | 335: J-124 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -432.6      | 0.93            | 0.001                     | FALSE                    |

| Id | Label     | Scaled Length (m) | Start Node | Stop Node  | Diameter (mm) | Material     | Hazen-Williams C () | Has Check Valve? | Minor Loss () | Flow (m3/d) | Velocity (ft/s) | Headloss Gradient (ft/ft) | Has User Defined Length? |
|----|-----------|-------------------|------------|------------|---------------|--------------|---------------------|------------------|---------------|-------------|-----------------|---------------------------|--------------------------|
|    | 406 P-212 | 365               | 398: J-135 | 405: J-136 | 150           | Ductile Iron | 130                 | FALSE            | 0             | -433.92     | 0.93            | 0.001                     | FALSE                    |
|    | 399 P-206 | 327               | 151: J-69  | 398: J-135 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 435.35      | 0.94            | 0.001                     | FALSE                    |
|    | 249 P-124 | 318               | 247: J-99  | 87: J-36   | 150           | Ductile Iron | 130                 | FALSE            | 0             | -448.39     | 0.96            | 0.001                     | FALSE                    |
|    | 304 P-156 | 149               | 239: J-97  | 303: J-111 | 300           | Ductile Iron | 130                 | FALSE            | 0             | -2906.29    | 1.56            | 0.001                     | FALSE                    |
|    | 288 P-145 | 175               | 87: J-36   | 287: J-106 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 532.92      | 1.15            | 0.001                     | FALSE                    |
|    | 401 P-208 | 273               | 270: J-101 | 398: J-135 | 200           | Ductile Iron | 130                 | FALSE            | 0             | -1182.09    | 1.43            | 0.001                     | FALSE                    |
|    | 248 P-123 | 158               | 85: J-35   | 247: J-99  | 150           | Ductile Iron | 130                 | FALSE            | 0             | -564.01     | 1.21            | 0.001                     | FALSE                    |
|    | 461 P-244 | 282               | 235: J-96  | 411: J-140 | 300           | Ductile Iron | 130                 | FALSE            | 0             | -3541.69    | 1.9             | 0.001                     | FALSE                    |
|    | 418 P-217 | 337               | 411: J-140 | 416: J-142 | 300           | Ductile Iron | 130                 | FALSE            | 0             | -4177.26    | 2.24            | 0.002                     | FALSE                    |
|    | 306 P-158 | 262               | 295: J-109 | 303: J-111 | 250           | Ductile Iron | 130                 | FALSE            | 0             | 2615.82     | 2.02            | 0.002                     | FALSE                    |
|    | 434 P-228 | 187               | 431: J-148 | 315: J-116 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 4336.05     | 2.33            | 0.002                     | FALSE                    |
|    | 433 P-227 | 309               | 430: J-147 | 431: J-148 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 4562.56     | 2.45            | 0.002                     | FALSE                    |
|    | 213 P-98  | 66                | 90: J-38   | 212: J-89  | 150           | Ductile Iron | 130                 | FALSE            | 0             | -738.21     | 1.59            | 0.002                     | FALSE                    |
|    | 290 P-147 | 264               | 287: J-106 | 212: J-89  | 150           | Ductile Iron | 130                 | FALSE            | 0             | 771.51      | 1.66            | 0.002                     | FALSE                    |
|    | 432 P-226 | 394               | 423: J-145 | 430: J-147 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 4789.08     | 2.57            | 0.002                     | FALSE                    |
|    | 300 P-153 | 145               | 295: J-109 | 299: J-110 | 250           | Ductile Iron | 130                 | FALSE            | 0             | -3050.95    | 2.36            | 0.002                     | FALSE                    |
|    | 455 P-241 | 341               | 422: J-144 | 423: J-145 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 5015.59     | 2.69            | 0.002                     | FALSE                    |
|    | 454 P-240 | 416               | 451: J-156 | 422: J-144 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 5515.96     | 2.96            | 0.003                     | FALSE                    |
|    | 251 P-126 | 219               | 247: J-99  | 90: J-38   | 150           | Ductile Iron | 130                 | FALSE            | 0             | 910.12      | 1.96            | 0.003                     | FALSE                    |
|    | 278 P-139 | 299               | 87: J-36   | 119: J-53  | 150           | Ductile Iron | 130                 | FALSE            | 0             | -919.14     | 1.98            | 0.003                     | FALSE                    |
|    | 453 P-239 | 424               | 424: J-146 | 451: J-156 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 5742.48     | 3.08            | 0.003                     | FALSE                    |
|    | 224 P-107 | 184               | 220: J-91  | 85: J-35   | 150           | Ductile Iron | 130                 | FALSE            | 0             | 932.19      | 2               | 0.003                     | FALSE                    |
|    | 209 P-95  | 113               | 119: J-53  | 208: J-88  | 150           | Ductile Iron | 130                 | FALSE            | 0             | -953.25     | 2.05            | 0.003                     | FALSE                    |
|    | 226 P-108 | 462               | 220: J-91  | 225: J-92  | 300           | Ductile Iron | 130                 | FALSE            | 0             | -6182.25    | 3.32            | 0.003                     | FALSE                    |
|    | 236 P-114 | 432               | 225: J-92  | 235: J-96  | 300           | Ductile Iron | 130                 | FALSE            | 0             | -6207.05    | 3.33            | 0.003                     | FALSE                    |
|    | 279 P-140 | 222               | 247: J-99  | 121: J-54  | 150           | Ductile Iron | 130                 | FALSE            | 0             | -1059.05    | 2.28            | 0.004                     | FALSE                    |
|    | 210 P-96  | 157               | 208: J-88  | 121: J-54  | 150           | Ductile Iron | 130                 | FALSE            | 0             | 1089.38     | 2.34            | 0.004                     | FALSE                    |
|    | 419 P-218 | 235               | 416: J-142 | 415: J-141 | 300           | Ductile Iron | 130                 | FALSE            | 0             | -6838.63    | 3.67            | 0.004                     | FALSE                    |
|    | 351 P-184 | 454               | 315: J-116 | 203: J-87  | 200           | Ductile Iron | 130                 | FALSE            | 0             | 2363.74     | 2.86            | 0.004                     | FALSE                    |
|    | 421 P-220 | 428               | 415: J-141 | 235: J-96  | 200           | Ductile Iron | 130                 | FALSE            | 0             | 2429.48     | 2.94            | 0.004                     | FALSE                    |
|    | 241 P-118 | 725               | 239: J-97  | 220: J-91  | 300           | Ductile Iron | 130                 | FALSE            | 0             | -7085.53    | 3.81            | 0.004                     | FALSE                    |
|    | 452 P-238 | 353               | 422: J-144 | 424: J-146 | 300           | Ductile Iron | 130                 | FALSE            | 0             | -8994.25    | 4.83            | 0.007                     | FALSE                    |
|    | 301 P-154 | 250               | 299: J-110 | 85: J-35   | 150           | Ductile Iron | 130                 | FALSE            | 0             | -1467.11    | 3.15            | 0.007                     | FALSE                    |
|    | 425 P-221 | 353               | 415: J-141 | 422: J-144 | 300           | Ductile Iron | 130                 | FALSE            | 0             | -9268.12    | 4.98            | 0.007                     | FALSE                    |
|    | 389 P-201 | 614               | 27: J-4    | 388: T-4   | 300           | Ductile Iron | 130                 | FALSE            | 0             | 9400.65     | 5.05            | 0.008                     | FALSE                    |
|    | 240 P-117 | 302               | 27: J-4    | 239: J-97  | 300           | Ductile Iron | 130                 | FALSE            | 0             | -9428.02    | 5.06            | 0.008                     | FALSE                    |
|    | 302 P-155 | 156               | 90: J-38   | 299: J-110 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 1615.02     | 3.47            | 0.008                     | FALSE                    |
|    | 273 P-135 | 240               | 220: J-91  | 270: J-101 | 150           | Ductile Iron | 130                 | FALSE            | 0             | -1886.36    | 4.05            | 0.011                     | FALSE                    |
|    | 329 P-170 | 310               | 325: J-120 | 328: J-121 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 1922.12     | 4.13            | 0.012                     | FALSE                    |
|    | 327 P-169 | 92                | 325: J-120 | 315: J-116 | 150           | Ductile Iron | 130                 | FALSE            | 0             | -1972.31    | 4.24            | 0.012                     | FALSE                    |
|    | 211 P-97  | 146               | 203: J-87  | 208: J-88  | 150           | Ductile Iron | 130                 | FALSE            | 0             | 2076.75     | 4.46            | 0.013                     | FALSE                    |
|    | 475 P-246 | 155               | 474: T-5   | 424: J-146 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 14963.24    | 8.04            | 0.018                     | FALSE                    |

## Tank Report





| Id  | Label | Zone   | Base Elevation (m) | Minimum Elevation (m) | Initial Elevation (m) | Maximum Elevation (m) | Inactive Volume (m?) | Diameter (ft) | Outflow (m?/d) | Hydraulic Grade (m) |
|-----|-------|--------|--------------------|-----------------------|-----------------------|-----------------------|----------------------|---------------|----------------|---------------------|
| 388 | T-4   | <None> | 285                | 285.1                 | 290.5                 | 290.7                 | 0                    | 99.34         | 2934.63        | 290.5               |

## Reservoir Report



| Id  | Label | Elevation (m) | Zone   | Outflow (m3/d) | Hydraulic Grade (m) |
|-----|-------|---------------|--------|----------------|---------------------|
| 167 | R-2   | 332           | <None> | (N/A)          | (N/A)               |
| 168 | R-3   | 351           | <None> | (N/A)          | (N/A)               |

**Water Storage Option WS2/WS3 –  
Elevated Storage or Expanded Storage with Pumping**

**Water Distribution Option WD2-  
New Trunk Watermain 300 mm with Improvements to Ex. System**

**Scenario: Maximum Daily Demand (M.D.D.)**



## Junction Report



| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 27  | J-4   | 246           | <None> | 27.37         | 292                 | 449.8          |
| 85  | J-35  | 241           | <None> | 29.1          | 290.3               | 482.6          |
| 87  | J-36  | 241           | <None> | 33.3          | 289.9               | 479            |
| 90  | J-38  | 240           | <None> | 33.3          | 290.3               | 492.7          |
| 119 | J-53  | 243.2         | <None> | 34.12         | 289.9               | 457.4          |
| 121 | J-54  | 242.1         | <None> | 30.33         | 290.1               | 469.5          |
| 151 | J-69  | 241           | <None> | 48.45         | 289.8               | 477.7          |
| 159 | J-72  | 254           | <None> | 48.45         | 289.8               | 350.7          |
| 199 | J-86  | 244           | <None> | 26.54         | 289.8               | 448.5          |
| 203 | J-87  | 244.2         | <None> | 29.1          | 289.8               | 446.4          |
| 208 | J-88  | 243.2         | <None> | 34.12         | 289.9               | 457.4          |
| 212 | J-89  | 240           | <None> | 33.3          | 290.3               | 491.9          |
| 220 | J-91  | 242.2         | <None> | 50.89         | 290.3               | 471.2          |
| 225 | J-92  | 244.1         | <None> | 24.79         | 290.1               | 450.1          |
| 235 | J-96  | 246.1         | <None> | 24.79         | 289.9               | 428.3          |
| 239 | J-97  | 242           | <None> | 27.37         | 291.1               | 480.6          |
| 247 | J-99  | 241           | <None> | 33.3          | 290.3               | 482.5          |
| 266 | J-100 | 242           | <None> | 48.45         | 289.9               | 468.3          |
| 270 | J-101 | 242.2         | <None> | 31.56         | 289.9               | 466.6          |
| 275 | J-102 | 247           | <None> | 24.79         | 289.9               | 419.4          |
| 280 | J-103 | 242           | <None> | 32.83         | 289.7               | 466.9          |
| 282 | J-104 | 241           | <None> | 32.83         | 289.6               | 475.5          |
| 284 | J-105 | 241           | <None> | 32.83         | 289.6               | 475.6          |
| 287 | J-106 | 240           | <None> | 32.83         | 290                 | 488.9          |
| 291 | J-107 | 242           | <None> | 41.15         | 290.9               | 478.8          |
| 293 | J-108 | 240           | <None> | 41.15         | 290.9               | 497.9          |
| 295 | J-109 | 240           | <None> | 31.18         | 290.8               | 497.6          |
| 299 | J-110 | 240           | <None> | 31.18         | 290.7               | 496.6          |
| 303 | J-111 | 242           | <None> | 31.18         | 291                 | 479.5          |
| 311 | J-114 | 240           | <None> | 60.77         | 289.5               | 484.4          |
| 313 | J-115 | 242           | <None> | 50.19         | 289.5               | 464.8          |
| 315 | J-116 | 244           | <None> | 0             | 289.6               | 446.8          |
| 317 | J-117 | 241           | <None> | 55.42         | 289.5               | 474.3          |
| 319 | J-118 | 243           | <None> | 55.42         | 289.4               | 454.6          |
| 321 | J-119 | 243           | <None> | 55.42         | 289.4               | 454.5          |
| 325 | J-120 | 244           | <None> | 50.19         | 289.5               | 445.4          |
| 328 | J-121 | 242           | <None> | 50.19         | 289.5               | 464.8          |
| 330 | J-122 | 242           | <None> | 50.19         | 289.5               | 464.8          |
| 333 | J-123 | 238           | <None> | 60.77         | 289.5               | 503.9          |
| 335 | J-124 | 239           | <None> | 60.77         | 289.5               | 494.1          |
| 337 | J-125 | 240           | <None> | 60.77         | 289.5               | 484.3          |
| 340 | J-126 | 237           | <None> | 51.22         | 289.5               | 513.7          |
| 342 | J-127 | 236           | <None> | 51.22         | 289.5               | 523.5          |
| 344 | J-128 | 238           | <None> | 51.22         | 289.5               | 503.9          |
| 347 | J-129 | 239           | <None> | 60.77         | 289.5               | 494.2          |
| 398 | J-135 | 243           | <None> | 30.33         | 289.8               | 458.3          |



| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 405 | J-136 | 245.8         | <None> | 178.18        | 289.8               | 430.7          |
| 408 | J-137 | 242.5         | <None> | 189.83        | 289.8               | 462.9          |
| 411 | J-140 | 247.2         | <None> | 197.13        | 289.8               | 417            |
| 415 | J-141 | 250.1         | <None> | 0             | 289.8               | 388.1          |
| 416 | J-142 | 249.5         | <None> | 197.13        | 289.8               | 394.2          |
| 417 | J-143 | 249.1         | <None> | 197.13        | 289.8               | 398.1          |
| 422 | J-144 | 249.8         | <None> | 226.51        | 289.7               | 390.3          |
| 423 | J-145 | 248.5         | <None> | 226.51        | 289.7               | 402.8          |
| 424 | J-146 | 253.9         | <None> | 226.51        | 289.7               | 350.2          |
| 430 | J-147 | 247.9         | <None> | 226.51        | 289.7               | 408.6          |
| 431 | J-148 | 245.3         | <None> | 226.51        | 289.6               | 434            |
| 435 | J-149 | 238.2         | <None> | 227.46        | 289.5               | 502            |
| 436 | J-150 | 240.2         | <None> | 227.46        | 289.5               | 482.4          |
| 437 | J-151 | 238.5         | <None> | 227.46        | 289.5               | 499            |
| 442 | J-152 | 243.8         | <None> | 134.11        | 291.1               | 463            |
| 443 | J-153 | 252.2         | <None> | 134.11        | 291.1               | 380.8          |
| 444 | J-154 | 266.5         | <None> | 134.11        | 291.1               | 240.8          |
| 445 | J-155 | 272.5         | <None> | 134.11        | 291.1               | 182.1          |
| 451 | J-156 | 251.5         | <None> | 226.51        | 289.7               | 373.7          |
| 456 | J-157 | 246.1         | <None> | 189.83        | 289.8               | 427.7          |

## Pipe Report



| Id  | Label | Scaled Length |            | Start Node | Stop Node | Diameter     |          | Hazen-Williams C ( ) | Has Check Valve? | Minor Loss ( ) | Flow (m³/d) | Velocity (ft/s) | Headloss Gradient<br>(mm/m (V:H)) | Has User Defined<br>Length? |
|-----|-------|---------------|------------|------------|-----------|--------------|----------|----------------------|------------------|----------------|-------------|-----------------|-----------------------------------|-----------------------------|
|     |       | (m)           |            |            |           | (mm)         | Material |                      |                  |                |             |                 |                                   |                             |
| 322 | P-165 | 269           | 313: J-115 | 321: J-119 | 300       | Ductile Iron | 130      | FALSE                |                  | 0 (N/A)        | (N/A)       | (N/A)           |                                   | FALSE                       |
| 326 | P-168 | 47            | 321: J-119 | 325: J-120 | 300       | Ductile Iron | 130      | FALSE                |                  | 0 (N/A)        | (N/A)       | (N/A)           |                                   | FALSE                       |
| 396 | P-204 | 50            | 167: R-2   | 379: PMP-4 | 200       | Ductile Iron | 130      | FALSE                |                  | 0 (N/A)        | (N/A)       | (N/A)           |                                   | FALSE                       |
| 397 | P-205 | 60            | 379: PMP-4 | 225: J-92  | 200       | Ductile Iron | 130      | FALSE                |                  | 0 (N/A)        | (N/A)       | (N/A)           |                                   | FALSE                       |
| 403 | P-210 | 11            | 168: R-3   | 382: PMP-5 | 200       | Ductile Iron | 130      | FALSE                |                  | 0 (N/A)        | (N/A)       | (N/A)           |                                   | FALSE                       |
| 404 | P-211 | 14            | 382: PMP-5 | 212: J-89  | 200       | Ductile Iron | 130      | FALSE                |                  | 0 (N/A)        | (N/A)       | (N/A)           |                                   | FALSE                       |
| 453 | P-239 | 424           | 424: J-146 | 451: J-156 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 9.85        | 0.01            | 0                                 | FALSE                       |
| 446 | P-233 | 359           | 444: J-154 | 445: J-155 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | -18.58      | 0.01            | 0                                 | FALSE                       |
| 440 | P-231 | 483           | 436: J-150 | 437: J-151 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 21.62       | 0.01            | 0                                 | FALSE                       |
| 434 | P-228 | 187           | 431: J-148 | 315: J-116 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 10.06       | 0.01            | 0                                 | FALSE                       |
| 338 | P-175 | 392           | 335: J-124 | 337: J-125 | 150       | Ductile Iron | 130      | FALSE                |                  | 0              | -7.43       | 0.02            | 0                                 | FALSE                       |
| 332 | P-172 | 328           | 330: J-122 | 313: J-115 | 150       | Ductile Iron | 130      | FALSE                |                  | 0              | 7.87        | 0.02            | 0                                 | FALSE                       |
| 348 | P-181 | 374           | 311: J-114 | 347: J-129 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 107.15      | 0.06            | 0.002                             | FALSE                       |
| 450 | P-237 | 392           | 442: J-152 | 444: J-154 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 115.53      | 0.06            | 0.002                             | FALSE                       |
| 343 | P-178 | 325           | 340: J-126 | 342: J-127 | 150       | Ductile Iron | 200      | FALSE                |                  | 0              | 30.54       | 0.07            | 0.002                             | FALSE                       |
| 345 | P-179 | 131           | 342: J-127 | 344: J-128 | 150       | Ductile Iron | 130      | FALSE                |                  | 0              | -20.68      | 0.04            | 0.003                             | FALSE                       |
| 447 | P-234 | 343           | 445: J-155 | 443: J-153 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | -152.69     | 0.08            | 0.004                             | FALSE                       |
| 209 | P-95  | 113           | 119: J-53  | 208: J-88  | 150       | Ductile Iron | 130      | FALSE                |                  | 0              | 26.89       | 0.06            | 0.004                             | FALSE                       |
| 413 | P-215 | 330           | 405: J-136 | 408: J-137 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 169.5       | 0.09            | 0.004                             | FALSE                       |
| 441 | P-232 | 196           | 437: J-151 | 335: J-124 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | -205.84     | 0.11            | 0.006                             | FALSE                       |
| 314 | P-161 | 153           | 311: J-114 | 313: J-115 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 208.59      | 0.11            | 0.007                             | FALSE                       |
| 454 | P-240 | 416           | 451: J-156 | 422: J-144 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | -216.66     | 0.12            | 0.007                             | FALSE                       |
| 433 | P-227 | 309           | 430: J-147 | 431: J-148 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 236.57      | 0.13            | 0.008                             | FALSE                       |
| 452 | P-238 | 353           | 422: J-144 | 424: J-146 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 236.36      | 0.13            | 0.008                             | FALSE                       |
| 439 | P-230 | 328           | 435: J-149 | 436: J-150 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 249.08      | 0.13            | 0.009                             | FALSE                       |
| 449 | P-236 | 338           | 239: J-97  | 442: J-152 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 249.63      | 0.13            | 0.009                             | FALSE                       |
| 336 | P-174 | 210           | 333: J-123 | 335: J-124 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 259.18      | 0.14            | 0.01                              | FALSE                       |
| 420 | P-219 | 336           | 416: J-142 | 417: J-143 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | -258.63     | 0.14            | 0.01                              | FALSE                       |
| 457 | P-242 | 192           | 408: J-137 | 456: J-157 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 272.51      | 0.15            | 0.011                             | FALSE                       |
| 448 | P-235 | 225           | 443: J-153 | 239: J-97  | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | -286.79     | 0.15            | 0.012                             | FALSE                       |
| 412 | P-214 | 337           | 408: J-137 | 151: J-69  | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | -292.85     | 0.16            | 0.012                             | FALSE                       |
| 400 | P-207 | 368           | 398: J-135 | 199: J-86  | 200       | Ductile Iron | 130      | FALSE                |                  | 0              | 111.4       | 0.13            | 0.015                             | FALSE                       |
| 341 | P-177 | 235           | 333: J-123 | 340: J-126 | 150       | Ductile Iron | 200      | FALSE                |                  | 0              | 81.75       | 0.18            | 0.015                             | FALSE                       |
| 324 | P-167 | 234           | 319: J-118 | 321: J-119 | 150       | Ductile Iron | 130      | FALSE                |                  | 0              | 55.42       | 0.12            | 0.016                             | FALSE                       |
| 331 | P-171 | 181           | 328: J-121 | 330: J-122 | 150       | Ductile Iron | 130      | FALSE                |                  | 0              | 58.07       | 0.12            | 0.018                             | FALSE                       |
| 458 | P-243 | 233           | 456: J-157 | 411: J-140 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | -373.09     | 0.2             | 0.019                             | FALSE                       |
| 278 | P-139 | 299           | 87: J-36   | 119: J-53  | 150       | Ductile Iron | 130      | FALSE                |                  | 0              | 61.01       | 0.13            | 0.019                             | FALSE                       |
| 339 | P-176 | 233           | 337: J-125 | 311: J-114 | 150       | Ductile Iron | 130      | FALSE                |                  | 0              | -68.2       | 0.15            | 0.024                             | FALSE                       |
| 346 | P-180 | 151           | 344: J-128 | 333: J-123 | 150       | Ductile Iron | 130      | FALSE                |                  | 0              | -71.9       | 0.15            | 0.026                             | FALSE                       |
| 285 | P-143 | 372           | 282: J-104 | 284: J-105 | 150       | Ductile Iron | 130      | FALSE                |                  | 0              | -71.94      | 0.15            | 0.026                             | FALSE                       |
| 462 | P-245 | 663           | 456: J-157 | 417: J-143 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 455.77      | 0.24            | 0.028                             | FALSE                       |
| 432 | P-226 | 394           | 423: J-145 | 430: J-147 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 463.08      | 0.25            | 0.028                             | FALSE                       |
| 349 | P-182 | 101           | 347: J-129 | 333: J-123 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 473.6       | 0.25            | 0.03                              | FALSE                       |
| 438 | P-229 | 211           | 328: J-121 | 435: J-149 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 476.54      | 0.26            | 0.03                              | FALSE                       |
| 402 | P-209 | 393           | 203: J-87  | 199: J-86  | 200       | Ductile Iron | 130      | FALSE                |                  | 0              | -181.65     | 0.22            | 0.036                             | FALSE                       |
| 329 | P-170 | 310           | 325: J-120 | 328: J-121 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 584.8       | 0.31            | 0.044                             | FALSE                       |
| 276 | P-137 | 601           | 199: J-86  | 275: J-102 | 150       | Ductile Iron | 130      | FALSE                |                  | 0              | -96.78      | 0.21            | 0.046                             | FALSE                       |
| 269 | P-132 | 491           | 151: J-69  | 159: J-72  | 200       | Ductile Iron | 130      | FALSE                |                  | 0              | -215.79     | 0.26            | 0.05                              | FALSE                       |
| 288 | P-145 | 175           | 87: J-36   | 287: J-106 | 150       | Ductile Iron | 130      | FALSE                |                  | 0              | -101.82     | 0.22            | 0.05                              | FALSE                       |
| 320 | P-164 | 273           | 317: J-117 | 319: J-118 | 150       | Ductile Iron | 130      | FALSE                |                  | 0              | 110.85      | 0.24            | 0.059                             | FALSE                       |
| 455 | P-241 | 341           | 422: J-144 | 423: J-145 | 300       | Ductile Iron | 130      | FALSE                |                  | 0              | 689.59      | 0.37            | 0.059                             | FALSE                       |

| Id  | Label | Scaled Length |            | Start Node | Stop Node | Diameter |              | Hazen-Williams C ( ) | Has Check Valve? | Minor Loss ( ) | Flow (m³/d) | Velocity (ft/s) | Headloss Gradient |       | Has User Defined Length? |
|-----|-------|---------------|------------|------------|-----------|----------|--------------|----------------------|------------------|----------------|-------------|-----------------|-------------------|-------|--------------------------|
|     |       | (m)           |            |            |           | (mm)     | Material     |                      |                  |                |             |                 | (mm/m (V:H))      |       |                          |
| 277 | P-138 | 162           | 275: J-102 | 235: J-96  |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | -121.58         | 0.26              | 0.07  | FALSE                    |
| 267 | P-130 | 327           | 159: J-72  | 266: J-100 |           | 200      | Ductile Iron | 130                  | FALSE            |                | 0           | -264.24         | 0.32              | 0.073 | FALSE                    |
| 406 | P-212 | 365           | 398: J-135 | 405: J-136 |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | 125.06          | 0.27              | 0.074 | FALSE                    |
| 399 | P-206 | 327           | 151: J-69  | 398: J-135 |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | -125.51         | 0.27              | 0.074 | FALSE                    |
| 418 | P-217 | 337           | 411: J-140 | 416: J-142 |           | 300      | Ductile Iron | 130                  | FALSE            |                | 0           | 794.17          | 0.43              | 0.077 | FALSE                    |
| 419 | P-218 | 235           | 416: J-142 | 415: J-141 |           | 300      | Ductile Iron | 130                  | FALSE            |                | 0           | 855.67          | 0.46              | 0.089 | FALSE                    |
| 248 | P-123 | 158           | 85: J-35   | 247: J-99  |           | 300      | Ductile Iron | 130                  | FALSE            |                | 0           | 857.59          | 0.46              | 0.089 | FALSE                    |
| 271 | P-133 | 174           | 266: J-100 | 270: J-101 |           | 200      | Ductile Iron | 130                  | FALSE            |                | 0           | -312.68         | 0.38              | 0.099 | FALSE                    |
| 296 | P-150 | 306           | 293: J-108 | 295: J-109 |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | 158.46          | 0.34              | 0.114 | FALSE                    |
| 318 | P-163 | 232           | 313: J-115 | 317: J-117 |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | 166.27          | 0.36              | 0.125 | FALSE                    |
| 401 | P-208 | 273           | 270: J-101 | 398: J-135 |           | 200      | Ductile Iron | 130                  | FALSE            |                | 0           | 392.3           | 0.47              | 0.151 | FALSE                    |
| 224 | P-107 | 184           | 220: J-91  | 85: J-35   |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | 197.41          | 0.42              | 0.172 | FALSE                    |
| 294 | P-149 | 238           | 291: J-107 | 293: J-108 |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | 199.61          | 0.43              | 0.175 | FALSE                    |
| 461 | P-244 | 282           | 235: J-96  | 411: J-140 |           | 300      | Ductile Iron | 130                  | FALSE            |                | 0           | 1364.39         | 0.73              | 0.211 | FALSE                    |
| 425 | P-221 | 353           | 415: J-141 | 422: J-144 |           | 300      | Ductile Iron | 130                  | FALSE            |                | 0           | 1369.13         | 0.74              | 0.212 | FALSE                    |
| 407 | P-213 | 282           | 405: J-136 | 235: J-96  |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | -222.62         | 0.48              | 0.215 | FALSE                    |
| 251 | P-126 | 219           | 247: J-99  | 90: J-38   |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | -227.63         | 0.49              | 0.224 | FALSE                    |
| 305 | P-157 | 290           | 303: J-111 | 291: J-107 |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | 240.76          | 0.52              | 0.248 | FALSE                    |
| 421 | P-220 | 428           | 415: J-141 | 235: J-96  |           | 200      | Ductile Iron | 130                  | FALSE            |                | 0           | -513.46         | 0.62              | 0.248 | FALSE                    |
| 351 | P-184 | 454           | 315: J-116 | 203: J-87  |           | 200      | Ductile Iron | 130                  | FALSE            |                | 0           | -624.93         | 0.76              | 0.357 | FALSE                    |
| 389 | P-201 | 614           | 27: J-4    | 388: T-4   |           | 450      | Ductile Iron | 130                  | FALSE            |                | 0           | -5562.59        | 1.33              | 0.394 | FALSE                    |
| 236 | P-114 | 432           | 225: J-92  | 235: J-96  |           | 300      | Ductile Iron | 130                  | FALSE            |                | 0           | 2246.84         | 1.21              | 0.53  | FALSE                    |
| 226 | P-108 | 462           | 220: J-91  | 225: J-92  |           | 300      | Ductile Iron | 130                  | FALSE            |                | 0           | 2271.63         | 1.22              | 0.541 | FALSE                    |
| 306 | P-158 | 262           | 295: J-109 | 303: J-111 |           | 250      | Ductile Iron | 130                  | FALSE            |                | 0           | -1443           | 1.12              | 0.568 | FALSE                    |
| 283 | P-142 | 206           | 280: J-103 | 282: J-104 |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | 388.11          | 0.83              | 0.601 | FALSE                    |
| 300 | P-153 | 145           | 295: J-109 | 299: J-110 |           | 250      | Ductile Iron | 130                  | FALSE            |                | 0           | 1570.28         | 1.21              | 0.664 | FALSE                    |
| 289 | P-146 | 346           | 287: J-106 | 280: J-103 |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | 420.94          | 0.9               | 0.698 | FALSE                    |
| 350 | P-183 | 129           | 347: J-129 | 282: J-104 |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | -427.22         | 0.92              | 0.718 | FALSE                    |
| 352 | P-185 | 132           | 311: J-114 | 284: J-105 |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | -444.72         | 0.96              | 0.773 | FALSE                    |
| 304 | P-156 | 149           | 239: J-97  | 303: J-111 |           | 250      | Ductile Iron | 130                  | FALSE            |                | 0           | 1714.94         | 1.33              | 0.782 | FALSE                    |
| 211 | P-97  | 146           | 203: J-87  | 208: J-88  |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | -472.38         | 1.02              | 0.864 | FALSE                    |
| 210 | P-96  | 157           | 208: J-88  | 121: J-54  |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | -479.61         | 1.03              | 0.889 | FALSE                    |
| 279 | P-140 | 222           | 247: J-99  | 121: J-54  |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | 509.94          | 1.1               | 0.996 | FALSE                    |
| 241 | P-118 | 725           | 239: J-97  | 220: J-91  |           | 300      | Ductile Iron | 130                  | FALSE            |                | 0           | 3256.48         | 1.75              | 1.055 | FALSE                    |
| 249 | P-124 | 318           | 247: J-99  | 87: J-36   |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | 541.98          | 1.16              | 1.115 | FALSE                    |
| 286 | P-144 | 303           | 284: J-105 | 87: J-36   |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | -549.49         | 1.18              | 1.143 | FALSE                    |
| 290 | P-147 | 264           | 287: J-106 | 212: J-89  |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | -555.58         | 1.19              | 1.167 | FALSE                    |
| 213 | P-98  | 66            | 90: J-38   | 212: J-89  |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | 588.89          | 1.27              | 1.3   | FALSE                    |
| 327 | P-169 | 92            | 325: J-120 | 315: J-116 |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | -634.99         | 1.36              | 1.495 | FALSE                    |
| 301 | P-154 | 250           | 299: J-110 | 85: J-35   |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | 689.27          | 1.48              | 1.74  | FALSE                    |
| 273 | P-135 | 240           | 220: J-91  | 270: J-101 |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | 736.54          | 1.58              | 1.967 | FALSE                    |
| 302 | P-155 | 156           | 90: J-38   | 299: J-110 |           | 150      | Ductile Iron | 130                  | FALSE            |                | 0           | -849.82         | 1.83              | 2.564 | FALSE                    |
| 240 | P-117 | 302           | 27: J-4    | 239: J-97  |           | 300      | Ductile Iron | 130                  | FALSE            |                | 0           | 5535.22         | 2.97              | 2.817 | FALSE                    |

## Tank Report



| Id  | Label | Zone   | Base Elevation<br>(m) | Minimum<br>Elevation<br>(m) | Initial Elevation<br>(m) | Maximum<br>Elevation (m) | Inactive Volume<br>(m?) | Diameter (ft) | Outflow<br>(m3/d) | Hydraulic<br>Grade (m) |
|-----|-------|--------|-----------------------|-----------------------------|--------------------------|--------------------------|-------------------------|---------------|-------------------|------------------------|
| 388 | T-4   | <None> | 285                   | 285.1                       | 292.2                    | 292.4                    | 0                       | 136.02        | 5562.59           | 292.2                  |



## Reservoir Report



| Id  | Label | Elevation (m) | Zone   | Outflow (m3/d) | Hydraulic Grade (m) |
|-----|-------|---------------|--------|----------------|---------------------|
| 167 | R-2   | 332           | <None> | (N/A)          | (N/A)               |
| 168 | R-3   | 351           | <None> | (N/A)          | (N/A)               |

**Water Storage Option WS2/WS3 –  
Elevated Storage or Expanded Storage with Pumping**

**Water Distribution Option WD2-  
New Trunk Watermain 300 mm with Improvements to Ex. System**

**Scenario: Maximum Daily Demand with Fire Storage (M.D.D.+Fire)**



## Fire Flow Report



| Label | Zone   | Fire Flow Iterations | Satisfies Fire Flow Constraints? | Fire Flow (Needed) (m <sup>3</sup> /d) | Fire Flow (Available) (m <sup>3</sup> /d) | Flow (Total Needed) (m <sup>3</sup> /d) | Flow (Total Available) (m <sup>3</sup> /d) | Pressure (Residual Lower Limit) (kPa) |                                   | Pressure (Zone Lower Limit) (kPa) |                                   | Calculated Minimum Zone Pressure (kPa) |                                        | Junction w/Minimum Pressure (Zone) |
|-------|--------|----------------------|----------------------------------|----------------------------------------|-------------------------------------------|-----------------------------------------|--------------------------------------------|---------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|----------------------------------------|----------------------------------------|------------------------------------|
|       |        |                      |                                  |                                        |                                           |                                         |                                            | Pressure (Residual Lower Limit) (kPa) | Pressure (Zone Lower Limit) (kPa) | Pressure (Zone Lower Limit) (kPa) | Pressure (Zone Lower Limit) (kPa) | Calculated Minimum Zone Pressure (kPa) | Calculated Minimum Zone Pressure (kPa) |                                    |
| J-4   | <None> | 2                    | TRUE                             | 2592                                   | 8640                                      | 2619.37                                 | 8667.37                                    | 137.9                                 | 408.2                             | 137.9                             | 140                               |                                        |                                        | 445                                |
| J-35  | <None> | 15                   | TRUE                             | 2592                                   | 2997.2                                    | 2621.1                                  | 3026.29                                    | 137.9                                 | 421.3                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-36  | <None> | 16                   | TRUE                             | 2592                                   | 2997.19                                   | 2625.3                                  | 3030.5                                     | 137.9                                 | 407.3                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-38  | <None> | 15                   | TRUE                             | 2592                                   | 2997.19                                   | 2625.3                                  | 3030.5                                     | 137.9                                 | 427.8                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-53  | <None> | 16                   | TRUE                             | 2592                                   | 2997.18                                   | 2626.12                                 | 3031.3                                     | 137.9                                 | 377.7                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-54  | <None> | 16                   | TRUE                             | 2592                                   | 2997.19                                   | 2622.33                                 | 3027.52                                    | 137.9                                 | 393.2                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-69  | <None> | 15                   | TRUE                             | 2592                                   | 2997.16                                   | 2640.45                                 | 3045.61                                    | 137.9                                 | 411.5                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-72  | <None> | 18                   | TRUE                             | 2592                                   | 2997.11                                   | 2640.45                                 | 3045.56                                    | 137.9                                 | 276.6                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-86  | <None> | 16                   | TRUE                             | 2592                                   | 2997.21                                   | 2618.54                                 | 3023.75                                    | 137.9                                 | 378.8                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-87  | <None> | 16                   | TRUE                             | 2592                                   | 2997.2                                    | 2621.1                                  | 3026.3                                     | 137.9                                 | 377.6                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-88  | <None> | 16                   | TRUE                             | 2592                                   | 2997.17                                   | 2626.12                                 | 3031.29                                    | 137.9                                 | 386                               | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-89  | <None> | 15                   | TRUE                             | 2592                                   | 2997.19                                   | 2625.3                                  | 3030.5                                     | 137.9                                 | 419.9                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-91  | <None> | 15                   | TRUE                             | 2592                                   | 2997.14                                   | 2642.89                                 | 3048.04                                    | 137.9                                 | 415.8                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-92  | <None> | 15                   | TRUE                             | 2592                                   | 2997.21                                   | 2616.79                                 | 3022.01                                    | 137.9                                 | 389                               | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-96  | <None> | 15                   | TRUE                             | 2592                                   | 2997.21                                   | 2616.79                                 | 3022.01                                    | 137.9                                 | 364.6                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-97  | <None> | 15                   | TRUE                             | 2592                                   | 2997.21                                   | 2619.37                                 | 3024.58                                    | 137.9                                 | 437                               | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-99  | <None> | 15                   | TRUE                             | 2592                                   | 2997.19                                   | 2625.3                                  | 3030.5                                     | 137.9                                 | 420.9                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-100 | <None> | 16                   | TRUE                             | 2592                                   | 2997.15                                   | 2640.45                                 | 3045.6                                     | 137.9                                 | 397                               | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-101 | <None> | 15                   | TRUE                             | 2592                                   | 2997.19                                   | 2623.56                                 | 3028.75                                    | 137.9                                 | 399.3                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-102 | <None> | 17                   | TRUE                             | 2592                                   | 2997.15                                   | 2616.79                                 | 3021.94                                    | 137.9                                 | 335.6                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-103 | <None> | 17                   | TRUE                             | 2592                                   | 2997.14                                   | 2624.83                                 | 3029.97                                    | 137.9                                 | 373                               | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-104 | <None> | 16                   | TRUE                             | 2592                                   | 2997.18                                   | 2624.83                                 | 3030.01                                    | 137.9                                 | 389.3                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-105 | <None> | 16                   | TRUE                             | 2592                                   | 2997.18                                   | 2624.83                                 | 3030.01                                    | 137.9                                 | 391.4                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-106 | <None> | 16                   | TRUE                             | 2592                                   | 2997.18                                   | 2624.83                                 | 3030.01                                    | 137.9                                 | 413                               | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-107 | <None> | 16                   | TRUE                             | 2592                                   | 2997.17                                   | 2633.15                                 | 3038.32                                    | 137.9                                 | 400.6                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-108 | <None> | 16                   | TRUE                             | 2592                                   | 2997.17                                   | 2633.15                                 | 3038.32                                    | 137.9                                 | 418.6                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-109 | <None> | 15                   | TRUE                             | 2592                                   | 2997.21                                   | 2623.18                                 | 3028.39                                    | 137.9                                 | 444                               | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-110 | <None> | 15                   | TRUE                             | 2592                                   | 2997.21                                   | 2623.18                                 | 3028.39                                    | 137.9                                 | 440.8                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-111 | <None> | 15                   | TRUE                             | 2592                                   | 2997.21                                   | 2623.18                                 | 3028.39                                    | 137.9                                 | 430.6                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-114 | <None> | 16                   | TRUE                             | 2592                                   | 2997.12                                   | 2652.77                                 | 3057.89                                    | 137.9                                 | 400.9                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-115 | <None> | 16                   | TRUE                             | 2592                                   | 2997.14                                   | 2642.19                                 | 3047.33                                    | 137.9                                 | 380.3                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-116 | <None> | 16                   | TRUE                             | 2592                                   | 2997.3                                    | 2592                                    | 2997.3                                     | 137.9                                 | 376.7                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-117 | <None> | 10                   | TRUE                             | 2592                                   | 2998.88                                   | 2647.42                                 | 3054.31                                    | 137.9                                 | 323.3                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-118 | <None> | 6                    | TRUE                             | 2592                                   | 2999.17                                   | 2647.42                                 | 3054.59                                    | 137.9                                 | 227.9                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-119 | <None> | 5                    | TRUE                             | 2592                                   | 2997.85                                   | 2647.42                                 | 3053.27                                    | 137.9                                 | 165.3                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-120 | <None> | 16                   | TRUE                             | 2592                                   | 2997.14                                   | 2642.19                                 | 3047.33                                    | 137.9                                 | 364.1                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-121 | <None> | 16                   | TRUE                             | 2592                                   | 2997.14                                   | 2642.19                                 | 3047.33                                    | 137.9                                 | 382.8                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-122 | <None> | 17                   | TRUE                             | 2592                                   | 2997.11                                   | 2642.19                                 | 3047.3                                     | 137.9                                 | 365.7                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-123 | <None> | 16                   | TRUE                             | 2592                                   | 2997.12                                   | 2652.77                                 | 3057.89                                    | 137.9                                 | 420.6                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-124 | <None> | 16                   | TRUE                             | 2592                                   | 2997.12                                   | 2652.77                                 | 3057.89                                    | 137.9                                 | 410.7                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-125 | <None> | 17                   | TRUE                             | 2592                                   | 2997.15                                   | 2652.77                                 | 3057.92                                    | 137.9                                 | 379.4                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-126 | <None> | 16                   | TRUE                             | 2592                                   | 2997.14                                   | 2643.22                                 | 3048.35                                    | 137.9                                 | 416.1                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |
| J-127 | <None> | 17                   | TRUE                             | 2592                                   | 2997.12                                   | 2643.22                                 | 3048.34                                    | 137.9                                 | 419.9                             | 137.9                             | 137.9                             |                                        |                                        | 445                                |

| Label | Zone   | Fire Flow Iterations | Satisfies Fire Flow Constraints? | Fire Flow (Needed) (m³/d) | Fire Flow (Available) (m³/d) | Flow (Total Needed) (m³/d) | Flow (Total Available) (m³/d) | Pressure (Calculated)                 |                            | Pressure (Zone Lower Limit) (kPa) | Calculated Minimum Zone Pressure (kPa) | Junction w/Minimum Pressure (Zone) |
|-------|--------|----------------------|----------------------------------|---------------------------|------------------------------|----------------------------|-------------------------------|---------------------------------------|----------------------------|-----------------------------------|----------------------------------------|------------------------------------|
|       |        |                      |                                  |                           |                              |                            |                               | Pressure (Residual Lower Limit) (kPa) | Residual Lower Limit (kPa) |                                   |                                        |                                    |
| J-128 | <None> | 17                   | TRUE                             | 2592                      | 2997.11                      | 2643.22                    | 3048.33                       | 137.9                                 | 403.3                      | 137.9                             | 137.9                                  | 445                                |
| J-129 | <None> | 16                   | TRUE                             | 2592                      | 2997.12                      | 2652.77                    | 3057.89                       | 137.9                                 | 411                        | 137.9                             | 137.9                                  | 445                                |
| J-135 | <None> | 15                   | TRUE                             | 2592                      | 2997.2                       | 2622.33                    | 3027.52                       | 137.9                                 | 391.2                      | 137.9                             | 137.9                                  | 445                                |
| J-136 | <None> | 15                   | TRUE                             | 2592                      | 2996.97                      | 2770.18                    | 3175.15                       | 137.9                                 | 364.3                      | 137.9                             | 137.9                                  | 445                                |
| J-137 | <None> | 15                   | TRUE                             | 2592                      | 2996.97                      | 2781.83                    | 3186.81                       | 137.9                                 | 397.8                      | 137.9                             | 137.9                                  | 445                                |
| J-140 | <None> | 15                   | TRUE                             | 2592                      | 2996.94                      | 2789.13                    | 3194.07                       | 137.9                                 | 352.3                      | 137.9                             | 137.9                                  | 445                                |
| J-141 | <None> | 16                   | TRUE                             | 2592                      | 2997.3                       | 2592                       | 2997.3                        | 137.9                                 | 322                        | 137.9                             | 137.9                                  | 445                                |
| J-142 | <None> | 16                   | TRUE                             | 2592                      | 2996.94                      | 2789.13                    | 3194.07                       | 137.9                                 | 328.8                      | 137.9                             | 137.9                                  | 445                                |
| J-143 | <None> | 16                   | TRUE                             | 2592                      | 2996.94                      | 2789.13                    | 3194.07                       | 137.9                                 | 332.1                      | 137.9                             | 137.9                                  | 445                                |
| J-144 | <None> | 16                   | TRUE                             | 2592                      | 2996.94                      | 2818.51                    | 3223.46                       | 137.9                                 | 322.3                      | 137.9                             | 137.9                                  | 445                                |
| J-145 | <None> | 16                   | TRUE                             | 2592                      | 2996.94                      | 2818.51                    | 3223.46                       | 137.9                                 | 333.8                      | 137.9                             | 137.9                                  | 445                                |
| J-146 | <None> | 16                   | TRUE                             | 2592                      | 2996.94                      | 2818.51                    | 3223.46                       | 137.9                                 | 280.6                      | 137.9                             | 137.9                                  | 445                                |
| J-147 | <None> | 16                   | TRUE                             | 2592                      | 2996.94                      | 2818.51                    | 3223.46                       | 137.9                                 | 338.8                      | 137.9                             | 137.9                                  | 445                                |
| J-148 | <None> | 16                   | TRUE                             | 2592                      | 2996.94                      | 2818.51                    | 3223.46                       | 137.9                                 | 364                        | 137.9                             | 137.9                                  | 445                                |
| J-149 | <None> | 16                   | TRUE                             | 2592                      | 2996.95                      | 2819.46                    | 3224.41                       | 137.9                                 | 419.3                      | 137.9                             | 137.9                                  | 445                                |
| J-150 | <None> | 16                   | TRUE                             | 2592                      | 2996.95                      | 2819.46                    | 3224.41                       | 137.9                                 | 398.9                      | 137.9                             | 137.9                                  | 445                                |
| J-151 | <None> | 16                   | TRUE                             | 2592                      | 2996.95                      | 2819.46                    | 3224.41                       | 137.9                                 | 415.4                      | 137.9                             | 137.9                                  | 445                                |
| J-152 | <None> | 15                   | TRUE                             | 2592                      | 2835.02                      | 2726.11                    | 2969.12                       | 137.9                                 | 418.6                      | 137.9                             | 137.9                                  | 445                                |
| J-153 | <None> | 15                   | TRUE                             | 2592                      | 2799.51                      | 2726.11                    | 2933.62                       | 137.9                                 | 336.8                      | 137.9                             | 137.9                                  | 445                                |
| J-154 | <None> | 16                   | TRUE                             | 2592                      | 2732.07                      | 2726.11                    | 2866.18                       | 137.9                                 | 196.1                      | 137.9                             | 137.9                                  | 445                                |
| J-155 | <None> | 3                    | TRUE                             | 2592                      | 2643.76                      | 2726.11                    | 2777.87                       | 137.9                                 | 137.9                      | 137.9                             | 197.2                                  | 444                                |
| J-156 | <None> | 16                   | TRUE                             | 2592                      | 2996.94                      | 2818.51                    | 3223.46                       | 137.9                                 | 304                        | 137.9                             | 137.9                                  | 445                                |
| J-157 | <None> | 15                   | TRUE                             | 2592                      | 2996.97                      | 2781.83                    | 3186.81                       | 137.9                                 | 362.7                      | 137.9                             | 137.9                                  | 445                                |



| Label | Pressure           |              | Junction          | Is Fire Flow Run<br>Balanced? |
|-------|--------------------|--------------|-------------------|-------------------------------|
|       | Pressure (System   | System Lower |                   |                               |
|       | Lower Limit) (kPa) | Limit) (kPa) | Pressure (System) |                               |
| J-4   | 137.9              | 140          | 445               | TRUE                          |
| J-35  | 137.9              | 137.9        | 445               | TRUE                          |
| J-36  | 137.9              | 137.9        | 445               | TRUE                          |
| J-38  | 137.9              | 137.9        | 445               | TRUE                          |
| J-53  | 137.9              | 137.9        | 445               | TRUE                          |
| J-54  | 137.9              | 137.9        | 445               | TRUE                          |
| J-69  | 137.9              | 137.9        | 445               | TRUE                          |
| J-72  | 137.9              | 137.9        | 445               | TRUE                          |
| J-86  | 137.9              | 137.9        | 445               | TRUE                          |
| J-87  | 137.9              | 137.9        | 445               | TRUE                          |
| J-88  | 137.9              | 137.9        | 445               | TRUE                          |
| J-89  | 137.9              | 137.9        | 445               | TRUE                          |
| J-91  | 137.9              | 137.9        | 445               | TRUE                          |
| J-92  | 137.9              | 137.9        | 445               | TRUE                          |
| J-96  | 137.9              | 137.9        | 445               | TRUE                          |
| J-97  | 137.9              | 137.9        | 445               | TRUE                          |
| J-99  | 137.9              | 137.9        | 445               | TRUE                          |
| J-100 | 137.9              | 137.9        | 445               | TRUE                          |
| J-101 | 137.9              | 137.9        | 445               | TRUE                          |
| J-102 | 137.9              | 137.9        | 445               | TRUE                          |
| J-103 | 137.9              | 137.9        | 445               | TRUE                          |
| J-104 | 137.9              | 137.9        | 445               | TRUE                          |
| J-105 | 137.9              | 137.9        | 445               | TRUE                          |
| J-106 | 137.9              | 137.9        | 445               | TRUE                          |
| J-107 | 137.9              | 137.9        | 445               | TRUE                          |
| J-108 | 137.9              | 137.9        | 445               | TRUE                          |
| J-109 | 137.9              | 137.9        | 445               | TRUE                          |
| J-110 | 137.9              | 137.9        | 445               | TRUE                          |
| J-111 | 137.9              | 137.9        | 445               | TRUE                          |
| J-114 | 137.9              | 137.9        | 445               | TRUE                          |
| J-115 | 137.9              | 137.9        | 445               | TRUE                          |
| J-116 | 137.9              | 137.9        | 445               | TRUE                          |
| J-117 | 137.9              | 137.9        | 445               | TRUE                          |
| J-118 | 137.9              | 137.9        | 445               | TRUE                          |
| J-119 | 137.9              | 137.9        | 445               | TRUE                          |
| J-120 | 137.9              | 137.9        | 445               | TRUE                          |
| J-121 | 137.9              | 137.9        | 445               | TRUE                          |
| J-122 | 137.9              | 137.9        | 445               | TRUE                          |
| J-123 | 137.9              | 137.9        | 445               | TRUE                          |
| J-124 | 137.9              | 137.9        | 445               | TRUE                          |
| J-125 | 137.9              | 137.9        | 445               | TRUE                          |
| J-126 | 137.9              | 137.9        | 445               | TRUE                          |
| J-127 | 137.9              | 137.9        | 445               | TRUE                          |

| Label | Pressure           |              | Junction          | Is Fire Flow Run |
|-------|--------------------|--------------|-------------------|------------------|
|       | Pressure (System   | System Lower |                   |                  |
|       | Lower Limit) (kPa) | Limit) (kPa) | Pressure (System) |                  |
| J-128 | 137.9              | 137.9        | 445               | TRUE             |
| J-129 | 137.9              | 137.9        | 445               | TRUE             |
| J-135 | 137.9              | 137.9        | 445               | TRUE             |
| J-136 | 137.9              | 137.9        | 445               | TRUE             |
| J-137 | 137.9              | 137.9        | 445               | TRUE             |
| J-140 | 137.9              | 137.9        | 445               | TRUE             |
| J-141 | 137.9              | 137.9        | 445               | TRUE             |
| J-142 | 137.9              | 137.9        | 445               | TRUE             |
| J-143 | 137.9              | 137.9        | 445               | TRUE             |
| J-144 | 137.9              | 137.9        | 445               | TRUE             |
| J-145 | 137.9              | 137.9        | 445               | TRUE             |
| J-146 | 137.9              | 137.9        | 445               | TRUE             |
| J-147 | 137.9              | 137.9        | 445               | TRUE             |
| J-148 | 137.9              | 137.9        | 445               | TRUE             |
| J-149 | 137.9              | 137.9        | 445               | TRUE             |
| J-150 | 137.9              | 137.9        | 445               | TRUE             |
| J-151 | 137.9              | 137.9        | 445               | TRUE             |
| J-152 | 137.9              | 137.9        | 445               | TRUE             |
| J-153 | 137.9              | 137.9        | 445               | TRUE             |
| J-154 | 137.9              | 137.9        | 445               | TRUE             |
| J-155 | 137.9              | 197.2        | 444               | TRUE             |
| J-156 | 137.9              | 137.9        | 445               | TRUE             |
| J-157 | 137.9              | 137.9        | 445               | TRUE             |

## Junction Report



| Id  | Label | Elevation (m) | Zone   | Demand (m³/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 27  | J-4   | 246           | <None> | 27.37         | 288.8               | 418.5          |
| 85  | J-35  | 241           | <None> | 29.1          | 287.1               | 451.3          |
| 87  | J-36  | 241           | <None> | 33.3          | 286.7               | 447.7          |
| 90  | J-38  | 240           | <None> | 33.3          | 287.1               | 461.4          |
| 119 | J-53  | 243.2         | <None> | 34.12         | 286.7               | 426.1          |
| 121 | J-54  | 242.1         | <None> | 30.33         | 286.9               | 438.2          |
| 151 | J-69  | 241           | <None> | 48.45         | 286.6               | 446.3          |
| 159 | J-72  | 254           | <None> | 48.45         | 286.6               | 319.3          |
| 199 | J-86  | 244           | <None> | 26.54         | 286.6               | 417.2          |
| 203 | J-87  | 244.2         | <None> | 29.1          | 286.6               | 415.1          |
| 208 | J-88  | 243.2         | <None> | 34.12         | 286.7               | 426.1          |
| 212 | J-89  | 240           | <None> | 33.3          | 287.1               | 460.6          |
| 220 | J-91  | 242.2         | <None> | 50.89         | 287.1               | 439.9          |
| 225 | J-92  | 244.1         | <None> | 24.79         | 286.9               | 418.8          |
| 235 | J-96  | 246.1         | <None> | 24.79         | 286.7               | 397            |
| 239 | J-97  | 242           | <None> | 27.37         | 287.9               | 449.3          |
| 247 | J-99  | 241           | <None> | 33.3          | 287.1               | 451.1          |
| 266 | J-100 | 242           | <None> | 48.45         | 286.7               | 437            |
| 270 | J-101 | 242.2         | <None> | 31.56         | 286.7               | 435.2          |
| 275 | J-102 | 247           | <None> | 24.79         | 286.7               | 388.1          |
| 280 | J-103 | 242           | <None> | 32.83         | 286.5               | 435.6          |
| 282 | J-104 | 241           | <None> | 32.83         | 286.4               | 444.2          |
| 284 | J-105 | 241           | <None> | 32.83         | 286.4               | 444.3          |
| 287 | J-106 | 240           | <None> | 32.83         | 286.8               | 457.6          |
| 291 | J-107 | 242           | <None> | 41.15         | 287.7               | 447.4          |
| 293 | J-108 | 240           | <None> | 41.15         | 287.7               | 466.6          |
| 295 | J-109 | 240           | <None> | 31.18         | 287.6               | 466.3          |
| 299 | J-110 | 240           | <None> | 31.18         | 287.5               | 465.3          |
| 303 | J-111 | 242           | <None> | 31.18         | 287.8               | 448.1          |
| 311 | J-114 | 240           | <None> | 60.77         | 286.3               | 453.1          |
| 313 | J-115 | 242           | <None> | 50.19         | 286.3               | 433.5          |
| 315 | J-116 | 244           | <None> | 0             | 286.4               | 415.4          |
| 317 | J-117 | 241           | <None> | 55.42         | 286.3               | 443            |
| 319 | J-118 | 243           | <None> | 55.42         | 286.2               | 423.3          |
| 321 | J-119 | 243           | <None> | 55.42         | 286.2               | 423.2          |
| 325 | J-120 | 244           | <None> | 50.19         | 286.3               | 414.1          |
| 328 | J-121 | 242           | <None> | 50.19         | 286.3               | 433.5          |
| 330 | J-122 | 242           | <None> | 50.19         | 286.3               | 433.5          |
| 333 | J-123 | 238           | <None> | 60.77         | 286.3               | 472.6          |
| 335 | J-124 | 239           | <None> | 60.77         | 286.3               | 462.8          |
| 337 | J-125 | 240           | <None> | 60.77         | 286.3               | 453            |
| 340 | J-126 | 237           | <None> | 51.22         | 286.3               | 482.4          |
| 342 | J-127 | 236           | <None> | 51.22         | 286.3               | 492.1          |
| 344 | J-128 | 238           | <None> | 51.22         | 286.3               | 472.6          |
| 347 | J-129 | 239           | <None> | 60.77         | 286.3               | 462.9          |
| 398 | J-135 | 243           | <None> | 30.33         | 286.6               | 427            |

| Id  | Label | Elevation (m) | Zone   | Demand (m <sup>3</sup> /d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|----------------------------|---------------------|----------------|
| 405 | J-136 | 245.8         | <None> | 178.18                     | 286.6               | 399.3          |
| 408 | J-137 | 242.5         | <None> | 189.83                     | 286.6               | 431.6          |
| 411 | J-140 | 247.2         | <None> | 197.13                     | 286.6               | 385.6          |
| 415 | J-141 | 250.1         | <None> | 0                          | 286.6               | 356.8          |
| 416 | J-142 | 249.5         | <None> | 197.13                     | 286.6               | 362.9          |
| 417 | J-143 | 249.1         | <None> | 197.13                     | 286.6               | 366.8          |
| 422 | J-144 | 249.8         | <None> | 226.51                     | 286.5               | 359            |
| 423 | J-145 | 248.5         | <None> | 226.51                     | 286.5               | 371.5          |
| 424 | J-146 | 253.9         | <None> | 226.51                     | 286.5               | 318.9          |
| 430 | J-147 | 247.9         | <None> | 226.51                     | 286.5               | 377.3          |
| 431 | J-148 | 245.3         | <None> | 226.51                     | 286.4               | 402.7          |
| 435 | J-149 | 238.2         | <None> | 227.46                     | 286.3               | 470.7          |
| 436 | J-150 | 240.2         | <None> | 227.46                     | 286.3               | 451.1          |
| 437 | J-151 | 238.5         | <None> | 227.46                     | 286.3               | 467.7          |
| 442 | J-152 | 243.8         | <None> | 134.11                     | 287.9               | 431.6          |
| 443 | J-153 | 252.2         | <None> | 134.11                     | 287.9               | 349.4          |
| 444 | J-154 | 266.5         | <None> | 134.11                     | 287.9               | 209.5          |
| 445 | J-155 | 272.5         | <None> | 134.11                     | 287.9               | 150.8          |
| 451 | J-156 | 251.5         | <None> | 226.51                     | 286.5               | 342.3          |
| 456 | J-157 | 246.1         | <None> | 189.83                     | 286.6               | 396.4          |

## Pipe Report



| Id  | Label | Scaled Length (m) | Start Node | Stop Node  | Diameter (mm) | Material         | Hazen-Williams C () | Has Check Valve? | Minor Loss () | Flow (m3/d) | Velocity (ft/s) | Headloss Gradient (mm/m (V:H)) | Has User Defined Length? |
|-----|-------|-------------------|------------|------------|---------------|------------------|---------------------|------------------|---------------|-------------|-----------------|--------------------------------|--------------------------|
| 322 | P-165 | 269               | 313: J-115 | 321: J-119 |               | 300 Ductile Iron | 130                 | FALSE            |               | 0 (N/A)     | (N/A)           | (N/A)                          | FALSE                    |
| 326 | P-168 | 47                | 321: J-119 | 325: J-120 |               | 300 Ductile Iron | 130                 | FALSE            |               | 0 (N/A)     | (N/A)           | (N/A)                          | FALSE                    |
| 396 | P-204 | 50                | 167: R-2   | 379: PMP-4 |               | 200 Ductile Iron | 130                 | FALSE            |               | 0 (N/A)     | (N/A)           | (N/A)                          | FALSE                    |
| 397 | P-205 | 60                | 379: PMP-4 | 225: J-92  |               | 200 Ductile Iron | 130                 | FALSE            |               | 0 (N/A)     | (N/A)           | (N/A)                          | FALSE                    |
| 403 | P-210 | 11                | 168: R-3   | 382: PMP-5 |               | 200 Ductile Iron | 130                 | FALSE            |               | 0 (N/A)     | (N/A)           | (N/A)                          | FALSE                    |
| 404 | P-211 | 14                | 382: PMP-5 | 212: J-89  |               | 200 Ductile Iron | 130                 | FALSE            |               | 0 (N/A)     | (N/A)           | (N/A)                          | FALSE                    |
| 453 | P-239 | 424               | 424: J-146 | 451: J-156 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 9.85        | 0.01            | 0                              | FALSE                    |
| 446 | P-233 | 359               | 444: J-154 | 445: J-155 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | -18.58      | 0.01            | 0                              | FALSE                    |
| 440 | P-231 | 483               | 436: J-150 | 437: J-151 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 21.62       | 0.01            | 0                              | FALSE                    |
| 434 | P-228 | 187               | 431: J-148 | 315: J-116 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 10.06       | 0.01            | 0                              | FALSE                    |
| 338 | P-175 | 392               | 335: J-124 | 337: J-125 |               | 150 Ductile Iron | 130                 | FALSE            | 0             | -7.43       | 0.02            | 0                              | FALSE                    |
| 332 | P-172 | 328               | 330: J-122 | 313: J-115 |               | 150 Ductile Iron | 130                 | FALSE            | 0             | 7.87        | 0.02            | 0                              | FALSE                    |
| 348 | P-181 | 374               | 311: J-114 | 347: J-129 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 107.15      | 0.06            | 0.002                          | FALSE                    |
| 450 | P-237 | 392               | 442: J-152 | 444: J-154 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 115.53      | 0.06            | 0.002                          | FALSE                    |
| 343 | P-178 | 325               | 340: J-126 | 342: J-127 |               | 150 Ductile Iron | 200                 | FALSE            | 0             | 30.54       | 0.07            | 0.002                          | FALSE                    |
| 345 | P-179 | 131               | 342: J-127 | 344: J-128 |               | 150 Ductile Iron | 130                 | FALSE            | 0             | -20.68      | 0.04            | 0.003                          | FALSE                    |
| 447 | P-234 | 343               | 445: J-155 | 443: J-153 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | -152.69     | 0.08            | 0.004                          | FALSE                    |
| 209 | P-95  | 113               | 119: J-53  | 208: J-88  |               | 150 Ductile Iron | 130                 | FALSE            | 0             | 26.89       | 0.06            | 0.004                          | FALSE                    |
| 413 | P-215 | 330               | 405: J-136 | 408: J-137 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 169.5       | 0.09            | 0.004                          | FALSE                    |
| 441 | P-232 | 196               | 437: J-151 | 335: J-124 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | -205.84     | 0.11            | 0.006                          | FALSE                    |
| 314 | P-161 | 153               | 311: J-114 | 313: J-115 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 208.59      | 0.11            | 0.007                          | FALSE                    |
| 454 | P-240 | 416               | 451: J-156 | 422: J-144 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | -216.66     | 0.12            | 0.007                          | FALSE                    |
| 433 | P-227 | 309               | 430: J-147 | 431: J-148 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 236.57      | 0.13            | 0.008                          | FALSE                    |
| 452 | P-238 | 353               | 422: J-144 | 424: J-146 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 236.36      | 0.13            | 0.008                          | FALSE                    |
| 439 | P-230 | 328               | 435: J-149 | 436: J-150 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 249.08      | 0.13            | 0.009                          | FALSE                    |
| 449 | P-236 | 338               | 239: J-97  | 442: J-152 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 249.63      | 0.13            | 0.009                          | FALSE                    |
| 336 | P-174 | 210               | 333: J-123 | 335: J-124 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 259.18      | 0.14            | 0.01                           | FALSE                    |
| 420 | P-219 | 336               | 416: J-142 | 417: J-143 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | -258.63     | 0.14            | 0.01                           | FALSE                    |
| 457 | P-242 | 192               | 408: J-137 | 456: J-157 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 272.51      | 0.15            | 0.011                          | FALSE                    |
| 448 | P-235 | 225               | 443: J-153 | 239: J-97  |               | 300 Ductile Iron | 130                 | FALSE            | 0             | -286.79     | 0.15            | 0.012                          | FALSE                    |
| 412 | P-214 | 337               | 408: J-137 | 151: J-69  |               | 300 Ductile Iron | 130                 | FALSE            | 0             | -292.85     | 0.16            | 0.012                          | FALSE                    |
| 400 | P-207 | 368               | 398: J-135 | 199: J-86  |               | 200 Ductile Iron | 130                 | FALSE            | 0             | 111.4       | 0.13            | 0.015                          | FALSE                    |
| 341 | P-177 | 235               | 333: J-123 | 340: J-126 |               | 150 Ductile Iron | 200                 | FALSE            | 0             | 81.75       | 0.18            | 0.015                          | FALSE                    |
| 324 | P-167 | 234               | 319: J-118 | 321: J-119 |               | 150 Ductile Iron | 130                 | FALSE            | 0             | 55.42       | 0.12            | 0.016                          | FALSE                    |
| 331 | P-171 | 181               | 328: J-121 | 330: J-122 |               | 150 Ductile Iron | 130                 | FALSE            | 0             | 58.07       | 0.12            | 0.018                          | FALSE                    |
| 458 | P-243 | 233               | 456: J-157 | 411: J-140 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | -373.09     | 0.2             | 0.019                          | FALSE                    |
| 278 | P-139 | 299               | 87: J-36   | 119: J-53  |               | 150 Ductile Iron | 130                 | FALSE            | 0             | 61.01       | 0.13            | 0.019                          | FALSE                    |
| 339 | P-176 | 233               | 337: J-125 | 311: J-114 |               | 150 Ductile Iron | 130                 | FALSE            | 0             | -68.2       | 0.15            | 0.024                          | FALSE                    |
| 346 | P-180 | 151               | 344: J-128 | 333: J-123 |               | 150 Ductile Iron | 130                 | FALSE            | 0             | -71.9       | 0.15            | 0.026                          | FALSE                    |
| 285 | P-143 | 372               | 282: J-104 | 284: J-105 |               | 150 Ductile Iron | 130                 | FALSE            | 0             | -71.94      | 0.15            | 0.026                          | FALSE                    |
| 462 | P-245 | 663               | 456: J-157 | 417: J-143 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 455.77      | 0.24            | 0.028                          | FALSE                    |
| 432 | P-226 | 394               | 423: J-145 | 430: J-147 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 463.08      | 0.25            | 0.028                          | FALSE                    |
| 349 | P-182 | 101               | 347: J-129 | 333: J-123 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 473.6       | 0.25            | 0.03                           | FALSE                    |
| 438 | P-229 | 211               | 328: J-121 | 435: J-149 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 476.54      | 0.26            | 0.03                           | FALSE                    |
| 402 | P-209 | 393               | 203: J-87  | 199: J-86  |               | 200 Ductile Iron | 130                 | FALSE            | 0             | -181.65     | 0.22            | 0.036                          | FALSE                    |
| 329 | P-170 | 310               | 325: J-120 | 328: J-121 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 584.8       | 0.31            | 0.044                          | FALSE                    |
| 276 | P-137 | 601               | 199: J-86  | 275: J-102 |               | 150 Ductile Iron | 130                 | FALSE            | 0             | -96.78      | 0.21            | 0.046                          | FALSE                    |
| 269 | P-132 | 491               | 151: J-69  | 159: J-72  |               | 200 Ductile Iron | 130                 | FALSE            | 0             | -215.79     | 0.26            | 0.05                           | FALSE                    |
| 288 | P-145 | 175               | 87: J-36   | 287: J-106 |               | 150 Ductile Iron | 130                 | FALSE            | 0             | -101.82     | 0.22            | 0.05                           | FALSE                    |
| 320 | P-164 | 273               | 317: J-117 | 319: J-118 |               | 150 Ductile Iron | 130                 | FALSE            | 0             | 110.85      | 0.24            | 0.059                          | FALSE                    |
| 455 | P-241 | 341               | 422: J-144 | 423: J-145 |               | 300 Ductile Iron | 130                 | FALSE            | 0             | 689.59      | 0.37            | 0.059                          | FALSE                    |
| 277 | P-138 | 162               | 275: J-102 | 235: J-96  |               | 150 Ductile Iron | 130                 | FALSE            | 0             | -121.58     | 0.26            | 0.07                           | FALSE                    |
| 267 | P-130 | 327               | 159: J-72  | 266: J-100 |               | 200 Ductile Iron | 130                 | FALSE            | 0             | -264.24     | 0.32            | 0.073                          | FALSE                    |



| Id  | Label | Scaled Length (m) | Start Node | Stop Node  | Diameter (mm) | Material     | Hazen-Williams C () | Has Check Valve? | Minor Loss () | Flow (m3/d) | Velocity (ft/s) | Headloss Gradient (mm/m (V:H)) | Has User Defined Length? |
|-----|-------|-------------------|------------|------------|---------------|--------------|---------------------|------------------|---------------|-------------|-----------------|--------------------------------|--------------------------|
| 406 | P-212 | 365               | 398: J-135 | 405: J-136 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 125.06      | 0.27            | 0.074                          | FALSE                    |
| 399 | P-206 | 327               | 151: J-69  | 398: J-135 | 150           | Ductile Iron | 130                 | FALSE            | 0             | -125.51     | 0.27            | 0.074                          | FALSE                    |
| 418 | P-217 | 337               | 411: J-140 | 416: J-142 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 794.17      | 0.43            | 0.077                          | FALSE                    |
| 419 | P-218 | 235               | 416: J-142 | 415: J-141 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 855.67      | 0.46            | 0.089                          | FALSE                    |
| 248 | P-123 | 158               | 85: J-35   | 247: J-99  | 300           | Ductile Iron | 130                 | FALSE            | 0             | 857.59      | 0.46            | 0.089                          | FALSE                    |
| 271 | P-133 | 174               | 266: J-100 | 270: J-101 | 200           | Ductile Iron | 130                 | FALSE            | 0             | -312.68     | 0.38            | 0.099                          | FALSE                    |
| 296 | P-150 | 306               | 293: J-108 | 295: J-109 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 158.46      | 0.34            | 0.114                          | FALSE                    |
| 318 | P-163 | 232               | 313: J-115 | 317: J-117 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 166.27      | 0.36            | 0.125                          | FALSE                    |
| 401 | P-208 | 273               | 270: J-101 | 398: J-135 | 200           | Ductile Iron | 130                 | FALSE            | 0             | 392.3       | 0.47            | 0.151                          | FALSE                    |
| 224 | P-107 | 184               | 220: J-91  | 85: J-35   | 150           | Ductile Iron | 130                 | FALSE            | 0             | 197.41      | 0.42            | 0.172                          | FALSE                    |
| 294 | P-149 | 238               | 291: J-107 | 293: J-108 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 199.61      | 0.43            | 0.175                          | FALSE                    |
| 461 | P-244 | 282               | 235: J-96  | 411: J-140 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 1364.39     | 0.73            | 0.211                          | FALSE                    |
| 425 | P-221 | 353               | 415: J-141 | 422: J-144 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 1369.13     | 0.74            | 0.212                          | FALSE                    |
| 407 | P-213 | 282               | 405: J-136 | 235: J-96  | 150           | Ductile Iron | 130                 | FALSE            | 0             | -222.62     | 0.48            | 0.215                          | FALSE                    |
| 251 | P-126 | 219               | 247: J-99  | 90: J-38   | 150           | Ductile Iron | 130                 | FALSE            | 0             | -227.63     | 0.49            | 0.224                          | FALSE                    |
| 305 | P-157 | 290               | 303: J-111 | 291: J-107 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 240.76      | 0.52            | 0.248                          | FALSE                    |
| 421 | P-220 | 428               | 415: J-141 | 235: J-96  | 200           | Ductile Iron | 130                 | FALSE            | 0             | -513.46     | 0.62            | 0.248                          | FALSE                    |
| 351 | P-184 | 454               | 315: J-116 | 203: J-87  | 200           | Ductile Iron | 130                 | FALSE            | 0             | -624.93     | 0.76            | 0.357                          | FALSE                    |
| 389 | P-201 | 614               | 27: J-4    | 388: T-4   | 450           | Ductile Iron | 130                 | FALSE            | 0             | -5562.59    | 1.33            | 0.394                          | FALSE                    |
| 236 | P-114 | 432               | 225: J-92  | 235: J-96  | 300           | Ductile Iron | 130                 | FALSE            | 0             | 2246.84     | 1.21            | 0.53                           | FALSE                    |
| 226 | P-108 | 462               | 220: J-91  | 225: J-92  | 300           | Ductile Iron | 130                 | FALSE            | 0             | 2271.63     | 1.22            | 0.541                          | FALSE                    |
| 306 | P-158 | 262               | 295: J-109 | 303: J-111 | 250           | Ductile Iron | 130                 | FALSE            | 0             | -1443       | 1.12            | 0.568                          | FALSE                    |
| 283 | P-142 | 206               | 280: J-103 | 282: J-104 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 388.11      | 0.83            | 0.601                          | FALSE                    |
| 300 | P-153 | 145               | 295: J-109 | 299: J-110 | 250           | Ductile Iron | 130                 | FALSE            | 0             | 1570.28     | 1.21            | 0.664                          | FALSE                    |
| 289 | P-146 | 346               | 287: J-106 | 280: J-103 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 420.94      | 0.9             | 0.698                          | FALSE                    |
| 350 | P-183 | 129               | 347: J-129 | 282: J-104 | 150           | Ductile Iron | 130                 | FALSE            | 0             | -427.22     | 0.92            | 0.718                          | FALSE                    |
| 352 | P-185 | 132               | 311: J-114 | 284: J-105 | 150           | Ductile Iron | 130                 | FALSE            | 0             | -444.72     | 0.96            | 0.773                          | FALSE                    |
| 304 | P-156 | 149               | 239: J-97  | 303: J-111 | 250           | Ductile Iron | 130                 | FALSE            | 0             | 1714.94     | 1.33            | 0.782                          | FALSE                    |
| 211 | P-97  | 146               | 203: J-87  | 208: J-88  | 150           | Ductile Iron | 130                 | FALSE            | 0             | -472.38     | 1.02            | 0.864                          | FALSE                    |
| 210 | P-96  | 157               | 208: J-88  | 121: J-54  | 150           | Ductile Iron | 130                 | FALSE            | 0             | -479.61     | 1.03            | 0.889                          | FALSE                    |
| 279 | P-140 | 222               | 247: J-99  | 121: J-54  | 150           | Ductile Iron | 130                 | FALSE            | 0             | 509.94      | 1.1             | 0.996                          | FALSE                    |
| 241 | P-118 | 725               | 239: J-97  | 220: J-91  | 300           | Ductile Iron | 130                 | FALSE            | 0             | 3256.48     | 1.75            | 1.055                          | FALSE                    |
| 249 | P-124 | 318               | 247: J-99  | 87: J-36   | 150           | Ductile Iron | 130                 | FALSE            | 0             | 541.98      | 1.16            | 1.115                          | FALSE                    |
| 286 | P-144 | 303               | 284: J-105 | 87: J-36   | 150           | Ductile Iron | 130                 | FALSE            | 0             | -549.49     | 1.18            | 1.143                          | FALSE                    |
| 290 | P-147 | 264               | 287: J-106 | 212: J-89  | 150           | Ductile Iron | 130                 | FALSE            | 0             | -555.58     | 1.19            | 1.167                          | FALSE                    |
| 213 | P-98  | 66                | 90: J-38   | 212: J-89  | 150           | Ductile Iron | 130                 | FALSE            | 0             | 588.89      | 1.27            | 1.3                            | FALSE                    |
| 327 | P-169 | 92                | 325: J-120 | 315: J-116 | 150           | Ductile Iron | 130                 | FALSE            | 0             | -634.99     | 1.36            | 1.495                          | FALSE                    |
| 301 | P-154 | 250               | 299: J-110 | 85: J-35   | 150           | Ductile Iron | 130                 | FALSE            | 0             | 689.27      | 1.48            | 1.74                           | FALSE                    |
| 273 | P-135 | 240               | 220: J-91  | 270: J-101 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 736.54      | 1.58            | 1.967                          | FALSE                    |
| 302 | P-155 | 156               | 90: J-38   | 299: J-110 | 150           | Ductile Iron | 130                 | FALSE            | 0             | -849.82     | 1.83            | 2.564                          | FALSE                    |
| 240 | P-117 | 302               | 27: J-4    | 239: J-97  | 300           | Ductile Iron | 130                 | FALSE            | 0             | 5535.22     | 2.97            | 2.817                          | FALSE                    |

## Tank Report



| Id  | Label | Zone   | Base<br>Elevation (m) | Minimum<br>Elevation (m) | Initial<br>Elevation (m) | Maximum<br>Elevation (m) | Inactive<br>Volume (m³) | Diameter (ft) | Outflow<br>(m³/d) | Hydraulic<br>Grade (m) |
|-----|-------|--------|-----------------------|--------------------------|--------------------------|--------------------------|-------------------------|---------------|-------------------|------------------------|
| 388 | T-4   | <None> | 285                   | 285.1                    | 289                      | 289.2                    | 0                       | 90.68         | 5562.59           | 289                    |

## Reservoir Report



| Id  | Label | Elevation (m) | Zone   | Outflow (m3/d) | Hydraulic Grade (m) |
|-----|-------|---------------|--------|----------------|---------------------|
| 167 | R-2   | 332           | <None> | (N/A)          | (N/A)               |
| 168 | R-3   | 351           | <None> | (N/A)          | (N/A)               |

**Water Storage Option WS4 –  
Elevated Storage at New Location**

**Water Distribution Option WD1-  
New Trunk Watermain 300 mm**

**Scenario: Average Daily Demand (A.D.D.)**



## Junction Report





| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 27  | J-4   | 246           | <None> | 14.44         | 286                 | 391.8          |
| 85  | J-35  | 241           | <None> | 15.35         | 290.9               | 488.4          |
| 87  | J-36  | 241           | <None> | 17.57         | 291.6               | 495.7          |
| 90  | J-38  | 240           | <None> | 17.57         | 290.6               | 495.6          |
| 119 | J-53  | 243.2         | <None> | 18            | 292.3               | 480.1          |
| 121 | J-54  | 242.1         | <None> | 16            | 291.9               | 487.8          |
| 151 | J-69  | 241           | <None> | 25.56         | 294.1               | 519.5          |
| 159 | J-72  | 254           | <None> | 25.56         | 293.8               | 389.9          |
| 199 | J-86  | 244           | <None> | 14            | 293.9               | 488.6          |
| 203 | J-87  | 244.2         | <None> | 15.35         | 294                 | 487            |
| 208 | J-88  | 243.2         | <None> | 18            | 292.5               | 482.4          |
| 212 | J-89  | 240           | <None> | 17.57         | 290.8               | 497.2          |
| 220 | J-91  | 242.2         | <None> | 26.85         | 291.2               | 480            |
| 225 | J-92  | 244.1         | <None> | 13.08         | 292.6               | 474.9          |
| 235 | J-96  | 246.1         | <None> | 13.08         | 293.9               | 468.1          |
| 239 | J-97  | 242           | <None> | 14.44         | 288.3               | 453.3          |
| 247 | J-99  | 241           | <None> | 17.57         | 291.2               | 491.4          |
| 266 | J-100 | 242           | <None> | 25.56         | 293.7               | 505.9          |
| 270 | J-101 | 242.2         | <None> | 16.65         | 293.6               | 503.2          |
| 275 | J-102 | 247           | <None> | 13.08         | 293.9               | 459.2          |
| 280 | J-103 | 242           | <None> | 17.32         | 291.7               | 486.3          |
| 282 | J-104 | 241           | <None> | 17.32         | 291.8               | 497.3          |
| 284 | J-105 | 241           | <None> | 17.32         | 291.8               | 497.3          |
| 287 | J-106 | 240           | <None> | 17.32         | 291.5               | 503.9          |
| 291 | J-107 | 242           | <None> | 21.71         | 288.6               | 456            |
| 293 | J-108 | 240           | <None> | 21.71         | 288.7               | 476.8          |
| 295 | J-109 | 240           | <None> | 16.45         | 288.9               | 478.7          |
| 299 | J-110 | 240           | <None> | 16.45         | 289.2               | 482            |
| 303 | J-111 | 242           | <None> | 16.45         | 288.4               | 454.6          |
| 311 | J-114 | 240           | <None> | 32.06         | 291.9               | 508            |
| 313 | J-115 | 242           | <None> | 26.48         | 291.9               | 488.9          |
| 315 | J-116 | 244           | <None> | 0             | 295.5               | 504            |
| 317 | J-117 | 241           | <None> | 29.24         | 291.9               | 498.6          |
| 319 | J-118 | 243           | <None> | 29.24         | 291.9               | 478.9          |
| 321 | J-119 | 243           | <None> | 29.24         | 291.9               | 478.9          |
| 325 | J-120 | 244           | <None> | 26.48         | 294.7               | 496.6          |
| 328 | J-121 | 242           | <None> | 26.48         | 292.3               | 491.8          |
| 330 | J-122 | 242           | <None> | 26.48         | 292.1               | 490.7          |
| 333 | J-123 | 238           | <None> | 32.06         | 291.9               | 527.9          |
| 335 | J-124 | 239           | <None> | 32.06         | 292.1               | 519.8          |
| 337 | J-125 | 240           | <None> | 32.06         | 292                 | 508.7          |
| 340 | J-126 | 237           | <None> | 27.02         | 291.9               | 537.7          |
| 342 | J-127 | 236           | <None> | 27.02         | 291.9               | 547.5          |
| 344 | J-128 | 238           | <None> | 27.02         | 291.9               | 527.9          |
| 347 | J-129 | 239           | <None> | 32.06         | 291.9               | 517.7          |
| 398 | J-135 | 243           | <None> | 16            | 293.9               | 498            |

| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 405 | J-136 | 245.8         | <None> | 94            | 294.1               | 472.7          |
| 408 | J-137 | 242.5         | <None> | 100.15        | 294.1               | 505.3          |
| 411 | J-140 | 247.2         | <None> | 104           | 294.2               | 460.2          |
| 415 | J-141 | 250.1         | <None> | 0             | 295.4               | 443.2          |
| 416 | J-142 | 249.5         | <None> | 104           | 294.7               | 442            |
| 417 | J-143 | 249.1         | <None> | 104           | 294.5               | 444.4          |
| 422 | J-144 | 249.8         | <None> | 119.5         | 297.3               | 465.1          |
| 423 | J-145 | 248.5         | <None> | 119.5         | 296.8               | 472.5          |
| 424 | J-146 | 253.9         | <None> | 119.5         | 299.1               | 442            |
| 430 | J-147 | 247.9         | <None> | 119.5         | 296.2               | 472.6          |
| 431 | J-148 | 245.3         | <None> | 119.5         | 295.8               | 493.8          |
| 435 | J-149 | 238.2         | <None> | 120           | 292.2               | 528.7          |
| 436 | J-150 | 240.2         | <None> | 120           | 292.2               | 508.7          |
| 437 | J-151 | 238.5         | <None> | 120           | 292.1               | 524.9          |
| 442 | J-152 | 243.8         | <None> | 70.75         | 288.3               | 435.6          |
| 443 | J-153 | 252.2         | <None> | 70.75         | 288.3               | 353.4          |
| 444 | J-154 | 246.5         | <None> | 70.75         | 288.3               | 409.2          |
| 445 | J-155 | 252.5         | <None> | 70.75         | 288.3               | 350.5          |
| 451 | J-156 | 251.5         | <None> | 119.5         | 298.2               | 456.7          |
| 456 | J-157 | 246.1         | <None> | 100.15        | 294.2               | 471            |

## Pipe Report



| Id | Label     | Scaled Length (m) | Start Node | Stop Node  | Diameter (mm) | Material     | Hazen-Williams C (l) | Has Check Valve? | Minor Loss (l) | Flow (m <sup>3</sup> /d) | Velocity (ft/s) | Headloss Gradient (ft/ft) | Has User Defined Length? |
|----|-----------|-------------------|------------|------------|---------------|--------------|----------------------|------------------|----------------|--------------------------|-----------------|---------------------------|--------------------------|
|    | 322 P-165 | 269               | 313: J-115 | 321: J-119 | 150           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)                  | (N/A)           | (N/A)                     | FALSE                    |
|    | 326 P-168 | 47                | 321: J-119 | 325: J-120 | 150           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)                  | (N/A)           | (N/A)                     | FALSE                    |
|    | 396 P-204 | 50                | 167: R-2   | 379: PMP-4 | 200           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)                  | (N/A)           | (N/A)                     | FALSE                    |
|    | 397 P-205 | 60                | 379: PMP-4 | 225: J-92  | 200           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)                  | (N/A)           | (N/A)                     | FALSE                    |
|    | 403 P-210 | 11                | 168: R-3   | 382: PMP-5 | 200           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)                  | (N/A)           | (N/A)                     | FALSE                    |
|    | 404 P-211 | 14                | 382: PMP-5 | 212: J-89  | 200           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)                  | (N/A)           | (N/A)                     | FALSE                    |
|    | 446 P-233 | 400               | 444: J-154 | 445: J-155 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -10.14                   | 0.01            | 0                         | FALSE                    |
|    | 343 P-178 | 325               | 340: J-126 | 342: J-127 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 9.17                     | 0.02            | 0                         | FALSE                    |
|    | 450 P-237 | 417               | 442: J-152 | 444: J-154 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 60.61                    | 0.03            | 0                         | FALSE                    |
|    | 447 P-234 | 346               | 445: J-155 | 443: J-153 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -80.89                   | 0.04            | 0                         | FALSE                    |
|    | 345 P-179 | 131               | 342: J-127 | 344: J-128 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -17.85                   | 0.04            | 0                         | FALSE                    |
|    | 449 P-236 | 338               | 239: J-97  | 442: J-152 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 131.36                   | 0.07            | 0                         | FALSE                    |
|    | 285 P-143 | 372               | 282: J-104 | 284: J-105 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -23.57                   | 0.05            | 0                         | FALSE                    |
|    | 448 P-235 | 225               | 443: J-153 | 239: J-97  | 300           | Ductile Iron | 130                  | FALSE            | 0              | -151.64                  | 0.08            | 0                         | FALSE                    |
|    | 276 P-137 | 601               | 199: J-86  | 275: J-102 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -27.4                    | 0.06            | 0                         | FALSE                    |
|    | 324 P-167 | 234               | 319: J-118 | 321: J-119 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 29.24                    | 0.06            | 0                         | FALSE                    |
|    | 341 P-177 | 235               | 333: J-123 | 340: J-126 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 36.19                    | 0.08            | 0                         | FALSE                    |
|    | 458 P-243 | 233               | 456: J-157 | 411: J-140 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -248.82                  | 0.13            | 0                         | FALSE                    |
|    | 277 P-138 | 162               | 275: J-102 | 235: J-96  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -40.48                   | 0.09            | 0                         | FALSE                    |
|    | 346 P-180 | 151               | 344: J-128 | 333: J-123 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -44.87                   | 0.1             | 0                         | FALSE                    |
|    | 320 P-164 | 273               | 317: J-117 | 319: J-118 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 58.48                    | 0.13            | 0                         | FALSE                    |
|    | 348 P-181 | 374               | 311: J-114 | 347: J-129 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 77.72                    | 0.17            | 0                         | FALSE                    |
|    | 318 P-163 | 232               | 313: J-115 | 317: J-117 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 87.72                    | 0.19            | 0                         | FALSE                    |
|    | 441 P-232 | 196               | 437: J-151 | 335: J-124 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 785.15                   | 0.42            | 0                         | FALSE                    |
|    | 413 P-215 | 330               | 405: J-136 | 408: J-137 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -876.88                  | 0.47            | 0                         | FALSE                    |
|    | 402 P-209 | 393               | 203: J-87  | 199: J-86  | 200           | Ductile Iron | 130                  | FALSE            | 0              | 311.11                   | 0.38            | 0                         | FALSE                    |
|    | 440 P-231 | 483               | 436: J-150 | 437: J-151 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 905.15                   | 0.49            | 0                         | FALSE                    |
|    | 400 P-207 | 368               | 398: J-135 | 199: J-86  | 200           | Ductile Iron | 130                  | FALSE            | 0              | -324.51                  | 0.39            | 0                         | FALSE                    |
|    | 439 P-230 | 328               | 435: J-149 | 436: J-150 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 1025.15                  | 0.55            | 0                         | FALSE                    |
|    | 438 P-229 | 211               | 328: J-121 | 435: J-149 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 1145.15                  | 0.62            | 0                         | FALSE                    |
|    | 412 P-214 | 337               | 408: J-137 | 151: J-69  | 300           | Ductile Iron | 130                  | FALSE            | 0              | 1156.62                  | 0.62            | 0                         | FALSE                    |
|    | 314 P-161 | 153               | 311: J-114 | 313: J-115 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -260.67                  | 0.56            | 0                         | FALSE                    |
|    | 339 P-176 | 233               | 337: J-125 | 311: J-114 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 262.43                   | 0.56            | 0                         | FALSE                    |
|    | 338 P-175 | 392               | 335: J-124 | 337: J-125 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 294.49                   | 0.63            | 0                         | FALSE                    |
|    | 462 P-245 | 663               | 456: J-157 | 417: J-143 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -1984.98                 | 1.07            | 0                         | FALSE                    |
|    | 271 P-133 | 174               | 266: J-100 | 270: J-101 | 200           | Ductile Iron | 130                  | FALSE            | 0              | 691.55                   | 0.84            | 0                         | FALSE                    |
|    | 267 P-130 | 327               | 159: J-72  | 266: J-100 | 200           | Ductile Iron | 130                  | FALSE            | 0              | 717.11                   | 0.87            | 0                         | FALSE                    |
|    | 420 P-219 | 336               | 416: J-142 | 417: J-143 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 2088.98                  | 1.12            | 0                         | FALSE                    |
|    | 457 P-242 | 192               | 408: J-137 | 456: J-157 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -2133.65                 | 1.15            | 0                         | FALSE                    |
|    | 349 P-182 | 101               | 347: J-129 | 333: J-123 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -345.48                  | 0.74            | 0                         | FALSE                    |
|    | 269 P-132 | 491               | 151: J-69  | 159: J-72  | 200           | Ductile Iron | 130                  | FALSE            | 0              | 742.67                   | 0.9             | 0                         | FALSE                    |
|    | 305 P-157 | 290               | 303: J-111 | 291: J-107 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -349.43                  | 0.75            | 0                         | FALSE                    |
|    | 294 P-149 | 238               | 291: J-107 | 293: J-108 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -371.14                  | 0.8             | 0.001                     | FALSE                    |
|    | 286 P-144 | 303               | 284: J-105 | 87: J-36   | 150           | Ductile Iron | 130                  | FALSE            | 0              | 372.43                   | 0.8             | 0.001                     | FALSE                    |
|    | 332 P-172 | 328               | 330: J-122 | 313: J-115 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 374.87                   | 0.81            | 0.001                     | FALSE                    |
|    | 289 P-146 | 346               | 287: J-106 | 280: J-103 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -380.07                  | 0.82            | 0.001                     | FALSE                    |
|    | 406 P-212 | 365               | 398: J-135 | 405: J-136 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -387.15                  | 0.83            | 0.001                     | FALSE                    |
|    | 399 P-206 | 327               | 151: J-69  | 398: J-135 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 388.39                   | 0.83            | 0.001                     | FALSE                    |
|    | 350 P-183 | 129               | 347: J-129 | 282: J-104 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 391.14                   | 0.84            | 0.001                     | FALSE                    |
|    | 296 P-150 | 306               | 293: J-108 | 295: J-109 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -392.85                  | 0.84            | 0.001                     | FALSE                    |
|    | 407 P-213 | 282               | 405: J-136 | 235: J-96  | 150           | Ductile Iron | 130                  | FALSE            | 0              | 395.73                   | 0.85            | 0.001                     | FALSE                    |
|    | 283 P-142 | 206               | 280: J-103 | 282: J-104 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -397.39                  | 0.85            | 0.001                     | FALSE                    |
|    | 331 P-171 | 181               | 328: J-121 | 330: J-122 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 401.35                   | 0.86            | 0.001                     | FALSE                    |

| Id | Label     | Scaled Length (m) | Start Node | Stop Node  | Diameter (mm) | Material     | Hazen-Williams C ( ) | Has Check Valve? | Minor Loss ( ) | Flow (m³/d) | Velocity (ft/s) | Headloss Gradient (ft/ft) | Has User Defined Length? |
|----|-----------|-------------------|------------|------------|---------------|--------------|----------------------|------------------|----------------|-------------|-----------------|---------------------------|--------------------------|
|    |           |                   |            |            |               |              |                      |                  |                |             |                 |                           |                          |
|    | 352 P-185 | 132               | 311: J-114 | 284: J-105 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 413.32      | 0.89            | 0.001                     | FALSE                    |
|    | 336 P-174 | 210               | 333: J-123 | 335: J-124 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -458.6      | 0.99            | 0.001                     | FALSE                    |
|    | 304 P-156 | 149               | 239: J-97  | 303: J-111 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -2998.4     | 1.61            | 0.001                     | FALSE                    |
|    | 288 P-145 | 175               | 87: J-36   | 287: J-106 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 489.73      | 1.05            | 0.001                     | FALSE                    |
|    | 401 P-208 | 273               | 270: J-101 | 398: J-135 | 200           | Ductile Iron | 130                  | FALSE            | 0              | -1084.05    | 1.31            | 0.001                     | FALSE                    |
|    | 461 P-244 | 282               | 235: J-96  | 411: J-140 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -3272.99    | 1.76            | 0.001                     | FALSE                    |
|    | 418 P-217 | 337               | 411: J-140 | 416: J-142 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -3625.81    | 1.95            | 0.001                     | FALSE                    |
|    | 434 P-228 | 187               | 431: J-148 | 315: J-116 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 3705.63     | 1.99            | 0.001                     | FALSE                    |
|    | 249 P-124 | 318               | 247: J-99  | 87: J-36   | 150           | Ductile Iron | 130                  | FALSE            | 0              | -611.71     | 1.31            | 0.001                     | FALSE                    |
|    | 433 P-227 | 309               | 430: J-147 | 431: J-148 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 3825.13     | 2.05            | 0.001                     | FALSE                    |
|    | 432 P-226 | 394               | 423: J-145 | 430: J-147 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 3944.63     | 2.12            | 0.002                     | FALSE                    |
|    | 455 P-241 | 341               | 422: J-144 | 423: J-145 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 4064.13     | 2.18            | 0.002                     | FALSE                    |
|    | 306 P-158 | 262               | 295: J-109 | 303: J-111 | 250           | Ductile Iron | 130                  | FALSE            | 0              | 2665.42     | 2.06            | 0.002                     | FALSE                    |
|    | 224 P-107 | 184               | 220: J-91  | 85: J-35   | 150           | Ductile Iron | 130                  | FALSE            | 0              | 713.91      | 1.53            | 0.002                     | FALSE                    |
|    | 248 P-123 | 158               | 85: J-35   | 247: J-99  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -722.94     | 1.55            | 0.002                     | FALSE                    |
|    | 278 P-139 | 299               | 87: J-36   | 119: J-53  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -746.58     | 1.6             | 0.002                     | FALSE                    |
|    | 454 P-240 | 416               | 451: J-156 | 422: J-144 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 4627.56     | 2.49            | 0.002                     | FALSE                    |
|    | 209 P-95  | 113               | 119: J-53  | 208: J-88  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -764.58     | 1.64            | 0.002                     | FALSE                    |
|    | 453 P-239 | 424               | 424: J-146 | 451: J-156 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 4747.06     | 2.55            | 0.002                     | FALSE                    |
|    | 300 P-153 | 145               | 295: J-109 | 299: J-110 | 250           | Ductile Iron | 130                  | FALSE            | 0              | -3074.72    | 2.38            | 0.002                     | FALSE                    |
|    | 213 P-98  | 66                | 90: J-38   | 212: J-89  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -834.91     | 1.79            | 0.002                     | FALSE                    |
|    | 251 P-126 | 219               | 247: J-99  | 90: J-38   | 150           | Ductile Iron | 130                  | FALSE            | 0              | 852.33      | 1.83            | 0.003                     | FALSE                    |
|    | 290 P-147 | 264               | 287: J-106 | 212: J-89  | 150           | Ductile Iron | 130                  | FALSE            | 0              | 852.48      | 1.83            | 0.003                     | FALSE                    |
|    | 226 P-108 | 462               | 220: J-91  | 225: J-92  | 300           | Ductile Iron | 130                  | FALSE            | 0              | -5715.22    | 3.07            | 0.003                     | FALSE                    |
|    | 236 P-114 | 432               | 225: J-92  | 235: J-96  | 300           | Ductile Iron | 130                  | FALSE            | 0              | -5728.3     | 3.08            | 0.003                     | FALSE                    |
|    | 419 P-218 | 235               | 416: J-142 | 415: J-141 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -5818.79    | 3.13            | 0.003                     | FALSE                    |
|    | 279 P-140 | 222               | 247: J-99  | 121: J-54  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -981.13     | 2.11            | 0.003                     | FALSE                    |
|    | 351 P-184 | 454               | 315: J-116 | 203: J-87  | 200           | Ductile Iron | 130                  | FALSE            | 0              | 2106.17     | 2.55            | 0.003                     | FALSE                    |
|    | 421 P-220 | 428               | 415: J-141 | 235: J-96  | 200           | Ductile Iron | 130                  | FALSE            | 0              | 2113.14     | 2.55            | 0.003                     | FALSE                    |
|    | 210 P-96  | 157               | 208: J-88  | 121: J-54  | 150           | Ductile Iron | 130                  | FALSE            | 0              | 997.13      | 2.14            | 0.003                     | FALSE                    |
|    | 241 P-118 | 725               | 239: J-97  | 220: J-91  | 300           | Ductile Iron | 130                  | FALSE            | 0              | -6733.41    | 3.62            | 0.004                     | FALSE                    |
|    | 452 P-238 | 353               | 422: J-144 | 424: J-146 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -7488       | 4.02            | 0.005                     | FALSE                    |
|    | 425 P-221 | 353               | 415: J-141 | 422: J-144 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -7931.93    | 4.26            | 0.005                     | FALSE                    |
|    | 301 P-154 | 250               | 299: J-110 | 85: J-35   | 150           | Ductile Iron | 130                  | FALSE            | 0              | -1421.5     | 3.05            | 0.007                     | FALSE                    |
|    | 389 P-201 | 614               | 27: J-4    | 388: T-4   | 300           | Ductile Iron | 130                  | FALSE            | 0              | 9419.93     | 5.06            | 0.008                     | FALSE                    |
|    | 240 P-117 | 302               | 27: J-4    | 239: J-97  | 300           | Ductile Iron | 130                  | FALSE            | 0              | -9434.37    | 5.07            | 0.008                     | FALSE                    |
|    | 329 P-170 | 310               | 325: J-120 | 328: J-121 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 1572.98     | 3.38            | 0.008                     | FALSE                    |
|    | 327 P-169 | 92                | 325: J-120 | 315: J-116 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -1599.46    | 3.44            | 0.008                     | FALSE                    |
|    | 302 P-155 | 156               | 90: J-38   | 299: J-110 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 1669.67     | 3.59            | 0.009                     | FALSE                    |
|    | 273 P-135 | 240               | 220: J-91  | 270: J-101 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -1758.94    | 3.78            | 0.01                      | FALSE                    |
|    | 211 P-97  | 146               | 203: J-87  | 208: J-88  | 150           | Ductile Iron | 130                  | FALSE            | 0              | 1779.71     | 3.82            | 0.01                      | FALSE                    |
|    | 475 P-246 | 155               | 474: T-5   | 424: J-146 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 12354.56    | 6.64            | 0.012                     | FALSE                    |

## Tank Report



| Id  | Label | Zone   | Base Elevation (m) | Minimum Elevation (m) | Initial Elevation (m) | Maximum Elevation (m) | Inactive Volume (m³) | Diameter (ft) | Outflow (m³/d) | Hydraulic Grade (m) |
|-----|-------|--------|--------------------|-----------------------|-----------------------|-----------------------|----------------------|---------------|----------------|---------------------|
| 388 | T-4   | <None> | 278.4              | 280.4                 | 281.4                 | 281.7                 | 1600                 | 86.82         | -9419.93       | 281.4               |
| 474 | T-5   | <None> | 264                | 264.2                 | 301                   | 301.2                 | 0                    | 37.02         | 12354.56       | 301                 |



## Reservoir Report



| Id  | Label | Elevation (m) | Zone   | Outflow (m3/d) | Hydraulic Grade (m) |
|-----|-------|---------------|--------|----------------|---------------------|
| 167 | R-2   | 332           | <None> | (N/A)          | (N/A)               |
| 168 | R-3   | 351           | <None> | (N/A)          | (N/A)               |

**Water Storage Option WS4 –  
Elevated Storage at New Location**

**Water Distribution Option WD1-  
New Trunk Watermain 300 mm**

**Scenario: Maximum Daily Demand (M.D.D.)**



## Junction Report



| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 27  | J-4   | 246           | <None> | 27.37         | 286                 | 391.6          |
| 85  | J-35  | 241           | <None> | 29.1          | 291                 | 488.9          |
| 87  | J-36  | 241           | <None> | 33.3          | 291.4               | 493.2          |
| 90  | J-38  | 240           | <None> | 33.3          | 290.5               | 494.3          |
| 119 | J-53  | 243.2         | <None> | 34.12         | 292.3               | 480.3          |
| 121 | J-54  | 242.1         | <None> | 30.33         | 292                 | 488.4          |
| 151 | J-69  | 241           | <None> | 48.45         | 294.8               | 526.2          |
| 159 | J-72  | 254           | <None> | 48.45         | 294.5               | 396.1          |
| 199 | J-86  | 244           | <None> | 26.54         | 294.6               | 494.9          |
| 203 | J-87  | 244.2         | <None> | 29.1          | 294.6               | 493.2          |
| 208 | J-88  | 243.2         | <None> | 34.12         | 292.6               | 483.9          |
| 212 | J-89  | 240           | <None> | 33.3          | 290.6               | 495.6          |
| 220 | J-91  | 242.2         | <None> | 50.89         | 291.5               | 482.7          |
| 225 | J-92  | 244.1         | <None> | 24.79         | 293.1               | 479.7          |
| 235 | J-96  | 246.1         | <None> | 24.79         | 294.6               | 474.9          |
| 239 | J-97  | 242           | <None> | 27.37         | 288.3               | 453.1          |
| 247 | J-99  | 241           | <None> | 33.3          | 291.1               | 490.8          |
| 266 | J-100 | 242           | <None> | 48.45         | 294.3               | 511.8          |
| 270 | J-101 | 242.2         | <None> | 31.56         | 294.2               | 509            |
| 275 | J-102 | 247           | <None> | 24.79         | 294.6               | 465.9          |
| 280 | J-103 | 242           | <None> | 32.83         | 291.3               | 482.6          |
| 282 | J-104 | 241           | <None> | 32.83         | 291.4               | 493.2          |
| 284 | J-105 | 241           | <None> | 32.83         | 291.4               | 493.3          |
| 287 | J-106 | 240           | <None> | 32.83         | 291.2               | 501.1          |
| 291 | J-107 | 242           | <None> | 41.15         | 288.5               | 455.5          |
| 293 | J-108 | 240           | <None> | 41.15         | 288.7               | 476.3          |
| 295 | J-109 | 240           | <None> | 31.18         | 288.9               | 478.3          |
| 299 | J-110 | 240           | <None> | 31.18         | 289.2               | 481.5          |
| 303 | J-111 | 242           | <None> | 31.18         | 288.4               | 454.3          |
| 311 | J-114 | 240           | <None> | 60.77         | 291.4               | 503.4          |
| 313 | J-115 | 242           | <None> | 50.19         | 291.5               | 484            |
| 315 | J-116 | 244           | <None> | 0             | 296.5               | 513.8          |
| 317 | J-117 | 241           | <None> | 55.42         | 291.4               | 493.5          |
| 319 | J-118 | 243           | <None> | 55.42         | 291.4               | 473.8          |
| 321 | J-119 | 243           | <None> | 55.42         | 291.4               | 473.8          |
| 325 | J-120 | 244           | <None> | 50.19         | 295.4               | 502.8          |
| 328 | J-121 | 242           | <None> | 50.19         | 291.8               | 487.1          |
| 330 | J-122 | 242           | <None> | 50.19         | 291.6               | 485.9          |
| 333 | J-123 | 238           | <None> | 60.77         | 291.4               | 523.1          |
| 335 | J-124 | 239           | <None> | 60.77         | 291.6               | 514.8          |
| 337 | J-125 | 240           | <None> | 60.77         | 291.5               | 503.8          |
| 340 | J-126 | 237           | <None> | 51.22         | 291.4               | 532.8          |
| 342 | J-127 | 236           | <None> | 51.22         | 291.4               | 542.6          |
| 344 | J-128 | 238           | <None> | 51.22         | 291.4               | 523            |
| 347 | J-129 | 239           | <None> | 60.77         | 291.4               | 513.1          |
| 398 | J-135 | 243           | <None> | 30.33         | 294.5               | 504.3          |

| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 405 | J-136 | 245.8         | <None> | 178.18        | 294.8               | 479.5          |
| 408 | J-137 | 242.5         | <None> | 189.83        | 294.8               | 512.2          |
| 411 | J-140 | 247.2         | <None> | 197.13        | 295                 | 467.5          |
| 415 | J-141 | 250.1         | <None> | 0             | 296.5               | 454.2          |
| 416 | J-142 | 249.5         | <None> | 197.13        | 295.5               | 450.5          |
| 417 | J-143 | 249.1         | <None> | 197.13        | 295.3               | 452.4          |
| 422 | J-144 | 249.8         | <None> | 226.51        | 299.1               | 482.5          |
| 423 | J-145 | 248.5         | <None> | 226.51        | 298.3               | 487.4          |
| 424 | J-146 | 253.9         | <None> | 226.51        | 301.5               | 466.3          |
| 430 | J-147 | 247.9         | <None> | 226.51        | 297.4               | 484.9          |
| 431 | J-148 | 245.3         | <None> | 226.51        | 296.8               | 504.4          |
| 435 | J-149 | 238.2         | <None> | 227.46        | 291.7               | 523.8          |
| 436 | J-150 | 240.2         | <None> | 227.46        | 291.7               | 503.7          |
| 437 | J-151 | 238.5         | <None> | 227.46        | 291.6               | 519.8          |
| 442 | J-152 | 243.8         | <None> | 134.11        | 288.3               | 435.4          |
| 443 | J-153 | 252.2         | <None> | 134.11        | 288.3               | 353.2          |
| 444 | J-154 | 246.5         | <None> | 134.11        | 288.3               | 409            |
| 445 | J-155 | 252.5         | <None> | 134.11        | 288.3               | 350.3          |
| 451 | J-156 | 251.5         | <None> | 226.51        | 300.3               | 477.2          |
| 456 | J-157 | 246.1         | <None> | 189.83        | 295                 | 478.2          |

## Pipe Report





| Id | Label     | Scaled Length (m) | Start Node | Stop Node  | Diameter (mm) | Material     | Hazen-Williams C (l) | Has Check Valve? | Minor Loss (l) | Flow (m <sup>3</sup> /d) | Velocity (ft/s) | Headloss Gradient (ft/ft) | Has User Defined Length? |
|----|-----------|-------------------|------------|------------|---------------|--------------|----------------------|------------------|----------------|--------------------------|-----------------|---------------------------|--------------------------|
|    | 322 P-165 | 269               | 313: J-115 | 321: J-119 | 150           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)                  | (N/A)           | (N/A)                     | FALSE                    |
|    | 326 P-168 | 47                | 321: J-119 | 325: J-120 | 150           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)                  | (N/A)           | (N/A)                     | FALSE                    |
|    | 396 P-204 | 50                | 167: R-2   | 379: PMP-4 | 200           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)                  | (N/A)           | (N/A)                     | FALSE                    |
|    | 397 P-205 | 60                | 379: PMP-4 | 225: J-92  | 200           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)                  | (N/A)           | (N/A)                     | FALSE                    |
|    | 403 P-210 | 11                | 168: R-3   | 382: PMP-5 | 200           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)                  | (N/A)           | (N/A)                     | FALSE                    |
|    | 404 P-211 | 14                | 382: PMP-5 | 212: J-89  | 200           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)                  | (N/A)           | (N/A)                     | FALSE                    |
|    | 446 P-233 | 400               | 444: J-154 | 445: J-155 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -19.29                   | 0.01            | 0                         | FALSE                    |
|    | 343 P-178 | 325               | 340: J-126 | 342: J-127 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 17.38                    | 0.04            | 0                         | FALSE                    |
|    | 450 P-237 | 417               | 442: J-152 | 444: J-154 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 114.82                   | 0.06            | 0                         | FALSE                    |
|    | 447 P-234 | 346               | 445: J-155 | 443: J-153 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -153.39                  | 0.08            | 0                         | FALSE                    |
|    | 345 P-179 | 131               | 342: J-127 | 344: J-128 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -33.84                   | 0.07            | 0                         | FALSE                    |
|    | 449 P-236 | 338               | 239: J-97  | 442: J-152 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 248.93                   | 0.13            | 0                         | FALSE                    |
|    | 448 P-235 | 225               | 443: J-153 | 239: J-97  | 300           | Ductile Iron | 130                  | FALSE            | 0              | -287.5                   | 0.15            | 0                         | FALSE                    |
|    | 324 P-167 | 234               | 319: J-118 | 321: J-119 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 55.42                    | 0.12            | 0                         | FALSE                    |
|    | 341 P-177 | 235               | 333: J-123 | 340: J-126 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 68.59                    | 0.15            | 0                         | FALSE                    |
|    | 458 P-243 | 233               | 456: J-157 | 411: J-140 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -438.44                  | 0.24            | 0                         | FALSE                    |
|    | 348 P-181 | 374               | 311: J-114 | 347: J-129 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 83.88                    | 0.18            | 0                         | FALSE                    |
|    | 346 P-180 | 151               | 344: J-128 | 333: J-123 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -85.06                   | 0.18            | 0                         | FALSE                    |
|    | 286 P-144 | 303               | 284: J-105 | 87: J-36   | 150           | Ductile Iron | 130                  | FALSE            | 0              | 95.47                    | 0.21            | 0                         | FALSE                    |
|    | 285 P-143 | 372               | 282: J-104 | 284: J-105 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -95.8                    | 0.21            | 0                         | FALSE                    |
|    | 320 P-164 | 273               | 317: J-117 | 319: J-118 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 110.85                   | 0.24            | 0                         | FALSE                    |
|    | 276 P-137 | 601               | 199: J-86  | 275: J-102 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -111.8                   | 0.24            | 0                         | FALSE                    |
|    | 402 P-209 | 393               | 203: J-87  | 199: J-86  | 200           | Ductile Iron | 130                  | FALSE            | 0              | 257.89                   | 0.31            | 0                         | FALSE                    |
|    | 441 P-232 | 196               | 437: J-151 | 335: J-124 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 760.85                   | 0.41            | 0                         | FALSE                    |
|    | 277 P-138 | 162               | 275: J-102 | 235: J-96  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -136.59                  | 0.29            | 0                         | FALSE                    |
|    | 440 P-231 | 483               | 436: J-150 | 437: J-151 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 988.31                   | 0.53            | 0                         | FALSE                    |
|    | 400 P-207 | 368               | 398: J-135 | 199: J-86  | 200           | Ductile Iron | 130                  | FALSE            | 0              | -343.15                  | 0.41            | 0                         | FALSE                    |
|    | 314 P-161 | 153               | 311: J-114 | 313: J-115 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -162.04                  | 0.35            | 0                         | FALSE                    |
|    | 413 P-215 | 330               | 405: J-136 | 408: J-137 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -1009.35                 | 0.54            | 0                         | FALSE                    |
|    | 318 P-163 | 232               | 313: J-115 | 317: J-117 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 166.27                   | 0.36            | 0                         | FALSE                    |
|    | 439 P-230 | 328               | 435: J-149 | 436: J-150 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 1215.77                  | 0.65            | 0                         | FALSE                    |
|    | 339 P-176 | 233               | 337: J-125 | 311: J-114 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 206.71                   | 0.44            | 0                         | FALSE                    |
|    | 412 P-214 | 337               | 408: J-137 | 151: J-69  | 300           | Ductile Iron | 130                  | FALSE            | 0              | 1316.53                  | 0.71            | 0                         | FALSE                    |
|    | 349 P-182 | 101               | 347: J-129 | 333: J-123 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -218.18                  | 0.47            | 0                         | FALSE                    |
|    | 352 P-185 | 132               | 311: J-114 | 284: J-105 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 224.1                    | 0.48            | 0                         | FALSE                    |
|    | 438 P-229 | 211               | 328: J-121 | 435: J-149 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 1443.23                  | 0.78            | 0                         | FALSE                    |
|    | 350 P-183 | 129               | 347: J-129 | 282: J-104 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 241.29                   | 0.52            | 0                         | FALSE                    |
|    | 338 P-175 | 392               | 335: J-124 | 337: J-125 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 267.48                   | 0.57            | 0                         | FALSE                    |
|    | 289 P-146 | 346               | 287: J-106 | 280: J-103 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -271.43                  | 0.58            | 0                         | FALSE                    |
|    | 283 P-142 | 206               | 280: J-103 | 282: J-104 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -304.26                  | 0.65            | 0                         | FALSE                    |
|    | 305 P-157 | 290               | 303: J-111 | 291: J-107 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -321.65                  | 0.69            | 0                         | FALSE                    |
|    | 271 P-133 | 174               | 266: J-100 | 270: J-101 | 200           | Ductile Iron | 130                  | FALSE            | 0              | 735.84                   | 0.89            | 0                         | FALSE                    |
|    | 294 P-149 | 238               | 291: J-107 | 293: J-108 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -362.8                   | 0.78            | 0.001                     | FALSE                    |
|    | 462 P-245 | 663               | 456: J-157 | 417: J-143 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -2267.11                 | 1.22            | 0.001                     | FALSE                    |
|    | 267 P-130 | 327               | 159: J-72  | 266: J-100 | 200           | Ductile Iron | 130                  | FALSE            | 0              | 784.29                   | 0.95            | 0.001                     | FALSE                    |
|    | 332 P-172 | 328               | 330: J-122 | 313: J-115 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 378.5                    | 0.81            | 0.001                     | FALSE                    |
|    | 269 P-132 | 491               | 151: J-69  | 159: J-72  | 200           | Ductile Iron | 130                  | FALSE            | 0              | 832.73                   | 1.01            | 0.001                     | FALSE                    |
|    | 407 P-213 | 282               | 405: J-136 | 235: J-96  | 150           | Ductile Iron | 130                  | FALSE            | 0              | 397.25                   | 0.85            | 0.001                     | FALSE                    |
|    | 420 P-219 | 336               | 416: J-142 | 417: J-143 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 2464.24                  | 1.32            | 0.001                     | FALSE                    |
|    | 296 P-150 | 306               | 293: J-108 | 295: J-109 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -403.95                  | 0.87            | 0.001                     | FALSE                    |
|    | 457 P-242 | 192               | 408: J-137 | 456: J-157 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -2515.71                 | 1.35            | 0.001                     | FALSE                    |
|    | 331 P-171 | 181               | 328: J-121 | 330: J-122 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 428.7                    | 0.92            | 0.001                     | FALSE                    |
|    | 336 P-174 | 210               | 333: J-123 | 335: J-124 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -432.6                   | 0.93            | 0.001                     | FALSE                    |

| Id | Label     | Scaled Length (m) | Start Node | Stop Node  | Diameter (mm) | Material     | Hazen-Williams C ( ) | Has Check Valve? | Minor Loss ( ) | Flow (m³/d) | Velocity (ft/s) | Headloss Gradient (ft/ft) | Has User Defined Length? |
|----|-----------|-------------------|------------|------------|---------------|--------------|----------------------|------------------|----------------|-------------|-----------------|---------------------------|--------------------------|
|    | 406 P-212 | 365               | 398: J-135 | 405: J-136 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -433.92     | 0.93            | 0.001                     | FALSE                    |
|    | 399 P-206 | 327               | 151: J-69  | 398: J-135 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 435.35      | 0.94            | 0.001                     | FALSE                    |
|    | 249 P-124 | 318               | 247: J-99  | 87: J-36   | 150           | Ductile Iron | 130                  | FALSE            | 0              | -448.39     | 0.96            | 0.001                     | FALSE                    |
|    | 304 P-156 | 149               | 239: J-97  | 303: J-111 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -2906.29    | 1.56            | 0.001                     | FALSE                    |
|    | 288 P-145 | 175               | 87: J-36   | 287: J-106 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 532.92      | 1.15            | 0.001                     | FALSE                    |
|    | 401 P-208 | 273               | 270: J-101 | 398: J-135 | 200           | Ductile Iron | 130                  | FALSE            | 0              | -1182.09    | 1.43            | 0.001                     | FALSE                    |
|    | 248 P-123 | 158               | 85: J-35   | 247: J-99  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -564.01     | 1.21            | 0.001                     | FALSE                    |
|    | 461 P-244 | 282               | 235: J-96  | 411: J-140 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -3541.69    | 1.9             | 0.001                     | FALSE                    |
|    | 418 P-217 | 337               | 411: J-140 | 416: J-142 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -4177.26    | 2.24            | 0.002                     | FALSE                    |
|    | 306 P-158 | 262               | 295: J-109 | 303: J-111 | 250           | Ductile Iron | 130                  | FALSE            | 0              | 2615.82     | 2.02            | 0.002                     | FALSE                    |
|    | 434 P-228 | 187               | 431: J-148 | 315: J-116 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 4336.05     | 2.33            | 0.002                     | FALSE                    |
|    | 433 P-227 | 309               | 430: J-147 | 431: J-148 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 4562.56     | 2.45            | 0.002                     | FALSE                    |
|    | 213 P-98  | 66                | 90: J-38   | 212: J-89  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -738.21     | 1.59            | 0.002                     | FALSE                    |
|    | 290 P-147 | 264               | 287: J-106 | 212: J-89  | 150           | Ductile Iron | 130                  | FALSE            | 0              | 771.51      | 1.66            | 0.002                     | FALSE                    |
|    | 432 P-226 | 394               | 423: J-145 | 430: J-147 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 4789.08     | 2.57            | 0.002                     | FALSE                    |
|    | 300 P-153 | 145               | 295: J-109 | 299: J-110 | 250           | Ductile Iron | 130                  | FALSE            | 0              | -3050.95    | 2.36            | 0.002                     | FALSE                    |
|    | 455 P-241 | 341               | 422: J-144 | 423: J-145 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 5015.59     | 2.69            | 0.002                     | FALSE                    |
|    | 454 P-240 | 416               | 451: J-156 | 422: J-144 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 5515.96     | 2.96            | 0.003                     | FALSE                    |
|    | 251 P-126 | 219               | 247: J-99  | 90: J-38   | 150           | Ductile Iron | 130                  | FALSE            | 0              | 910.12      | 1.96            | 0.003                     | FALSE                    |
|    | 278 P-139 | 299               | 87: J-36   | 119: J-53  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -919.14     | 1.98            | 0.003                     | FALSE                    |
|    | 453 P-239 | 424               | 424: J-146 | 451: J-156 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 5742.48     | 3.08            | 0.003                     | FALSE                    |
|    | 224 P-107 | 184               | 220: J-91  | 85: J-35   | 150           | Ductile Iron | 130                  | FALSE            | 0              | 932.19      | 2               | 0.003                     | FALSE                    |
|    | 209 P-95  | 113               | 119: J-53  | 208: J-88  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -953.25     | 2.05            | 0.003                     | FALSE                    |
|    | 226 P-108 | 462               | 220: J-91  | 225: J-92  | 300           | Ductile Iron | 130                  | FALSE            | 0              | -6182.25    | 3.32            | 0.003                     | FALSE                    |
|    | 236 P-114 | 432               | 225: J-92  | 235: J-96  | 300           | Ductile Iron | 130                  | FALSE            | 0              | -6207.05    | 3.33            | 0.003                     | FALSE                    |
|    | 279 P-140 | 222               | 247: J-99  | 121: J-54  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -1059.05    | 2.28            | 0.004                     | FALSE                    |
|    | 210 P-96  | 157               | 208: J-88  | 121: J-54  | 150           | Ductile Iron | 130                  | FALSE            | 0              | 1089.38     | 2.34            | 0.004                     | FALSE                    |
|    | 419 P-218 | 235               | 416: J-142 | 415: J-141 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -6838.63    | 3.67            | 0.004                     | FALSE                    |
|    | 351 P-184 | 454               | 315: J-116 | 203: J-87  | 200           | Ductile Iron | 130                  | FALSE            | 0              | 2363.74     | 2.86            | 0.004                     | FALSE                    |
|    | 421 P-220 | 428               | 415: J-141 | 235: J-96  | 200           | Ductile Iron | 130                  | FALSE            | 0              | 2429.48     | 2.94            | 0.004                     | FALSE                    |
|    | 241 P-118 | 725               | 239: J-97  | 220: J-91  | 300           | Ductile Iron | 130                  | FALSE            | 0              | -7085.53    | 3.81            | 0.004                     | FALSE                    |
|    | 452 P-238 | 353               | 422: J-144 | 424: J-146 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -8994.25    | 4.83            | 0.007                     | FALSE                    |
|    | 301 P-154 | 250               | 299: J-110 | 85: J-35   | 150           | Ductile Iron | 130                  | FALSE            | 0              | -1467.11    | 3.15            | 0.007                     | FALSE                    |
|    | 425 P-221 | 353               | 415: J-141 | 422: J-144 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -9268.12    | 4.98            | 0.007                     | FALSE                    |
|    | 389 P-201 | 614               | 27: J-4    | 388: T-4   | 300           | Ductile Iron | 130                  | FALSE            | 0              | 9400.65     | 5.05            | 0.008                     | FALSE                    |
|    | 240 P-117 | 302               | 27: J-4    | 239: J-97  | 300           | Ductile Iron | 130                  | FALSE            | 0              | -9428.02    | 5.06            | 0.008                     | FALSE                    |
|    | 302 P-155 | 156               | 90: J-38   | 299: J-110 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 1615.02     | 3.47            | 0.008                     | FALSE                    |
|    | 273 P-135 | 240               | 220: J-91  | 270: J-101 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -1886.36    | 4.05            | 0.011                     | FALSE                    |
|    | 329 P-170 | 310               | 325: J-120 | 328: J-121 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 1922.12     | 4.13            | 0.012                     | FALSE                    |
|    | 327 P-169 | 92                | 325: J-120 | 315: J-116 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -1972.31    | 4.24            | 0.012                     | FALSE                    |
|    | 211 P-97  | 146               | 203: J-87  | 208: J-88  | 150           | Ductile Iron | 130                  | FALSE            | 0              | 2076.75     | 4.46            | 0.013                     | FALSE                    |
|    | 475 P-246 | 155               | 474: T-5   | 424: J-146 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 14963.24    | 8.04            | 0.018                     | FALSE                    |

## Tank Report



| Id  | Label | Zone   | Base Elevation<br>(m) | Minimum<br>Elevation (m) | Initial Elevation<br>(m) | Maximum<br>Elevation (m) | Inactive Volume<br>(m³) | Diameter (ft) | Outflow (m³/d) | Hydraulic Grade<br>(m) |
|-----|-------|--------|-----------------------|--------------------------|--------------------------|--------------------------|-------------------------|---------------|----------------|------------------------|
| 388 | T-4   | <None> | 278.4                 | 280.4                    | 281.4                    | 281.7                    | 1600                    | 86.82         | -9400.65       | 281.4                  |
| 474 | T-5   | <None> | 264                   | 264.2                    | 304.3                    | 304.5                    | 1600                    | 38.83         | 14963.24       | 304.3                  |

## Reservoir Report



| Id  | Label | Elevation (m) | Zone   | Outflow (m3/d) | Hydraulic Grade (m) |
|-----|-------|---------------|--------|----------------|---------------------|
| 167 | R-2   | 332           | <None> | (N/A)          | (N/A)               |
| 168 | R-3   | 351           | <None> | (N/A)          | (N/A)               |

**Water Storage Option WS4 –  
Elevated Storage at New Location**

**Water Distribution Option WD1-  
New Trunk Watermain 300 mm**

**Scenario: Maximum Daily Demand with Fire Storage (M.D.D.+Fire)**



## Fire Flow Report





| Label | Zone   | Fire Flow Iterations | Satisfies Fire Flow Constraints? |  | Fire Flow (Available)    |       | Flow (Total Needed) | Flow (Total Available) | Pressure (Residual Lower Limit) (kPa) | Pressure (Calculated)      |       | Pressure (Zone Lower Limit) (kPa) | Calculated Minimum Zone Pressure (kPa) |
|-------|--------|----------------------|----------------------------------|--|--------------------------|-------|---------------------|------------------------|---------------------------------------|----------------------------|-------|-----------------------------------|----------------------------------------|
|       |        |                      |                                  |  | Fire Flow (Needed) (L/s) | (L/s) | (L/s)               | (L/s)                  |                                       | Residual Lower Limit (kPa) |       |                                   |                                        |
| J-4   | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.17               | 80.17                  | 137.9                                 |                            | 305   | 137.9                             | 223.4                                  |
| J-35  | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.18               | 80.18                  | 137.9                                 |                            | 310.6 | 137.9                             | 220.7                                  |
| J-36  | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.2                | 80.2                   | 137.9                                 |                            | 277.1 | 137.9                             | 220.8                                  |
| J-38  | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.2                | 80.2                   | 137.9                                 |                            | 303.2 | 137.9                             | 221.2                                  |
| J-53  | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.21               | 80.21                  | 137.9                                 |                            | 225.7 | 137.9                             | 220.6                                  |
| J-54  | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.19               | 80.19                  | 137.9                                 |                            | 239.3 | 137.9                             | 220.6                                  |
| J-69  | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.3                | 80.3                   | 137.9                                 |                            | 331.3 | 137.9                             | 208.3                                  |
| J-72  | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.3                | 80.3                   | 137.9                                 |                            | 164.9 | 137.9                             | 222.7                                  |
| J-86  | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.16               | 80.16                  | 137.9                                 |                            | 284.3 | 137.9                             | 216.5                                  |
| J-87  | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.18               | 80.18                  | 137.9                                 |                            | 284.3 | 137.9                             | 219.5                                  |
| J-88  | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.21               | 80.21                  | 137.9                                 |                            | 264.8 | 137.9                             | 220.4                                  |
| J-89  | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.2                | 80.2                   | 137.9                                 |                            | 273.8 | 137.9                             | 221.1                                  |
| J-91  | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.31               | 80.31                  | 137.9                                 |                            | 333.2 | 137.9                             | 218.8                                  |
| J-92  | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.15               | 80.15                  | 137.9                                 |                            | 310.9 | 137.9                             | 218.3                                  |
| J-96  | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.15               | 80.15                  | 137.9                                 |                            | 292.5 | 137.9                             | 217.6                                  |
| J-97  | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.17               | 80.17                  | 137.9                                 |                            | 339.4 | 137.9                             | 221.7                                  |
| J-99  | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.2                | 80.2                   | 137.9                                 |                            | 304.1 | 137.9                             | 220.9                                  |
| J-100 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.3                | 80.3                   | 137.9                                 |                            | 291   | 137.9                             | 188.4                                  |
| J-101 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.19               | 80.19                  | 137.9                                 |                            | 305.1 | 137.9                             | 201.1                                  |
| J-102 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.15               | 80.15                  | 137.9                                 |                            | 190.2 | 137.9                             | 217.4                                  |
| J-103 | <None> | 3                    | TRUE                             |  | 30                       | 80    | 30.2                | 80.2                   | 137.9                                 |                            | 157.9 | 137.9                             | 220.8                                  |
| J-104 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.2                | 80.2                   | 137.9                                 |                            | 199.2 | 137.9                             | 220.8                                  |
| J-105 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.2                | 80.2                   | 137.9                                 |                            | 213.4 | 137.9                             | 216.4                                  |
| J-106 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.2                | 80.2                   | 137.9                                 |                            | 263.3 | 137.9                             | 220.9                                  |
| J-107 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.25               | 80.25                  | 137.9                                 |                            | 202.8 | 137.9                             | 221.7                                  |
| J-108 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.25               | 80.25                  | 137.9                                 |                            | 218.7 | 137.9                             | 221.6                                  |
| J-109 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.19               | 80.19                  | 137.9                                 |                            | 344.8 | 137.9                             | 221.6                                  |
| J-110 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.19               | 80.19                  | 137.9                                 |                            | 340.3 | 137.9                             | 221.5                                  |
| J-111 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.19               | 80.19                  | 137.9                                 |                            | 335   | 137.9                             | 221.7                                  |
| J-114 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.37               | 80.37                  | 137.9                                 |                            | 209.8 | 137.9                             | 186.6                                  |
| J-115 | <None> | 6                    | TRUE                             |  | 30                       | 73.93 | 30.31               | 74.24                  | 137.9                                 |                            | 147.9 | 137.9                             | 137.9                                  |
| J-116 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30                  | 80                     | 137.9                                 |                            | 295.3 | 137.9                             | 221.2                                  |
| J-117 | <None> | 5                    | TRUE                             |  | 30                       | 46.54 | 30.34               | 46.88                  | 137.9                                 |                            | 157.6 | 137.9                             | 137.9                                  |
| J-118 | <None> | 3                    | TRUE                             |  | 30                       | 35.25 | 30.34               | 35.59                  | 137.9                                 |                            | 137.9 | 137.9                             | 137.9                                  |
| J-119 | <None> | 2                    | TRUE                             |  | 30                       | 30.1  | 30.34               | 30.43                  | 137.9                                 |                            | 137.9 | 137.9                             | 185.5                                  |
| J-120 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.31               | 80.31                  | 137.9                                 |                            | 234.3 | 137.9                             | 220.8                                  |
| J-121 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.31               | 80.31                  | 137.9                                 |                            | 192.7 | 137.9                             | 201.2                                  |
| J-122 | <None> | 4                    | TRUE                             |  | 30                       | 75.14 | 30.31               | 75.45                  | 137.9                                 |                            | 137.9 | 137.9                             | 187                                    |
| J-123 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.37               | 80.37                  | 137.9                                 |                            | 192.9 | 137.9                             | 192.9                                  |
| J-124 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.37               | 80.37                  | 137.9                                 |                            | 214.1 | 137.9                             | 202.4                                  |
| J-125 | <None> | 4                    | TRUE                             |  | 30                       | 77.62 | 30.37               | 77.99                  | 137.9                                 |                            | 137.9 | 137.9                             | 204.7                                  |
| J-126 | <None> | 4                    | TRUE                             |  | 30                       | 71.43 | 30.31               | 71.74                  | 137.9                                 |                            | 137.9 | 137.9                             | 199.8                                  |
| J-127 | <None> | 4                    | TRUE                             |  | 30                       | 71.65 | 30.31               | 71.96                  | 137.9                                 |                            | 137.9 | 137.9                             | 167.9                                  |
| J-128 | <None> | 4                    | TRUE                             |  | 30                       | 73.41 | 30.31               | 73.72                  | 137.9                                 |                            | 137.9 | 137.9                             | 172.5                                  |
| J-129 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.37               | 80.37                  | 137.9                                 |                            | 210   | 137.9                             | 211.2                                  |
| J-135 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30.19               | 80.19                  | 137.9                                 |                            | 304.5 | 137.9                             | 210.4                                  |
| J-136 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 31.09               | 81.09                  | 137.9                                 |                            | 284.6 | 137.9                             | 213.5                                  |
| J-137 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 31.16               | 81.16                  | 137.9                                 |                            | 323   | 137.9                             | 213.1                                  |
| J-140 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 31.2                | 81.2                   | 137.9                                 |                            | 280.9 | 137.9                             | 217                                    |
| J-141 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 30                  | 80                     | 137.9                                 |                            | 254.2 | 137.9                             | 219.8                                  |
| J-142 | <None> | 2                    | TRUE                             |  | 30                       | 80    | 31.2                | 81.2                   | 137.9                                 |                            | 258.3 | 137.9                             | 217.8                                  |

| Label | Zone   | Fire Flow Iterations | Satisfies Fire Flow Constraints? |      | Fire Flow (Available)    | Flow (Total Needed) | Flow (Total Available) | Pressure (Residual | Pressure (Calculated        | Pressure (Zone Lower | Calculated Minimum  |       |
|-------|--------|----------------------|----------------------------------|------|--------------------------|---------------------|------------------------|--------------------|-----------------------------|----------------------|---------------------|-------|
|       |        |                      |                                  |      | Fire Flow (Needed) (L/s) | (L/s)               | (L/s)                  | Lower Limit) (kPa) | Residual Lower Limit) (kPa) | Limit) (kPa)         | Zone Pressure (kPa) |       |
| J-143 | <None> |                      | 2                                | TRUE | 30                       | 80                  | 31.2                   | 81.2               | 137.9                       | 257.5                | 137.9               | 216.9 |
| J-144 | <None> |                      | 2                                | TRUE | 30                       | 80                  | 31.38                  | 81.38              | 137.9                       | 260.5                | 137.9               | 222.3 |
| J-145 | <None> |                      | 2                                | TRUE | 30                       | 80                  | 31.38                  | 81.38              | 137.9                       | 264                  | 137.9               | 222.4 |
| J-146 | <None> |                      | 2                                | TRUE | 30                       | 80                  | 31.38                  | 81.38              | 137.9                       | 222.1                | 137.9               | 226.6 |
| J-147 | <None> |                      | 2                                | TRUE | 30                       | 80                  | 31.38                  | 81.38              | 137.9                       | 262.7                | 137.9               | 221.8 |
| J-148 | <None> |                      | 2                                | TRUE | 30                       | 80                  | 31.38                  | 81.38              | 137.9                       | 284.3                | 137.9               | 221.4 |
| J-149 | <None> |                      | 2                                | TRUE | 30                       | 80                  | 31.39                  | 81.39              | 137.9                       | 227.9                | 137.9               | 194.6 |
| J-150 | <None> |                      | 2                                | TRUE | 30                       | 80                  | 31.39                  | 81.39              | 137.9                       | 205.7                | 137.9               | 197.3 |
| J-151 | <None> |                      | 2                                | TRUE | 30                       | 80                  | 31.39                  | 81.39              | 137.9                       | 219.7                | 137.9               | 201   |
| J-152 | <None> |                      | 2                                | TRUE | 30                       | 80                  | 30.82                  | 80.82              | 137.9                       | 314.5                | 137.9               | 221.7 |
| J-153 | <None> |                      | 2                                | TRUE | 30                       | 80                  | 30.82                  | 80.82              | 137.9                       | 233.8                | 137.9               | 221.7 |
| J-154 | <None> |                      | 2                                | TRUE | 30                       | 80                  | 30.82                  | 80.82              | 137.9                       | 285                  | 137.9               | 221.7 |
| J-155 | <None> |                      | 2                                | TRUE | 30                       | 80                  | 30.82                  | 80.82              | 137.9                       | 227                  | 137.9               | 221.7 |
| J-156 | <None> |                      | 2                                | TRUE | 30                       | 80                  | 31.38                  | 81.38              | 137.9                       | 240.6                | 137.9               | 222.1 |
| J-157 | <None> |                      | 2                                | TRUE | 30                       | 80                  | 31.16                  | 81.16              | 137.9                       | 290.2                | 137.9               | 215.5 |

| Label | Junction w/Minimum<br>Pressure (Zone) | Pressure (Calculated)                  |                             | Junction w/Minimum<br>Pressure (System) | Is Fire Flow Run<br>Balanced? |
|-------|---------------------------------------|----------------------------------------|-----------------------------|-----------------------------------------|-------------------------------|
|       |                                       | Pressure (System Lower<br>Limit) (kPa) | System Lower Limit<br>(kPa) |                                         |                               |
| J-4   | 159                                   | 137.9                                  | 223.4                       | 159                                     | TRUE                          |
| J-35  | 159                                   | 137.9                                  | 220.7                       | 159                                     | TRUE                          |
| J-36  | 159                                   | 137.9                                  | 220.8                       | 159                                     | TRUE                          |
| J-38  | 159                                   | 137.9                                  | 221.2                       | 159                                     | TRUE                          |
| J-53  | 159                                   | 137.9                                  | 220.6                       | 159                                     | TRUE                          |
| J-54  | 159                                   | 137.9                                  | 220.6                       | 159                                     | TRUE                          |
| J-69  | 159                                   | 137.9                                  | 208.3                       | 159                                     | TRUE                          |
| J-72  | 424                                   | 137.9                                  | 222.7                       | 424                                     | TRUE                          |
| J-86  | 159                                   | 137.9                                  | 216.5                       | 159                                     | TRUE                          |
| J-87  | 159                                   | 137.9                                  | 219.5                       | 159                                     | TRUE                          |
| J-88  | 159                                   | 137.9                                  | 220.4                       | 159                                     | TRUE                          |
| J-89  | 159                                   | 137.9                                  | 221.1                       | 159                                     | TRUE                          |
| J-91  | 159                                   | 137.9                                  | 218.8                       | 159                                     | TRUE                          |
| J-92  | 159                                   | 137.9                                  | 218.3                       | 159                                     | TRUE                          |
| J-96  | 159                                   | 137.9                                  | 217.6                       | 159                                     | TRUE                          |
| J-97  | 159                                   | 137.9                                  | 221.7                       | 159                                     | TRUE                          |
| J-99  | 159                                   | 137.9                                  | 220.9                       | 159                                     | TRUE                          |
| J-100 | 159                                   | 137.9                                  | 188.4                       | 159                                     | TRUE                          |
| J-101 | 159                                   | 137.9                                  | 201.1                       | 159                                     | TRUE                          |
| J-102 | 159                                   | 137.9                                  | 217.4                       | 159                                     | TRUE                          |
| J-103 | 159                                   | 137.9                                  | 220.8                       | 159                                     | TRUE                          |
| J-104 | 159                                   | 137.9                                  | 220.8                       | 159                                     | TRUE                          |
| J-105 | 321                                   | 137.9                                  | 216.4                       | 321                                     | TRUE                          |
| J-106 | 159                                   | 137.9                                  | 220.9                       | 159                                     | TRUE                          |
| J-107 | 159                                   | 137.9                                  | 221.7                       | 159                                     | TRUE                          |
| J-108 | 159                                   | 137.9                                  | 221.6                       | 159                                     | TRUE                          |
| J-109 | 159                                   | 137.9                                  | 221.6                       | 159                                     | TRUE                          |
| J-110 | 159                                   | 137.9                                  | 221.5                       | 159                                     | TRUE                          |
| J-111 | 159                                   | 137.9                                  | 221.7                       | 159                                     | TRUE                          |
| J-114 | 321                                   | 137.9                                  | 186.6                       | 321                                     | TRUE                          |
| J-115 | 321                                   | 137.9                                  | 137.9                       | 321                                     | TRUE                          |
| J-116 | 159                                   | 137.9                                  | 221.2                       | 159                                     | TRUE                          |
| J-117 | 321                                   | 137.9                                  | 137.9                       | 321                                     | TRUE                          |
| J-118 | 321                                   | 137.9                                  | 137.9                       | 321                                     | TRUE                          |
| J-119 | 319                                   | 137.9                                  | 185.5                       | 319                                     | TRUE                          |
| J-120 | 159                                   | 137.9                                  | 220.8                       | 159                                     | TRUE                          |
| J-121 | 330                                   | 137.9                                  | 201.2                       | 330                                     | TRUE                          |
| J-122 | 321                                   | 137.9                                  | 187                         | 321                                     | TRUE                          |
| J-123 | 344                                   | 137.9                                  | 192.9                       | 344                                     | TRUE                          |
| J-124 | 328                                   | 137.9                                  | 202.4                       | 328                                     | TRUE                          |
| J-125 | 321                                   | 137.9                                  | 204.7                       | 321                                     | TRUE                          |
| J-126 | 342                                   | 137.9                                  | 199.8                       | 342                                     | TRUE                          |
| J-127 | 344                                   | 137.9                                  | 167.9                       | 344                                     | TRUE                          |
| J-128 | 342                                   | 137.9                                  | 172.5                       | 342                                     | TRUE                          |
| J-129 | 321                                   | 137.9                                  | 211.2                       | 321                                     | TRUE                          |
| J-135 | 159                                   | 137.9                                  | 210.4                       | 159                                     | TRUE                          |
| J-136 | 159                                   | 137.9                                  | 213.5                       | 159                                     | TRUE                          |
| J-137 | 159                                   | 137.9                                  | 213.1                       | 159                                     | TRUE                          |
| J-140 | 159                                   | 137.9                                  | 217                         | 159                                     | TRUE                          |
| J-141 | 159                                   | 137.9                                  | 219.8                       | 159                                     | TRUE                          |
| J-142 | 159                                   | 137.9                                  | 217.8                       | 159                                     | TRUE                          |

| Label | Junction w/Minimum<br>Pressure (Zone) | Pressure (Calculated)                  |                             |  | Junction w/Minimum<br>Pressure (System) | Is Fire Flow Run<br>Balanced? |
|-------|---------------------------------------|----------------------------------------|-----------------------------|--|-----------------------------------------|-------------------------------|
|       |                                       | Pressure (System Lower<br>Limit) (kPa) | System Lower Limit<br>(kPa) |  |                                         |                               |
| J-143 | 159                                   | 137.9                                  | 216.9                       |  | 159                                     | TRUE                          |
| J-144 | 424                                   | 137.9                                  | 222.3                       |  | 424                                     | TRUE                          |
| J-145 | 424                                   | 137.9                                  | 222.4                       |  | 424                                     | TRUE                          |
| J-146 | 159                                   | 137.9                                  | 226.6                       |  | 159                                     | TRUE                          |
| J-147 | 159                                   | 137.9                                  | 221.8                       |  | 159                                     | TRUE                          |
| J-148 | 159                                   | 137.9                                  | 221.4                       |  | 159                                     | TRUE                          |
| J-149 | 328                                   | 137.9                                  | 194.6                       |  | 328                                     | TRUE                          |
| J-150 | 328                                   | 137.9                                  | 197.3                       |  | 328                                     | TRUE                          |
| J-151 | 328                                   | 137.9                                  | 201                         |  | 328                                     | TRUE                          |
| J-152 | 159                                   | 137.9                                  | 221.7                       |  | 159                                     | TRUE                          |
| J-153 | 159                                   | 137.9                                  | 221.7                       |  | 159                                     | TRUE                          |
| J-154 | 159                                   | 137.9                                  | 221.7                       |  | 159                                     | TRUE                          |
| J-155 | 159                                   | 137.9                                  | 221.7                       |  | 159                                     | TRUE                          |
| J-156 | 424                                   | 137.9                                  | 222.1                       |  | 424                                     | TRUE                          |
| J-157 | 159                                   | 137.9                                  | 215.5                       |  | 159                                     | TRUE                          |

## Junction Report



| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 27  | J-4   | 246           | <None> | 14.44         | 279.7               | 329.8          |
| 85  | J-35  | 241           | <None> | 15.35         | 278.1               | 362.7          |
| 87  | J-36  | 241           | <None> | 17.57         | 277.6               | 357.8          |
| 90  | J-38  | 240           | <None> | 17.57         | 278                 | 371.8          |
| 119 | J-53  | 243.2         | <None> | 18            | 277.5               | 336            |
| 121 | J-54  | 242.1         | <None> | 16            | 277.7               | 348            |
| 151 | J-69  | 241           | <None> | 25.56         | 277.4               | 355.9          |
| 159 | J-72  | 254           | <None> | 25.56         | 277.4               | 229.1          |
| 199 | J-86  | 244           | <None> | 14            | 277.4               | 326.7          |
| 203 | J-87  | 244.2         | <None> | 15.35         | 277.4               | 324.5          |
| 208 | J-88  | 243.2         | <None> | 18            | 277.5               | 336            |
| 212 | J-89  | 240           | <None> | 17.57         | 277.9               | 371            |
| 220 | J-91  | 242.2         | <None> | 26.85         | 278.1               | 350.9          |
| 225 | J-92  | 244.1         | <None> | 13.08         | 277.7               | 329.1          |
| 235 | J-96  | 246.1         | <None> | 13.08         | 277.4               | 306.6          |
| 239 | J-97  | 242           | <None> | 14.44         | 278.9               | 360.8          |
| 247 | J-99  | 241           | <None> | 17.57         | 277.9               | 360.7          |
| 266 | J-100 | 242           | <None> | 25.56         | 277.4               | 346.8          |
| 270 | J-101 | 242.2         | <None> | 16.65         | 277.5               | 345.1          |
| 275 | J-102 | 247           | <None> | 13.08         | 277.4               | 297.7          |
| 280 | J-103 | 242           | <None> | 17.32         | 277.4               | 346.2          |
| 282 | J-104 | 241           | <None> | 17.32         | 277.3               | 354.9          |
| 284 | J-105 | 241           | <None> | 17.32         | 277.3               | 355            |
| 287 | J-106 | 240           | <None> | 17.32         | 277.6               | 367.8          |
| 291 | J-107 | 242           | <None> | 21.71         | 278.7               | 359.6          |
| 293 | J-108 | 240           | <None> | 21.71         | 278.7               | 378.7          |
| 295 | J-109 | 240           | <None> | 16.45         | 278.6               | 378.2          |
| 299 | J-110 | 240           | <None> | 16.45         | 278.5               | 377.1          |
| 303 | J-111 | 242           | <None> | 16.45         | 278.8               | 360.3          |
| 311 | J-114 | 240           | <None> | 32.06         | 277.2               | 363.8          |
| 313 | J-115 | 242           | <None> | 26.48         | 277.1               | 343.8          |
| 315 | J-116 | 244           | <None> | 0             | 277.1               | 323.8          |
| 317 | J-117 | 241           | <None> | 29.24         | 277.1               | 353.5          |
| 319 | J-118 | 243           | <None> | 29.24         | 277.1               | 333.9          |
| 321 | J-119 | 243           | <None> | 29.24         | 277.1               | 333.9          |
| 325 | J-120 | 244           | <None> | 26.48         | 277.1               | 323.8          |
| 328 | J-121 | 242           | <None> | 26.48         | 277.1               | 343.4          |
| 330 | J-122 | 242           | <None> | 26.48         | 277.1               | 343.5          |
| 333 | J-123 | 238           | <None> | 32.06         | 277.1               | 383            |
| 335 | J-124 | 239           | <None> | 32.06         | 277.1               | 372.9          |
| 337 | J-125 | 240           | <None> | 32.06         | 277.1               | 363.5          |
| 340 | J-126 | 237           | <None> | 27.02         | 277.1               | 392.8          |
| 342 | J-127 | 236           | <None> | 27.02         | 277.1               | 402.6          |
| 344 | J-128 | 238           | <None> | 27.02         | 277.1               | 383            |
| 347 | J-129 | 239           | <None> | 32.06         | 277.2               | 373.7          |
| 398 | J-135 | 243           | <None> | 16            | 277.4               | 336.7          |

| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 405 | J-136 | 245.8         | <None> | 94            | 277.4               | 308.9          |
| 408 | J-137 | 242.5         | <None> | 100.15        | 277.4               | 341.2          |
| 411 | J-140 | 247.2         | <None> | 104           | 277.4               | 295.1          |
| 415 | J-141 | 250.1         | <None> | 0             | 277.2               | 265.5          |
| 416 | J-142 | 249.5         | <None> | 104           | 277.3               | 272.1          |
| 417 | J-143 | 249.1         | <None> | 104           | 277.3               | 276.1          |
| 422 | J-144 | 249.8         | <None> | 119.5         | 277                 | 266.3          |
| 423 | J-145 | 248.5         | <None> | 119.5         | 277                 | 279.2          |
| 424 | J-146 | 253.9         | <None> | 119.5         | 276.9               | 225.1          |
| 430 | J-147 | 247.9         | <None> | 119.5         | 277                 | 285.2          |
| 431 | J-148 | 245.3         | <None> | 119.5         | 277.1               | 310.9          |
| 435 | J-149 | 238.2         | <None> | 120           | 277.1               | 380.6          |
| 436 | J-150 | 240.2         | <None> | 120           | 277.1               | 361            |
| 437 | J-151 | 238.5         | <None> | 120           | 277.1               | 377.7          |
| 442 | J-152 | 243.8         | <None> | 70.75         | 278.9               | 343.2          |
| 443 | J-153 | 252.2         | <None> | 70.75         | 278.9               | 261            |
| 444 | J-154 | 246.5         | <None> | 70.75         | 278.9               | 316.8          |
| 445 | J-155 | 252.5         | <None> | 70.75         | 278.9               | 258            |
| 451 | J-156 | 251.5         | <None> | 119.5         | 277                 | 249.1          |
| 456 | J-157 | 246.1         | <None> | 100.15        | 277.4               | 305.9          |

## Pipe Report





| Id  | Label | Scaled Length | Start Node | Stop Node  | Diameter (mm) | Material     | Hazen-Williams C () | Has Check Valve? | Minor Loss (') | Flow (m3/d) | Velocity (ft/s) | Headloss Gradient (ft/ft) | Has User Defined Length? |
|-----|-------|---------------|------------|------------|---------------|--------------|---------------------|------------------|----------------|-------------|-----------------|---------------------------|--------------------------|
| 322 | P-165 | 269           | 313: J-115 | 321: J-119 | 150           | Ductile Iron | 130                 | FALSE            | 0              | (N/A)       | (N/A)           | (N/A)                     | FALSE                    |
| 326 | P-168 | 47            | 321: J-119 | 325: J-120 | 150           | Ductile Iron | 130                 | FALSE            | 0              | (N/A)       | (N/A)           | (N/A)                     | FALSE                    |
| 396 | P-204 | 50            | 167: R-2   | 379: PMP-4 | 200           | Ductile Iron | 130                 | FALSE            | 0              | (N/A)       | (N/A)           | (N/A)                     | FALSE                    |
| 397 | P-205 | 60            | 379: PMP-4 | 225: J-92  | 200           | Ductile Iron | 130                 | FALSE            | 0              | (N/A)       | (N/A)           | (N/A)                     | FALSE                    |
| 403 | P-210 | 11            | 168: R-3   | 382: PMP-5 | 200           | Ductile Iron | 130                 | FALSE            | 0              | (N/A)       | (N/A)           | (N/A)                     | FALSE                    |
| 404 | P-211 | 14            | 382: PMP-5 | 212: J-89  | 200           | Ductile Iron | 130                 | FALSE            | 0              | (N/A)       | (N/A)           | (N/A)                     | FALSE                    |
| 446 | P-233 | 400           | 444: J-154 | 445: J-155 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -10.14      | 0.01            | 0                         | FALSE                    |
| 438 | P-229 | 211           | 328: J-121 | 435: J-149 | 300           | Ductile Iron | 130                 | FALSE            | 0              | 25.28       | 0.01            | 0                         | FALSE                    |
| 343 | P-178 | 325           | 340: J-126 | 342: J-127 | 150           | Ductile Iron | 130                 | FALSE            | 0              | 9.17        | 0.02            | 0                         | FALSE                    |
| 450 | P-237 | 417           | 442: J-152 | 444: J-154 | 300           | Ductile Iron | 130                 | FALSE            | 0              | 60.61       | 0.03            | 0                         | FALSE                    |
| 447 | P-234 | 346           | 445: J-155 | 443: J-153 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -80.89      | 0.04            | 0                         | FALSE                    |
| 439 | P-230 | 328           | 435: J-149 | 436: J-150 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -94.72      | 0.05            | 0                         | FALSE                    |
| 345 | P-179 | 131           | 342: J-127 | 344: J-128 | 150           | Ductile Iron | 130                 | FALSE            | 0              | -17.85      | 0.04            | 0                         | FALSE                    |
| 449 | P-236 | 338           | 239: J-97  | 442: J-152 | 300           | Ductile Iron | 130                 | FALSE            | 0              | 131.36      | 0.07            | 0                         | FALSE                    |
| 448 | P-235 | 225           | 443: J-153 | 239: J-97  | 300           | Ductile Iron | 130                 | FALSE            | 0              | -151.64     | 0.08            | 0                         | FALSE                    |
| 324 | P-167 | 234           | 319: J-118 | 321: J-119 | 150           | Ductile Iron | 130                 | FALSE            | 0              | 29.24       | 0.06            | 0                         | FALSE                    |
| 440 | P-231 | 483           | 436: J-150 | 437: J-151 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -214.72     | 0.12            | 0                         | FALSE                    |
| 458 | P-243 | 233           | 456: J-157 | 411: J-140 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -217.23     | 0.12            | 0                         | FALSE                    |
| 341 | P-177 | 235           | 333: J-123 | 340: J-126 | 150           | Ductile Iron | 130                 | FALSE            | 0              | 36.19       | 0.08            | 0                         | FALSE                    |
| 327 | P-169 | 92            | 325: J-120 | 315: J-116 | 150           | Ductile Iron | 130                 | FALSE            | 0              | 39.14       | 0.08            | 0                         | FALSE                    |
| 413 | P-215 | 330           | 405: J-136 | 408: J-137 | 300           | Ductile Iron | 130                 | FALSE            | 0              | 274.53      | 0.15            | 0                         | FALSE                    |
| 346 | P-180 | 151           | 344: J-128 | 333: J-123 | 150           | Ductile Iron | 130                 | FALSE            | 0              | -44.87      | 0.1             | 0                         | FALSE                    |
| 348 | P-181 | 374           | 311: J-114 | 347: J-129 | 150           | Ductile Iron | 130                 | FALSE            | 0              | -49.11      | 0.11            | 0                         | FALSE                    |
| 441 | P-232 | 196           | 437: J-151 | 335: J-124 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -334.72     | 0.18            | 0                         | FALSE                    |
| 285 | P-143 | 372           | 282: J-104 | 284: J-105 | 150           | Ductile Iron | 130                 | FALSE            | 0              | -54.3       | 0.12            | 0                         | FALSE                    |
| 320 | P-164 | 273           | 317: J-117 | 319: J-118 | 150           | Ductile Iron | 130                 | FALSE            | 0              | 58.48       | 0.13            | 0                         | FALSE                    |
| 412 | P-214 | 337           | 408: J-137 | 151: J-69  | 300           | Ductile Iron | 130                 | FALSE            | 0              | -397.63     | 0.21            | 0                         | FALSE                    |
| 329 | P-170 | 310           | 325: J-120 | 328: J-121 | 150           | Ductile Iron | 130                 | FALSE            | 0              | -65.62      | 0.14            | 0                         | FALSE                    |
| 455 | P-241 | 341           | 422: J-144 | 423: J-145 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -505.37     | 0.27            | 0                         | FALSE                    |
| 400 | P-207 | 368           | 398: J-135 | 199: J-86  | 200           | Ductile Iron | 130                 | FALSE            | 0              | 185.4       | 0.22            | 0                         | FALSE                    |
| 318 | P-163 | 232           | 313: J-115 | 317: J-117 | 150           | Ductile Iron | 130                 | FALSE            | 0              | 87.72       | 0.19            | 0                         | FALSE                    |
| 457 | P-242 | 192           | 408: J-137 | 456: J-157 | 300           | Ductile Iron | 130                 | FALSE            | 0              | 572.01      | 0.31            | 0                         | FALSE                    |
| 420 | P-219 | 336           | 416: J-142 | 417: J-143 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -585.09     | 0.31            | 0                         | FALSE                    |
| 432 | P-226 | 394           | 423: J-145 | 430: J-147 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -624.87     | 0.34            | 0                         | FALSE                    |
| 276 | P-137 | 601           | 199: J-86  | 275: J-102 | 150           | Ductile Iron | 130                 | FALSE            | 0              | -104.75     | 0.23            | 0                         | FALSE                    |
| 224 | P-107 | 184           | 220: J-91  | 85: J-35   | 150           | Ductile Iron | 130                 | FALSE            | 0              | -107.91     | 0.23            | 0                         | FALSE                    |
| 462 | P-245 | 663           | 456: J-157 | 417: J-143 | 300           | Ductile Iron | 130                 | FALSE            | 0              | 689.09      | 0.37            | 0                         | FALSE                    |
| 331 | P-171 | 181           | 328: J-121 | 330: J-122 | 150           | Ductile Iron | 130                 | FALSE            | 0              | -117.38     | 0.25            | 0                         | FALSE                    |
| 277 | P-138 | 162           | 275: J-102 | 235: J-96  | 150           | Ductile Iron | 130                 | FALSE            | 0              | -117.83     | 0.25            | 0                         | FALSE                    |
| 209 | P-95  | 113           | 119: J-53  | 208: J-88  | 150           | Ductile Iron | 130                 | FALSE            | 0              | 119.15      | 0.26            | 0                         | FALSE                    |
| 433 | P-227 | 309           | 430: J-147 | 431: J-148 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -744.37     | 0.4             | 0                         | FALSE                    |
| 402 | P-209 | 393           | 203: J-87  | 199: J-86  | 200           | Ductile Iron | 130                 | FALSE            | 0              | -276.16     | 0.33            | 0                         | FALSE                    |
| 269 | P-132 | 491           | 151: J-69  | 159: J-72  | 200           | Ductile Iron | 130                 | FALSE            | 0              | -281.98     | 0.34            | 0                         | FALSE                    |
| 278 | P-139 | 299           | 87: J-36   | 119: J-53  | 150           | Ductile Iron | 130                 | FALSE            | 0              | 137.15      | 0.29            | 0                         | FALSE                    |
| 434 | P-228 | 187           | 431: J-148 | 315: J-116 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -863.87     | 0.46            | 0                         | FALSE                    |
| 399 | P-206 | 327           | 151: J-69  | 398: J-135 | 150           | Ductile Iron | 130                 | FALSE            | 0              | -141.21     | 0.3             | 0                         | FALSE                    |
| 406 | P-212 | 365           | 398: J-135 | 405: J-136 | 150           | Ductile Iron | 130                 | FALSE            | 0              | 141.55      | 0.3             | 0                         | FALSE                    |
| 332 | P-172 | 328           | 330: J-122 | 313: J-115 | 150           | Ductile Iron | 130                 | FALSE            | 0              | -143.86     | 0.31            | 0                         | FALSE                    |
| 267 | P-130 | 327           | 159: J-72  | 266: J-100 | 200           | Ductile Iron | 130                 | FALSE            | 0              | -307.54     | 0.37            | 0                         | FALSE                    |
| 338 | P-175 | 392           | 335: J-124 | 337: J-125 | 150           | Ductile Iron | 130                 | FALSE            | 0              | -155.29     | 0.33            | 0                         | FALSE                    |
| 271 | P-133 | 174           | 266: J-100 | 270: J-101 | 200           | Ductile Iron | 130                 | FALSE            | 0              | -333.1      | 0.4             | 0                         | FALSE                    |
| 453 | P-239 | 424           | 424: J-146 | 451: J-156 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -991.04     | 0.53            | 0                         | FALSE                    |
| 288 | P-145 | 175           | 87: J-36   | 287: J-106 | 150           | Ductile Iron | 130                 | FALSE            | 0              | -165.04     | 0.35            | 0                         | FALSE                    |

| Id  | Label | Scaled Lenç | Start Node | Stop Node  | Diameter (mm) | Material     | Hazen-Williams C () | Has Check Valve? | Minor Loss () | Flow (m3/d) | Velocity (ft/s) | Headloss Gradient (ft/ft) | Has User Defined Length? |
|-----|-------|-------------|------------|------------|---------------|--------------|---------------------|------------------|---------------|-------------|-----------------|---------------------------|--------------------------|
| 454 | P-240 | 416         | 451: J-156 | 422: J-144 | 300           | Ductile Iron | 130                 | FALSE            | 0             | -1110.54    | 0.6             | 0                         | FALSE                    |
| 339 | P-176 | 233         | 337: J-125 | 311: J-114 | 150           | Ductile Iron | 130                 | FALSE            | 0             | -187.35     | 0.4             | 0                         | FALSE                    |
| 418 | P-217 | 337         | 411: J-140 | 416: J-142 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 1198.78     | 0.64            | 0                         | FALSE                    |
| 296 | P-150 | 306         | 293: J-108 | 295: J-109 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 194.54      | 0.42            | 0                         | FALSE                    |
| 336 | P-174 | 210         | 333: J-123 | 335: J-124 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 211.49      | 0.45            | 0                         | FALSE                    |
| 294 | P-149 | 238         | 291: J-107 | 293: J-108 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 216.25      | 0.46            | 0                         | FALSE                    |
| 407 | P-213 | 282         | 405: J-136 | 235: J-96  | 150           | Ductile Iron | 130                 | FALSE            | 0             | -226.98     | 0.49            | 0                         | FALSE                    |
| 401 | P-208 | 273         | 270: J-101 | 398: J-135 | 200           | Ductile Iron | 130                 | FALSE            | 0             | 484.17      | 0.59            | 0                         | FALSE                    |
| 305 | P-157 | 290         | 303: J-111 | 291: J-107 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 237.96      | 0.51            | 0                         | FALSE                    |
| 461 | P-244 | 282         | 235: J-96  | 411: J-140 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 1520.01     | 0.82            | 0                         | FALSE                    |
| 314 | P-161 | 153         | 311: J-114 | 313: J-115 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 258.06      | 0.55            | 0                         | FALSE                    |
| 452 | P-238 | 353         | 422: J-144 | 424: J-146 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 1679.74     | 0.9             | 0                         | FALSE                    |
| 419 | P-218 | 235         | 416: J-142 | 415: J-141 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 1679.87     | 0.9             | 0                         | FALSE                    |
| 304 | P-156 | 149         | 239: J-97  | 303: J-111 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 1805.66     | 0.97            | 0                         | FALSE                    |
| 349 | P-182 | 101         | 347: J-129 | 333: J-123 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 324.61      | 0.7             | 0                         | FALSE                    |
| 421 | P-220 | 428         | 415: J-141 | 235: J-96  | 200           | Ductile Iron | 130                 | FALSE            | 0             | -724.54     | 0.88            | 0                         | FALSE                    |
| 283 | P-142 | 206         | 280: J-103 | 282: J-104 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 368.8       | 0.79            | 0.001                     | FALSE                    |
| 289 | P-146 | 346         | 287: J-106 | 280: J-103 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 386.12      | 0.83            | 0.001                     | FALSE                    |
| 351 | P-184 | 454         | 315: J-116 | 203: J-87  | 200           | Ductile Iron | 130                 | FALSE            | 0             | -824.73     | 1               | 0.001                     | FALSE                    |
| 425 | P-221 | 353         | 415: J-141 | 422: J-144 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 2404.41     | 1.29            | 0.001                     | FALSE                    |
| 251 | P-126 | 219         | 247: J-99  | 90: J-38   | 150           | Ductile Iron | 130                 | FALSE            | 0             | -393.86     | 0.85            | 0.001                     | FALSE                    |
| 306 | P-158 | 262         | 295: J-109 | 303: J-111 | 250           | Ductile Iron | 130                 | FALSE            | 0             | -1551.26    | 1.2             | 0.001                     | FALSE                    |
| 350 | P-183 | 129         | 347: J-129 | 282: J-104 | 150           | Ductile Iron | 130                 | FALSE            | 0             | -405.78     | 0.87            | 0.001                     | FALSE                    |
| 475 | P-246 | 155         | 474: T-5   | 424: J-146 | 300           | Ductile Iron | 130                 | FALSE            | 0             | -2551.28    | 1.37            | 0.001                     | FALSE                    |
| 236 | P-114 | 432         | 225: J-92  | 235: J-96  | 300           | Ductile Iron | 130                 | FALSE            | 0             | 2602.44     | 1.4             | 0.001                     | FALSE                    |
| 226 | P-108 | 462         | 220: J-91  | 225: J-92  | 300           | Ductile Iron | 130                 | FALSE            | 0             | 2615.52     | 1.41            | 0.001                     | FALSE                    |
| 352 | P-185 | 132         | 311: J-114 | 284: J-105 | 150           | Ductile Iron | 130                 | FALSE            | 0             | -428.36     | 0.92            | 0.001                     | FALSE                    |
| 300 | P-153 | 145         | 295: J-109 | 299: J-110 | 250           | Ductile Iron | 130                 | FALSE            | 0             | 1729.34     | 1.34            | 0.001                     | FALSE                    |
| 210 | P-96  | 157         | 208: J-88  | 121: J-54  | 150           | Ductile Iron | 130                 | FALSE            | 0             | -462.78     | 0.99            | 0.001                     | FALSE                    |
| 279 | P-140 | 222         | 247: J-99  | 121: J-54  | 150           | Ductile Iron | 130                 | FALSE            | 0             | 478.78      | 1.03            | 0.001                     | FALSE                    |
| 249 | P-124 | 318         | 247: J-99  | 87: J-36   | 150           | Ductile Iron | 130                 | FALSE            | 0             | 489.66      | 1.05            | 0.001                     | FALSE                    |
| 286 | P-144 | 303         | 284: J-105 | 87: J-36   | 150           | Ductile Iron | 130                 | FALSE            | 0             | -499.98     | 1.07            | 0.001                     | FALSE                    |
| 241 | P-118 | 725         | 239: J-97  | 220: J-91  | 300           | Ductile Iron | 130                 | FALSE            | 0             | 3368.37     | 1.81            | 0.001                     | FALSE                    |
| 211 | P-97  | 146         | 203: J-87  | 208: J-88  | 150           | Ductile Iron | 130                 | FALSE            | 0             | -563.93     | 1.21            | 0.001                     | FALSE                    |
| 290 | P-147 | 264         | 287: J-106 | 212: J-89  | 150           | Ductile Iron | 130                 | FALSE            | 0             | -568.48     | 1.22            | 0.001                     | FALSE                    |
| 213 | P-98  | 66          | 90: J-38   | 212: J-89  | 150           | Ductile Iron | 130                 | FALSE            | 0             | 586.05      | 1.26            | 0.001                     | FALSE                    |
| 248 | P-123 | 158         | 85: J-35   | 247: J-99  | 150           | Ductile Iron | 130                 | FALSE            | 0             | 592.14      | 1.27            | 0.001                     | FALSE                    |
| 301 | P-154 | 250         | 299: J-110 | 85: J-35   | 150           | Ductile Iron | 130                 | FALSE            | 0             | 715.41      | 1.54            | 0.002                     | FALSE                    |
| 273 | P-135 | 240         | 220: J-91  | 270: J-101 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 833.91      | 1.79            | 0.002                     | FALSE                    |
| 240 | P-117 | 302         | 27: J-4    | 239: J-97  | 300           | Ductile Iron | 130                 | FALSE            | 0             | 5471.47     | 2.94            | 0.003                     | FALSE                    |
| 389 | P-201 | 614         | 27: J-4    | 388: T-4   | 300           | Ductile Iron | 130                 | FALSE            | 0             | -5485.91    | 2.95            | 0.003                     | FALSE                    |
| 302 | P-155 | 156         | 90: J-38   | 299: J-110 | 150           | Ductile Iron | 130                 | FALSE            | 0             | -997.49     | 2.14            | 0.003                     | FALSE                    |

## Tank Report



| Id  | Label | Zone   | Base Elevation<br>(m) | Minimum<br>Elevation (m) | Initial Elevation<br>(m) | Maximum<br>Elevation (m) | Inactive<br>Volume (m?) | Diameter (ft) | Outflow (L/s) | Hydraulic<br>Grade (m) |
|-----|-------|--------|-----------------------|--------------------------|--------------------------|--------------------------|-------------------------|---------------|---------------|------------------------|
| 388 | T-4   | <None> | 278.4                 | 280.4                    | 281.4                    | 281.7                    | 1600                    | 86.82         | 63.49         | 281.4                  |
| 474 | T-5   | <None> | 264                   | 264.2                    | 276.8                    | 277                      | 0                       | 69.26         | -29.53        | 276.8                  |

## Reservoir Report



| Id  | Label | Elevation (m) | Zone   | Outflow (m3/d) | Hydraulic Grade (m) |
|-----|-------|---------------|--------|----------------|---------------------|
| 167 | R-2   | 332           | <None> | (N/A)          | (N/A)               |
| 168 | R-3   | 351           | <None> | (N/A)          | (N/A)               |

**Water Storage Option WS4 –  
Elevated Storage at New Location**

**Water Distribution Option WD2-  
New Trunk Watermain 300 mm with Improvements to Ex. System**

**Scenario: Average Daily Demand (A.D.D.)**



## Junction Report





| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 27  | J-4   | 246           | <None> | 14.44         | 285.8               | 389.8          |
| 85  | J-35  | 241           | <None> | 15.35         | 290.5               | 484.7          |
| 87  | J-36  | 241           | <None> | 17.57         | 291.5               | 494.5          |
| 90  | J-38  | 240           | <None> | 17.57         | 290.4               | 493.2          |
| 119 | J-53  | 243.2         | <None> | 18            | 291.9               | 476.3          |
| 121 | J-54  | 242.1         | <None> | 16            | 291.5               | 483.8          |
| 151 | J-69  | 241           | <None> | 25.56         | 293.2               | 511            |
| 159 | J-72  | 254           | <None> | 25.56         | 293                 | 381.7          |
| 199 | J-86  | 244           | <None> | 14            | 293.1               | 480.3          |
| 203 | J-87  | 244.2         | <None> | 15.35         | 293.1               | 478.4          |
| 208 | J-88  | 243.2         | <None> | 18            | 292                 | 477.6          |
| 212 | J-89  | 240           | <None> | 17.57         | 290.6               | 495.1          |
| 220 | J-91  | 242.2         | <None> | 26.85         | 290.8               | 475.2          |
| 225 | J-92  | 244.1         | <None> | 13.08         | 292                 | 469.2          |
| 235 | J-96  | 246.1         | <None> | 13.08         | 293.2               | 461.3          |
| 239 | J-97  | 242           | <None> | 14.44         | 288                 | 450.3          |
| 247 | J-99  | 241           | <None> | 17.57         | 290.9               | 488.4          |
| 266 | J-100 | 242           | <None> | 25.56         | 292.9               | 497.9          |
| 270 | J-101 | 242.2         | <None> | 16.65         | 292.8               | 495.3          |
| 275 | J-102 | 247           | <None> | 13.08         | 293.2               | 452.2          |
| 280 | J-103 | 242           | <None> | 17.32         | 291.8               | 487            |
| 282 | J-104 | 241           | <None> | 17.32         | 292                 | 499.1          |
| 284 | J-105 | 241           | <None> | 17.32         | 292                 | 499            |
| 287 | J-106 | 240           | <None> | 17.32         | 291.4               | 503.1          |
| 291 | J-107 | 242           | <None> | 21.71         | 288.3               | 453            |
| 293 | J-108 | 240           | <None> | 21.71         | 288.4               | 473.8          |
| 295 | J-109 | 240           | <None> | 16.45         | 288.6               | 475.7          |
| 299 | J-110 | 240           | <None> | 16.45         | 288.9               | 479            |
| 303 | J-111 | 242           | <None> | 16.45         | 288.1               | 451.6          |
| 311 | J-114 | 240           | <None> | 32.06         | 292.2               | 510.6          |
| 313 | J-115 | 242           | <None> | 26.48         | 292.2               | 491            |
| 315 | J-116 | 244           | <None> | 0             | 294                 | 489.4          |
| 317 | J-117 | 241           | <None> | 29.24         | 292.2               | 500.7          |
| 319 | J-118 | 243           | <None> | 29.24         | 292.2               | 481.1          |
| 321 | J-119 | 243           | <None> | 29.24         | 292.2               | 481.1          |
| 325 | J-120 | 244           | <None> | 26.48         | 292.8               | 478            |
| 328 | J-121 | 242           | <None> | 26.48         | 292.7               | 496.3          |
| 330 | J-122 | 242           | <None> | 26.48         | 292.5               | 494.3          |
| 333 | J-123 | 238           | <None> | 32.06         | 292.2               | 530.2          |
| 335 | J-124 | 239           | <None> | 32.06         | 292.5               | 523.6          |
| 337 | J-125 | 240           | <None> | 32.06         | 292.3               | 511.7          |
| 340 | J-126 | 237           | <None> | 27.02         | 292.2               | 540            |
| 342 | J-127 | 236           | <None> | 27.02         | 292.2               | 549.7          |
| 344 | J-128 | 238           | <None> | 27.02         | 292.2               | 530.2          |
| 347 | J-129 | 239           | <None> | 32.06         | 292.2               | 520.4          |
| 398 | J-135 | 243           | <None> | 16            | 293                 | 489.8          |

| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 405 | J-136 | 245.8         | <None> | 94            | 293.2               | 464.4          |
| 408 | J-137 | 242.5         | <None> | 100.15        | 293.3               | 496.8          |
| 411 | J-140 | 247.2         | <None> | 104           | 293.3               | 451.5          |
| 415 | J-141 | 250.1         | <None> | 0             | 293.9               | 428.4          |
| 416 | J-142 | 249.5         | <None> | 104           | 293.5               | 430.9          |
| 417 | J-143 | 249.1         | <None> | 104           | 293.5               | 434.1          |
| 422 | J-144 | 249.8         | <None> | 119.5         | 295.8               | 449.7          |
| 423 | J-145 | 248.5         | <None> | 119.5         | 295.2               | 457.4          |
| 424 | J-146 | 253.9         | <None> | 119.5         | 297.4               | 426            |
| 430 | J-147 | 247.9         | <None> | 119.5         | 294.7               | 457.7          |
| 431 | J-148 | 245.3         | <None> | 119.5         | 294.2               | 479            |
| 435 | J-149 | 238.2         | <None> | 120           | 292.7               | 533            |
| 436 | J-150 | 240.2         | <None> | 120           | 292.6               | 512.8          |
| 437 | J-151 | 238.5         | <None> | 120           | 292.5               | 528.7          |
| 442 | J-152 | 243.8         | <None> | 70.75         | 288                 | 432.6          |
| 443 | J-153 | 252.2         | <None> | 70.75         | 288                 | 350.4          |
| 444 | J-154 | 246.5         | <None> | 70.75         | 288                 | 406.2          |
| 445 | J-155 | 252.5         | <None> | 70.75         | 288                 | 347.5          |
| 451 | J-156 | 251.5         | <None> | 119.5         | 296.6               | 441            |
| 456 | J-157 | 246.1         | <None> | 100.15        | 293.3               | 462.2          |

## Pipe Report



| Id  | Label | Scaled Length | Start Node | Stop Node  | Diameter (mm) | Material     | Hazen-Williams C () | Has Check Valve? | Minor Loss (') | Flow (m3/d) | Velocity (ft/s) | Headloss Gradient (ft/ft) | Has User Defined Length? |
|-----|-------|---------------|------------|------------|---------------|--------------|---------------------|------------------|----------------|-------------|-----------------|---------------------------|--------------------------|
| 322 | P-165 | 269           | 313: J-115 | 321: J-119 | 300           | Ductile Iron | 130                 | FALSE            | 0              | (N/A)       | (N/A)           | (N/A)                     | FALSE                    |
| 326 | P-168 | 47            | 321: J-119 | 325: J-120 | 300           | Ductile Iron | 130                 | FALSE            | 0              | (N/A)       | (N/A)           | (N/A)                     | FALSE                    |
| 396 | P-204 | 50            | 167: R-2   | 379: PMP-4 | 200           | Ductile Iron | 130                 | FALSE            | 0              | (N/A)       | (N/A)           | (N/A)                     | FALSE                    |
| 397 | P-205 | 60            | 379: PMP-4 | 225: J-92  | 200           | Ductile Iron | 130                 | FALSE            | 0              | (N/A)       | (N/A)           | (N/A)                     | FALSE                    |
| 403 | P-210 | 11            | 168: R-3   | 382: PMP-5 | 200           | Ductile Iron | 130                 | FALSE            | 0              | (N/A)       | (N/A)           | (N/A)                     | FALSE                    |
| 404 | P-211 | 14            | 382: PMP-5 | 212: J-89  | 200           | Ductile Iron | 130                 | FALSE            | 0              | (N/A)       | (N/A)           | (N/A)                     | FALSE                    |
| 446 | P-233 | 400           | 444: J-154 | 445: J-155 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -10.14      | 0.01            | 0                         | FALSE                    |
| 343 | P-178 | 325           | 340: J-126 | 342: J-127 | 150           | Ductile Iron | 130                 | FALSE            | 0              | 9.17        | 0.02            | 0                         | FALSE                    |
| 450 | P-237 | 417           | 442: J-152 | 444: J-154 | 300           | Ductile Iron | 130                 | FALSE            | 0              | 60.61       | 0.03            | 0                         | FALSE                    |
| 447 | P-234 | 346           | 445: J-155 | 443: J-153 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -80.89      | 0.04            | 0                         | FALSE                    |
| 348 | P-181 | 374           | 311: J-114 | 347: J-129 | 300           | Ductile Iron | 130                 | FALSE            | 0              | 102.98      | 0.06            | 0                         | FALSE                    |
| 345 | P-179 | 131           | 342: J-127 | 344: J-128 | 150           | Ductile Iron | 130                 | FALSE            | 0              | -17.85      | 0.04            | 0                         | FALSE                    |
| 449 | P-236 | 338           | 239: J-97  | 442: J-152 | 300           | Ductile Iron | 130                 | FALSE            | 0              | 131.36      | 0.07            | 0                         | FALSE                    |
| 448 | P-235 | 225           | 443: J-153 | 239: J-97  | 300           | Ductile Iron | 130                 | FALSE            | 0              | -151.64     | 0.08            | 0                         | FALSE                    |
| 324 | P-167 | 234           | 319: J-118 | 321: J-119 | 150           | Ductile Iron | 130                 | FALSE            | 0              | 29.24       | 0.06            | 0                         | FALSE                    |
| 341 | P-177 | 235           | 333: J-123 | 340: J-126 | 150           | Ductile Iron | 130                 | FALSE            | 0              | 36.19       | 0.08            | 0                         | FALSE                    |
| 402 | P-209 | 393           | 203: J-87  | 199: J-86  | 200           | Ductile Iron | 130                 | FALSE            | 0              | 83.34       | 0.1             | 0                         | FALSE                    |
| 346 | P-180 | 151           | 344: J-128 | 333: J-123 | 150           | Ductile Iron | 130                 | FALSE            | 0              | -44.87      | 0.1             | 0                         | FALSE                    |
| 285 | P-143 | 372           | 282: J-104 | 284: J-105 | 150           | Ductile Iron | 130                 | FALSE            | 0              | 47.59       | 0.1             | 0                         | FALSE                    |
| 320 | P-164 | 273           | 317: J-117 | 319: J-118 | 150           | Ductile Iron | 130                 | FALSE            | 0              | 58.48       | 0.13            | 0                         | FALSE                    |
| 314 | P-161 | 153           | 311: J-114 | 313: J-115 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -403.03     | 0.22            | 0                         | FALSE                    |
| 458 | P-243 | 233           | 456: J-157 | 411: J-140 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -518.67     | 0.28            | 0                         | FALSE                    |
| 407 | P-213 | 282           | 405: J-136 | 235: J-96  | 150           | Ductile Iron | 130                 | FALSE            | 0              | 84.1        | 0.18            | 0                         | FALSE                    |
| 349 | P-182 | 101           | 347: J-129 | 333: J-123 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -535.01     | 0.29            | 0                         | FALSE                    |
| 318 | P-163 | 232           | 313: J-115 | 317: J-117 | 150           | Ductile Iron | 130                 | FALSE            | 0              | 87.72       | 0.19            | 0                         | FALSE                    |
| 413 | P-215 | 330           | 405: J-136 | 408: J-137 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -551.33     | 0.3             | 0                         | FALSE                    |
| 400 | P-207 | 368           | 398: J-135 | 199: J-86  | 200           | Ductile Iron | 130                 | FALSE            | 0              | -288.59     | 0.35            | 0                         | FALSE                    |
| 441 | P-232 | 196           | 437: J-151 | 335: J-124 | 300           | Ductile Iron | 130                 | FALSE            | 0              | 1053.3      | 0.57            | 0                         | FALSE                    |
| 412 | P-214 | 337           | 408: J-137 | 151: J-69  | 300           | Ductile Iron | 130                 | FALSE            | 0              | 1076.4      | 0.58            | 0                         | FALSE                    |
| 440 | P-231 | 483           | 436: J-150 | 437: J-151 | 300           | Ductile Iron | 130                 | FALSE            | 0              | 1173.3      | 0.63            | 0                         | FALSE                    |
| 439 | P-230 | 328           | 435: J-149 | 436: J-150 | 300           | Ductile Iron | 130                 | FALSE            | 0              | 1293.3      | 0.69            | 0                         | FALSE                    |
| 462 | P-245 | 663           | 456: J-157 | 417: J-143 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -1309.36    | 0.7             | 0                         | FALSE                    |
| 276 | P-137 | 601           | 199: J-86  | 275: J-102 | 150           | Ductile Iron | 130                 | FALSE            | 0              | -219.25     | 0.47            | 0                         | FALSE                    |
| 438 | P-229 | 211           | 328: J-121 | 435: J-149 | 300           | Ductile Iron | 130                 | FALSE            | 0              | 1413.3      | 0.76            | 0                         | FALSE                    |
| 420 | P-219 | 336           | 416: J-142 | 417: J-143 | 300           | Ductile Iron | 130                 | FALSE            | 0              | 1413.36     | 0.76            | 0                         | FALSE                    |
| 277 | P-138 | 162           | 275: J-102 | 235: J-96  | 150           | Ductile Iron | 130                 | FALSE            | 0              | -232.33     | 0.5             | 0                         | FALSE                    |
| 457 | P-242 | 192           | 408: J-137 | 456: J-157 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -1727.88    | 0.93            | 0                         | FALSE                    |
| 461 | P-244 | 282           | 235: J-96  | 411: J-140 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -1744.8     | 0.94            | 0                         | FALSE                    |
| 271 | P-133 | 174           | 266: J-100 | 270: J-101 | 200           | Ductile Iron | 130                 | FALSE            | 0              | 639.34      | 0.77            | 0                         | FALSE                    |
| 267 | P-130 | 327           | 159: J-72  | 266: J-100 | 200           | Ductile Iron | 130                 | FALSE            | 0              | 664.9       | 0.8             | 0                         | FALSE                    |
| 329 | P-170 | 310           | 325: J-120 | 328: J-121 | 300           | Ductile Iron | 130                 | FALSE            | 0              | 1983.49     | 1.07            | 0                         | FALSE                    |
| 269 | P-132 | 491           | 151: J-69  | 159: J-72  | 200           | Ductile Iron | 130                 | FALSE            | 0              | 690.46      | 0.83            | 0                         | FALSE                    |
| 339 | P-176 | 233           | 337: J-125 | 311: J-114 | 150           | Ductile Iron | 130                 | FALSE            | 0              | 341.05      | 0.73            | 0                         | FALSE                    |
| 305 | P-157 | 290           | 303: J-111 | 291: J-107 | 150           | Ductile Iron | 130                 | FALSE            | 0              | -349.63     | 0.75            | 0                         | FALSE                    |
| 399 | P-206 | 327           | 151: J-69  | 398: J-135 | 150           | Ductile Iron | 130                 | FALSE            | 0              | 360.38      | 0.77            | 0.001                     | FALSE                    |
| 294 | P-149 | 238           | 291: J-107 | 293: J-108 | 150           | Ductile Iron | 130                 | FALSE            | 0              | -371.34     | 0.8             | 0.001                     | FALSE                    |
| 338 | P-175 | 392           | 335: J-124 | 337: J-125 | 150           | Ductile Iron | 130                 | FALSE            | 0              | 373.11      | 0.8             | 0.001                     | FALSE                    |
| 406 | P-212 | 365           | 398: J-135 | 405: J-136 | 150           | Ductile Iron | 130                 | FALSE            | 0              | -373.23     | 0.8             | 0.001                     | FALSE                    |
| 418 | P-217 | 337           | 411: J-140 | 416: J-142 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -2367.47    | 1.27            | 0.001                     | FALSE                    |
| 296 | P-150 | 306           | 293: J-108 | 295: J-109 | 150           | Ductile Iron | 130                 | FALSE            | 0              | -393.05     | 0.84            | 0.001                     | FALSE                    |
| 288 | P-145 | 175           | 87: J-36   | 287: J-106 | 150           | Ductile Iron | 130                 | FALSE            | 0              | 430.66      | 0.93            | 0.001                     | FALSE                    |
| 401 | P-208 | 273           | 270: J-101 | 398: J-135 | 200           | Ductile Iron | 130                 | FALSE            | 0              | -1006.21    | 1.22            | 0.001                     | FALSE                    |
| 304 | P-156 | 149           | 239: J-97  | 303: J-111 | 300           | Ductile Iron | 130                 | FALSE            | 0              | -3000.07    | 1.61            | 0.001                     | FALSE                    |

| Id  | Label | Scaled Lenç | Start Node | Stop Node  | Diameter (mm) | Material     | Hazen-Williams C () | Has Check Valve? | Minor Loss () | Flow (m3/d) | Velocity (ft/s) | Headloss Gradient (ft/ft) | Has User Defined Length? |
|-----|-------|-------------|------------|------------|---------------|--------------|---------------------|------------------|---------------|-------------|-----------------|---------------------------|--------------------------|
| 332 | P-172 | 328         | 330: J-122 | 313: J-115 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 517.23      | 1.11            | 0.001                     | FALSE                    |
| 289 | P-146 | 346         | 287: J-106 | 280: J-103 | 150           | Ductile Iron | 130                 | FALSE            | 0             | -523.69     | 1.13            | 0.001                     | FALSE                    |
| 283 | P-142 | 206         | 280: J-103 | 282: J-104 | 150           | Ductile Iron | 130                 | FALSE            | 0             | -541.01     | 1.16            | 0.001                     | FALSE                    |
| 331 | P-171 | 181         | 328: J-121 | 330: J-122 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 543.71      | 1.17            | 0.001                     | FALSE                    |
| 278 | P-139 | 299         | 87: J-36   | 119: J-53  | 150           | Ductile Iron | 130                 | FALSE            | 0             | -547.23     | 1.18            | 0.001                     | FALSE                    |
| 209 | P-95  | 113         | 119: J-53  | 208: J-88  | 150           | Ductile Iron | 130                 | FALSE            | 0             | -565.23     | 1.21            | 0.001                     | FALSE                    |
| 224 | P-107 | 184         | 220: J-91  | 85: J-35   | 150           | Ductile Iron | 130                 | FALSE            | 0             | 582.2       | 1.25            | 0.001                     | FALSE                    |
| 434 | P-228 | 187         | 431: J-148 | 315: J-116 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 3611.24     | 1.94            | 0.001                     | FALSE                    |
| 433 | P-227 | 309         | 430: J-147 | 431: J-148 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 3730.74     | 2               | 0.001                     | FALSE                    |
| 350 | P-183 | 129         | 347: J-129 | 282: J-104 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 605.93      | 1.3             | 0.001                     | FALSE                    |
| 352 | P-185 | 132         | 311: J-114 | 284: J-105 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 609.04      | 1.31            | 0.001                     | FALSE                    |
| 432 | P-226 | 394         | 423: J-145 | 430: J-147 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 3850.24     | 2.07            | 0.001                     | FALSE                    |
| 419 | P-218 | 235         | 416: J-142 | 415: J-141 | 300           | Ductile Iron | 130                 | FALSE            | 0             | -3884.83    | 2.09            | 0.001                     | FALSE                    |
| 421 | P-220 | 428         | 415: J-141 | 235: J-96  | 300           | Ductile Iron | 130                 | FALSE            | 0             | 3913.17     | 2.1             | 0.001                     | FALSE                    |
| 286 | P-144 | 303         | 284: J-105 | 87: J-36   | 150           | Ductile Iron | 130                 | FALSE            | 0             | 639.32      | 1.37            | 0.002                     | FALSE                    |
| 455 | P-241 | 341         | 422: J-144 | 423: J-145 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 3969.74     | 2.13            | 0.002                     | FALSE                    |
| 336 | P-174 | 210         | 333: J-123 | 335: J-124 | 150           | Ductile Iron | 130                 | FALSE            | 0             | -648.13     | 1.39            | 0.002                     | FALSE                    |
| 306 | P-158 | 262         | 295: J-109 | 303: J-111 | 250           | Ductile Iron | 130                 | FALSE            | 0             | 2666.89     | 2.06            | 0.002                     | FALSE                    |
| 454 | P-240 | 416         | 451: J-156 | 422: J-144 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 4539.65     | 2.44            | 0.002                     | FALSE                    |
| 249 | P-124 | 318         | 247: J-99  | 87: J-36   | 150           | Ductile Iron | 130                 | FALSE            | 0             | -738.32     | 1.59            | 0.002                     | FALSE                    |
| 351 | P-184 | 454         | 315: J-116 | 203: J-87  | 200           | Ductile Iron | 130                 | FALSE            | 0             | 1601.27     | 1.94            | 0.002                     | FALSE                    |
| 453 | P-239 | 424         | 424: J-146 | 451: J-156 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 4659.15     | 2.5             | 0.002                     | FALSE                    |
| 300 | P-153 | 145         | 295: J-109 | 299: J-110 | 250           | Ductile Iron | 130                 | FALSE            | 0             | -3076.39    | 2.38            | 0.002                     | FALSE                    |
| 251 | P-126 | 219         | 247: J-99  | 90: J-38   | 150           | Ductile Iron | 130                 | FALSE            | 0             | 805.08      | 1.73            | 0.002                     | FALSE                    |
| 248 | P-123 | 158         | 85: J-35   | 247: J-99  | 150           | Ductile Iron | 130                 | FALSE            | 0             | -819.02     | 1.76            | 0.002                     | FALSE                    |
| 226 | P-108 | 462         | 220: J-91  | 225: J-92  | 300           | Ductile Iron | 130                 | FALSE            | 0             | -5483.57    | 2.95            | 0.003                     | FALSE                    |
| 236 | P-114 | 432         | 225: J-92  | 235: J-96  | 300           | Ductile Iron | 130                 | FALSE            | 0             | -5496.65    | 2.95            | 0.003                     | FALSE                    |
| 279 | P-140 | 222         | 247: J-99  | 121: J-54  | 150           | Ductile Iron | 130                 | FALSE            | 0             | -903.35     | 1.94            | 0.003                     | FALSE                    |
| 210 | P-96  | 157         | 208: J-88  | 121: J-54  | 150           | Ductile Iron | 130                 | FALSE            | 0             | 919.35      | 1.98            | 0.003                     | FALSE                    |
| 213 | P-98  | 66          | 90: J-38   | 212: J-89  | 150           | Ductile Iron | 130                 | FALSE            | 0             | -919.46     | 1.98            | 0.003                     | FALSE                    |
| 290 | P-147 | 264         | 287: J-106 | 212: J-89  | 150           | Ductile Iron | 130                 | FALSE            | 0             | 937.03      | 2.01            | 0.003                     | FALSE                    |
| 241 | P-118 | 725         | 239: J-97  | 220: J-91  | 300           | Ductile Iron | 130                 | FALSE            | 0             | -6503.42    | 3.49            | 0.004                     | FALSE                    |
| 452 | P-238 | 353         | 422: J-144 | 424: J-146 | 300           | Ductile Iron | 130                 | FALSE            | 0             | -7347.59    | 3.95            | 0.005                     | FALSE                    |
| 425 | P-221 | 353         | 415: J-141 | 422: J-144 | 300           | Ductile Iron | 130                 | FALSE            | 0             | -7798       | 4.19            | 0.005                     | FALSE                    |
| 301 | P-154 | 250         | 299: J-110 | 85: J-35   | 150           | Ductile Iron | 130                 | FALSE            | 0             | -1385.87    | 2.98            | 0.006                     | FALSE                    |
| 389 | P-201 | 614         | 27: J-4    | 388: T-4   | 300           | Ductile Iron | 130                 | FALSE            | 0             | 9191.61     | 4.94            | 0.007                     | FALSE                    |
| 240 | P-117 | 302         | 27: J-4    | 239: J-97  | 300           | Ductile Iron | 130                 | FALSE            | 0             | -9206.05    | 4.95            | 0.007                     | FALSE                    |
| 211 | P-97  | 146         | 203: J-87  | 208: J-88  | 150           | Ductile Iron | 130                 | FALSE            | 0             | 1502.58     | 3.23            | 0.007                     | FALSE                    |
| 273 | P-135 | 240         | 220: J-91  | 270: J-101 | 150           | Ductile Iron | 130                 | FALSE            | 0             | -1628.9     | 3.5             | 0.009                     | FALSE                    |
| 302 | P-155 | 156         | 90: J-38   | 299: J-110 | 150           | Ductile Iron | 130                 | FALSE            | 0             | 1706.97     | 3.67            | 0.009                     | FALSE                    |
| 475 | P-246 | 155         | 474: T-5   | 424: J-146 | 300           | Ductile Iron | 130                 | FALSE            | 0             | 12126.24    | 6.51            | 0.012                     | FALSE                    |
| 327 | P-169 | 92          | 325: J-120 | 315: J-116 | 150           | Ductile Iron | 130                 | FALSE            | 0             | -2009.97    | 4.32            | 0.013                     | FALSE                    |

## Tank Report



| Id  | Label | Zone   | Base Elevation (m) | Minimum Elevation (m) | Initial Elevation (m) | Maximum Elevation (m) | Inactive Volume (m?) | Diameter (ft) | Outflow (m <sup>3</sup> /d) | Hydraulic Grade (m) |
|-----|-------|--------|--------------------|-----------------------|-----------------------|-----------------------|----------------------|---------------|-----------------------------|---------------------|
| 388 | T-4   | <None> | 278.4              | 280.4                 | 281.4                 | 281.7                 | 1600                 | 86.82         | -9191.61                    | 281.4               |
| 474 | T-5   | <None> | 264                | 264.2                 | 299.3                 | 299.5                 | 0                    | 37.02         | 12126.24                    | 299.3               |

## Reservoir Report





| Id  | Label | Elevation (m) | Zone   | Outflow (m3/d) | Hydraulic Grade (m) |
|-----|-------|---------------|--------|----------------|---------------------|
| 167 | R-2   | 332           | <None> | (N/A)          | (N/A)               |
| 168 | R-3   | 351           | <None> | (N/A)          | (N/A)               |

**Water Storage Option WS4 –  
Elevated Storage at New Location**

**Water Distribution Option WD2-  
New Trunk Watermain 300 mm with Improvements to Ex. System**

**Scenario: Maximum Daily Demand (M.D.D.)**



## Junction Report



| Id  | Label | Elevation (m) | Zone   | Demand (m <sup>3</sup> /d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|----------------------------|---------------------|----------------|
| 27  | J-4   | 246           | <None> | 27.37                      | 286                 | 391.1          |
| 85  | J-35  | 241           | <None> | 29.1                       | 290.9               | 488.8          |
| 87  | J-36  | 241           | <None> | 33.3                       | 291.8               | 497.2          |
| 90  | J-38  | 240           | <None> | 33.3                       | 290.7               | 495.9          |
| 119 | J-53  | 243.2         | <None> | 34.12                      | 292.3               | 480.7          |
| 121 | J-54  | 242.1         | <None> | 30.33                      | 292                 | 488.2          |
| 151 | J-69  | 241           | <None> | 48.45                      | 294.2               | 520.4          |
| 159 | J-72  | 254           | <None> | 48.45                      | 293.9               | 390.5          |
| 199 | J-86  | 244           | <None> | 26.54                      | 294                 | 488.9          |
| 203 | J-87  | 244.2         | <None> | 29.1                       | 294                 | 486.9          |
| 208 | J-88  | 243.2         | <None> | 34.12                      | 292.5               | 482.8          |
| 212 | J-89  | 240           | <None> | 33.3                       | 290.9               | 497.7          |
| 220 | J-91  | 242.2         | <None> | 50.89                      | 291.3               | 480.7          |
| 225 | J-92  | 244.1         | <None> | 24.79                      | 292.8               | 476.8          |
| 235 | J-96  | 246.1         | <None> | 24.79                      | 294.2               | 471            |
| 239 | J-97  | 242           | <None> | 27.37                      | 288.2               | 452.4          |
| 247 | J-99  | 241           | <None> | 33.3                       | 291.3               | 491.9          |
| 266 | J-100 | 242           | <None> | 48.45                      | 293.7               | 506.3          |
| 270 | J-101 | 242.2         | <None> | 31.56                      | 293.7               | 503.6          |
| 275 | J-102 | 247           | <None> | 24.79                      | 294.2               | 461.6          |
| 280 | J-103 | 242           | <None> | 32.83                      | 291.9               | 488.7          |
| 282 | J-104 | 241           | <None> | 32.83                      | 292.1               | 500.3          |
| 284 | J-105 | 241           | <None> | 32.83                      | 292.1               | 500.3          |
| 287 | J-106 | 240           | <None> | 32.83                      | 291.6               | 505.4          |
| 291 | J-107 | 242           | <None> | 41.15                      | 288.5               | 455            |
| 293 | J-108 | 240           | <None> | 41.15                      | 288.6               | 475.9          |
| 295 | J-109 | 240           | <None> | 31.18                      | 288.8               | 478            |
| 299 | J-110 | 240           | <None> | 31.18                      | 289.2               | 481.4          |
| 303 | J-111 | 242           | <None> | 31.18                      | 288.4               | 453.7          |
| 311 | J-114 | 240           | <None> | 60.77                      | 292.3               | 511.6          |
| 313 | J-115 | 242           | <None> | 50.19                      | 292.3               | 492            |
| 315 | J-116 | 244           | <None> | 0                          | 295                 | 499.5          |
| 317 | J-117 | 241           | <None> | 55.42                      | 292.2               | 501.5          |
| 319 | J-118 | 243           | <None> | 55.42                      | 292.2               | 481.8          |
| 321 | J-119 | 243           | <None> | 55.42                      | 292.2               | 481.7          |
| 325 | J-120 | 244           | <None> | 50.19                      | 293.2               | 481.2          |
| 328 | J-121 | 242           | <None> | 50.19                      | 293                 | 498.8          |
| 330 | J-122 | 242           | <None> | 50.19                      | 292.7               | 496.1          |
| 333 | J-123 | 238           | <None> | 60.77                      | 292.3               | 531.2          |
| 335 | J-124 | 239           | <None> | 60.77                      | 292.7               | 525.1          |
| 337 | J-125 | 240           | <None> | 60.77                      | 292.4               | 512.7          |
| 340 | J-126 | 237           | <None> | 51.22                      | 292.3               | 540.9          |
| 342 | J-127 | 236           | <None> | 51.22                      | 292.3               | 550.7          |
| 344 | J-128 | 238           | <None> | 51.22                      | 292.3               | 531.1          |
| 347 | J-129 | 239           | <None> | 60.77                      | 292.3               | 521.3          |
| 398 | J-135 | 243           | <None> | 30.33                      | 293.9               | 498.5          |

| Id  | Label | Elevation (m) | Zone   | Demand (m <sup>3</sup> /d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|----------------------------|---------------------|----------------|
| 405 | J-136 | 245.8         | <None> | 178.18                     | 294.2               | 473.9          |
| 408 | J-137 | 242.5         | <None> | 189.83                     | 294.2               | 506.3          |
| 411 | J-140 | 247.2         | <None> | 197.13                     | 294.3               | 461.3          |
| 415 | J-141 | 250.1         | <None> | 0                          | 295.1               | 440.1          |
| 416 | J-142 | 249.5         | <None> | 197.13                     | 294.6               | 441.3          |
| 417 | J-143 | 249.1         | <None> | 197.13                     | 294.5               | 444.2          |
| 422 | J-144 | 249.8         | <None> | 226.51                     | 297.6               | 468.1          |
| 423 | J-145 | 248.5         | <None> | 226.51                     | 296.8               | 473            |
| 424 | J-146 | 253.9         | <None> | 226.51                     | 300.1               | 451.7          |
| 430 | J-147 | 247.9         | <None> | 226.51                     | 296                 | 470.6          |
| 431 | J-148 | 245.3         | <None> | 226.51                     | 295.4               | 490            |
| 435 | J-149 | 238.2         | <None> | 227.46                     | 292.9               | 535.2          |
| 436 | J-150 | 240.2         | <None> | 227.46                     | 292.8               | 514.7          |
| 437 | J-151 | 238.5         | <None> | 227.46                     | 292.7               | 530.3          |
| 442 | J-152 | 243.8         | <None> | 134.11                     | 288.2               | 434.7          |
| 443 | J-153 | 252.2         | <None> | 134.11                     | 288.2               | 352.5          |
| 444 | J-154 | 246.5         | <None> | 134.11                     | 288.2               | 408.3          |
| 445 | J-155 | 252.5         | <None> | 134.11                     | 288.2               | 349.6          |
| 451 | J-156 | 251.5         | <None> | 226.51                     | 298.8               | 462.8          |
| 456 | J-157 | 246.1         | <None> | 189.83                     | 294.3               | 471.9          |

## Pipe Report



| Id | Label     | Scaled Length (m) | Start Node | Stop Node  | Diameter (mm) | Material     | Hazen-Williams C ( ) | Has Check Valve? | Minor Loss ( ) | Flow (m3/d) | Velocity (ft/s) | Headloss Gradient (ft/ft) | Has User Defined Length? |
|----|-----------|-------------------|------------|------------|---------------|--------------|----------------------|------------------|----------------|-------------|-----------------|---------------------------|--------------------------|
|    | 322 P-165 | 269               | 313: J-115 | 321: J-119 | 300           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                     | FALSE                    |
|    | 326 P-168 | 47                | 321: J-119 | 325: J-120 | 300           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                     | FALSE                    |
|    | 396 P-204 | 50                | 167: R-2   | 379: PMP-4 | 200           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                     | FALSE                    |
|    | 397 P-205 | 60                | 379: PMP-4 | 225: J-92  | 200           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                     | FALSE                    |
|    | 403 P-210 | 11                | 168: R-3   | 382: PMP-5 | 200           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                     | FALSE                    |
|    | 404 P-211 | 14                | 382: PMP-5 | 212: J-89  | 200           | Ductile Iron | 130                  | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                     | FALSE                    |
|    | 446 P-233 | 400               | 444: J-154 | 445: J-155 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -19.29      | 0.01            | 0                         | FALSE                    |
|    | 402 P-209 | 393               | 203: J-87  | 199: J-86  | 200           | Ductile Iron | 130                  | FALSE            | 0              | -33.83      | 0.04            | 0                         | FALSE                    |
|    | 285 P-143 | 372               | 282: J-104 | 284: J-105 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 16.31       | 0.04            | 0                         | FALSE                    |
|    | 343 P-178 | 325               | 340: J-126 | 342: J-127 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 17.38       | 0.04            | 0                         | FALSE                    |
|    | 450 P-237 | 417               | 442: J-152 | 444: J-154 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 114.82      | 0.06            | 0                         | FALSE                    |
|    | 348 P-181 | 374               | 311: J-114 | 347: J-129 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 117.47      | 0.06            | 0                         | FALSE                    |
|    | 447 P-234 | 346               | 445: J-155 | 443: J-153 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -153.39     | 0.08            | 0                         | FALSE                    |
|    | 345 P-179 | 131               | 342: J-127 | 344: J-128 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -33.84      | 0.07            | 0                         | FALSE                    |
|    | 449 P-236 | 338               | 239: J-97  | 442: J-152 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 248.93      | 0.13            | 0                         | FALSE                    |
|    | 448 P-235 | 225               | 443: J-153 | 239: J-97  | 300           | Ductile Iron | 130                  | FALSE            | 0              | -287.5      | 0.15            | 0                         | FALSE                    |
|    | 324 P-167 | 234               | 319: J-118 | 321: J-119 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 55.42       | 0.12            | 0                         | FALSE                    |
|    | 314 P-161 | 153               | 311: J-114 | 313: J-115 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -368.06     | 0.2             | 0                         | FALSE                    |
|    | 341 P-177 | 235               | 333: J-123 | 340: J-126 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 68.59       | 0.15            | 0                         | FALSE                    |
|    | 407 P-213 | 282               | 405: J-136 | 235: J-96  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -72.3       | 0.16            | 0                         | FALSE                    |
|    | 349 P-182 | 101               | 347: J-129 | 333: J-123 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -487.71     | 0.26            | 0                         | FALSE                    |
|    | 346 P-180 | 151               | 344: J-128 | 333: J-123 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -85.06      | 0.18            | 0                         | FALSE                    |
|    | 413 P-215 | 330               | 405: J-136 | 408: J-137 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -557.39     | 0.3             | 0                         | FALSE                    |
|    | 400 P-207 | 368               | 398: J-135 | 199: J-86  | 200           | Ductile Iron | 130                  | FALSE            | 0              | -230.32     | 0.28            | 0                         | FALSE                    |
|    | 320 P-164 | 273               | 317: J-117 | 319: J-118 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 110.85      | 0.24            | 0                         | FALSE                    |
|    | 458 P-243 | 233               | 456: J-157 | 411: J-140 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -707.09     | 0.38            | 0                         | FALSE                    |
|    | 318 P-163 | 232               | 313: J-115 | 317: J-117 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 166.27      | 0.36            | 0                         | FALSE                    |
|    | 441 P-232 | 196               | 437: J-151 | 335: J-124 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 1175.46     | 0.63            | 0                         | FALSE                    |
|    | 412 P-214 | 337               | 408: J-137 | 151: J-69  | 300           | Ductile Iron | 130                  | FALSE            | 0              | 1275.92     | 0.69            | 0                         | FALSE                    |
|    | 440 P-231 | 483               | 436: J-150 | 437: J-151 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 1402.92     | 0.75            | 0                         | FALSE                    |
|    | 462 P-245 | 663               | 456: J-157 | 417: J-143 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -1505.88    | 0.81            | 0                         | FALSE                    |
|    | 439 P-230 | 328               | 435: J-149 | 436: J-150 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 1630.38     | 0.88            | 0                         | FALSE                    |
|    | 420 P-219 | 336               | 416: J-142 | 417: J-143 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 1703.01     | 0.91            | 0                         | FALSE                    |
|    | 276 P-137 | 601               | 199: J-86  | 275: J-102 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -290.69     | 0.62            | 0                         | FALSE                    |
|    | 461 P-244 | 282               | 235: J-96  | 411: J-140 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -1846.7     | 0.99            | 0                         | FALSE                    |
|    | 438 P-229 | 211               | 328: J-121 | 435: J-149 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 1857.84     | 1               | 0                         | FALSE                    |
|    | 277 P-138 | 162               | 275: J-102 | 235: J-96  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -315.48     | 0.68            | 0                         | FALSE                    |
|    | 457 P-242 | 192               | 408: J-137 | 456: J-157 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -2023.14    | 1.09            | 0                         | FALSE                    |
|    | 271 P-133 | 174               | 266: J-100 | 270: J-101 | 200           | Ductile Iron | 130                  | FALSE            | 0              | 697.33      | 0.84            | 0                         | FALSE                    |
|    | 305 P-157 | 290               | 303: J-111 | 291: J-107 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -334.92     | 0.72            | 0                         | FALSE                    |
|    | 267 P-130 | 327               | 159: J-72  | 266: J-100 | 200           | Ductile Iron | 130                  | FALSE            | 0              | 745.78      | 0.9             | 0                         | FALSE                    |
|    | 339 P-176 | 233               | 337: J-125 | 311: J-114 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 351.78      | 0.76            | 0.001                     | FALSE                    |
|    | 269 P-132 | 491               | 151: J-69  | 159: J-72  | 200           | Ductile Iron | 130                  | FALSE            | 0              | 794.23      | 0.96            | 0.001                     | FALSE                    |
|    | 294 P-149 | 238               | 291: J-107 | 293: J-108 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -376.07     | 0.81            | 0.001                     | FALSE                    |
|    | 329 P-170 | 310               | 325: J-120 | 328: J-121 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 2542.75     | 1.37            | 0.001                     | FALSE                    |
|    | 338 P-175 | 392               | 335: J-124 | 337: J-125 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 412.55      | 0.89            | 0.001                     | FALSE                    |
|    | 296 P-150 | 306               | 293: J-108 | 295: J-109 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -417.22     | 0.9             | 0.001                     | FALSE                    |
|    | 399 P-206 | 327               | 151: J-69  | 398: J-135 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 433.24      | 0.93            | 0.001                     | FALSE                    |
|    | 418 P-217 | 337               | 411: J-140 | 416: J-142 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -2750.92    | 1.48            | 0.001                     | FALSE                    |
|    | 406 P-212 | 365               | 398: J-135 | 405: J-136 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -451.51     | 0.97            | 0.001                     | FALSE                    |
|    | 289 P-146 | 346               | 287: J-106 | 280: J-103 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -462.44     | 0.99            | 0.001                     | FALSE                    |
|    | 304 P-156 | 149               | 239: J-97  | 303: J-111 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -3014.29    | 1.62            | 0.001                     | FALSE                    |
|    | 288 P-145 | 175               | 87: J-36   | 287: J-106 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 491.05      | 1.06            | 0.001                     | FALSE                    |

| Id  | Label | Scaled Length (m) | Start Node | Stop Node  | Diameter (mm) | Material     | Hazen-Williams C ( ) | Has Check Valve? | Minor Loss ( ) | Flow (m3/d) | Velocity (ft/s) | Headloss Gradient (ft/ft) | Has User Defined Length? |
|-----|-------|-------------------|------------|------------|---------------|--------------|----------------------|------------------|----------------|-------------|-----------------|---------------------------|--------------------------|
| 283 | P-142 | 206               | 280: J-103 | 282: J-104 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -495.27     | 1.06            | 0.001                     | FALSE                    |
| 401 | P-208 | 273               | 270: J-101 | 398: J-135 | 200           | Ductile Iron | 130                  | FALSE            | 0              | -1084.74    | 1.31            | 0.001                     | FALSE                    |
| 286 | P-144 | 303               | 284: J-105 | 87: J-36   | 150           | Ductile Iron | 130                  | FALSE            | 0              | 525.09      | 1.13            | 0.001                     | FALSE                    |
| 352 | P-185 | 132               | 311: J-114 | 284: J-105 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 541.61      | 1.16            | 0.001                     | FALSE                    |
| 350 | P-183 | 129               | 347: J-129 | 282: J-104 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 544.41      | 1.17            | 0.001                     | FALSE                    |
| 332 | P-172 | 328               | 330: J-122 | 313: J-115 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 584.53      | 1.26            | 0.001                     | FALSE                    |
| 331 | P-171 | 181               | 328: J-121 | 330: J-122 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 634.72      | 1.36            | 0.001                     | FALSE                    |
| 278 | P-139 | 299               | 87: J-36   | 119: J-53  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -682.57     | 1.47            | 0.002                     | FALSE                    |
| 249 | P-124 | 318               | 247: J-99  | 87: J-36   | 150           | Ductile Iron | 130                  | FALSE            | 0              | -683.3      | 1.47            | 0.002                     | FALSE                    |
| 434 | P-228 | 187               | 431: J-148 | 315: J-116 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 4336.86     | 2.33            | 0.002                     | FALSE                    |
| 336 | P-174 | 210               | 333: J-123 | 335: J-124 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -702.13     | 1.51            | 0.002                     | FALSE                    |
| 306 | P-158 | 262               | 295: J-109 | 303: J-111 | 250           | Ductile Iron | 130                  | FALSE            | 0              | 2710.55     | 2.1             | 0.002                     | FALSE                    |
| 209 | P-95  | 113               | 119: J-53  | 208: J-88  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -716.69     | 1.54            | 0.002                     | FALSE                    |
| 433 | P-227 | 309               | 430: J-147 | 431: J-148 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 4563.37     | 2.45            | 0.002                     | FALSE                    |
| 421 | P-220 | 428               | 415: J-141 | 235: J-96  | 300           | Ductile Iron | 130                  | FALSE            | 0              | 4565.18     | 2.45            | 0.002                     | FALSE                    |
| 248 | P-123 | 158               | 85: J-35   | 247: J-99  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -745.86     | 1.6             | 0.002                     | FALSE                    |
| 224 | P-107 | 184               | 220: J-91  | 85: J-35   | 150           | Ductile Iron | 130                  | FALSE            | 0              | 747.67      | 1.61            | 0.002                     | FALSE                    |
| 419 | P-218 | 235               | 416: J-142 | 415: J-141 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -4651.07    | 2.5             | 0.002                     | FALSE                    |
| 432 | P-226 | 394               | 423: J-145 | 430: J-147 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 4789.88     | 2.57            | 0.002                     | FALSE                    |
| 455 | P-241 | 341               | 422: J-144 | 423: J-145 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 5016.39     | 2.69            | 0.002                     | FALSE                    |
| 351 | P-184 | 454               | 315: J-116 | 203: J-87  | 200           | Ductile Iron | 130                  | FALSE            | 0              | 1743.91     | 2.11            | 0.002                     | FALSE                    |
| 300 | P-153 | 145               | 295: J-109 | 299: J-110 | 250           | Ductile Iron | 130                  | FALSE            | 0              | -3158.95    | 2.44            | 0.002                     | FALSE                    |
| 251 | P-126 | 219               | 247: J-99  | 90: J-38   | 150           | Ductile Iron | 130                  | FALSE            | 0              | 871.64      | 1.87            | 0.003                     | FALSE                    |
| 213 | P-98  | 66                | 90: J-38   | 212: J-89  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -887.36     | 1.91            | 0.003                     | FALSE                    |
| 454 | P-240 | 416               | 451: J-156 | 422: J-144 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 5496.3      | 2.95            | 0.003                     | FALSE                    |
| 290 | P-147 | 264               | 287: J-106 | 212: J-89  | 150           | Ductile Iron | 130                  | FALSE            | 0              | 920.67      | 1.98            | 0.003                     | FALSE                    |
| 453 | P-239 | 424               | 424: J-146 | 451: J-156 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 5722.81     | 3.07            | 0.003                     | FALSE                    |
| 226 | P-108 | 462               | 220: J-91  | 225: J-92  | 300           | Ductile Iron | 130                  | FALSE            | 0              | -5974.52    | 3.21            | 0.003                     | FALSE                    |
| 279 | P-140 | 222               | 247: J-99  | 121: J-54  | 150           | Ductile Iron | 130                  | FALSE            | 0              | -967.51     | 2.08            | 0.003                     | FALSE                    |
| 236 | P-114 | 432               | 225: J-92  | 235: J-96  | 300           | Ductile Iron | 130                  | FALSE            | 0              | -5999.31    | 3.22            | 0.003                     | FALSE                    |
| 210 | P-96  | 157               | 208: J-88  | 121: J-54  | 150           | Ductile Iron | 130                  | FALSE            | 0              | 997.84      | 2.14            | 0.003                     | FALSE                    |
| 241 | P-118 | 725               | 239: J-97  | 220: J-91  | 300           | Ductile Iron | 130                  | FALSE            | 0              | -6926.46    | 3.72            | 0.004                     | FALSE                    |
| 452 | P-238 | 353               | 422: J-144 | 424: J-146 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -8962.85    | 4.81            | 0.007                     | FALSE                    |
| 301 | P-154 | 250               | 299: J-110 | 85: J-35   | 150           | Ductile Iron | 130                  | FALSE            | 0              | -1464.43    | 3.15            | 0.007                     | FALSE                    |
| 425 | P-221 | 353               | 415: J-141 | 422: J-144 | 300           | Ductile Iron | 130                  | FALSE            | 0              | -9216.25    | 4.95            | 0.007                     | FALSE                    |
| 389 | P-201 | 614               | 27: J-4    | 388: T-4   | 300           | Ductile Iron | 130                  | FALSE            | 0              | 9349.58     | 5.02            | 0.007                     | FALSE                    |
| 240 | P-117 | 302               | 27: J-4    | 239: J-97  | 300           | Ductile Iron | 130                  | FALSE            | 0              | -9376.95    | 5.04            | 0.007                     | FALSE                    |
| 302 | P-155 | 156               | 90: J-38   | 299: J-110 | 150           | Ductile Iron | 130                  | FALSE            | 0              | 1725.7      | 3.71            | 0.01                      | FALSE                    |
| 211 | P-97  | 146               | 203: J-87  | 208: J-88  | 150           | Ductile Iron | 130                  | FALSE            | 0              | 1748.65     | 3.76            | 0.01                      | FALSE                    |
| 273 | P-135 | 240               | 220: J-91  | 270: J-101 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -1750.51    | 3.76            | 0.01                      | FALSE                    |
| 475 | P-246 | 155               | 474: T-5   | 424: J-146 | 300           | Ductile Iron | 130                  | FALSE            | 0              | 14912.17    | 8.01            | 0.018                     | FALSE                    |
| 327 | P-169 | 92                | 325: J-120 | 315: J-116 | 150           | Ductile Iron | 130                  | FALSE            | 0              | -2592.94    | 5.57            | 0.02                      | FALSE                    |



## Tank Report



| Id  | Label | Zone   | Base Elevation (m) | Minimum Elevation (m) | Initial Elevation (m) | Maximum Elevation (m) | Inactive Volume (m3) | Diameter (ft) | Outflow (m3/d) | Hydraulic Grade (m) |
|-----|-------|--------|--------------------|-----------------------|-----------------------|-----------------------|----------------------|---------------|----------------|---------------------|
| 388 | T-4   | <None> | 278.4              | 280.4                 | 281.4                 | 281.7                 | 1600                 | 86.82         | -9349.58       | 281.4               |
| 474 | T-5   | <None> | 264                | 264.2                 | 302.8                 | 303                   | 0                    | 37.02         | 14912.17       | 302.8               |

## Reservoir Report



| Id  | Label | Elevation (m) | Zone   | Outflow (m3/d) | Hydraulic Grade (m) |
|-----|-------|---------------|--------|----------------|---------------------|
| 167 | R-2   | 332           | <None> | (N/A)          | (N/A)               |
| 168 | R-3   | 351           | <None> | (N/A)          | (N/A)               |

**Water Storage Option WS4 –  
Elevated Storage at New Location**

**Water Distribution Option WD2-  
New Trunk Watermain 300 mm with Improvements to Ex. System**

**Scenario: Maximum Daily Demand with Fire Storage (M.D.D.+Fire)**



## Fire Flow Report



| Label | Zone   | Fire Flow Iterations | Satisfies Fire Flow Constraints? | Fire Flow (Available)     |         | Flow (Total Needed) (m³/d) | Flow (Total Available) (m³/d) | Pressure (Residual Lower Limit) (kPa) | Pressure (Calculated)       |  | Pressure (Zone Lower Limit) (kPa) | Calculated Minimum Zone Pressure (kPa) |
|-------|--------|----------------------|----------------------------------|---------------------------|---------|----------------------------|-------------------------------|---------------------------------------|-----------------------------|--|-----------------------------------|----------------------------------------|
|       |        |                      |                                  | Fire Flow (Needed) (m³/d) | (m³/d)  |                            |                               |                                       | Residual Lower Limit) (kPa) |  |                                   |                                        |
| J-4   | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2633.06                    | 8681.06                       | 0                                     | 245.2                       |  | 0                                 | 145.6                                  |
| J-35  | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2635.64                    | 8683.64                       | 0                                     | 212.1                       |  | 0                                 | 139.3                                  |
| J-36  | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2641.96                    | 8689.96                       | 0                                     | 163.1                       |  | 0                                 | 138.9                                  |
| J-38  | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2641.96                    | 8689.96                       | 0                                     | 195.4                       |  | 0                                 | 139.7                                  |
| J-53  | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2643.18                    | 8691.18                       | 0                                     | 89.1                        |  | 0                                 | 138.5                                  |
| J-54  | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2637.49                    | 8685.49                       | 0                                     | 104.4                       |  | 0                                 | 138.7                                  |
| J-69  | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2664.67                    | 8712.67                       | 0                                     | 239.5                       |  | 0                                 | 118.9                                  |
| J-72  | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2664.67                    | 8712.67                       | 0                                     | 53.2                        |  | 0                                 | 143                                    |
| J-86  | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2631.81                    | 8679.81                       | 0                                     | 182.5                       |  | 0                                 | 132.2                                  |
| J-87  | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2635.64                    | 8683.64                       | 0                                     | 180.9                       |  | 0                                 | 136.8                                  |
| J-88  | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2643.18                    | 8691.18                       | 0                                     | 147.1                       |  | 0                                 | 138.2                                  |
| J-89  | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2641.96                    | 8689.96                       | 0                                     | 150.6                       |  | 0                                 | 139.5                                  |
| J-91  | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2668.34                    | 8716.34                       | 0                                     | 252.4                       |  | 0                                 | 136.7                                  |
| J-92  | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2629.19                    | 8677.19                       | 0                                     | 228.6                       |  | 0                                 | 135.5                                  |
| J-96  | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2629.19                    | 8677.19                       | 0                                     | 209.5                       |  | 0                                 | 134.5                                  |
| J-97  | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2633.06                    | 8681.06                       | 0                                     | 264.6                       |  | 0                                 | 142                                    |
| J-99  | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2641.96                    | 8689.96                       | 0                                     | 200.1                       |  | 0                                 | 139.2                                  |
| J-100 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2664.67                    | 8712.67                       | 0                                     | 184.1                       |  | 0                                 | 88.6                                   |
| J-101 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2639.34                    | 8687.34                       | 0                                     | 207                         |  | 0                                 | 108.2                                  |
| J-102 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2629.19                    | 8677.19                       | 0                                     | 57.2                        |  | 0                                 | 134.5                                  |
| J-103 | <None> | 3                    | TRUE                             | 2592                      | 8640    | 2641.24                    | 8689.24                       | 0                                     | 2.3                         |  | 0                                 | 124.7                                  |
| J-104 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2641.24                    | 8689.24                       | 0                                     | 78.1                        |  | 0                                 | 110.3                                  |
| J-105 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2641.24                    | 8689.24                       | 0                                     | 92.2                        |  | 0                                 | 110.6                                  |
| J-106 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2641.24                    | 8689.24                       | 0                                     | 137                         |  | 0                                 | 139                                    |
| J-107 | <None> | 3                    | TRUE                             | 2592                      | 8640    | 2653.73                    | 8701.73                       | 0                                     | 55.3                        |  | 0                                 | 141.5                                  |
| J-108 | <None> | 3                    | TRUE                             | 2592                      | 8640    | 2653.73                    | 8701.73                       | 0                                     | 69                          |  | 0                                 | 141.4                                  |
| J-109 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2638.77                    | 8686.77                       | 0                                     | 261.5                       |  | 0                                 | 141                                    |
| J-110 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2638.77                    | 8686.77                       | 0                                     | 254.2                       |  | 0                                 | 140.7                                  |
| J-111 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2638.77                    | 8686.77                       | 0                                     | 257                         |  | 0                                 | 141.7                                  |
| J-114 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2683.15                    | 8731.15                       | 0                                     | 115.9                       |  | 0                                 | 85.7                                   |
| J-115 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2667.29                    | 8715.29                       | 0                                     | 90.5                        |  | 0                                 | 79.7                                   |
| J-116 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2592                       | 8640                          | 0                                     | 192.7                       |  | 0                                 | 139.2                                  |
| J-117 | <None> | 6                    | TRUE                             | 2592                      | 5124.63 | 2675.14                    | 5207.77                       | 0                                     | 20                          |  | 0                                 | 0                                      |
| J-118 | <None> | 3                    | TRUE                             | 2592                      | 3644.82 | 2675.14                    | 3727.95                       | 0                                     | 0.1                         |  | 0                                 | 0                                      |
| J-119 | <None> | 3                    | TRUE                             | 2592                      | 3051.31 | 2675.14                    | 3134.45                       | 0                                     | 0                           |  | 0                                 | 65.9                                   |
| J-120 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2667.29                    | 8715.29                       | 0                                     | 100.4                       |  | 0                                 | 121.4                                  |
| J-121 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2667.29                    | 8715.29                       | 0                                     | 113.3                       |  | 0                                 | 105                                    |
| J-122 | <None> | 4                    | TRUE                             | 2592                      | 8586.53 | 2667.29                    | 8661.82                       | 0                                     | 0                           |  | 0                                 | 109.5                                  |
| J-123 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2683.15                    | 8731.15                       | 0                                     | 131.1                       |  | 0                                 | 91.9                                   |
| J-124 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2683.15                    | 8731.15                       | 0                                     | 116.5                       |  | 0                                 | 111.3                                  |
| J-125 | <None> | 4                    | TRUE                             | 2592                      | 8216.32 | 2683.15                    | 8307.47                       | 0                                     | 0                           |  | 0                                 | 110.2                                  |
| J-126 | <None> | 4                    | TRUE                             | 2592                      | 7976.11 | 2668.82                    | 8052.93                       | 0                                     | 0                           |  | 0                                 | 93.5                                   |
| J-127 | <None> | 4                    | TRUE                             | 2592                      | 7916.26 | 2668.82                    | 7993.08                       | 0                                     | 0                           |  | 0                                 | 59.5                                   |
| J-128 | <None> | 4                    | TRUE                             | 2592                      | 8383.05 | 2668.82                    | 8459.88                       | 0                                     | 0                           |  | 0                                 | 44.4                                   |
| J-129 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2683.15                    | 8731.15                       | 0                                     | 124.4                       |  | 0                                 | 91                                     |
| J-135 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2637.49                    | 8685.49                       | 0                                     | 209.3                       |  | 0                                 | 122.7                                  |
| J-136 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2859.27                    | 8907.27                       | 0                                     | 193                         |  | 0                                 | 127.2                                  |
| J-137 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2876.75                    | 8924.75                       | 0                                     | 234.5                       |  | 0                                 | 126.4                                  |
| J-140 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2887.7                     | 8935.7                        | 0                                     | 195.1                       |  | 0                                 | 132.7                                  |
| J-141 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2592                       | 8640                          | 0                                     | 170.7                       |  | 0                                 | 136.4                                  |
| J-142 | <None> | 2                    | TRUE                             | 2592                      | 8640    | 2887.7                     | 8935.7                        | 0                                     | 172.3                       |  | 0                                 | 133.6                                  |

| Label | Zone   | Fire Flow<br>Iterations | Satisfies Fire Flow<br>Constraints? | Fire Flow (Available)                  |                     | Flow (Total Needed)<br>(m <sup>3</sup> /d) | Flow (Total Available)<br>(m <sup>3</sup> /d) | Pressure (Residual Lower<br>Limit) (kPa) | Pressure (Calculated)         |  | Pressure (Zone Lower<br>Limit) (kPa) | Calculated Minimum Zone |  |
|-------|--------|-------------------------|-------------------------------------|----------------------------------------|---------------------|--------------------------------------------|-----------------------------------------------|------------------------------------------|-------------------------------|--|--------------------------------------|-------------------------|--|
|       |        |                         |                                     | Fire Flow (Needed) (m <sup>3</sup> /d) | (m <sup>3</sup> /d) |                                            |                                               |                                          | Residual Lower Limit<br>(kPa) |  |                                      | Pressure (kPa)          |  |
| J-143 | <None> | 2                       | TRUE                                | 2592                                   | 8640                | 2887.7                                     | 8935.7                                        | 0                                        | 168.8                         |  | 0                                    | 132.4                   |  |
| J-144 | <None> | 2                       | TRUE                                | 2592                                   | 8640                | 2931.77                                    | 8979.77                                       | 0                                        | 177.9                         |  | 0                                    | 142.3                   |  |
| J-145 | <None> | 2                       | TRUE                                | 2592                                   | 8640                | 2931.77                                    | 8979.77                                       | 0                                        | 172.4                         |  | 0                                    | 141.1                   |  |
| J-146 | <None> | 2                       | TRUE                                | 2592                                   | 8640                | 2931.77                                    | 8979.77                                       | 0                                        | 141.9                         |  | 0                                    | 148.2                   |  |
| J-147 | <None> | 2                       | TRUE                                | 2592                                   | 8640                | 2931.77                                    | 8979.77                                       | 0                                        | 164.7                         |  | 0                                    | 140                     |  |
| J-148 | <None> | 2                       | TRUE                                | 2592                                   | 8640                | 2931.77                                    | 8979.77                                       | 0                                        | 183                           |  | 0                                    | 139.4                   |  |
| J-149 | <None> | 2                       | TRUE                                | 2592                                   | 8640                | 2933.19                                    | 8981.19                                       | 0                                        | 143.7                         |  | 0                                    | 107.1                   |  |
| J-150 | <None> | 2                       | TRUE                                | 2592                                   | 8640                | 2933.19                                    | 8981.19                                       | 0                                        | 115.6                         |  | 0                                    | 109.7                   |  |
| J-151 | <None> | 2                       | TRUE                                | 2592                                   | 8640                | 2933.19                                    | 8981.19                                       | 0                                        | 123.6                         |  | 0                                    | 112.1                   |  |
| J-152 | <None> | 2                       | TRUE                                | 2592                                   | 8640                | 2793.16                                    | 8841.16                                       | 0                                        | 235.4                         |  | 0                                    | 142                     |  |
| J-153 | <None> | 2                       | TRUE                                | 2592                                   | 8640                | 2793.16                                    | 8841.16                                       | 0                                        | 155.7                         |  | 0                                    | 142                     |  |
| J-154 | <None> | 2                       | TRUE                                | 2592                                   | 8640                | 2793.16                                    | 8841.16                                       | 0                                        | 204.1                         |  | 0                                    | 142                     |  |
| J-155 | <None> | 2                       | TRUE                                | 2592                                   | 8640                | 2793.16                                    | 8841.16                                       | 0                                        | 146.5                         |  | 0                                    | 142                     |  |
| J-156 | <None> | 2                       | TRUE                                | 2592                                   | 8640                | 2931.77                                    | 8979.77                                       | 0                                        | 157.2                         |  | 0                                    | 142.1                   |  |
| J-157 | <None> | 2                       | TRUE                                | 2592                                   | 8640                | 2876.75                                    | 8924.75                                       | 0                                        | 203.1                         |  | 0                                    | 130.1                   |  |



| Label | Junction w/Minimum Pressure (Zone) | Pressure (System Lower Limit) (kPa) | Pressure (Calculated System Lower Limit) (kPa) | Junction w/Minimum Pressure (System) | Is Fire Flow Run Balanced? |
|-------|------------------------------------|-------------------------------------|------------------------------------------------|--------------------------------------|----------------------------|
| J-4   |                                    | 159                                 | 0                                              | 145.6                                | 159 TRUE                   |
| J-35  |                                    | 159                                 | 0                                              | 139.3                                | 159 TRUE                   |
| J-36  |                                    | 159                                 | 0                                              | 138.9                                | 159 TRUE                   |
| J-38  |                                    | 159                                 | 0                                              | 139.7                                | 159 TRUE                   |
| J-53  |                                    | 159                                 | 0                                              | 138.5                                | 159 TRUE                   |
| J-54  |                                    | 159                                 | 0                                              | 138.7                                | 159 TRUE                   |
| J-69  |                                    | 159                                 | 0                                              | 118.9                                | 159 TRUE                   |
| J-72  |                                    | 424                                 | 0                                              | 143                                  | 424 TRUE                   |
| J-86  |                                    | 159                                 | 0                                              | 132.2                                | 159 TRUE                   |
| J-87  |                                    | 159                                 | 0                                              | 136.8                                | 159 TRUE                   |
| J-88  |                                    | 159                                 | 0                                              | 138.2                                | 159 TRUE                   |
| J-89  |                                    | 159                                 | 0                                              | 139.5                                | 159 TRUE                   |
| J-91  |                                    | 159                                 | 0                                              | 136.7                                | 159 TRUE                   |
| J-92  |                                    | 159                                 | 0                                              | 135.5                                | 159 TRUE                   |
| J-96  |                                    | 159                                 | 0                                              | 134.5                                | 159 TRUE                   |
| J-97  |                                    | 159                                 | 0                                              | 142                                  | 159 TRUE                   |
| J-99  |                                    | 159                                 | 0                                              | 139.2                                | 159 TRUE                   |
| J-100 |                                    | 159                                 | 0                                              | 88.6                                 | 159 TRUE                   |
| J-101 |                                    | 159                                 | 0                                              | 108.2                                | 159 TRUE                   |
| J-102 |                                    | 159                                 | 0                                              | 134.5                                | 159 TRUE                   |
| J-103 |                                    | 282                                 | 0                                              | 124.7                                | 282 TRUE                   |
| J-104 |                                    | 321                                 | 0                                              | 110.3                                | 321 TRUE                   |
| J-105 |                                    | 321                                 | 0                                              | 110.6                                | 321 TRUE                   |
| J-106 |                                    | 159                                 | 0                                              | 139                                  | 159 TRUE                   |
| J-107 |                                    | 159                                 | 0                                              | 141.5                                | 159 TRUE                   |
| J-108 |                                    | 159                                 | 0                                              | 141.4                                | 159 TRUE                   |
| J-109 |                                    | 159                                 | 0                                              | 141                                  | 159 TRUE                   |
| J-110 |                                    | 159                                 | 0                                              | 140.7                                | 159 TRUE                   |
| J-111 |                                    | 159                                 | 0                                              | 141.7                                | 159 TRUE                   |
| J-114 |                                    | 321                                 | 0                                              | 85.7                                 | 321 TRUE                   |
| J-115 |                                    | 321                                 | 0                                              | 79.7                                 | 321 TRUE                   |
| J-116 |                                    | 159                                 | 0                                              | 139.2                                | 159 TRUE                   |
| J-117 |                                    | 321                                 | 0                                              | 0                                    | 321 TRUE                   |
| J-118 |                                    | 321                                 | 0                                              | 0                                    | 321 TRUE                   |
| J-119 |                                    | 319                                 | 0                                              | 65.9                                 | 319 TRUE                   |
| J-120 |                                    | 328                                 | 0                                              | 121.4                                | 328 TRUE                   |
| J-121 |                                    | 325                                 | 0                                              | 105                                  | 325 TRUE                   |
| J-122 |                                    | 321                                 | 0                                              | 109.5                                | 321 TRUE                   |
| J-123 |                                    | 321                                 | 0                                              | 91.9                                 | 321 TRUE                   |
| J-124 |                                    | 321                                 | 0                                              | 111.3                                | 321 TRUE                   |
| J-125 |                                    | 321                                 | 0                                              | 110.2                                | 321 TRUE                   |
| J-126 |                                    | 342                                 | 0                                              | 93.5                                 | 342 TRUE                   |
| J-127 |                                    | 344                                 | 0                                              | 59.5                                 | 344 TRUE                   |
| J-128 |                                    | 342                                 | 0                                              | 44.4                                 | 342 TRUE                   |
| J-129 |                                    | 321                                 | 0                                              | 91                                   | 321 TRUE                   |
| J-135 |                                    | 159                                 | 0                                              | 122.7                                | 159 TRUE                   |
| J-136 |                                    | 159                                 | 0                                              | 127.2                                | 159 TRUE                   |
| J-137 |                                    | 159                                 | 0                                              | 126.4                                | 159 TRUE                   |
| J-140 |                                    | 159                                 | 0                                              | 132.7                                | 159 TRUE                   |
| J-141 |                                    | 159                                 | 0                                              | 136.4                                | 159 TRUE                   |
| J-142 |                                    | 159                                 | 0                                              | 133.6                                | 159 TRUE                   |

| Label | Junction w/Minimum<br>Pressure (Zone) | Pressure (System Lower<br>Limit) (kPa) | Pressure (Calculated<br>System Lower Limit) (kPa) | Junction w/Minimum<br>Pressure (System) | Is Fire Flow Run<br>Balanced? |
|-------|---------------------------------------|----------------------------------------|---------------------------------------------------|-----------------------------------------|-------------------------------|
| J-143 |                                       | 159                                    | 0                                                 | 132.4                                   | 159 TRUE                      |
| J-144 |                                       | 424                                    | 0                                                 | 142.3                                   | 424 TRUE                      |
| J-145 |                                       | 159                                    | 0                                                 | 141.1                                   | 159 TRUE                      |
| J-146 |                                       | 159                                    | 0                                                 | 148.2                                   | 159 TRUE                      |
| J-147 |                                       | 159                                    | 0                                                 | 140                                     | 159 TRUE                      |
| J-148 |                                       | 159                                    | 0                                                 | 139.4                                   | 159 TRUE                      |
| J-149 |                                       | 325                                    | 0                                                 | 107.1                                   | 325 TRUE                      |
| J-150 |                                       | 325                                    | 0                                                 | 109.7                                   | 325 TRUE                      |
| J-151 |                                       | 321                                    | 0                                                 | 112.1                                   | 321 TRUE                      |
| J-152 |                                       | 159                                    | 0                                                 | 142                                     | 159 TRUE                      |
| J-153 |                                       | 159                                    | 0                                                 | 142                                     | 159 TRUE                      |
| J-154 |                                       | 159                                    | 0                                                 | 142                                     | 159 TRUE                      |
| J-155 |                                       | 159                                    | 0                                                 | 142                                     | 159 TRUE                      |
| J-156 |                                       | 424                                    | 0                                                 | 142.1                                   | 424 TRUE                      |
| J-157 |                                       | 159                                    | 0                                                 | 130.1                                   | 159 TRUE                      |

## Junction Report



| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 27  | J-4   | 246           | <None> | 41.06         | 276.2               | 295.8          |
| 85  | J-35  | 241           | <None> | 43.64         | 271.4               | 297.9          |
| 87  | J-36  | 241           | <None> | 49.96         | 270                 | 283.9          |
| 90  | J-38  | 240           | <None> | 49.96         | 271.2               | 305.3          |
| 119 | J-53  | 243.2         | <None> | 51.18         | 270                 | 262            |
| 121 | J-54  | 242.1         | <None> | 45.49         | 270.3               | 276            |
| 151 | J-69  | 241           | <None> | 72.67         | 269.6               | 280.1          |
| 159 | J-72  | 254           | <None> | 72.67         | 269.7               | 153.8          |
| 199 | J-86  | 244           | <None> | 39.81         | 269.7               | 251.1          |
| 203 | J-87  | 244.2         | <None> | 43.64         | 269.6               | 248.6          |
| 208 | J-88  | 243.2         | <None> | 51.18         | 270                 | 261.9          |
| 212 | J-89  | 240           | <None> | 49.96         | 270.9               | 302.8          |
| 220 | J-91  | 242.2         | <None> | 76.34         | 271.4               | 286            |
| 225 | J-92  | 244.1         | <None> | 37.19         | 270.5               | 258.7          |
| 235 | J-96  | 246.1         | <None> | 37.19         | 269.7               | 231.1          |
| 239 | J-97  | 242           | <None> | 41.06         | 273.7               | 310.2          |
| 247 | J-99  | 241           | <None> | 49.96         | 270.8               | 292            |
| 266 | J-100 | 242           | <None> | 72.67         | 269.8               | 272            |
| 270 | J-101 | 242.2         | <None> | 47.34         | 269.8               | 270.6          |
| 275 | J-102 | 247           | <None> | 37.19         | 269.7               | 222.2          |
| 280 | J-103 | 242           | <None> | 49.25         | 269.4               | 268.6          |
| 282 | J-104 | 241           | <None> | 49.25         | 269.1               | 275.3          |
| 284 | J-105 | 241           | <None> | 49.25         | 269.2               | 275.5          |
| 287 | J-106 | 240           | <None> | 49.25         | 270.1               | 294.1          |
| 291 | J-107 | 242           | <None> | 61.73         | 273.3               | 306.5          |
| 293 | J-108 | 240           | <None> | 61.73         | 273.2               | 324.7          |
| 295 | J-109 | 240           | <None> | 46.77         | 273                 | 323.4          |
| 299 | J-110 | 240           | <None> | 46.77         | 272.7               | 320.2          |
| 303 | J-111 | 242           | <None> | 46.77         | 273.5               | 308.7          |
| 311 | J-114 | 240           | <None> | 91.15         | 268.9               | 282.8          |
| 313 | J-115 | 242           | <None> | 75.29         | 268.9               | 263.2          |
| 315 | J-116 | 244           | <None> | 0             | 269.1               | 245.6          |
| 317 | J-117 | 241           | <None> | 83.14         | 268.8               | 272.4          |
| 319 | J-118 | 243           | <None> | 83.14         | 268.8               | 252.5          |
| 321 | J-119 | 243           | <None> | 83.14         | 268.8               | 252.4          |
| 325 | J-120 | 244           | <None> | 75.29         | 268.9               | 243.4          |
| 328 | J-121 | 242           | <None> | 75.29         | 268.9               | 262.8          |
| 330 | J-122 | 242           | <None> | 75.29         | 268.9               | 262.8          |
| 333 | J-123 | 238           | <None> | 91.15         | 268.9               | 302.3          |
| 335 | J-124 | 239           | <None> | 91.15         | 268.8               | 292            |
| 337 | J-125 | 240           | <None> | 91.15         | 268.9               | 282.4          |
| 340 | J-126 | 237           | <None> | 76.82         | 268.9               | 312            |
| 342 | J-127 | 236           | <None> | 76.82         | 268.9               | 321.8          |
| 344 | J-128 | 238           | <None> | 76.82         | 268.9               | 302.2          |
| 347 | J-129 | 239           | <None> | 91.15         | 268.9               | 292.6          |
| 398 | J-135 | 243           | <None> | 45.49         | 269.7               | 261.3          |

| Id  | Label | Elevation (m) | Zone   | Demand (m3/d) | Hydraulic Grade (m) | Pressure (kPa) |
|-----|-------|---------------|--------|---------------|---------------------|----------------|
| 405 | J-136 | 245.8         | <None> | 267.27        | 269.6               | 233.1          |
| 408 | J-137 | 242.5         | <None> | 284.75        | 269.6               | 265.3          |
| 411 | J-140 | 247.2         | <None> | 295.7         | 269.6               | 219.3          |
| 415 | J-141 | 250.1         | <None> | 0             | 269.5               | 190            |
| 416 | J-142 | 249.5         | <None> | 295.7         | 269.6               | 196.3          |
| 417 | J-143 | 249.1         | <None> | 295.7         | 269.6               | 200.3          |
| 422 | J-144 | 249.8         | <None> | 339.77        | 269.1               | 189.1          |
| 423 | J-145 | 248.5         | <None> | 339.77        | 269.1               | 201.6          |
| 424 | J-146 | 253.9         | <None> | 339.77        | 269                 | 148.2          |
| 430 | J-147 | 247.9         | <None> | 339.77        | 269.1               | 207.4          |
| 431 | J-148 | 245.3         | <None> | 339.77        | 269.1               | 232.9          |
| 435 | J-149 | 238.2         | <None> | 341.19        | 268.8               | 299.8          |
| 436 | J-150 | 240.2         | <None> | 341.19        | 268.8               | 280.2          |
| 437 | J-151 | 238.5         | <None> | 341.19        | 268.8               | 296.8          |
| 442 | J-152 | 243.8         | <None> | 201.16        | 273.7               | 292.5          |
| 443 | J-153 | 252.2         | <None> | 201.16        | 273.7               | 210.3          |
| 444 | J-154 | 246.5         | <None> | 201.16        | 273.7               | 266.1          |
| 445 | J-155 | 252.5         | <None> | 201.16        | 273.7               | 207.4          |
| 451 | J-156 | 251.5         | <None> | 339.77        | 269.1               | 172            |
| 456 | J-157 | 246.1         | <None> | 284.75        | 269.6               | 230            |

## Pipe Report



| Id | Label     | Scaled Length |            | Diameter (mm) | Material         | Hazen-Williams C ( ) | Has Check Valve? | Minor Loss ( ) | Flow (m³/d) | Velocity (ft/s) | Headloss Gradient (ft/ft) | Has User Defined Length? |
|----|-----------|---------------|------------|---------------|------------------|----------------------|------------------|----------------|-------------|-----------------|---------------------------|--------------------------|
|    |           | (m)           | Start Node | Stop Node     |                  |                      |                  |                |             |                 |                           |                          |
|    | 322 P-165 | 269           | 313: J-115 | 321: J-119    | 300 Ductile Iron | 130                  | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                     | FALSE                    |
|    | 326 P-168 | 47            | 321: J-119 | 325: J-120    | 300 Ductile Iron | 130                  | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                     | FALSE                    |
|    | 396 P-204 | 50            | 167: R-2   | 379: PMP-4    | 200 Ductile Iron | 130                  | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                     | FALSE                    |
|    | 397 P-205 | 60            | 379: PMP-4 | 225: J-92     | 200 Ductile Iron | 130                  | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                     | FALSE                    |
|    | 403 P-210 | 11            | 168: R-3   | 382: PMP-5    | 200 Ductile Iron | 130                  | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                     | FALSE                    |
|    | 404 P-211 | 14            | 382: PMP-5 | 212: J-89     | 200 Ductile Iron | 130                  | FALSE            |                | 0 (N/A)     | (N/A)           | (N/A)                     | FALSE                    |
|    | 433 P-227 | 309           | 430: J-147 | 431: J-148    | 300 Ductile Iron | 130                  | FALSE            | 0              | 1.72        | 0               | 0                         | FALSE                    |
|    | 446 P-233 | 400           | 444: J-154 | 445: J-155    | 300 Ductile Iron | 130                  | FALSE            | 0              | -28.77      | 0.02            | 0                         | FALSE                    |
|    | 348 P-181 | 374           | 311: J-114 | 347: J-129    | 300 Ductile Iron | 130                  | FALSE            | 0              | -33.72      | 0.02            | 0                         | FALSE                    |
|    | 440 P-231 | 483           | 436: J-150 | 437: J-151    | 300 Ductile Iron | 130                  | FALSE            | 0              | 64.41       | 0.03            | 0                         | FALSE                    |
|    | 343 P-178 | 325           | 340: J-126 | 342: J-127    | 150 Ductile Iron | 130                  | FALSE            | 0              | 26.06       | 0.06            | 0                         | FALSE                    |
|    | 450 P-237 | 417           | 442: J-152 | 444: J-154    | 300 Ductile Iron | 130                  | FALSE            | 0              | 172.39      | 0.09            | 0                         | FALSE                    |
|    | 447 P-234 | 346           | 445: J-155 | 443: J-153    | 300 Ductile Iron | 130                  | FALSE            | 0              | -229.93     | 0.12            | 0                         | FALSE                    |
|    | 413 P-215 | 330           | 405: J-136 | 408: J-137    | 300 Ductile Iron | 130                  | FALSE            | 0              | 254.66      | 0.14            | 0                         | FALSE                    |
|    | 441 P-232 | 196           | 437: J-151 | 335: J-124    | 300 Ductile Iron | 130                  | FALSE            | 0              | -276.78     | 0.15            | 0                         | FALSE                    |
|    | 345 P-179 | 131           | 342: J-127 | 344: J-128    | 150 Ductile Iron | 130                  | FALSE            | 0              | -50.77      | 0.11            | 0                         | FALSE                    |
|    | 434 P-228 | 187           | 431: J-148 | 315: J-116    | 300 Ductile Iron | 130                  | FALSE            | 0              | -338.05     | 0.18            | 0                         | FALSE                    |
|    | 432 P-226 | 394           | 423: J-145 | 430: J-147    | 300 Ductile Iron | 130                  | FALSE            | 0              | 341.49      | 0.18            | 0                         | FALSE                    |
|    | 449 P-236 | 338           | 239: J-97  | 442: J-152    | 300 Ductile Iron | 130                  | FALSE            | 0              | 373.55      | 0.2             | 0                         | FALSE                    |
|    | 420 P-219 | 336           | 416: J-142 | 417: J-143    | 300 Ductile Iron | 130                  | FALSE            | 0              | -393.51     | 0.21            | 0                         | FALSE                    |
|    | 439 P-230 | 328           | 435: J-149 | 436: J-150    | 300 Ductile Iron | 130                  | FALSE            | 0              | 405.6       | 0.22            | 0                         | FALSE                    |
|    | 458 P-243 | 233           | 456: J-157 | 411: J-140    | 300 Ductile Iron | 130                  | FALSE            | 0              | -424.9      | 0.23            | 0                         | FALSE                    |
|    | 448 P-235 | 225           | 443: J-153 | 239: J-97     | 300 Ductile Iron | 130                  | FALSE            | 0              | -431.09     | 0.23            | 0                         | FALSE                    |
|    | 331 P-171 | 181           | 328: J-121 | 330: J-122    | 150 Ductile Iron | 130                  | FALSE            | 0              | -74.81      | 0.16            | 0                         | FALSE                    |
|    | 314 P-161 | 153           | 311: J-114 | 313: J-115    | 300 Ductile Iron | 130                  | FALSE            | 0              | 474.8       | 0.26            | 0                         | FALSE                    |
|    | 324 P-167 | 234           | 319: J-118 | 321: J-119    | 150 Ductile Iron | 130                  | FALSE            | 0              | 83.14       | 0.18            | 0                         | FALSE                    |
|    | 457 P-242 | 192           | 408: J-137 | 456: J-157    | 300 Ductile Iron | 130                  | FALSE            | 0              | 549.06      | 0.29            | 0                         | FALSE                    |
|    | 412 P-214 | 337           | 408: J-137 | 151: J-69     | 300 Ductile Iron | 130                  | FALSE            | 0              | -579.15     | 0.31            | 0                         | FALSE                    |
|    | 349 P-182 | 101           | 347: J-129 | 333: J-123    | 300 Ductile Iron | 130                  | FALSE            | 0              | 580.18      | 0.31            | 0                         | FALSE                    |
|    | 341 P-177 | 235           | 333: J-123 | 340: J-126    | 150 Ductile Iron | 130                  | FALSE            | 0              | 102.88      | 0.22            | 0                         | FALSE                    |
|    | 453 P-239 | 424           | 424: J-146 | 451: J-156    | 300 Ductile Iron | 130                  | FALSE            | 0              | -657.72     | 0.35            | 0                         | FALSE                    |
|    | 209 P-95  | 113           | 119: J-53  | 208: J-88     | 150 Ductile Iron | 130                  | FALSE            | 0              | 108.33      | 0.23            | 0                         | FALSE                    |
|    | 338 P-175 | 392           | 335: J-124 | 337: J-125    | 150 Ductile Iron | 130                  | FALSE            | 0              | -109.38     | 0.24            | 0                         | FALSE                    |
|    | 455 P-241 | 341           | 422: J-144 | 423: J-145    | 300 Ductile Iron | 130                  | FALSE            | 0              | 681.26      | 0.37            | 0                         | FALSE                    |
|    | 462 P-245 | 663           | 456: J-157 | 417: J-143    | 300 Ductile Iron | 130                  | FALSE            | 0              | 689.2       | 0.37            | 0                         | FALSE                    |
|    | 285 P-143 | 372           | 282: J-104 | 284: J-105    | 150 Ductile Iron | 130                  | FALSE            | 0              | -111.76     | 0.24            | 0                         | FALSE                    |
|    | 276 P-137 | 601           | 199: J-86  | 275: J-102    | 150 Ductile Iron | 130                  | FALSE            | 0              | -115.28     | 0.25            | 0                         | FALSE                    |
|    | 438 P-229 | 211           | 328: J-121 | 435: J-149    | 300 Ductile Iron | 130                  | FALSE            | 0              | 746.79      | 0.4             | 0                         | FALSE                    |
|    | 329 P-170 | 310           | 325: J-120 | 328: J-121    | 300 Ductile Iron | 130                  | FALSE            | 0              | 747.27      | 0.4             | 0                         | FALSE                    |
|    | 346 P-180 | 151           | 344: J-128 | 333: J-123    | 150 Ductile Iron | 130                  | FALSE            | 0              | -127.59     | 0.27            | 0                         | FALSE                    |
|    | 224 P-107 | 184           | 220: J-91  | 85: J-35      | 150 Ductile Iron | 130                  | FALSE            | 0              | -132.96     | 0.29            | 0                         | FALSE                    |
|    | 400 P-207 | 368           | 398: J-135 | 199: J-86     | 200 Ductile Iron | 130                  | FALSE            | 0              | 298.78      | 0.36            | 0                         | FALSE                    |
|    | 332 P-172 | 328           | 330: J-122 | 313: J-115    | 150 Ductile Iron | 130                  | FALSE            | 0              | -150.1      | 0.32            | 0                         | FALSE                    |
|    | 277 P-138 | 162           | 275: J-102 | 235: J-96     | 150 Ductile Iron | 130                  | FALSE            | 0              | -152.47     | 0.33            | 0                         | FALSE                    |
|    | 278 P-139 | 299           | 87: J-36   | 119: J-53     | 150 Ductile Iron | 130                  | FALSE            | 0              | 159.51      | 0.34            | 0                         | FALSE                    |
|    | 454 P-240 | 416           | 451: J-156 | 422: J-144    | 300 Ductile Iron | 130                  | FALSE            | 0              | -997.49     | 0.54            | 0                         | FALSE                    |
|    | 320 P-164 | 273           | 317: J-117 | 319: J-118    | 150 Ductile Iron | 130                  | FALSE            | 0              | 166.27      | 0.36            | 0                         | FALSE                    |
|    | 402 P-209 | 393           | 203: J-87  | 199: J-86     | 200 Ductile Iron | 130                  | FALSE            | 0              | -374.26     | 0.45            | 0                         | FALSE                    |
|    | 418 P-217 | 337           | 411: J-140 | 416: J-142    | 300 Ductile Iron | 130                  | FALSE            | 0              | 1155.86     | 0.62            | 0                         | FALSE                    |
|    | 339 P-176 | 233           | 337: J-125 | 311: J-114    | 150 Ductile Iron | 130                  | FALSE            | 0              | -200.53     | 0.43            | 0                         | FALSE                    |
|    | 269 P-132 | 491           | 151: J-69  | 159: J-72     | 200 Ductile Iron | 130                  | FALSE            | 0              | -430.99     | 0.52            | 0                         | FALSE                    |
|    | 419 P-218 | 235           | 416: J-142 | 415: J-141    | 300 Ductile Iron | 130                  | FALSE            | 0              | 1253.67     | 0.67            | 0                         | FALSE                    |

| Id | Label     | Scaled Length |            | Start Node | Stop Node | Diameter (mm)    | Material | Hazen-Williams C ( ) | Has Check Valve? | Minor Loss ( ) | Flow (m³/d) | Velocity (ft/s) | Headloss Gradient (ft/ft) | Has User Defined Length? |
|----|-----------|---------------|------------|------------|-----------|------------------|----------|----------------------|------------------|----------------|-------------|-----------------|---------------------------|--------------------------|
|    |           | (m)           |            |            |           |                  |          |                      |                  |                |             |                 |                           |                          |
|    | 452 P-238 | 353           | 422: J-144 | 424: J-146 |           | 300 Ductile Iron | 130      | FALSE                | 0                | 1342.89        | 0.72        | 0               | FALSE                     |                          |
|    | 399 P-206 | 327           | 151: J-69  | 398: J-135 |           | 150 Ductile Iron | 130      | FALSE                | 0                | -220.83        | 0.47        | 0               | FALSE                     |                          |
|    | 406 P-212 | 365           | 398: J-135 | 405: J-136 |           | 150 Ductile Iron | 130      | FALSE                | 0                | 225.97         | 0.49        | 0               | FALSE                     |                          |
|    | 267 P-130 | 327           | 159: J-72  | 266: J-100 |           | 200 Ductile Iron | 130      | FALSE                | 0                | -503.67        | 0.61        | 0               | FALSE                     |                          |
|    | 288 P-145 | 175           | 87: J-36   | 287: J-106 |           | 150 Ductile Iron | 130      | FALSE                | 0                | -246.38        | 0.53        | 0               | FALSE                     |                          |
|    | 318 P-163 | 232           | 313: J-115 | 317: J-117 |           | 150 Ductile Iron | 130      | FALSE                | 0                | 249.41         | 0.54        | 0               | FALSE                     |                          |
|    | 336 P-174 | 210           | 333: J-123 | 335: J-124 |           | 150 Ductile Iron | 130      | FALSE                | 0                | 258.55         | 0.56        | 0               | FALSE                     |                          |
|    | 475 P-246 | 155           | 474: T-5   | 424: J-146 |           | 300 Ductile Iron | 130      | FALSE                | 0                | -1660.84       | 0.89        | 0               | FALSE                     |                          |
|    | 271 P-133 | 174           | 266: J-100 | 270: J-101 |           | 200 Ductile Iron | 130      | FALSE                | 0                | -576.34        | 0.7         | 0               | FALSE                     |                          |
|    | 407 P-213 | 282           | 405: J-136 | 235: J-96  |           | 150 Ductile Iron | 130      | FALSE                | 0                | -295.96        | 0.64        | 0               | FALSE                     |                          |
|    | 461 P-244 | 282           | 235: J-96  | 411: J-140 |           | 300 Ductile Iron | 130      | FALSE                | 0                | 1876.46        | 1.01        | 0               | FALSE                     |                          |
|    | 296 P-150 | 306           | 293: J-108 | 295: J-109 |           | 150 Ductile Iron | 130      | FALSE                | 0                | 321.76         | 0.69        | 0               | FALSE                     |                          |
|    | 421 P-220 | 428           | 415: J-141 | 235: J-96  |           | 300 Ductile Iron | 130      | FALSE                | 0                | -2107.74       | 1.13        | 0               | FALSE                     |                          |
|    | 401 P-208 | 273           | 270: J-101 | 398: J-135 |           | 200 Ductile Iron | 130      | FALSE                | 0                | 791.06         | 0.96        | 0.001           | FALSE                     |                          |
|    | 294 P-149 | 238           | 291: J-107 | 293: J-108 |           | 150 Ductile Iron | 130      | FALSE                | 0                | 383.48         | 0.82        | 0.001           | FALSE                     |                          |
|    | 305 P-157 | 290           | 303: J-111 | 291: J-107 |           | 150 Ductile Iron | 130      | FALSE                | 0                | 445.21         | 0.96        | 0.001           | FALSE                     |                          |
|    | 304 P-156 | 149           | 239: J-97  | 303: J-111 |           | 300 Ductile Iron | 130      | FALSE                | 0                | 3252.85        | 1.75        | 0.001           | FALSE                     |                          |
|    | 425 P-221 | 353           | 415: J-141 | 422: J-144 |           | 300 Ductile Iron | 130      | FALSE                | 0                | 3361.41        | 1.81        | 0.001           | FALSE                     |                          |
|    | 351 P-184 | 454           | 315: J-116 | 203: J-87  |           | 200 Ductile Iron | 130      | FALSE                | 0                | -1160.61       | 1.4         | 0.001           | FALSE                     |                          |
|    | 283 P-142 | 206           | 280: J-103 | 282: J-104 |           | 150 Ductile Iron | 130      | FALSE                | 0                | 642.54         | 1.38        | 0.002           | FALSE                     |                          |
|    | 251 P-126 | 219           | 247: J-99  | 90: J-38   |           | 150 Ductile Iron | 130      | FALSE                | 0                | -666.69        | 1.43        | 0.002           | FALSE                     |                          |
|    | 289 P-146 | 346           | 287: J-106 | 280: J-103 |           | 150 Ductile Iron | 130      | FALSE                | 0                | 691.79         | 1.49        | 0.002           | FALSE                     |                          |
|    | 350 P-183 | 129           | 347: J-129 | 282: J-104 |           | 150 Ductile Iron | 130      | FALSE                | 0                | -705.06        | 1.52        | 0.002           | FALSE                     |                          |
|    | 306 P-158 | 262           | 295: J-109 | 303: J-111 |           | 250 Ductile Iron | 130      | FALSE                | 0                | -2760.86       | 2.14        | 0.002           | FALSE                     |                          |
|    | 236 P-114 | 432           | 225: J-92  | 235: J-96  |           | 300 Ductile Iron | 130      | FALSE                | 0                | 4469.82        | 2.4         | 0.002           | FALSE                     |                          |
|    | 226 P-108 | 462           | 220: J-91  | 225: J-92  |           | 300 Ductile Iron | 130      | FALSE                | 0                | 4507.01        | 2.42        | 0.002           | FALSE                     |                          |
|    | 352 P-185 | 132           | 311: J-114 | 284: J-105 |           | 150 Ductile Iron | 130      | FALSE                | 0                | -732.76        | 1.57        | 0.002           | FALSE                     |                          |
|    | 210 P-96  | 157           | 208: J-88  | 121: J-54  |           | 150 Ductile Iron | 130      | FALSE                | 0                | -772.84        | 1.66        | 0.002           | FALSE                     |                          |
|    | 300 P-153 | 145           | 295: J-109 | 299: J-110 |           | 250 Ductile Iron | 130      | FALSE                | 0                | 3035.85        | 2.35        | 0.002           | FALSE                     |                          |
|    | 279 P-140 | 222           | 247: J-99  | 121: J-54  |           | 150 Ductile Iron | 130      | FALSE                | 0                | 818.33         | 1.76        | 0.002           | FALSE                     |                          |
|    | 327 P-169 | 92            | 325: J-120 | 315: J-116 |           | 150 Ductile Iron | 130      | FALSE                | 0                | -822.56        | 1.77        | 0.002           | FALSE                     |                          |
|    | 211 P-97  | 146           | 203: J-87  | 208: J-88  |           | 150 Ductile Iron | 130      | FALSE                | 0                | -829.99        | 1.78        | 0.002           | FALSE                     |                          |
|    | 249 P-124 | 318           | 247: J-99  | 87: J-36   |           | 150 Ductile Iron | 130      | FALSE                | 0                | 856.85         | 1.84        | 0.003           | FALSE                     |                          |
|    | 286 P-144 | 303           | 284: J-105 | 87: J-36   |           | 150 Ductile Iron | 130      | FALSE                | 0                | -893.77        | 1.92        | 0.003           | FALSE                     |                          |
|    | 241 P-118 | 725           | 239: J-97  | 220: J-91  |           | 300 Ductile Iron | 130      | FALSE                | 0                | 5865.13        | 3.15        | 0.003           | FALSE                     |                          |
|    | 290 P-147 | 264           | 287: J-106 | 212: J-89  |           | 150 Ductile Iron | 130      | FALSE                | 0                | -987.42        | 2.12        | 0.003           | FALSE                     |                          |
|    | 213 P-98  | 66            | 90: J-38   | 212: J-89  |           | 150 Ductile Iron | 130      | FALSE                | 0                | 1037.37        | 2.23        | 0.004           | FALSE                     |                          |
|    | 248 P-123 | 158           | 85: J-35   | 247: J-99  |           | 150 Ductile Iron | 130      | FALSE                | 0                | 1058.45        | 2.27        | 0.004           | FALSE                     |                          |
|    | 301 P-154 | 250           | 299: J-110 | 85: J-35   |           | 150 Ductile Iron | 130      | FALSE                | 0                | 1235.06        | 2.65        | 0.005           | FALSE                     |                          |
|    | 273 P-135 | 240           | 220: J-91  | 270: J-101 |           | 150 Ductile Iron | 130      | FALSE                | 0                | 1414.74        | 3.04        | 0.007           | FALSE                     |                          |
|    | 240 P-117 | 302           | 27: J-4    | 239: J-97  |           | 300 Ductile Iron | 130      | FALSE                | 0                | 9963.67        | 5.35        | 0.008           | FALSE                     |                          |
|    | 389 P-201 | 614           | 27: J-4    | 388: T-4   |           | 300 Ductile Iron | 130      | FALSE                | 0                | -10004.73      | 5.37        | 0.008           | FALSE                     |                          |
|    | 302 P-155 | 156           | 90: J-38   | 299: J-110 |           | 150 Ductile Iron | 130      | FALSE                | 0                | -1754.02       | 3.77        | 0.01            | FALSE                     |                          |



## Tank Report



| Id  | Label | Zone   | Base Elevation<br>(m) | Minimum Elevation<br>(m) | Initial Elevation<br>(m) | Maximum Elevation<br>(m) | Inactive Volume<br>(m3) | Diameter (ft) | Outflow<br>(m3/d) | Hydraulic Grade<br>(m) |
|-----|-------|--------|-----------------------|--------------------------|--------------------------|--------------------------|-------------------------|---------------|-------------------|------------------------|
| 388 | T-4   | <None> | 278.4                 | 280.4                    | 281.4                    | 281.7                    | 1600                    | 86.82         | 10004.73          | 281.4                  |
| 474 | T-5   | <None> | 264                   | 264.2                    | 269                      | 269.2                    | 0                       | 90.68         | -1660.84          | 269                    |

## Reservoir Report



| Id  | Label | Elevation (m) | Zone   | Outflow (m3/d) | Hydraulic Grade (m) |
|-----|-------|---------------|--------|----------------|---------------------|
| 167 | R-2   | 332           | <None> | (N/A)          | (N/A)               |
| 168 | R-3   | 351           | <None> | (N/A)          | (N/A)               |

## **APPENDIX 'WS-F'**

### **1) Cost Analysis for Preferred Alternatives**



**Everett Secondary Plan Area Study - Water Servicing**  
**Preliminary Cost Estimates of Alternatives - General**

| Item                                                                            | Description                                                                                     | Unit           | Unit Price     | Quantity | Total          |
|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|----------------|----------------|----------|----------------|
| <b><u>Alternative WD1: Expand Existing Storage with New Trunk Watermain</u></b> |                                                                                                 |                |                |          |                |
|                                                                                 | Water Distribution <sup>(1)</sup>                                                               |                |                |          |                |
|                                                                                 | - 300 mm diameter PVC pipe                                                                      | m              | \$250.00       | 9,313    | \$2,328,250.00 |
| Distribution System Subtotal:                                                   |                                                                                                 |                |                |          | \$2,328,250.00 |
| <b><u>Alternative WD2: Expand Existing Storage with New Trunk Watermain</u></b> |                                                                                                 |                |                |          |                |
|                                                                                 | Water Distribution <sup>(1)</sup>                                                               |                |                |          |                |
|                                                                                 | - 300 mm diameter pipe                                                                          | m              | \$250.00       | 9,313    | \$2,328,250.00 |
|                                                                                 | - Replacing existing 300 mm dia. Pipe with 450 mm dia. Pipe from storage tank to Country Road 5 | m              | \$320.00       | 614      | \$196,480.00   |
| Distribution System Subtotal:                                                   |                                                                                                 |                |                |          | \$2,524,730.00 |
| <b><u>Alternative WS2: Elevated Storage Tank</u></b>                            |                                                                                                 |                |                |          |                |
|                                                                                 | Water Storage <sup>(2)</sup>                                                                    |                |                |          |                |
|                                                                                 | - Elevated Storage <sup>(3)</sup>                                                               | L.S.           | \$2,250,000.00 | 1        | \$2,250,000.00 |
| Subtotal: <sup>(4)</sup>                                                        |                                                                                                 |                |                |          | \$2,250,000.00 |
| <b><u>Alternative WS3: Expand Existing Storage with Pumping</u></b>             |                                                                                                 |                |                |          |                |
|                                                                                 | Water Storage                                                                                   |                |                |          |                |
|                                                                                 | - Expand In-Ground Storage                                                                      | cu.m           | \$476.25       | 2,710    | \$1,290,637.50 |
|                                                                                 | - Additional Land Cost for Storage                                                              | m <sup>2</sup> | \$10.00        | 2,600    | \$26,000.00    |
|                                                                                 | - New Booster Pumping Station                                                                   | L.S.           | \$508,000.00   | 1        | \$508,000.00   |
|                                                                                 | - Backup Power Generator                                                                        | unit           | \$150,000.00   | 1        | \$150,000.00   |
| System Subtotal:                                                                |                                                                                                 |                |                |          | \$1,974,637.50 |
| <b><u>Alternative WS4: Elevated Storage at New Location</u></b>                 |                                                                                                 |                |                |          |                |
|                                                                                 | Water Storage <sup>(2)</sup>                                                                    |                |                |          |                |
|                                                                                 | - Elevated Storage at New Location <sup>(3)</sup>                                               | L.S.           | \$2,252,500.00 | 1        | \$2,252,500.00 |
| Subtotal: <sup>(4)</sup>                                                        |                                                                                                 |                |                |          | \$2,252,500.00 |
| <b><u>Water Supply and Treatment</u></b>                                        |                                                                                                 |                |                |          |                |
|                                                                                 | New Back-up Well                                                                                | l/s            | \$30,000       | 21.7     | \$651,000.00   |
|                                                                                 | New Well with Treatment                                                                         | l/s            | \$30,000       | 21.7     | \$651,000.00   |
| Water Supply and Treatment Subtotal:                                            |                                                                                                 |                |                |          | \$1,302,000.00 |

(1) Costs include excavation, watermain, valve box, hydrant, installation and subgrade restoration.

(2) Estimate of elevated storage - Courtesy of **Landmark Structures**.

(3) Actual dimensions vary and will be determined by actual project requirements; A clear and open site and have assumed

(4) 5,000 psf shallow foundation; Steel tank coating -- zinc, epoxy, urethane exterior; stainless steel fill/draw line and overflow pipe.

**Everett Secondary Plan Area Study - Water Servicing**  
**Preliminary Cost Estimates of Alternatives**

**Alternative WD1+WS2: New Trunk Watermain with Elevated Storage**

| Item                                 | Description                       | Unit | Unit Price     | Quantity | Total                 |
|--------------------------------------|-----------------------------------|------|----------------|----------|-----------------------|
| 1.                                   | Water Distribution <sup>(1)</sup> |      |                |          |                       |
|                                      | - 300 mm diameter PVC pipe        | m    | \$250.00       | 9,313    | \$2,328,250.00        |
| Distribution System Subtotal:        |                                   |      |                |          | <u>\$2,328,250.00</u> |
| 2.                                   | Water Storage <sup>(2)</sup>      |      |                |          |                       |
|                                      | - Elevated Storage <sup>(3)</sup> | L.S. | \$2,250,000.00 | 1        | \$2,250,000.00        |
| Subtotal: <sup>(4)</sup>             |                                   |      |                |          | <u>\$2,250,000.00</u> |
| 3.                                   | Water Supply and Treatment        |      |                |          |                       |
|                                      | New Back-up Well                  | l/s  | \$30,000       | 21.7     | \$651,000.00          |
|                                      | New Well with Treatment           | l/s  | \$30,000       | 21.7     | \$651,000.00          |
| Water Supply and Treatment Subtotal: |                                   |      |                |          | <u>\$1,302,000.00</u> |
| Subtotal Construction Cost           |                                   |      |                |          | \$5,880,250.00        |
| Engineering & Contingency (40%)      |                                   |      |                |          | \$2,352,100.00        |
| Capital Cost                         |                                   |      |                |          | <u>\$8,232,350.00</u> |

(1) Costs include excavation, watermain, valve box, hydrant, installation and sub grade restoration.

(2) Estimate of elevated storage - Courtesy of **Landmark Structures**.

(3) Actual dimensions vary and will be determined by actual project requirements; A clear and open site and have assumed

(4) 5,000 psf shallow foundation; Steel tank coating -- zinc, epoxy, urethane exterior; stainless steel fill/draw line and overflow pipe.

Everett Secondary Plan Area Study - Water Servicing  
Preliminary Cost Estimates of Alternatives

**Alternative WD2+WS2: New Trunk Watermain and Improvements to Existing Watermain  
with Elevated Storage**

| Item                                 | Description                                                                                     | Unit | Unit Price     | Quantity | Total                 |
|--------------------------------------|-------------------------------------------------------------------------------------------------|------|----------------|----------|-----------------------|
| 1.                                   | Water Distribution <sup>(1)</sup>                                                               |      |                |          |                       |
|                                      | - 300 mm diameter pipe                                                                          | m    | \$250.00       | 9,313    | \$2,328,250.00        |
|                                      | - Replacing existing 300 mm dia. Pipe with 450 mm dia. Pipe from storage tank to Country Road 5 | m    | \$320.00       | 614      | \$196,480.00          |
| Distribution System Subtotal:        |                                                                                                 |      |                |          | <u>\$2,524,730.00</u> |
| 2.                                   | Water Storage <sup>(2)</sup>                                                                    |      |                |          |                       |
|                                      | - Elevated Storage <sup>(3)</sup>                                                               | L.S. | \$2,250,000.00 | 1        | \$2,250,000.00        |
| Subtotal: <sup>(4)</sup>             |                                                                                                 |      |                |          | <u>\$2,250,000.00</u> |
| 3.                                   | Water Supply and Treatment                                                                      |      |                |          |                       |
|                                      | New Back-up Well                                                                                | l/s  | \$30,000       | 21.7     | \$651,000.00          |
|                                      | New Well with Treatment                                                                         | l/s  | \$30,000       | 21.7     | \$651,000.00          |
| Water Supply and Treatment Subtotal: |                                                                                                 |      |                |          | <u>\$1,302,000.00</u> |
| Subtotal Construction Cost           |                                                                                                 |      |                |          | \$6,076,730.00        |
| Engineering & Contingency (40%)      |                                                                                                 |      |                |          | \$2,430,692.00        |
| Capital Cost                         |                                                                                                 |      |                |          | <u>\$8,507,422.00</u> |

(1) Costs include excavation, watermain, valve box, hydrant, installation and sub grade restoration.

(2) Estimate of elevated storage - Courtesy of **Landmark Structures**.

(3) Actual dimensions vary and will be determined by actual project requirements; A clear and open site and have assumed

(4) 5,000 psf shallow foundation; Steel tank coating -- zinc, epoxy, urethane exterior; stainless steel fill/draw line and overflow pipe.



**Everett Secondary Plan Area Study - Water Servicing  
Preliminary Cost Estimates of Alternatives**

**Alternative WD1+WS3: Expand Existing Storage with Pumping  
and a New Trunk Watermain**

| Item                                                            | Description                                      | Unit           | Unit Price   | Quantity | Total                 |
|-----------------------------------------------------------------|--------------------------------------------------|----------------|--------------|----------|-----------------------|
| 1.                                                              | Water Distribution <sup>(1)</sup>                |                |              |          |                       |
|                                                                 | - 300 mm diameter PVC pipe                       | m              | \$250.00     | 9,313    | \$2,328,250.00        |
| Distribution System Subtotal:                                   |                                                  |                |              |          | <b>\$2,328,250.00</b> |
| 2.                                                              | Water Storage                                    |                |              |          |                       |
|                                                                 | - Expand In-Ground Storage                       | cu.m           | \$476.25     | 2,710    | \$1,290,637.50        |
|                                                                 | - Additional Land Cost for Storage               | m <sup>2</sup> | \$10.00      | 2,600    | \$26,000.00           |
|                                                                 | - New Booster Pumping Station                    | L.S.           | \$508,000.00 | 1        | \$508,000.00          |
|                                                                 | - Backup Power Generator                         | unit           | \$150,000.00 | 1        | \$150,000.00          |
| System Subtotal:                                                |                                                  |                |              |          | <b>\$1,974,637.50</b> |
| 3.                                                              | Water Supply and Treatment                       |                |              |          |                       |
|                                                                 | New Back-up Well                                 | l/s            | \$30,000     | 21.7     | \$651,000.00          |
|                                                                 | New Well with Treatment                          | l/s            | \$30,000     | 21.7     | \$651,000.00          |
| Water Supply and Treatment Subtotal:                            |                                                  |                |              |          | <b>\$1,302,000.00</b> |
| Subtotal Construction Cost                                      |                                                  |                |              |          | \$5,604,887.50        |
| Engineering & Contingency (40%)                                 |                                                  |                |              |          | \$2,241,955.00        |
| <b>Capital Cost</b>                                             |                                                  |                |              |          | <b>\$7,846,842.50</b> |
|                                                                 |                                                  |                |              |          |                       |
| Operating & Maintenance Costs                                   |                                                  | Unit           | Unit Price   | Quantity | Total                 |
| 4.                                                              | Annual Repair/Replacement/Operating Requirements | unit           | \$10,000.00  | 1        | \$10,000.00           |
| 5.                                                              | Annual Power Costs                               | l/s            | \$66.78      | 33.96    | \$2,267.74            |
| Annual O&M Subtotal:                                            |                                                  |                |              |          | <b>\$12,267.74</b>    |
| <b>Net Present Value of Average Annual Costs<sup>(2)</sup>:</b> |                                                  |                |              |          | <b>\$94,375.84</b>    |
| <b>TOTAL LIFE CYCLE NPV COSTS:</b>                              |                                                  |                |              |          | <b>\$7,941,218.34</b> |

(1) Costs include excavation, watermain, valve box, hydrant, installation and subgrade restoration.

(2) NVP based on 20 years at 6% real discount rate, net of infiltration.

**Everett Secondary Plan Area Study - Water Servicing  
Preliminary Cost Estimates of Alternatives**

**Alternative WD2+WS3: New Trunk Watermain and Improvements to Existing Watermain  
Expand Existing Storage with Pumping**

| Item                                                       | Description                                                                                     | Unit           | Unit Price   | Quantity | Total                 |
|------------------------------------------------------------|-------------------------------------------------------------------------------------------------|----------------|--------------|----------|-----------------------|
| 1.                                                         | Water Distribution <sup>(1)</sup>                                                               |                |              |          |                       |
|                                                            | - 300 mm diameter PVC pipe                                                                      | m              | \$250.00     | 9,313    | \$2,328,250.00        |
|                                                            | - Replacing existing 300 mm dia. Pipe with 450 mm dia. Pipe from storage tank to Country Road 5 | m              | \$320.00     | 614      | \$196,480.00          |
| Distribution System Subtotal:                              |                                                                                                 |                |              |          | <b>\$2,524,730.00</b> |
| 2.                                                         | Water Storage                                                                                   |                |              |          |                       |
|                                                            | - Expand In-Ground Storage                                                                      | cu.m           | \$476.25     | 2,710    | \$1,290,637.50        |
|                                                            | - Additional Land Cost for Storage                                                              | m <sup>2</sup> | \$10.00      | 2,600    | \$26,000.00           |
|                                                            | - New Booster Pumping Station                                                                   | L.S.           | \$508,000.00 | 1        | \$508,000.00          |
|                                                            | - Backup Power Generator                                                                        | unit           | \$150,000.00 | 1        | \$150,000.00          |
| System Subtotal:                                           |                                                                                                 |                |              |          | <b>\$1,974,637.50</b> |
| 3.                                                         | Water Supply and Treatment                                                                      |                |              |          |                       |
|                                                            | New Back-up Well                                                                                | l/s            | \$30,000     | 21.7     | \$651,000.00          |
|                                                            | New Well with Treatment                                                                         | l/s            | \$30,000     | 21.7     | \$651,000.00          |
| Water Supply and Treatment Subtotal:                       |                                                                                                 |                |              |          | <b>\$1,302,000.00</b> |
| Subtotal Construction Cost                                 |                                                                                                 |                |              |          | <b>\$5,801,367.50</b> |
| Engineering & Contingency (40%)                            |                                                                                                 |                |              |          | <b>\$2,320,547.00</b> |
| Capital Cost                                               |                                                                                                 |                |              |          | <b>\$8,121,914.50</b> |
| Operating & Maintenance Costs                              |                                                                                                 | Unit           | Unit Price   | Quantity | Total                 |
| 4.                                                         | Annual Repair/Replacement/Operating Requirements                                                | unit           | \$10,000.00  | 1        | \$10,000.00           |
| 5.                                                         | Annual Power Costs                                                                              | l/s            | \$66.78      | 33.96    | \$2,267.74            |
| Annual O&M Subtotal:                                       |                                                                                                 |                |              |          | <b>\$12,267.74</b>    |
| Net Present Value of Average Annual Costs <sup>(2)</sup> : |                                                                                                 |                |              |          | <b>\$94,375.84</b>    |
| TOTAL LIFE CYCLE NPV COSTS:                                |                                                                                                 |                |              |          | <b>\$8,216,290.34</b> |

(1) Costs include excavation, watermain, valve box, hydrant, installation and subgrade restoration.

(2) NVP based on 20 years at 6% real discount rate, net of inflation.

**Everett Secondary Plan Area Study - Water Servicing  
Preliminary Cost Estimates of Alternatives**

**Alternative WD1+WS4: New Trunk Watermain with Elevated Storage at New Location**

| Item                                | Description                        | Unit | Unit Price     | Quantity | Total          |
|-------------------------------------|------------------------------------|------|----------------|----------|----------------|
| 1.                                  | Water Distribution <sup>(1)</sup>  |      |                |          |                |
|                                     | - 300 mm diameter pipe             | m    | \$250.00       | 9,468    | \$2,367,000.00 |
| Distribution System Subtotal:       |                                    |      |                |          | \$2,367,000.00 |
| 2.                                  | Water Storage <sup>(2)</sup>       |      |                |          |                |
|                                     | - Elevated Storage at New Location | L.S. | \$2,252,500.00 | 1        | \$2,252,500.00 |
| Subtotal: <sup>(4)</sup>            |                                    |      |                |          | \$2,252,500.00 |
| 3.                                  | Water Supply and Treatment         |      |                |          |                |
|                                     | New Back-up Well                   | l/s  | \$30,000       | 21.7     | \$651,000.00   |
|                                     | New Well with Treatment            | l/s  | \$30,000       | 21.7     | \$651,000.00   |
| Water Supply and Treatment Subtotal |                                    |      |                |          | \$1,302,000.00 |
| Subtotal Construction Cost          |                                    |      |                |          | \$5,921,500.00 |
| Engineering & Contingency (40%)     |                                    |      |                |          | \$2,368,600.00 |
| Capital Cost                        |                                    |      |                |          | \$8,290,100.00 |

(1) Costs include excavation, watermain, valve box, hydrant, installation and subgrade restoration.

(2) Estimate of elevated storage - Courtesy of **Landmark Structures**.

(3) Actual dimensions vary and will be determined by actual project requirements; A clear and open site and have assumed

(4) 5,000 psf shallow foundation; Steel tank coating -- zinc, epoxy, urethane exterior; stainless steel fill/draw line and overflow pipe.

**Everett Secondary Plan Area Study - Water Servicing  
Preliminary Cost Estimates of Alternatives**

**Alternative WD2+WS4: New Trunk Watermain with Improvements to Existing Watermain  
and Elevated Storage at New Location**

| Item                                 | Description                                                                                     | Unit | Unit Price     | Quantity | Total                 |
|--------------------------------------|-------------------------------------------------------------------------------------------------|------|----------------|----------|-----------------------|
| 1.                                   | Water Distribution <sup>(1)</sup>                                                               |      |                |          |                       |
|                                      | - 300 mm diameter pipe                                                                          | m    | \$250.00       | 9,468    | \$2,367,000.00        |
|                                      | - Replacing existing 300 mm dia. Pipe with 450 mm dia. Pipe from storage tank to Country Road 5 | m    | \$320.00       | 600      | \$192,000.00          |
| Distribution System Subtotal:        |                                                                                                 |      |                |          | <u>\$2,559,000.00</u> |
| 2.                                   | Water Storage <sup>(2)</sup>                                                                    |      |                |          |                       |
|                                      | - Elevated Storage at New Location                                                              | L.S. | \$2,252,500.00 | 1        | \$2,252,500.00        |
| Subtotal: <sup>(4)</sup>             |                                                                                                 |      |                |          | <u>\$2,252,500.00</u> |
| 3.                                   | Water Supply and Treatment                                                                      |      |                |          |                       |
|                                      | New Back-up Well                                                                                | l/s  | \$30,000       | 21.7     | \$651,000.00          |
|                                      | New Well with Treatment                                                                         | l/s  | \$30,000       | 21.7     | \$651,000.00          |
| Water Supply and Treatment Subtotal: |                                                                                                 |      |                |          | <u>\$1,302,000.00</u> |
| Subtotal Construction Cost           |                                                                                                 |      |                |          | \$6,113,500.00        |
| Engineering & Contingency (40%)      |                                                                                                 |      |                |          | \$2,445,400.00        |
| Capital Cost                         |                                                                                                 |      |                |          | <u>\$8,558,900.00</u> |

(1) Costs include excavation, watermain, valve box, hydrant, installation and subgrade restoration.

(2) Estimate of elevated storage - Courtesy of **Landmark Structures**.

(3) Actual dimensions vary and will be determined by actual project requirements; A clear and open site and have assumed

(4) 5,000 psf shallow foundation; Steel tank coating -- zinc, epoxy, urethane exterior; stainless steel fill/draw line and overflow pipe.

## **APPENDIX 'WS-G'**

### **1) Archaeological Assessment**



Stage 1 Archaeological Assessment of  
The Everett Secondary Plan and Master Services Class EA  
Township of Adjala-Tosorontio  
Simcoe County

ORIGINAL REPORT

Prepared for:

Township of Adjala-Tosorontio  
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Archaeological Licence #P047 (Bruce Welsh)  
Ministry of Tourism, Culture and Sport PIF# P047-374-2012  
ASI File 12TS-125

6 September, 2012



**Archaeological Services Inc.**

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Stage 1 Archaeological Assessment of  
The Everett Secondary Plan and Master Services Class EA  
Township of Adjala-Tosorontio  
Simcoe County

EXECUTIVE SUMMARY

Archaeological Services Inc. was contracted by the Township of Adjala-Tosorontio, Ontario to undertake a Stage 1 Archaeological Assessment of the Everett Secondary Plan and Master Services Class EA, located in the Township of Adjala-Tosorontio, Simcoe County. The study area is approximately 660 hectares. The study area is generally bordered by Forest Hill Drive to the north, Dekker Street to the south, Concession Road 4 to the west and Concession Road 6 to the east. The study area encompasses an area that includes both urban and rural residential areas, active farm land, wetlands, watercourses, forested lands, municipal parks and active commercial lands.

The background research determined that one archaeological site has been registered within the study area and that no other archaeological sites have been registered within a one kilometre radius. Nineteenth century mapping of the study area illustrated the historical settlement centre of Everett, the Hamilton and North Western Railway and a single dwelling. A review of the general physiographic setting of the study area determined that it is located in both the Simcoe Lowlands and the Peterborough Drumlin Field physiographic regions. The lands of the study area are well drained with multiple watercourses, including the Pine River, as well as multiple tributaries of the Nottawasaga River and the Boyne River. This research has led to the conclusion that there is archaeological potential for the recovery of both pre-contact and Euro-Canadian archaeological resources within the study area.

The detailed Stage 1 field review carried out for this assessment resulted in the following determinations for archaeological potential within the study area:

- All lands that have been fully developed are considered to have no archaeological potential. Likewise, all paved roadways, rail lines, and any parcels of land associated with buried utilities lack any archaeological potential, given the level and severity of land alteration which has occurred in these portions of the study area. This determination is consistent with section 1.3.2 of MTCS's Standards and Guidelines for Consultant Archaeologists.
- The areas of residential development within the Developed Area of Everett are considered to have no remaining archaeological potential. These areas have been subject to severe land alterations which were observed during the field review. This determination is consistent with Section 1.3.2 of MTCS's 2011 *Standards and Guidelines for Consultant Archaeologists*.
- All permanently low and wet areas such as watercourses or wetlands have no archaeological potential. This determination is consistent with standard 2, section 2.1 of MTCS's 2011 *Standards and Guidelines for Consultant Archaeologists*.
- A corduroy road was encountered within the unpaved portion of Concession Road 6. Any development within the roadway must be monitored by a licensed archaeologist. This determination is consistent with Standard 4, Section 2.1.7 of MTCS's 2011 *Standards and Guidelines for Consultant Archaeologists*.



- 
- A pond and berm dominated area within the Pine River Block fronting County Road 13 must be subject to a Stage 2 archaeological assessment using a judgmental testpitting strategy. This determination is consistent with Standard 2, Section 2.1.8 of MTCS's 2011 *Standards and Guidelines for Consultant Archaeologists*.
  - The balance of the study area, which consists of all active farm lands, woodlots and forested lands, as well as open, unaltered lands and all single residential lot lands as well as all infill lands are considered to have archaeological potential. These lands will require Stage 2 archaeological assessment carried out in accordance with section 2 of the MTCS's 2011 *Standards and Guidelines for Consultant Archaeologists* prior to any development occurring within these lands.





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ARCHAEOLOGICAL SERVICES INC.  
PLANNING DIVISION

PROJECT PERSONNEL

|                        |                                                                                 |
|------------------------|---------------------------------------------------------------------------------|
| Project Manager:       | Beverly Garner, Hons. BA,<br>Assistant Manager, Planning                        |
| Project Director:      | Bruce Welsh, PhD, (PO47)<br>Senior Archaeologist                                |
| Project Archaeologist: | John Dunlop, Hons. BA, (R261)<br>Staff Archaeologist                            |
| Report Preparation:    | John Dunlop<br>Jennifer Rose, Hons. BA, (R376)<br>Staff Archaeologist           |
| Report Reviewers:      | Beverly Garner<br>Lisa Merritt, MA, (PO94)<br>Senior Archaeologist, EA Division |



## **1.0 PROJECT CONTEXT**

### **1.1 Development Context**

Archaeological Services Inc. was contracted by the Township of Adjala-Tosorontio, Ontario to undertake a Stage 1 Archaeological Assessment of the Everett Secondary Plan and Master Servicing Municipal Class EA lands, located within the former Geographic Township of Tosorontio, Simcoe County, now in the Township of Adjala-Tosorontio, Simcoe County (Figure 1). The study area is approximately 660 hectares.

This assessment was conducted under the project management of Ms. Bev Garner and project direction of Dr. Bruce Welsh (MTCS PIF P047-374-2012) in accordance with the *Ontario Heritage Act* (R.S.O. 1990) and the Ministry of Tourism, Culture, and Sport's 2011 *Standards and Guidelines for Consultant Archaeologists*. This assessment was carried out prior to the Official Plan amendment for Simcoe County for the acceptance of the Secondary Plan and under the Municipal Class Environmental Assessment process as required by the *Ontario Planning Act* (R.S.O. 1990) and the *Environmental Assessment Act* (R.S.O. 1990) and regulations made under these Acts, and are therefore subject to all associated legislation. This project is being conducted under Schedule B of the Municipal Class Environmental Assessment process. Permission to access the study area and to carry out all activities necessary for the completion of the assessment was granted by the proponent on August 15, 2012.

### **1.2 Historical Context**

The MTCS's *Standards and Guidelines for Consultant Archaeologists* (MTC 2011:18) stipulates that areas of early Euro-Canadian settlement, including places of early military pioneer settlement (pioneer homesteads, isolated cabins, farmstead complexes), early wharf or dock complexes, pioneer churches and early cemeteries, are considered to have archaeological potential. There may be commemorative markers of their history, such as local, provincial, or federal monuments or heritage parks. Early historical transportation routes (trails, passes, roads, railways, portage routes), properties listed on a municipal register or designated under the *Ontario Heritage Act* or a federal, provincial, or municipal historic landmark or site, and properties that local histories or informants have identified with possible archaeological sites, historical events, activities, or occupations are also considered to have archaeological potential.

The study area extends across part of Lots 10, 11, 12 and 13, Concession 4 and Lots 10, 11, 12, 13 and 14, Concession 5, in the Geographic Township of Adjala-Tosorontio, Simcoe County.

#### **1.2.1 Brief History of Adjala-Tosorontio Township, Simcoe County**

The Township of Adjala was named after the wife or daughter of Chief Tecumseh, while the Township of Tosorontio was named after the Huron word for "beautiful mountain" (Township of Adjala-Tosorontio website).

Beginning in the 1820s, settlement of the Township began in the south. The Irish Catholics who came to Adjala began naming their communities after their hometowns in Ireland, or after prominent pioneer families who first settled in the area. The sandy soils of Tosorontio's provided habitat for the vast stands of pine trees, which supported as many as seven large sawmills and provided further incentive to come to the area (Township of Adjala-Tosorontio website).

In 1994, the former Township of Adjala and the former Township of Tosorontio were amalgamated into the Township of Adjala-Tosorontio (Township of Adjala-Tosorontio website).

### **The Hamilton and North Western Railway**

Simcoe County was desperate for an alternative to Toronto's Northern Railway of Canada, as the local residents believed that they did not have proper service to the western portion of the County. The North Railway, recognized this as an issue and decided to form a line from King City through Beeton, Angus and on to Penetanguishene (Cooper 2001). Simcoe County was able to provide municipal aid in the amount of \$300,000 in order to ensure the construction of a branch line from Beeton to Collingwood (Cooper 2001). The Hamilton and North Western Railway officially reached Barrie in 1877, and Collingwood in December of 1878, thus passing through such hamlets as Everett, Lisle and Glencairn in Tosorontio Township (Cooper 2001, Township of Adjala-Tosorontio website).

#### ***1.2.2 History of the Settlement Area of Everett***

The first use of the name Everett is a debated question. There are two competing ideas as to how the community was named. The first of which is that the name was taken after an early settler by the name of Mr. Fisher, who named his farm "Everett," while the other is after another early settler by the name of Mr. Henry Baycroft, who named the community after his hometown in England (New Tecumseth Public Library).

Everett was originally located one concession east at the intersection of present-day County Road 5 and Concession Road 7. A plaque is now found at this location commemorating the original location of the community (Plate 1). Everett was moved to its current location after the Hamilton and North Western Railway was established in 1878, so that the town could reap the benefits of a local railway station (New Tecumseth Public Library). Soon after its relocation, Everett began to see growth in population and commerce through the late-nineteenth and into the twentieth century.

The first business in Everett was William Lockhart's general store (JDG 2006). Other early businesses consisted of Pat Hanlan's blacksmith shop, Edward Anderson's shoemaker shop, Simpson Jenkin's carriage shop and John Gallagher's hotel (JDG 2006). The local timber industry also proved to be a prosperous commodity for the community (JDG 2006). However, by the mid-twentieth century the general decline of railways in favour of roads led to the demise of the Hamilton and North Western railway and the rail line was dismantled. Everett likewise declined in population and commercial presence.

### **1.2.3 Review of Nineteenth Century Mapping**

A review of the 1881 *Simcoe Supplement in the Illustrated Atlas of the Dominion of Canada* was completed in order to determine if this source depicts any nineteenth-century Euro-Canadian settlement features that may represent potential historical archaeological sites within the study area (Figure 2).

The 1881 *Illustrated Atlas* depicts the historical settlement centre of Everett at the intersection of present-day County Road 5 and County Road 13. Within this intersection, the Everett Post Office is depicted. Immediately adjacent to this settlement centre is the Hamilton and North Western Railway. Lot 11, Concession 4, depicts one additional historical feature of interest; a dwelling owned by A. Wanless. The Pine River is illustrated within Lot 13, Concession 4.

It should be noted that the schematic illustrations of settled areas such as Everett in the *Illustrated Atlas*, do not accurately depict the nature or frequency of any historical features potentially located therein. Depicting these smaller settled areas in a schematic manner was a common mapping practice of the nineteenth century.

Joe Hosick, Director of Growth and Development, Township of Adjala-Tosorontio was contacted in order to determine if any properties within the study area had been designated under Part IV of the *Ontario Heritage Act* (R.S.O. 1990) or otherwise listed as having heritage interest by the Township of Adjala-Tosorontio. It was confirmed that there are no designated properties within the study area (Joe Hosick pers. comm. 2012).

Therefore, given the presence of the schematically illustrated settlement area of Everett, the Hamilton and North Western Railway and the dwelling located in Lot 11, Concession 4, there is the potential for the recovery of historical archaeological resources, depending on degree of more recent land alterations.

## **1.3 Archaeological Context**

Understanding the archaeological context of a study area involves research to describe the known and potential archaeological resources within the vicinity of a study area. The background research for such an assessment incorporates a review of previous archaeological research, physiography, and nineteenth-century development for the study area. Background research was completed to identify any archaeological sites within the subject property and to assess its archaeological potential.

### **1.3.1 Registered Archaeological Sites**

In order that an inventory of archaeological resources could be compiled for the study area, three sources of information were consulted: the site record forms for registered sites housed at the Ministry of Tourism, Culture and Sport, published and unpublished documentary sources, and the files of Archaeological Services Inc.

In Ontario, information concerning archaeological sites is stored in the Ontario Archaeological Sites Database (OASD) which is maintained by the Ministry of Tourism, Culture and Sport. This database

contains archaeological sites registered within the Borden system. The Borden system was first proposed by Dr. Charles E. Borden and is based on a block of latitude and longitude. Each Borden block measures approximately 13 km east-west by 18.5 km north-south. Each Borden block is referenced by a four-letter designator, and sites within a block are numbered sequentially as they are found. The subject property under review is located within the BbGx Borden block.

One archaeological site has been registered within the study area; however, no other sites have been registered within a one kilometre radius of the study limits. The site consists of an isolated corner-notched projectile point fragment resembling a Middle Woodland Jack's Reef point (BP 1500-1000) (Spence, Pihl and Murphy 1990). The isolated point fragment was encountered by ASI in 2011 (ASI 2011). This type of point is not attributable to any specific cultural complex of the Middle Woodland, having being encountered in association with Point Peninsula, Saugeen and independent complexes (Spence, Pihl and Murphy 1990).

### ***1.3.2 Previously Assessed Lands***

Archaeological Services Inc. has previously assessed two large areas within the southwest corner of current study area limits.

The Stage 1 and 2 archaeological assessment of the Everett Community Phase 1 Proposed Residential Subdivision, located within part of Lot 10, Concession 4, took place in October of 2010, under MTCS PIF P049-577-2010. Approximately 28 hectares south of County Road 5 were assessed by means of a pedestrian survey and test pit survey employed at five metre intervals (ASI 2011). No cultural material was encountered during the course of the assessment.

The Stage 1 and 2 archaeological assessment of the Everett Community Phase 2 Proposed Residential Subdivision, located within part of Lot 10, Concession 4, took place in August of 2011, under MTCS PIF P049-578-2010 and P347-079-2011. Approximately 40 hectares south of County Road 5 and east of Concession Road 4 were assessed by means of a pedestrian survey employed at five metre intervals (ASI 2011). During the course of the assessment, pre-contact site BdGx-5 was encountered within a relatively flat portion of the southern half of the property. A single corner-notched projectile point fragment resembling a Middle Woodland Jack's Reef point (BP 1500-1000) manufactured from Onondaga chert was collected (ASI 2011). Due to the isolated nature of the find, no further archaeological assessment was recommended.

Further to the assessments completed by ASI, one additional assessment has been completed within the study area. A Stage 1 and 2 archaeological assessment of the R&M Homes Subdivision Development, located within part of Lot 12, Concession 4, was completed by Archaeological Assessments Ltd. in July of 2011, under MTCS PIF P013-595-2011 (AAL 2011). Approximately 6.96 hectares east of County Road 13 and north of Moore Avenue were assessed by means of a pedestrian survey employed at five metre intervals (AAL 2011). No cultural material was encountered during the course of the assessment.

### ***1.3.3 Review of Physiographic Setting***

The majority of the study area is situated within the Simcoe Lowlands physiographic region of southern Ontario; however the southeast corner of the study area is found within the Peterborough Drumlin Field physiographic region of southern Ontario.

The Simcoe Lowlands region occupies approximately 2,849 square km, lying predominately to the east and west of the City of Barrie (Chapman and Putman 1966:299). The lowland surrounding Lake Simcoe, also referred to as the Lake Simcoe basin is situated to the east. While the plains which drain into Nottawasaga Bay, by way of the Nottawasaga River, also referred to as the Nottawasaga basin, is situated to the west. The Nottawasaga basin at one time made up a portion of the glacial Lake Algonquin floor. However, the southern portion of the basin, primarily located in the area of Tecumseh Township represents an area separated from the main bay by moraine uplands. The upper Nottawasaga River and its tributaries have therefore transported large amounts of sand and silt into the area. Shallow streams are present in this area; however drainage is generally poor which in turn has created large bogs (Chapman and Putman 1966:300).

The Peterborough Drumlin Field region occupies an area of approximately 4,523 square km and extends from Hastings County to Simcoe County (Chapman and Putman 1966:280). This belt contains approximately 3,000 drumlins in addition to many drumlinoidal hills and eskers. The drumlins throughout this region are generally composed of highly calcareous till, however this does change locally. While, the eskers in this region are comprised of gravel ridges featuring poor soils. The orientation of the drumlin axes in this field is from northeast to southwest, however within the Lake Simcoe area, the direction of the ice movement seems to have been as much as 60 degrees west of south (Chapman and Putman 1966:282).

The study area is underlain by shales of the Utica formation, which contain layers of calcareous sandstone and sandy shale (Hoffman, Wicklund and Richards 1962:10-11). According to the Soil Survey of Simcoe County Ontario, the surface deposits within the study area are largely comprised of sandy and gravelly glacio-fluvial outwash, however areas within the southwest are found to be comprised of lacustrine clays, silts and sand laid down in glacial lakes. The topography in the southeast is found to feature gentle to moderately steeped slopes (Hoffman, Wicklund and Richards 1962:12-14).

Multiple watercourses are found within the limits of the study area. The largest of which is the Pine River, which flows through the northwest quadrant of the study area. Other watercourses located within the study area include multiple tributaries of the Nottawasaga River. These tributaries are found primarily throughout the east-central portion of the study area, surrounding much of the extant residential area. These tributaries also flow through the northeast corner of the study area. Within the eastern limits of the study area, these watercourses have created wet lands adjacent to Concession Road 6. Finally, the southern portion of the study area features several tributaries of the Boyne River.

The terrain of the study area consists of relatively level lands featuring a gentle northerly slope and is broken only by the Pine River Valley which extends through the northwest corner of the study area. However, the southeastern corner of the property, adjacent to Concession Road 6 and south of County Road 5 is situated approximately 40 metres higher in elevation than the majority of the study area.





A review of the surficial geology mapping of Simcoe County determined that the paleo-shoreline of glacial Lake Algonquin extended through the western extent of the study area (Figure 3). The balance of the study area features inland near shore deposits formed during the initial formation and flooding of glacial Lake Algonquin. The southeast corner of the study area, the highest point of lands, falls within lands classified as the edge of a glacially formed drumlin, which would have acted as an archipelago during the formation phase of glacial Lake Algonquin. Finally the present-day Pine River valley is classified as a glacial river delta, emptying into the glacial lake.

### 1.3.4 Pre-and-Post-Contact Period Aboriginal Occupation in Simcoe County

Human occupation of the northwest Simcoe County area extends over the entire breadth of the pre-and-post-contact period of southern Ontario, which is outlined generally in Table 1. There are two specific periods which are particularly significant to northwest Simcoe County; the Paleo-Indian period of occupation and the early-post contact period of the Huron-Wendat.

The paucity of documented sites in the study area may be attributable to the fact that much of the area has not been subject to development or has not been subject to detailed archaeological survey being conducted under the terms of the Planning and Environmental Assessment Acts. It is not a reflection of First Nation settlement or land use prior to Euro-Canadian colonization. Indeed it is known that the environment of the area was rich in resources of particular use to both the Paleo-Indian period and later early-post contact period of the Huron-Wendat. This does not preclude the occupation of the study area throughout the pre-contact period of Southern Ontario.

**Table 1: Outline of Southern Ontario Pre-contact and Post-contact Cultures**

| Period              | Archaeological Culture                               | Date Range       | Lifeways/Attributes                         |
|---------------------|------------------------------------------------------|------------------|---------------------------------------------|
| <b>PALEO-INDIAN</b> |                                                      |                  |                                             |
| Early               | Gainey, Barnes, Crowfield                            | 11000 - 10500 BP | Big game hunters                            |
| Late                | Holcombe, Hi-Lo, Lanceolate                          | 10500 - 9500 BP  | Small nomadic groups                        |
| <b>ARCHAIC</b>      |                                                      |                  |                                             |
| Early               | Nettling, Bifurcate-base                             | 9800 - 8000 BP   | Nomadic hunters and gatherers               |
| Middle              | Kirk, Stanly, Brewerton, Laurentian                  | 8000 - 4000 BP   | Transition to territorial settlements       |
| Late                | Lamoka, Genesee, Crawford Knoll, Innes               | 4500 - 2500 BP   | Polished/ground stone tools (small stemmed) |
| <b>WOODLAND</b>     |                                                      |                  |                                             |
| Early               | Meadowood                                            | 2800 - 2400 BP   | Introduction of pottery                     |
| Middle              | Point Peninsula, Saugeen, Jack's Reef Corner-Notched | 2400 -1200 BP    | Incipient horticulture                      |
| Late                | Algonkian, Iroquoian                                 | 1200-700 BP      | Transition to village life and agriculture  |
|                     | Algonkian, Iroquoian                                 | 700-600 BP       | Establishment of large palisaded villages   |
|                     | Algonkian, Iroquoian                                 | 600-400 BP       | Tribal differentiation and warfare          |

**Table 1: Outline of Southern Ontario Pre-contact and Post-contact Cultures**

| Period                      | Archaeological Culture                    | Date Range     | Lifeways/Attributes         |
|-----------------------------|-------------------------------------------|----------------|-----------------------------|
| <b>CONTACT/POST-CONTACT</b> |                                           |                |                             |
| Early                       | Huron, Neutral, Petun, Odawa, Ojibwa      | 400-350 BP     | Tribal displacements        |
| Late                        | Six Nations Iroquois, Ojibwa, Mississauga | 350-200 BP     |                             |
|                             | Euro/Canadian                             | 220 BP-Present | Present European settlement |

### ***Paleo-Indian Occupation of Simcoe County***

The term Paleo-Indian refers to the earliest well documented groups within the Americas dating from approximately 11,500 BP, at the time of the final ice sheets retreat (Ellis and Deller 1990 and Storck 1984). These populations were the first human occupation of the post-glacial landscape of southern Ontario. Archaeological sites dating to this period are rare and are considered to be highly significant archaeological resources. Paleo-Indian groups are defined by their artifact assemblages, site characteristics and the ways in which they subsist and exploit their environment (Ellis and Deller 1990). Living in small mobile bands or groups, Paleo-Indians relied on hunting large game rather than hunting and gathering or agriculture, like their later descendants (Ellis and Deller 1990).

Paleo-Indian populations inhabited an environment that may have been similar to present-day Arctic tundra (Ellis and Deller 1990). As such, many sites have been encountered within proximity of the glacial Lake Algonquin Strand, which represents the initial shoreline formed by the glacial lake during the retreat of the ice sheets (Karrow and Warner 1990). The glacial Lake Algonquin Strand extends within general proximity west of the study area (Jackson, Ellis, Morgan, McAndrews 2000). The terrain located within proximity of the strand, both inland and out towards the gradually diminishing glacial Lake Algonquin, provided a habitable environment for Paleo-Indian peoples (Jackson, Ellis, Morgan, McAndrews 2000). As previously noted in section 1.3.3, the paleo-shoreline of glacial Lake Algonquin extends through a portion of the study area. The present-day Pine River valley was also a glacial river delta. Finally, the southeast corner of the study area would have projected into the lake as a high point of land. All of these areas represent potential areas of habitation and activity for Paleo-Indian populations.

It should also be noted that given the path of the paleo-shoreline of glacial Lake Algonquin, the northern and western portions of Simcoe County may have been some of the more densely populated areas by Paleo-Indian people, as reflected by the relative density of known Paleo-Indian sites within this region (Jackson, Ellis, Morgan, McAndrews 2000).

The earliest Paleo-Indians produced distinctive spear or dart points featuring channels or “flutes” located in the centre of the point originating at the base (Ellis and Deller 1990), thus often referred to as fluted projectile points. Within Ontario, Onondaga and Collingwood (Fossil Hill formation) cherts were widely preferred as the raw material of choice. Other Ontario sources such as Haldimand, Selkirk, Ancaster and Kettle Point cherts were available, yet rarely utilized (Ellis and Deller 1990). Therefore, an important indicator in the Paleo-Indian occupation of Simcoe Region is also the known in situ exposure of Fossil Hill chert in the Collingwood area (Storck 1984).

### ***Early Contact/Post-Contact Occupation of Simcoe County***

The late sixteenth century witnessed a northward migration of Wendat communities from the north shore of Lake Ontario that resulted in the historical coalescence in Huronia and abandonment of the southern and eastern homelands (Popham and Emerson 1952; Emerson 1959, 1961). Recognizing the existing limitations in archaeological data, researchers considered three main lines of explanation for the migration: ecological factors, socio-economic factors, and socio-political factors (Heidenreich 1963; 1971, Trigger 1962, 1963, 1969, 1979, 1985).

Push and pull factors surrounding northern migration may have stemmed from the attractiveness of Huronia as a settlement area and the looming warfare that may have rendered southern haunts less appealing. However, Trigger (1962; 1963; 1969:24; 1985:157-158) argued that socio-economic incentives were most responsible for the late pre-contact and contact period coalescence of Huron tribes in Huronia. He suggested that trade relations with northern Algonquian peoples, who plied the canoe routes of the upper Great Lakes, were important and longstanding, having been established at least as early as the first Iroquoian settlement of Simcoe County in Middle Iroquoian times.

Indeed, towards the latter part of the fourteenth century, the Barrie region was a primary area of Iroquoian settlement in Simcoe County, but a more diffuse distribution of numerous other apparently late fourteenth century sites throughout southern Simcoe County also attests to an expansion of Middle Iroquoian settlement. Settlements in the Flos Lowlands, together with the sites on the Penetang Peninsula, suggest a western movement into this portion of Simcoe County (Warrick 1990:360-361). Similarly, expansion northwards from the Barrie core area is suggested by relatively isolated middle to late fourteenth century villages located along the rivers flowing north into Severn Sound and along the Sturgeon River watershed. The spread of villages further northward must, in large part, be attributable to the continued migration of new communities into the area, creating a “leapfrog” pattern of village distribution in which less favourable areas were avoided (Sutton 1995:74).

By the end of the sixteenth century, the northward migration that had begun in the thirteenth century approached its final stage, as groups coalesced to form the Huron tribal confederacy in the northern uplands of Simcoe County. The South Slopes Till Plain and the Trent Valley were virtually abandoned at this time, while settlement in southern Simcoe County was considerably reduced.

At the time of contact, the largest nation, the Attignawantan, were historically ensconced on the Penetang Peninsula. The Ataronchonnon were located to their east between Hog Bay and Matchdash Bay. Further east still were the Attingneenongnac and the Arendaronnon, the latter of whom were on the west side of Lake Couchiching. Finally, the Tahontaenrat were located to the south of the Ataronchonnon. They were the smallest nation of the confederacy and were the last group to migrate into Huronia, arriving circa A.D. 1610-1620 (Heidenreich 1971; Trigger 1976).

### ***Overall Pre-and-Post-Contact Period Archaeological Potential***

The MTCS’s Standards and Guidelines for Consultant Archaeologists (MTC 2011:17) stipulates that primary water sources (lakes, rivers, streams, creeks), secondary water sources (intermittent streams and creeks, springs, marshes, swamps), ancient water sources (glacial lake shorelines indicated by the

presence of raised sand or gravel beach ridges, relic river or stream channels indicated by clear dip or swale in the topography, shorelines of drained lakes or marshes, cobble beaches), as well as accessible or inaccessible shorelines (high bluffs, swamp or marsh fields by the edge of a lake, sandbars stretching into marsh) are characteristics that indicate archaeological potential.

Other geographic characteristics that can indicate archaeological potential include: elevated topography (eskers, drumlins, large knolls, plateaux), pockets of well-drained sandy soil, especially near areas of heavy soil or rocky ground, distinctive land formations that might have been special or spiritual places, such as waterfalls, rock outcrops, caverns, mounds, and promontories and their bases. There may be physical indicators of their use, such as burials, structures, offerings, rock paintings or carvings. Resource areas, including; food or medicinal plants (migratory routes, spawning areas, prairie), and scarce raw materials (quartz, copper, ochre, or outcrops of chert) are also considered characteristics that indicate archaeological potential (MTC 2011:18).

An added factor of this pre-contact potential model is the presence of the elevated, well drained lands found within the southeastern corner of the study area. These lands pose as an important indicator in the possibility of encountering potential for the presence of pre-contact archaeological sites.

Therefore, given the presence of the recorded pre-contact archaeological site, the presence of various physiographic determinants such as the Pine River and tributaries of the Boyne and Nottawasaga Rivers, as well as the proximity of the glacial Lake Algonquin Strand and the noted occupation of the Huronia Region, the study area has the potential for the recovery of pre-contact archaeological resources, depending on the degree of more recent land alterations.

### ***1.3.5 Study Area Description***

The Stage 1 field review was completed on August 21, 2012 in order to assess the archaeological potential of the property. All field work was conducted under the direction of Mr. John Dunlop (R261). The weather conditions were appropriate for the completion of field work.

The study area consists of the Everett Secondary Plan lands, which is generally bordered by the development boundary approximately extending along Forest Hill Drive to the north, the development boundary approximately extending along Dekker Street to the south, Concession Road 4 to the west and Concession Road 6 to the east. The study area encompasses an area that includes both urban and rural residential areas, active farm land, wetlands, watercourses, municipal parks and active commercial lands. Given the large size, the variety of land uses and physiographic characteristics, the study area was subdivided into eight distinct sections; The Developed Area of Everett, the Southwest Block, the Southeast Block, the Western Block, the Eastern Block, the Pine River Block, the Northern Block, and all Roadways and Right of Ways. The boundaries of these sections are illustrated on Figure 4. The location of the field photos are also depicted on Figure 3.

### **The Developed Area of Everett**

The central portion of the overall study area is dominated by mixed residential and commercial lands comprising the current settlement area of Everett. These lands extend outward from the major intersection

of County Road 5/Main Street and County Road 13, in the location of the centre of the historic settlement and the current downtown. County Road 5/Main Street and County Road 13 are dominated by late-nineteenth and early twentieth century structures including houses, store fronts and former churches (Plates 2 and 3). These structures were not depicted on the nineteenth century mapping, but were incorporated into the schematically illustrated Everett as noted on Figure 2. St. David's Anglican Church and cemetery are located on County Road 13, south of Main Street (Plates 4 and 5). The church and cemetery were founded 1880, and neither is noted on the historical mapping.

The northeast, northwest and southeast quadrants of the downtown are the locations of the more recently developed subdivisions. These areas consist of single residential lots, full servicing and utilities, and several municipal parks and were most likely developed within the past thirty years (Plates 6-10). The tributaries of the Nottawasaga River, flow through this portion of the study area (Plate 11). Portions of these tributaries have been modified and incorporated into the municipal water management system.

The Hamilton and Northwestern rail line is noted on the historical mapping as extending north-south on the eastern side of the historic downtown section of Everett. There is currently no evidence of a rail line within this portion of the study area, however, a detailed examination of aerial photography for the study area indicates a treeline and "shadow" outline of the rail line course, extending along the present-day path of Wales Avenue, and further north into agricultural fields in the northern block of the study area (Figure 5).

### **The Southeast Block**

The Southeast Block comprises the portion of the study area which is located within the Peterborough Drumlin Field, and is bordered by the residential development to the west, the study area boundary to the south, Concession Road 6 to the east and the residential lots fronting County Road 5/Main Street. Overall, it lies upon lands which slope up to the north and west, and are generally found to be approximately 40 m above the balance of the study area (Plate 12). This elevated area is a distinct feature when looking across the landscape. The Southeast Block currently consists of agricultural land with a farm complex as well as a separate, single residential lot, both of which front Concession Road 6 (Plates 13 and 14).

### **The Southwest Block**

The Southwest Block is bordered by County Road 5/Main Street to the north, developed lands to the east, Concession Road 4 to the west and the study area boundary to the south. This portion of the study area consists of agricultural lands featuring level terrain, as well as one farm complex, fronting County Road 5/Main Street (Plates 15 and 16). The majority of the lands within the Southwest Block have previously been subjected to archaeological assessments by ASI, as noted in section 1.3.2 (ASI 2011, 2012).

### **The Western Block**

The Western Block is bordered by County Road 5/Main Street to the south, the developed area of Everett to the southeast, County Road 13 to the east, the forested and undeveloped Pine River to the north, and Concession Road 4 to the west. These lands consist of open agricultural lands featuring level terrain

(Plate 17). There are two farm complexes within the Western Block; one fronting County Road 5/Main Street and the other fronting Concession Road 4, as well as a residence at the intersection of the two roads (Plates 18 and 19). The farm complex fronting County Road 5/Main Street is located in the same location as the homestead belonging to A. Wanless, as depicted on the nineteenth century mapping (Figure 2).

### **The Pine River Block**

The Pine River Block consists of lands dominated by the Pine River. These lands consist of forest and open agricultural lands (Plates 20-22). The block is bordered by County Road 13 to the east, the study area boundary to the north, the Western Block to the south and Concession Road 4 to the west. There are several large, single residential lots fronting Concession Road 4 (Plate 23). The eastern portion of the block features an area dominated by ponds and berms indicative of land altering activities in the past (Plates 24 and 25).

### **The Northern Block**

The Northern Block is bordered by County Road 13 to the west, the developed area of Everett to the south, Concession Road 6 to the east, and the study area boundary to the north. These lands consist of open agricultural lands and a woodlot which slopes slightly down to the south (Plates 26-28). There are several single residential lots and one farm complex which front County Road 13 within the lot (Plate 29). Several tributaries of the Nottawasaga River flow through the block, and the Hamilton and North Western rail line shadow extends through several agricultural fields and woodlot (Figure 5). The southernmost fields within the Northern Block have previously been assessed by Archaeological Assessments Limited in 2011 (AAL 2011).

### **The Eastern Block**

The Eastern Block fronts Concession Road 6 and is bordered by the Northern Block and the developed area of Everett. These lands consist primarily of low lying cedar swamp lands, although the low lying wet area ceases as the lands slope upward in the northern portion of the block (Plates 30 and 31). Several tributaries of the Nottawasaga River flow through the block, draining the developed areas to the west (Plate 32).

### **Roadways and Right of Ways**

There are two different types of road which extend through the study area; County and Concession Roads which follow the historical transportation corridors as noted on the nineteenth century mapping and the smaller residential roads which extend through the residential developments in Everett. Typically, rights-of-way (ROW) can be divided into two areas: the disturbed ROW, and ROW lands beyond the disturbed ROW. The typically disturbed ROW extends outwards from either side of the centerline of the traveled lanes, and it includes the traveled lanes and shoulders and extends to the toe of the fill slope, the top of the cut slope, or the outside edge of the drainage ditch, whichever is furthest from the centerline. Subsurface disturbance within these lands may be considered extreme and pervasive, thereby negating any archaeological potential for such lands.

ROW construction disturbance may be found to extend beyond the typical disturbed ROW area, and this generally includes additional grading, cutting and filling, additional drainage ditching, watercourse alteration or channelization, servicing, removals, intensive landscaping, and heavy construction traffic. Areas beyond the typically disturbed ROW generally require archaeological assessment in order to determine archaeological potential relative to the type or scale of disturbances that may have occurred in these zones

The County Roads (County Road 5/Main Street and County Road 13) feature two-lane paved roadways with right of ways which featured buried utilities and services as well as drainage ditches (Plates 33-36). Concession Road 4 consists of a two-lane paved road which features drainage ditches in both right of ways (Plate 37). Concession Road 6 consists of a paved two-lane road south of County Road 5; however, it is an unassumed packed dirt road north of County Road 5 (Plates 38 and 39). Concession Road 6 features a section of a corduroy road within the Eastern Block of the study area (Plates 40 and 41). This corduroy road consists of logs which have been laid lengthwise across the roadway in order to maintain its form through the low lying swampy lands. The logs were noted just below the surface of the packed dirt roadway along a section approximately 200 m in length. The corduroy road is not intact and there are several portions of the roadway which have flooded (Plate 42).

The residential roads which extend through the residential developments within Everett were all found to be two-lane paved roads which feature drainage ditches and buried utilities within the right of ways (Plates 43-45).

## **2.0 FIELD METHODS**

The Stage 1 archaeological assessment was conducted by means of a visual review of the study area that involved spot checking every 40 metres (131 feet) across the study area. Special emphasis was given to locations with high pre-contact archaeological potential and features of historical significance during the field assessment. This strategy is consistent with Section 1.2, Standard 1 of the *Standards and Guidelines for Consultant Archaeologists* (MTC 2011:5).

## **3.0 ANALYSIS AND CONCLUSION**

Archaeological Services Inc. was contracted by the Township of Adjala-Tosorontio, Ontario to undertake a Stage 1 Archaeological Assessment of the Everett Secondary Plan and Master Servicing Municipal Class EA lands, located within the former Geographic Township of Tosorontio, Simcoe County, now in the Township of Adjala-Tosorontio, Simcoe County.

The study area is approximately 660 hectares. The detailed background assessment determined that one archaeological site had been registered within the study area and no other sites have been registered within a one kilometre radius of the study area. A review of the history of the study area determined the settlement area of Everett was originally established one concession road east of its present-day location and that the settlement was moved to accommodate the Hamilton and North Western Railway in the late nineteenth century. A review of the general physiographic setting of the study area determined that it is located in both the Simcoe Lowlands and Peterborough Drumlin Field physiographic regions. The lands of the

study area were well drained with multiple watercourses, including Pine River in the northwest quadrant and tributaries of the Nottawasaga and Boyne River in the south and eastern portions of the study area. A review of pre-and-post contact archaeological potential determined that the study area is located within proximity of the glacial Lake Algonquin Strand and is located within a larger area which features a number of Paleo-Indian sites. Furthermore, the study area is located within the traditional lands of what is known as Huronia, the historically occupied lands associated with the Huron/Wendat people.

The study area consists of the Everett Secondary Plan lands, which is generally bordered by Forest Hill Drive to the north, Dekker Street to the south, Concession Road 4 to the west and Concession Road 6 to the east. The study area encompasses an area that includes both urban and rural residential areas, active farm land, wetlands, watercourses, municipal parks and commercial lands (Figures 4 and 6).

Three parcels of land within the study area have been previously subject to archaeological assessments. The recommendations from these assessments have stated that these lands are free of any further archaeological concern (Figure 6).

In order to determine the archaeological potential for the study area, a detailed Stage 1 field review was undertaken, in order to determine the integrity of archaeological potential across the study area.

All lands that have been developed for commercial use are considered to not require further archaeological assessment. Likewise, all paved roadways, rail lines, and any parcels of land associated with buried utilities are considered to lack any archaeological potential. These lands have been altered by the significant disturbance and removal of soils to such a degree that any extant archaeological resources would have been removed. This determination is consistent with section 1.3.2 of MTCS's *Standards and Guidelines for Consultant Archaeologists*. These areas are noted on Figure 6.

All recently built residential developments located inside the Developed Area of Everett are considered to not have remaining archaeological potential. These areas include any parkland which has been notably graded or otherwise impacted during the development process. These areas have been subject to including severe land alterations consistent with current construction techniques which were observed during the field review. This determination is consistent with Section 1.3.2 of MTCS's 2011 *Standards and Guidelines for Consultant Archaeologists*. These areas are noted on Figure 6.

All permanently low and wet areas such as watercourses or wetlands do not have archaeological potential. This determination is consistent with Standard 2, Section 2.1 of MTCS's 2011 *Standards and Guidelines for Consultant Archaeologists*. These areas are noted on Figure 6.

The pond and berm dominated area within the Pine River Block fronting County Road 13 must be subject to a Stage 2 archaeological assessment using a judgmental testpitting strategy. This determination is consistent with Standard 2, Section 2.1.8 of MTCS's 2011 *Standards and Guidelines for Consultant Archaeologists*. This area is noted on Figure 6.

The corduroy road located within Concession Road 6 is potentially representative of a unique historic transportation corridor. Although the visible corduroy road may have been constructed in more recent times, it should be subject to further investigation. Therefore, any development or alteration taking place



along the roadway should be monitored by a licensed archaeologist. This determination is consistent with Standard 4, Section 2.1.7 of MTCS's 2011 *Standards and Guidelines for Consultant Archaeologists*.

The balance of the study area, including all active farm lands, woodlots, open, unaltered lands, including and all residential lands excluding the above mentioned current developments and all infill lands within the residential developments where land alterations may not have taken place, are considered to have archaeological potential. There are several factors which were considered in this determination. The extensive forested areas within the Pine River Block and the Northern Block may represent undisturbed forest lands which have the potential for the recovery of insitu archaeological deposits. All active farm lands are considered to have been subject to minimal land alteration (i.e. ploughing). Likewise, any large, single lot residential lands, municipal parks, schoolyards or large scale, mid twentieth century residential lands have likely only been altered in the areas of building footprints or buried utilities. Finally, the majority of these non-agricultural lands are located within the historic settlement area of Everett as noted by the schematically illustrated settlement area on the historical mapping. Given these factors, these lands will require Stage 2 archaeological assessments carried out in accordance with section 2 of the MTCS's 2011 *Standards and Guidelines for Consultant Archaeologists* prior to any development. These lands are identified on Figure 6.

#### **4.0 RECOMMENDATIONS**

In light of these results, the following recommendations are made:

1. Prior to any land-disturbing activities within the subject property, a Stage 2 archaeological assessment must be conducted on the lands as identified in Figure 6. The Stage 2 assessment must be carried out in accordance with the Ministry of Tourism and Culture's 2011 *Standards and Guidelines for Consultant Archaeologists*.
2. Any development within the Concession Road 6 roadway must be carried out under monitoring of a licensed archaeologist. The archaeologist shall make a thorough inspection of the roadway for any evidence of a historic corduroy road. Any remnant of a historic corduroy road should be fully documented in accordance with the MTCS's 2011 *Standards and Guidelines for Consultant Archaeologists*.

#### **5.0 ADVICE ON COMPLIANCE WITH LEGISLATION**

- This report is submitted to the Minister of Tourism, Culture and Sport as a condition of licensing in accordance with Part VI of the Ontario Heritage Act, RSO 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological field work and report recommendations ensure the conservation, preservation and protection of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Tourism, Culture and Sport, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

- It is an offence under Sections 48 and 69 of the Ontario Heritage Act for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological field work on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the Ontario Heritage Act.
- Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the Ontario Heritage Act.
- The Cemeteries Act, R.S.O 1990 c. C.4 and the Funeral, Burial and Cremation Services Act, 2002, S.O. 2002. c.33 (when proclaimed in force) require that any person discovering human remains must immediately notify the police or coroner and the Registrar of Cemeteries, Ministry of Consumer Services.
- Archaeological sites recommended for further archaeological fieldwork or protection remain subject to Section 48 (1) of the Ontario Heritage Act and may not be altered, or have artifacts removed from them, except by a person holding an archaeological licence.

The documentation related to this archaeological assessment will be curated by Archaeological Services Inc. until such a time that arrangements for their ultimate transfer to Her Majesty the Queen in right of Ontario, or other public institution, can be made to the satisfaction of the project owner(s), the Ontario Ministry of Tourism, Culture and Sport, and any other legitimate interest groups.

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[http://www.e-laws.gov.on.ca/html/statutes/english/elaws\\_statutes\\_90o18\\_e.htm](http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90o18_e.htm)  
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## 7.0 PLATES/IMAGES



Plate 1: A Plaque commemorating the original location of Everett.



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Plate 3: The late-nineteenth and early twentieth century structures within the settlement area of Everett.



Plate 4: St. David's Anglican Church, County Road 13.



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Plate 7: A recently built residential area.



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Plate 16: The farm complex in the Southwest Block.



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Plate 35: Roadway and right of way of County Road 13.



Plate 36: Roadway and right of way of County Road 13.





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Plate 44: Roadway and right of way within the residential areas.



Plate 45: Typical utilities encountered in the right of way along the residential roads.

## 8.0 MAPS

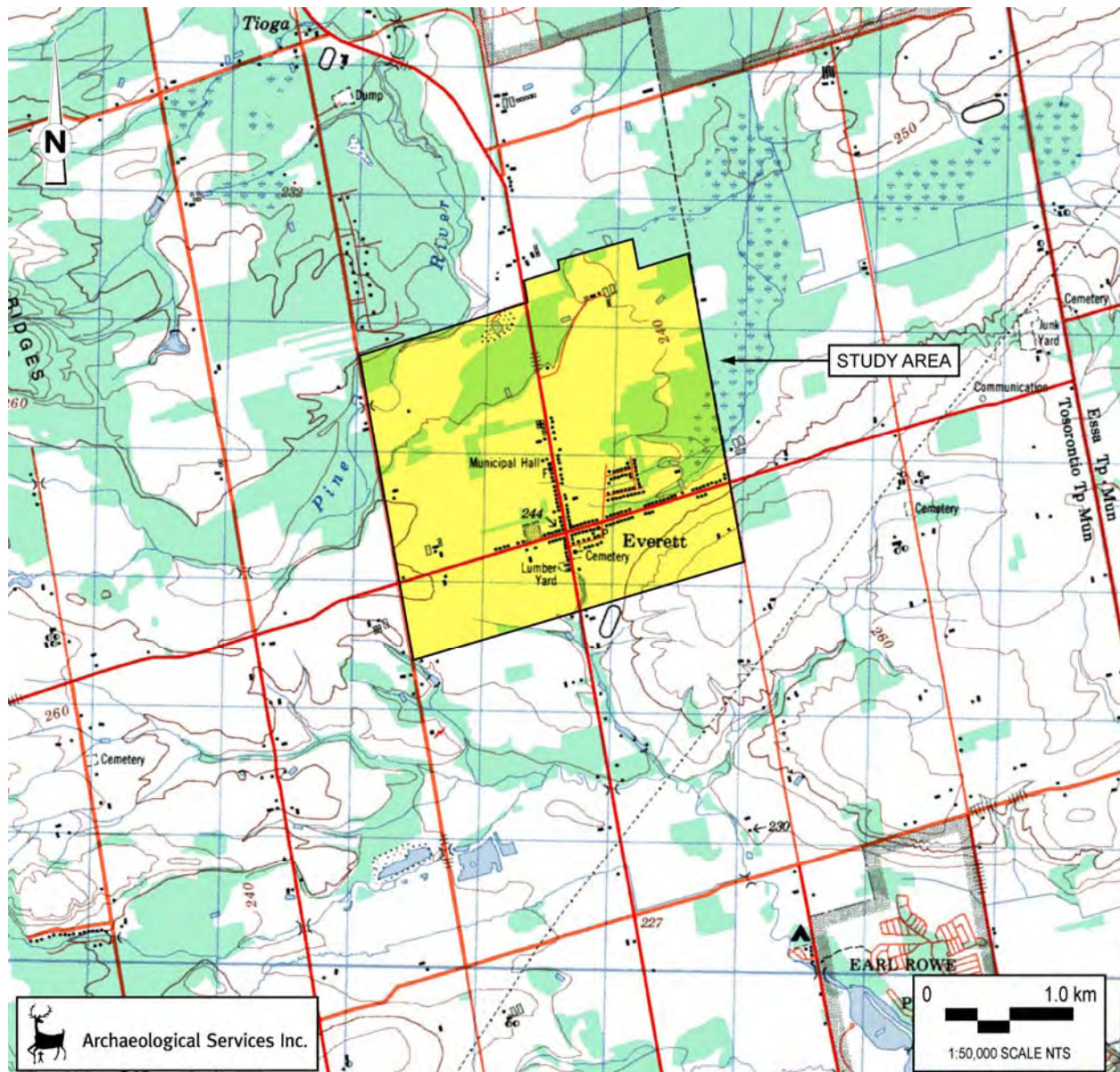


Figure 1: The study area illustrated on the NTS Sheet Alliston 31 D/4, 7<sup>th</sup> Edition, 1986.



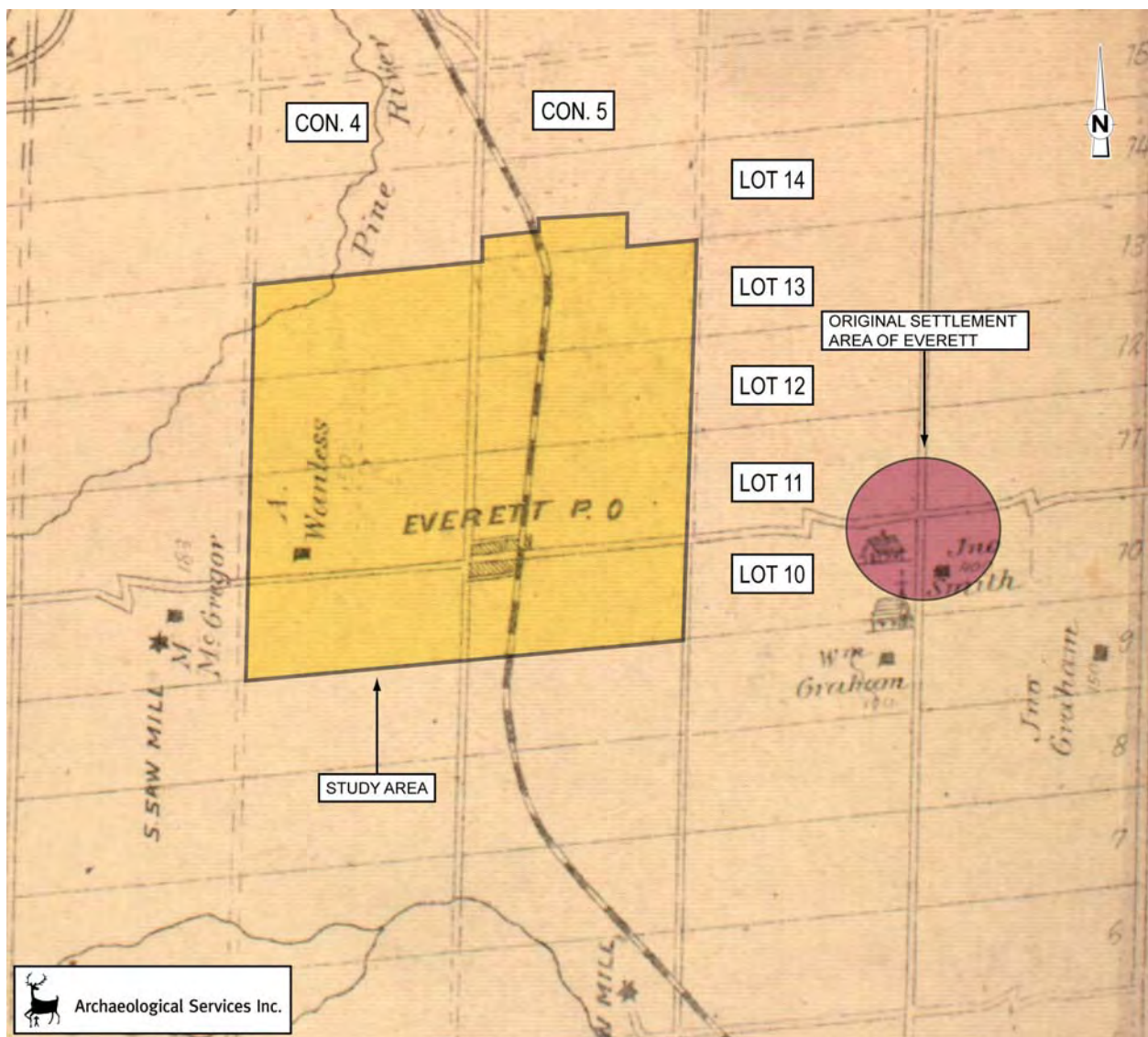
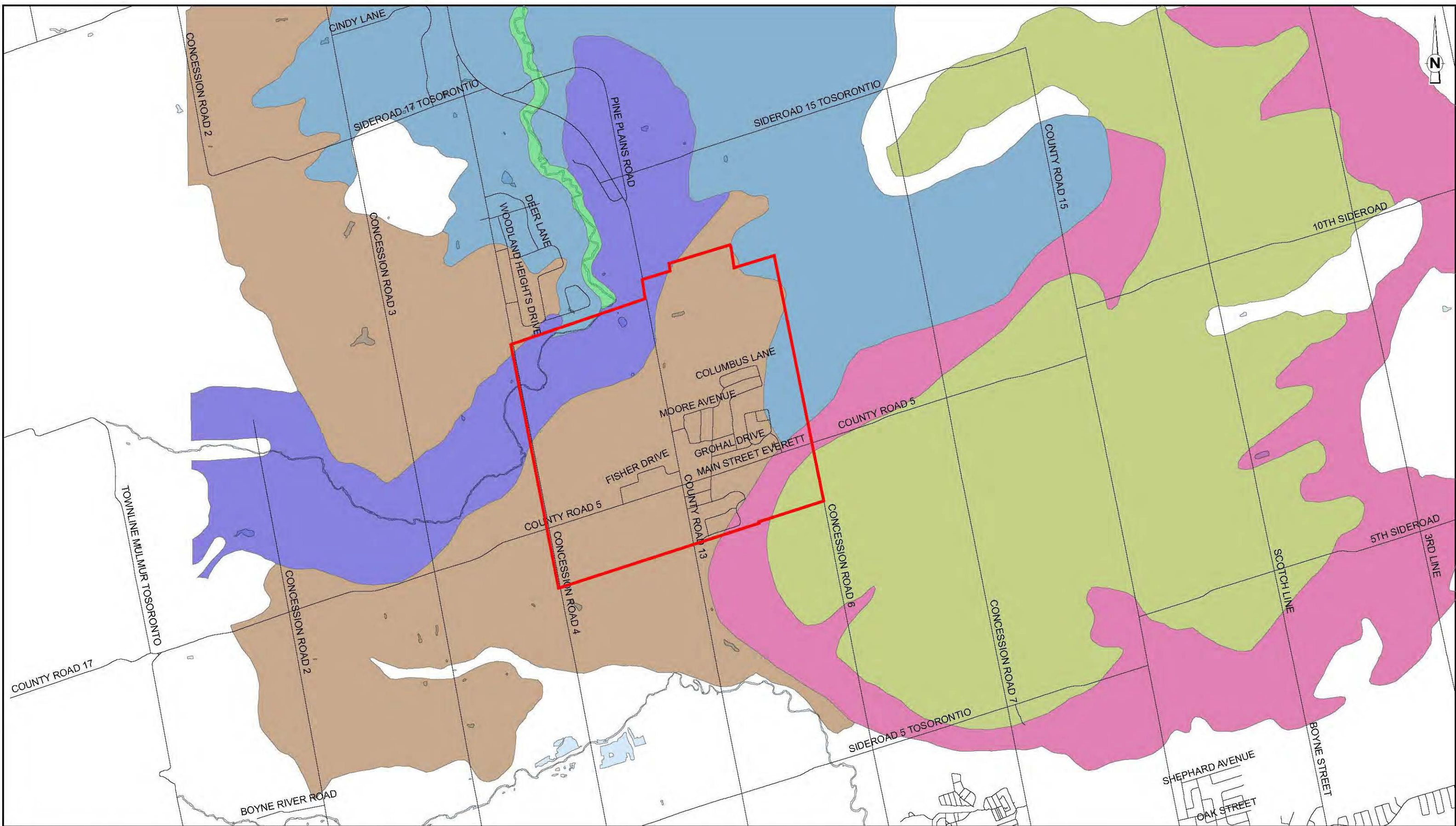


Figure 2: The study area located on the 1881 *Simcoe Supplement in the Illustrated Atlas of the Dominion of Canada*.







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**LEGEND**

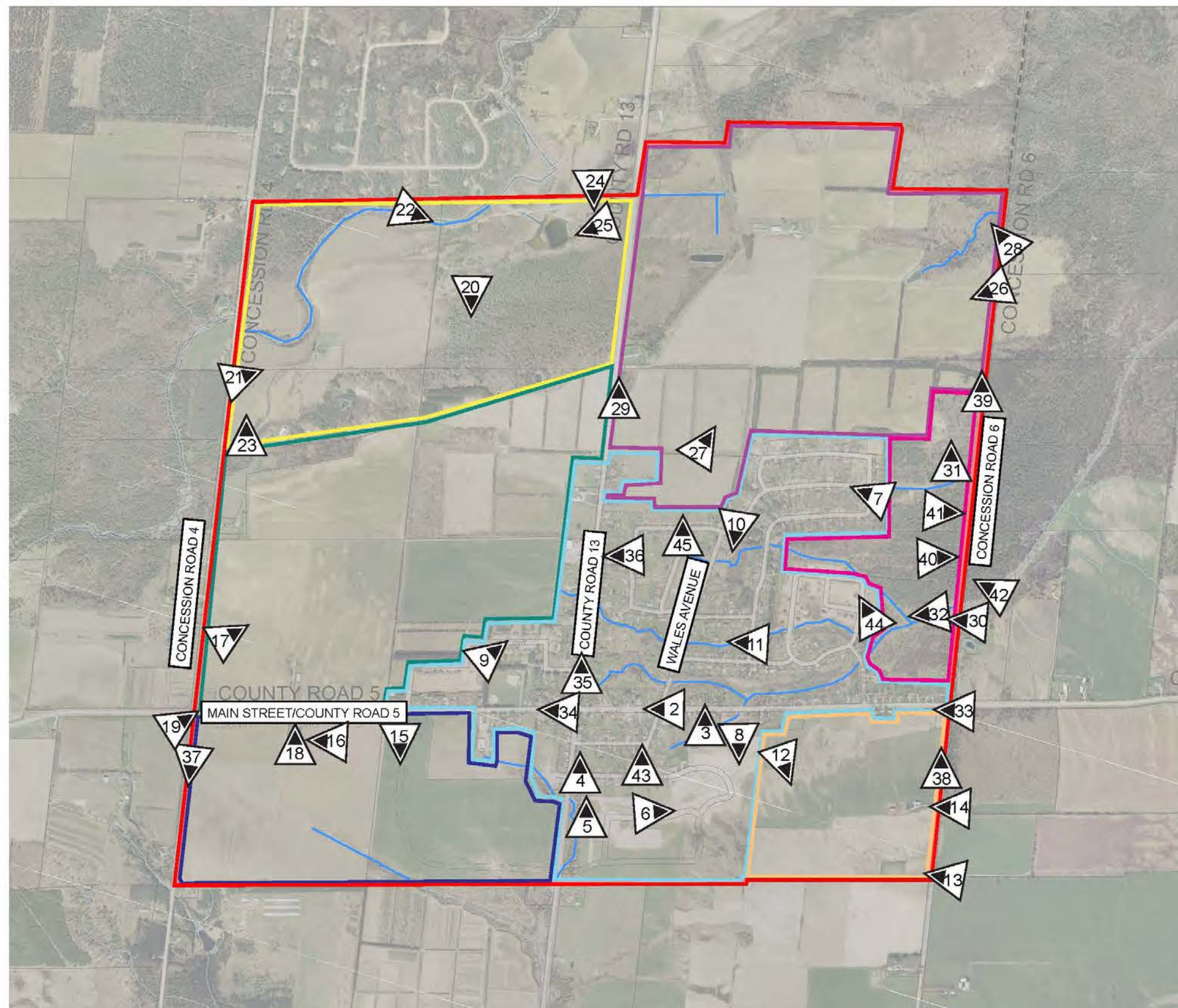
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| <div style="border: 2px solid red; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div> STUDY AREA BOUNDARY<br><div style="background-color: green; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div> GRAVEL, SAND, SILT, CLAY- MODERN FLOODPLAIN<br><div style="background-color: purple; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div> GRAVEL, SAND, SILT, CLAY- POST-GLACIAL RIVER DELTA | <div style="background-color: blue; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div> SAND, SILT, CLAY- GLACIAL NEARSHORE FLATS (LAKE ALGONQUIN)<br><div style="background-color: olive; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div> SILT AND CLAY GLACIAL DEPOSITS (DRUMLIN)<br><div style="background-color: brown; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div> SAND AND GRAVEL-NEARSHORE INLAND DEPOSITS | <div style="background-color: pink; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div> SANDY SILT TO SAND TILL- STRATIFIED LAKEBEDS |
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ASI PROJECT NO.: 12TS-125      DRAWN BY: BW/JD  
 DATE: AUG-2012                      FILE: 12TS-125\_FIGURE3.AI

Figure 3: The Surficial Geology of the Everett Secondary Plan, Township of Adjala-Tosorontio, Simcoe County





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- |                           |                 |               |                  |                                       |
|---------------------------|-----------------|---------------|------------------|---------------------------------------|
| WATERCOURSES              | SOUTHWEST BLOCK | WESTERN BLOCK | PINE RIVER BLOCK | ROADWAYS AND RIGHT OF WAYS            |
| STUDY AREA BOUNDARY       | SOUTHEAST BLOCK | EASTERN BLOCK | NORTHERN BLOCK   | LOCATION AND DIRECTION OF PHOTOGRAPHS |
| DEVELOPED AREA OF EVERETT |                 |               |                  |                                       |

**BASE:**

EVERETT SECONDARY PLAN  
 BASE SOLUTIONS INC.  
 2012



ASI PROJECT NO.: 12TS-125  
 DATE: Aug. 2012

DRAWN BY: JED  
 FILE: 12TS-125\_figure5.ai

Figure 4: Stage 1 field review outline of the Everett Secondary Plan Lands, Simcoe County.



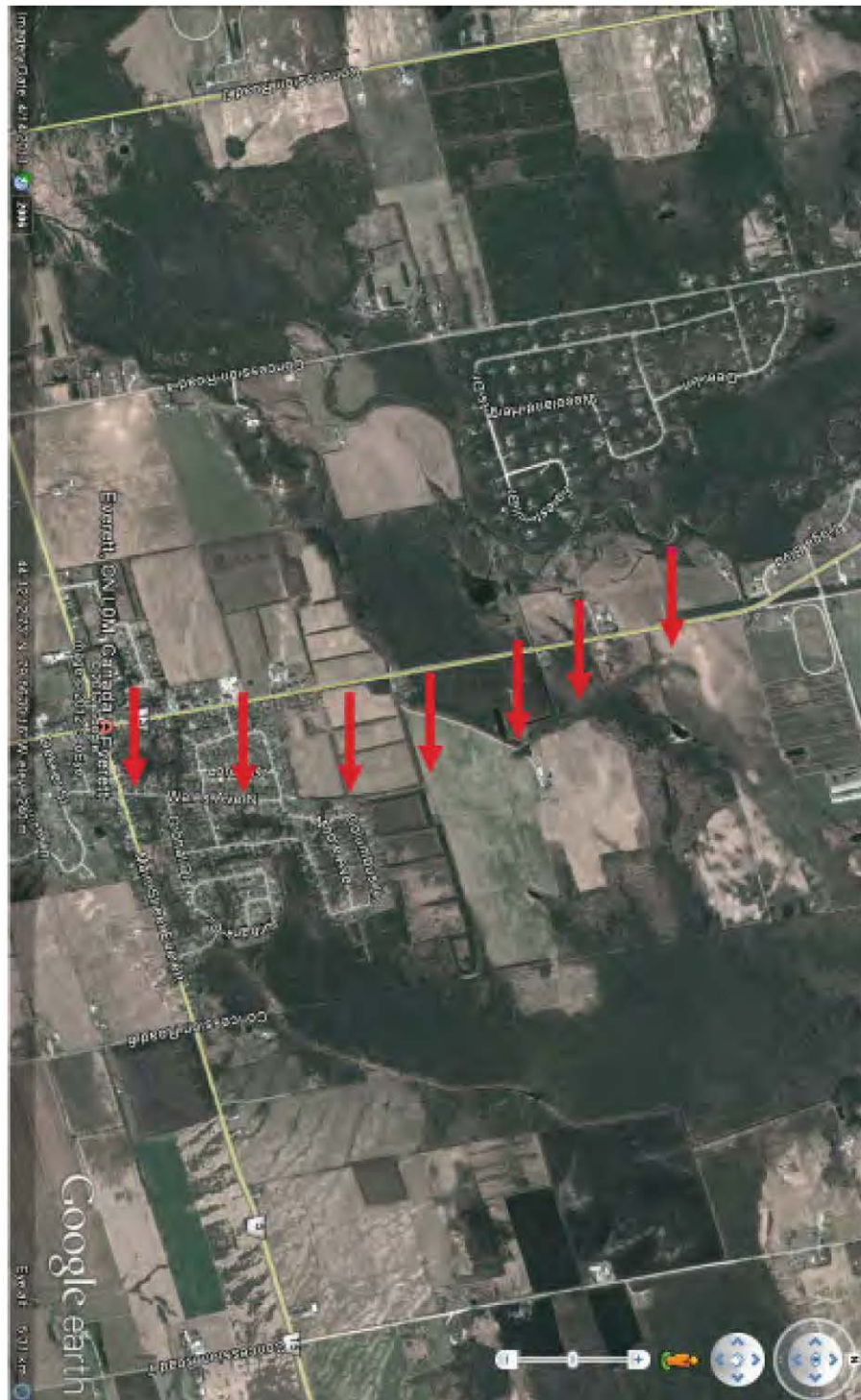
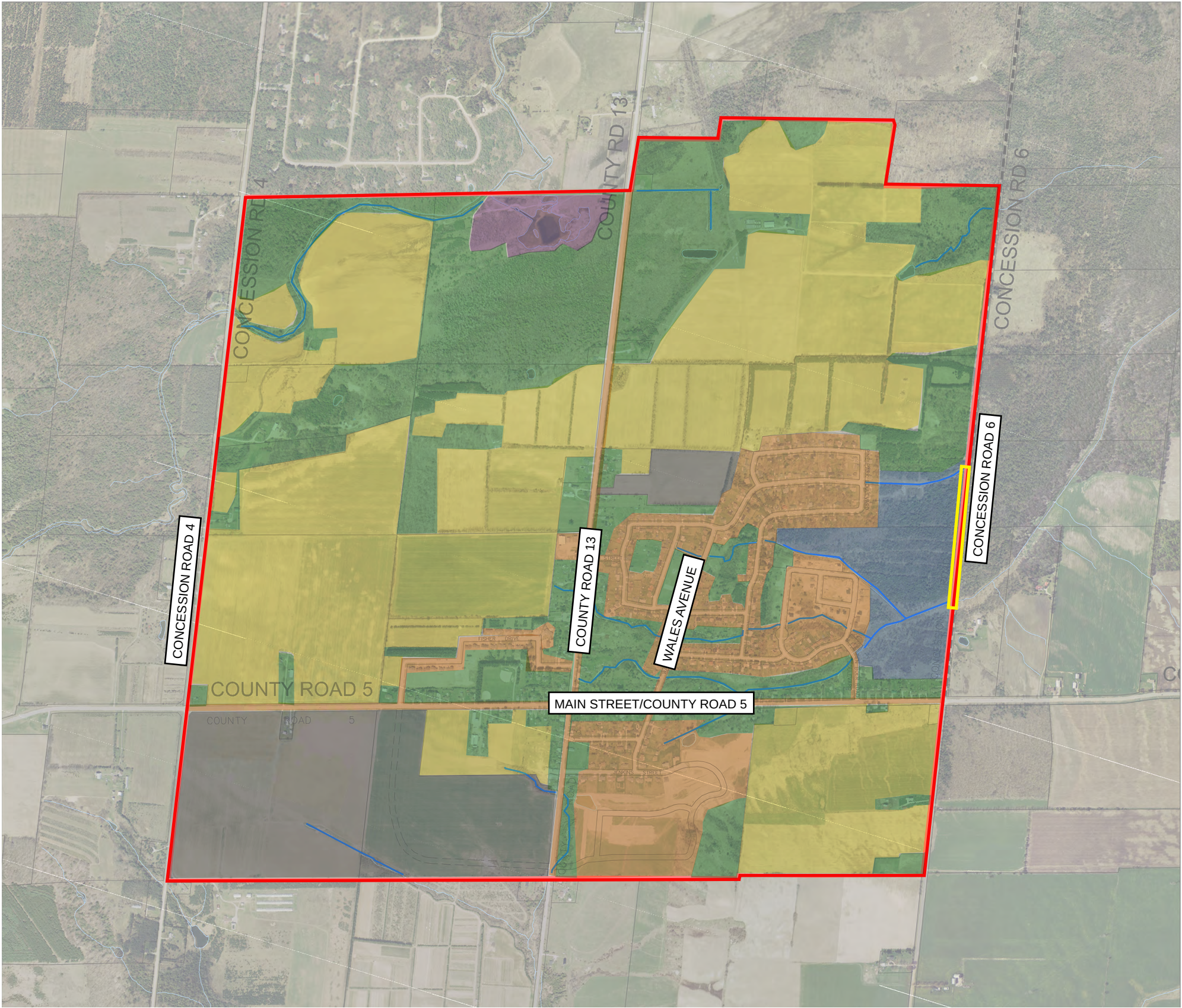


Figure 5: Aerial image showing the Hamilton and North Western Rail line “shadow” extending through the study area. The shadow line of the rail line is indicated with red arrows.





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**LEGEND**

- WATERCOURSES
- STUDY AREA BOUNDARY
- CORDUROY ROAD

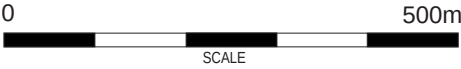
- PREVIOUSLY ARCHAEOLOGICALLY ASSESSED LANDS
- LANDS REQUIRING FURTHER JUDGMENTAL ASSESSMENT TO CONFIRM EXTEND OF DISTURBANCE

- LANDS REQUIRING PEDESTRIAN SURVEY AT FIVE METRE INTERVALS
- LANDS REQUIRING TESTPITTING AT FIVE METRE INTERVALS

- DISTURBED LANDS, NO FURTHER ASSESSMENT REQUIRED
- LOW LYING WET LANDS, NO FURTHER ASSESSMENT REQUIRED

**BASE:**

EVERETT SECONDARY PLAN  
BASE SOLUTIONS INC.  
2012



ASI PROJECT NO.: 12TS-125  
DATE: Aug, 2012

DRAWN BY: JED  
FILE: 12TS-125\_figure6.ai

Figure 6: Detailed Stage 1 Field Review of the Everett Secondary Plan Lands, Simcoe County.



**VOLUME 3: MASTER SERVING STUDIES**  
**Part 4 – Transportation Study Report**





# TRANSPORTATION STUDY

FINAL REPORT  
**EVERETT COMMUNITY SECONDARY PLAN**  
Township of Adjala-Tosorontio, Simcoe County, Ontario

October 2012

October 18, 2012

GREENLAND INTERNATIONAL CONSULTING LIMITED  
120 Hume Street  
Collingwood, ON L9Y 1V5

**Attention:**      **Jim Hartman, P.Eng.,** Senior Associate Project Engineer

**Re:**      **Everett Community Secondary Plan, Transportation Study**

Dear Mr. Hartman:

TRANS-PLAN INC is pleased to submit this transportation study in support of planned growth within the Everett Community Secondary Plan Area, in the Township of Adjala-Tosorontio. The study provides an analysis, conclusions and recommendations for the necessary improvements to accommodate the full build-out of the Everett Community.

This study builds upon our previously completed Existing Transportation Conditions Report, dated September 30, 2012, by Trans-Plan.

Yours truly,



Anil Seegobin, P.Eng.  
Associate Partner Engineer  
**Trans-Plan Inc.**

cc:      Derek Crawford, Greenland Consulting Engineers  
         Shadi Hagag, Trans-Plan Inc.

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Transmittal Letter

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## 1. PROPOSED SECONDARY PLAN

In addition to existing and approved developments within the community, the future development lands (Parcels 1 to 4) include the following land uses shown in Table 1. The locations of Parcels 1 to 4 are shown in Figure 1.

Table 1 – Land Use Projections, Centralized Services and Public Amenities

| Land Use                                | Parcel      |            |             |             | Total         |
|-----------------------------------------|-------------|------------|-------------|-------------|---------------|
|                                         | 1           | 2          | 3           | 4           |               |
| Retail (ha)                             | 4.40<br>72% | 0<br>0%    | 1.09<br>18% | 0.60<br>10% | 6.09<br>100%  |
| Schools (500 pupils)                    | 1<br>50%    | 1<br>50%   | 0<br>0%     | 0<br>0%     | 2<br>100%     |
| Community Centre<br>(8 ha)              | 1<br>100%   | 0<br>0%    | 0<br>0%     | 0<br>0%     | 1.00<br>100%  |
| Residential - Low<br>Density (units)    | 583<br>47%  | 297<br>24% | 66<br>5%    | 289<br>23%  | 1,235<br>100% |
| Residential - Medium<br>Density (units) | 97<br>47%   | 49<br>24%  | 11<br>5%    | 48<br>23%   | 206<br>100%   |

Source: Greenland Consulting Engineers, received October 1, 2012

The majority of retail and commercial uses are within Parcel 1 and fronting on Main Street Everett. Parcel 1 also includes an elementary school and a community centre (which will likely comprise of a skating rink). A second elementary school is proposed within Parcel 2. The majority of the future development lands is mainly residential, with approximately 90 percent low-density dwellings and approximately 10 percent medium-density dwellings.

The Everett Community Secondary Plan is provided in Figure 2 and is being developed through consultation with the Township of Adjala-Tosorontio. As to be noted in the Official Plan Amendment, “building on the principles of compact community design and active transportation as a healthy lifestyle, the transportation system within the study area includes a connected road pattern and a pedestrian system to promote convenient and safe access throughout the community and to community amenities”.

## 2. FUTURE BACKGROUND CONDITIONS

As noted in our Existing Conditions report, existing traffic volumes were accounted for by our counts conducted in mid-August 2012, which were compared to current traffic data received from the Township and County (that included recent Spring and Fall counts).

Future background traffic volumes were determined based on a review of area developments (that have been approved, but not yet built) and background traffic corridor growth. The following area developments have been included in the analysis:

1. Barzo Property Proposed Residential Development – approximately 658 low-density and 282 medium-density dwelling units (December 2007 Traffic Impact Study (TIS) by C. C. Tatham & Associates Ltd., December 2007)
2. R&M Homes Proposed Residential Development – approximately 488 low-density dwelling units (August 2007 Traffic Review by Read, Voorhees & Associates)
3. Southwest quadrant of Main Street Everett and County Road 13 (between land area parcels 2 and 3) – approximately 235 low-density dwelling units and 0.66 ha of retail/commercial uses (fronting on County Road 5).

For the third future development, where a traffic study was not provided, Trans-Plan generated and assigned trips to/from the roadway network based on the methodology provided in the Site Trip Generation section of this study.

To account for future growth along the roadway corridors, this study assumes a conservative 2.0 percent per annum growth rate for ten years, applied to peak hour traffic volumes on the major roadways within the study area (for through movements along corridors and for turning volumes at major intersections). This approach is consistent with previous traffic studies conducted within the area. Future background traffic volumes for the weekday AM and PM peak hours (and the general locations of planned developments) are provided in Figure 3 and Figure 4, respectively.

### 3. TRIP GENERATION

Site trips for the future development land area parcels were generated based on the Institute of Transportation Engineers (ITE) Trip Generation manuals, 8th Edition, based on the following land use assumptions:

Retail / Commercial Uses – are based on the ITE Land Use Code (LUC) 820, Shopping Centre, using the fitted curve trip rate equation. Widely accepted pass-by rates of 25 percent in the weekday PM peak hour were applied to determine pass-by trips (already on the road network). The building square footage was estimated at 30 percent of the land area, which results in approximately 20,000sq.m. (or about 200,000sq.ft.) of proposed retail / commercial area, as noted in the draft Official Plan Amendment.

Institutional Uses – are based on the ITE LUC 520, Elementary School, with approximately 500 pupils per school. The weekday PM *school* peak hour does not typically coincide with the weekday PM *roadway* peak hour and therefore, no school trips were generated in the weekday PM peak hour.

Community Centre Uses – are based on the ITE LUC 495, Recreational Community Centre. The available site statistics at this time are that the parcel is approximately 8 ha and the community centre includes a skating rink. A 15 percent building square footage to land area ratio was applied, with results in a trip generation estimates similar to that of the elementary school, and is appropriate for this level of analysis.

Residential Uses – are based on ITE LUC 210 for low-density units and ITE LUC 230 for medium-density units using the fitted curve trip rate equation.

The site trip generation is provided in Table 2.

Table 2 - Site Trip Generation, Future Development Land Area Parcels

| Land Use                               |             | Size         | AM Peak Hour          |       |       | PM Peak Hour          |      |       |     |     |
|----------------------------------------|-------------|--------------|-----------------------|-------|-------|-----------------------|------|-------|-----|-----|
|                                        |             |              | In                    | Out   | Total | In                    | Out  | Total |     |     |
| Retail                                 | sq.ft. GLA: | 196,656      |                       |       |       |                       |      |       |     |     |
| ITE LUC 820<br>(1000 sq.ft. GLA)       |             | Distribution | 61%                   | 39%   | 100%  | 49%                   | 51%  | 100%  |     |     |
|                                        |             | Equation     | Ln(T)=0.59Ln(X)+2.32  |       |       | Ln(T)=0.67Ln(X)+3.37  |      |       |     |     |
|                                        |             | Rate         | 0.71                  | 0.46  | 1.17  | 2.49                  | 2.60 | 5.09  |     |     |
|                                        |             | DW Volumes   | 140                   | 90    | 230   | 490                   | 511  | 1001  |     |     |
|                                        |             | Pass-by      | 0%                    | 0     | 0     | 0                     | 25%  | 123   | 127 | 250 |
|                                        |             | Trips        | 140                   | 90    | 230   | 367                   | 384  | 751   |     |     |
| Elementary School                      | Students:   | 1,000        |                       |       |       |                       |      |       |     |     |
| ITE LUC 520<br>(students)              |             | Distribution | 55%                   | 45%   | 100%  |                       |      |       |     |     |
|                                        |             | Equation     | Ln(T)=1.14Ln(X)-1.86  |       |       |                       |      |       |     |     |
|                                        |             | Rate         | 0.23                  | 0.18  | 0.41  |                       |      |       |     |     |
|                                        |             | Trips        | 225                   | 184   | 409   | 0                     | 0    | 0     |     |     |
| Community Centre                       |             | 129,167      |                       |       |       |                       |      |       |     |     |
| ITE LUC 495<br>(1000 sq. ft. GFA)      |             | Distribution | 61%                   | 39%   | 100%  | 37%                   | 63%  | 100%  |     |     |
|                                        |             | Rate         | 0.99                  | 0.63  | 1.62  | 0.54                  | 0.91 | 1.45  |     |     |
|                                        |             | Trips        | 127                   | 82    | 209   | 69                    | 118  | 187   |     |     |
| Residential - Low                      | Units:      | 1,235        |                       |       |       |                       |      |       |     |     |
| ITE Code 210<br>(low density units)    |             | Distribution | 25%                   | 75%   | 100%  | 63%                   | 37%  | 100%  |     |     |
|                                        |             | Equation     | T= 0.70(X)+9.74       |       |       | Ln(T)= 0.90Ln(X)+0.51 |      |       |     |     |
|                                        |             | Rate         | 0.18                  | 0.53  | 0.71  | 0.52                  | 0.30 | 0.82  |     |     |
|                                        |             | Trips        | 219                   | 656   | 875   | 637                   | 373  | 1,010 |     |     |
| Residential - Med                      | Units:      | 206          |                       |       |       |                       |      |       |     |     |
| ITE Code 230<br>(medium density units) |             |              | 17%                   | 83%   | 100%  | 67%                   | 33%  | 100%  |     |     |
|                                        |             |              | Ln(T)= 0.80Ln(X)+0.26 |       |       | Ln(T)= 0.82Ln(X)+0.32 |      |       |     |     |
|                                        |             |              | 0.08                  | 0.37  | 0.45  | 0.35                  | 0.17 | 0.53  |     |     |
|                                        |             |              | 16                    | 76    | 92    | 73                    | 36   | 109   |     |     |
|                                        |             |              |                       |       |       |                       |      |       |     |     |
| Sum                                    |             |              | 727                   | 1,088 | 1,815 | 1,146                 | 911  | 2,057 |     |     |
| Less Synergy                           |             |              | 5%                    | 36    | 55    | 91                    | 5%   | 57    | 46  | 103 |
| Total Trips                            |             |              | 691                   | 1,033 | 1,724 | 1,089                 | 865  | 1,954 |     |     |

A nominal five percent reduction was applied to the overall trip generation estimates to account for the interaction between the various land uses.

The proposed parklands / open space and trail network are ancillary by nature and are expected to generate mainly walk and cycle trips internal to the development.

The overall trip generation was segregated into trips for each parcel, as presented in Table 3.

Table 3 – Site Trip Generation, by Future Development Land Area Parcel

| Land Use        |            |              | AM Peak Hour |       |       | PM Peak Hour |     |       |
|-----------------|------------|--------------|--------------|-------|-------|--------------|-----|-------|
|                 |            |              | In           | Out   | Total | In           | Out | Total |
| <i>Parcel 1</i> |            |              |              |       |       |              |     |       |
| 142,083         | sq.ft. GLA | Retail       | 96           | 62    | 158   | 252          | 263 | 515   |
| 1               | bldg.      | School       | 107          | 87    | 194   | 0            | 0   | 0     |
| 1               | bldg.      | Comm. Centre | 121          | 78    | 199   | 66           | 112 | 178   |
| 681             | units      | Residential  | 105          | 329   | 434   | 319          | 183 | 502   |
| <i>Parcel 2</i> |            |              |              |       |       |              |     |       |
| 346             | units      | Residential  | 54           | 167   | 221   | 162          | 93  | 255   |
| 1               | bldg.      | School       | 107          | 87    | 194   | 0            | 0   | 0     |
| <i>Parcel 3</i> |            |              |              |       |       |              |     |       |
| 35,198          | sq.ft. GLA | Retail       | 24           | 15    | 39    | 62           | 66  | 128   |
| 77              | units      | Residential  | 12           | 37    | 49    | 36           | 20  | 56    |
| <i>Parcel 4</i> |            |              |              |       |       |              |     |       |
| 19,375          | sq.ft. GLA | Retail       | 13           | 9     | 22    | 34           | 36  | 70    |
| 338             | units      | Residential  | 52           | 163   | 215   | 158          | 91  | 249   |
| Total Trips     |            |              | 691          | 1,034 | 1,725 | 1,089        | 864 | 1,953 |

#### 4. TRIP DISTRIBUTION AND ASSIGNMENT

Site trips were distributed and assigned to/from the parcels and the boundary roadways within the study area based on the following methodology:

Retail / Commercial Uses – are based on the existing traffic patterns within the study area, determined from a review of existing traffic counts, and also by the expected interaction between residential uses and retail / commercial uses.

Institutional Uses – are based on the anticipated catchment area for auto passenger drop-offs to/from the schools, originating from the residential areas within Everett.

Community Centre Uses – similar to the school trips, distribution and assignment is based on the anticipated catchment area within Everett where trips would be attracted to/from.

Residential Uses – are based on a review of 2006 Transportation Tomorrow Survey (TTS) data for trips to/from the Adjala-Tosorontio northern zone (TTS Zone 8553) and based on a review of existing travel

patterns in the study area. The TTS results are summarized in Table 4 and details are provided in Appendix A.

Table 4 – 2006 TTS Survey Results, Trips From Adjala-Tosorontio TTS Zone 8553, Morning Period

| Direction | Trips | Percent |
|-----------|-------|---------|
| North     | 136   | 11%     |
| South     | 953   | 73%     |
| East      | 113   | 9%      |
| West      | 94    | 7%      |
| Total     | 1,297 | 100%    |

A review of the data indicates that the majority of trips are generally south or southeast to New Tecumseth in the morning peak period.

The assignment of site traffic volumes for the weekday AM and PM peak hours are shown in Figure 5 and Figure 6, respectively. Detailed site traffic assignment figures for each parcel are contained in Appendix B.

## **5. FUTURE TOTAL TRAFFIC CONDITIONS**

Site traffic volumes for the future development land area parcels were added to the future background traffic volumes to obtain future total traffic volumes for the peak hours (at full build-out of the Secondary Plan Area). Future total traffic volumes for the weekday AM and PM peak hours are shown in Figure 7 and Figure 8, respectively.

## **6. INTERSECTION CAPACITY AND QUEUE ANALYSES**

Intersection capacity analyses were performed for the study area intersections and for the future road connections proposed in the Secondary Plan based on the methodology contained in the Highway Capacity Manual. The software package employed in this regard was Synchro and SimTraffic, version 7.0.

Results for the weekday AM and PM peak hours under future background and future total conditions are shown in Table 5. Synchro summary sheets and level of service definitions are provided in Appendix C and Appendix D, respectively.

Table 5 - Intersection Capacity and Queuing Results

| Intersection<br>Movement                                                            | Future Background Conditions |                |          |             |                |          | Future Total Conditions |                |          |             |                |          |
|-------------------------------------------------------------------------------------|------------------------------|----------------|----------|-------------|----------------|----------|-------------------------|----------------|----------|-------------|----------------|----------|
|                                                                                     | AM                           |                |          | PM          |                |          | AM                      |                |          | PM          |                |          |
|                                                                                     | V/C                          | Delay<br>(sec) | LOS      | V/C         | Delay<br>(sec) | LOS      | V/C                     | Delay<br>(sec) | LOS      | V/C         | Delay<br>(sec) | LOS      |
| <b>Concession Rd 4 at Collector Rd 1</b><br>Westbound Left/Right                    | n/a                          |                |          | n/a         |                |          | 0.03                    | 9              | A        | 0.02        | 9              | A        |
| <b>Concession Rd 4 at County Rd 5</b><br>Northbound Approach                        | 0.07                         | 13             | B        | 0.12        | 15             | B        | 0.16                    | 16             | C        | 0.28        | 19             | C        |
| Southbound Approach                                                                 | 0.19                         | 14             | B        | 0.13        | 14             | B        | 0.31                    | 19             | C        | 0.38        | 26             | D        |
| <b>Concession Rd 4 at Collector Rd 2</b><br>Westbound Left/Right                    | n/a                          |                |          | n/a         |                |          | 0.04                    | 9              | A        | 0.03        | 9              | A        |
| <b>County Rd 5 at Collector Rd 3</b><br>Northbound Approach                         | n/a                          |                |          | n/a         |                |          | 0.21                    | 16             | C        | 0.12        | 16             | C        |
| Southbound Approach                                                                 | n/a                          |                |          | n/a         |                |          | 0.32                    | 19             | C        | 0.23        | 22             | C        |
| <b>County Rd 5 at Blanchards Way</b><br>Westbound Through                           | n/a                          |                |          | n/a         |                |          | <b>0.51</b>             | <b>10</b>      | <b>A</b> | <b>0.70</b> | <b>13</b>      | <b>B</b> |
| Northbound Approach                                                                 | 0.09                         | 11             | B        | 0.10        | 11             | B        | 0.57                    | 10             | A        | 0.75        | 15             | B        |
| Southbound Approach                                                                 | 0.01                         | 13             | B        | 0.01        | 14             | B        | 0.17                    | 10             | B        | 0.11        | 16             | B        |
| <b>County Rd 13 at Collector Rd 4</b><br>Westbound Left                             | 0.38                         |                |          | 0.62        |                |          | 0.43                    | 12             | B        | 0.59        | 21             | C        |
| <b>County Rd 13 at Collector Rd 3 / Collector Rd 5</b><br>Westbound Approach        | 0.38                         | 17             | C        | 0.62        | 40             | E        | 0.49                    | 22             | C        | 0.82        | 74             | F        |
| Northbound                                                                          | 0.30                         | 20             | C        | 0.32        | 34             | D        | <b>0.54</b>             | <b>13</b>      | <b>B</b> | <b>0.62</b> | <b>9</b>       | <b>A</b> |
| Southbound                                                                          | n/a                          | n/a            | n/a      | n/a         | n/a            | n/a      | 0.34                    | 12             | B        | 0.28        | 21             | C        |
| <b>County Rd 13 at Orsi St</b><br>Westbound Left/Right                              | 0.02                         |                |          | 0.06        |                |          | 0.57                    | 15             | B        | 0.70        | 9              | A        |
| <b>County Rd 13 at Fisher Dr</b><br>Eastbound Left/Right                            | 0.02                         |                |          | 0.01        |                |          | 0.72                    | 16             | B        | 0.53        | 6              | A        |
| <b>County Rd 13 at County Rd 5</b><br>Eastbound Left                                | <b>0.34</b>                  | <b>18</b>      | <b>B</b> | <b>0.67</b> | <b>24</b>      | <b>C</b> | 0.14                    | 18             | C        | 0.12        | 25             | D        |
| Westbound Through                                                                   | 0.45                         | 25             | C        | 0.51        | 17             | B        | 0.03                    | 17             | C        | 0.02        | 14             | B        |
| Northbound Through                                                                  | 0.50                         | 37             | D        | 0.64        | 33             | C        | <b>0.54</b>             | <b>24</b>      | <b>C</b> | <b>0.88</b> | <b>39</b>      | <b>D</b> |
| <b>County Rd 13 at Jenkins St</b><br>Westbound Left/Right                           | 0.15                         | 11             | B        | 0.79        | 32             | C        | 0.55                    | 23             | C        | 0.95        | 60             | E        |
| <b>County Rd 13 at Dekker St (North Leg)</b><br>Westbound Left/Right                | 0.01                         |                |          | 0.02        |                |          | 0.71                    | 40             | D        | 0.92        | 51             | D        |
| <b>County Rd 13 at Collector Rd 6 / Dekker St (South Leg)</b><br>Eastbound Approach | 0.01                         |                |          | 0.02        |                |          | 0.27                    | 18             | B        | 0.95        | 58             | E        |
| Westbound Approach                                                                  | 0.01                         | 11             | B        | 0.02        | 15             | B        | 0.02                    | 13             | B        | 0.03        | 22             | C        |
| <b>Main St Everett at Wales Av</b><br>Northbound Approach                           | 0.01                         | 11             | B        | 0.02        | 15             | B        | 0.04                    | 13             | B        | 0.04        | 20             | C        |
| Southbound Approach                                                                 | 0.14                         | 12             | B        | 0.20        | 16             | C        | <b>0.14</b>             | <b>30</b>      | <b>C</b> | <b>0.48</b> | <b>99</b>      | <b>F</b> |
| <b>Main St Everett at Den Boer Rd</b><br>Southbound Left/Right                      | 0.07                         | 15             | B        | 0.05        | 20             | B        | 0.14                    | 36             | E        | 0.11        | 83             | F        |
| <b>Concession Rd 6 at Collector Rd 7</b><br>Eastbound Left/Right                    | 0.00                         | 13             | B        | 0.02        | 18             | C        | 0.05                    | 27             | D        | 0.10        | 60             | F        |
| <b>Concession Rd 6 at Main St Everett</b><br>Eastbound Approach                     | 0.14                         | 13             | B        | 0.13        | 19             | C        | 0.37                    | 33             | D        | 0.46        | 82             | F        |
| Westbound Left/Through                                                              | 0.21                         | 14             | B        | 0.11        | 18             | C        | 0.41                    | 12             | B        | 0.22        | 10             | A        |
| Southbound Left                                                                     | 0.41                         | 12             | B        | 0.21        | 10             | A        | <b>0.70</b>             | <b>16</b>      | <b>B</b> | <b>0.60</b> | <b>12</b>      | <b>B</b> |
|                                                                                     | 0.65                         | 18             | B        | 0.41        | 10             | A        | <b>0.86</b>             | <b>24</b>      | <b>C</b> | <b>0.75</b> | <b>16</b>      | <b>B</b> |
|                                                                                     | 0.25                         | 13             | B        | 0.60        | 12             | B        | 0.86                    | 27             | C        | 0.67        | 12             | B        |
|                                                                                     | 0.73                         | 18             | B        | 0.60        | 18             | B        | 0.38                    | 14             | B        | 0.82        | 17             | B        |
|                                                                                     |                              |                |          |             |                |          | 0.85                    | 34             | C        | 0.73        | 34             | C        |

Results for the weekday AM and PM peak hours under future conditions are summarized for each intersection as follows:

Concession Road 4 at Collector Road 1 – is expected to operate well as minor street stop controlled.

Concession Road 4 at County Road 5 – is expected to operate well as minor street stop controlled (similar to existing conditions).

Concession Road 4 at Collector Road 2 – is expected to operate well as minor street stop controlled.

County Road 5 at Collector Road 3 – is expected to operate well as minor street stop controlled (providing access to future development lands to the north and south).

County Road 5 at Blanchards Way – could operate as unsignalized prior to the development of the land area parcels. When development occurs, a traffic signal and left-turn lanes at all approaches is required. The signal would support both residential uses and the future retail/commercial block at the northwest quadrant of the intersection.

County Road 13 at Collector Road 4 – is expected to operate with some delay for westbound left-turns (typical of minor street stop controlled intersections). The road pattern allows opportunities for traffic volumes to reassign to exit the development at the proposed traffic signal at the County Road 13 at Collector Road 3 / Collector Road 5 intersection to the south.

County Road 13 at Collector Road 3 / Collector Road 5 – requires a traffic signal and northbound/southbound left-turn lanes at full build-out of the future development lands. The signal would provide access to both the R&M Homes Subdivision to the east and Land Area Parcel 1 to the west (which includes residential uses, an elementary school and a community centre).

County Road 13 at Orsi Street – is expected to operate at an acceptable level of service and delay as minor street stop controlled.

County Road 13 at Fisher Drive – is expected to operate well as minor street stop controlled (with relatively low traffic volumes turning at this intersection).

County Road 13 at County Road 5 (Main Street Everett) – requires a traffic signal and left and right turn lanes at all intersection approaches under both future background and full build-out conditions. With these improvements, the intersection is expected to operate at an overall acceptable level of service and delay, with all turning movements below a volume-to-capacity (V/C) ratio of 1.0 in the peak hours. The recommended intersection improvements are consistent with the traffic impact study findings in support of the R&M Homes and Barzo Property developments.

County Road 13 at Jenkins Street – is expected to operate at an acceptable level of service and delay as minor street stop controlled.

County Road 13 at Dekker Street (North Leg) – is expected to operate at an acceptable level of service and delay as minor street stop controlled.

County Road 13 at Collector Road 6 / Dekker Street (South Leg) – some delays are expected for vehicles exiting the development; however, the delays are typical of minor street stop controlled intersections and

left-turn traffic volumes are relatively low. Left turn lanes are provided at all approaches under future total conditions.

Main Street Everett at Wales Avenue – similar to the above intersection, some delays are expected for vehicles exiting the development; however, the delays are typical of minor street stop controlled intersections. Left turn lanes are provided for the northbound and southbound approaches.

Main Street Everett at Den Boer Road – some delays are expected for vehicles exiting the development; however, the delays are typical of minor street stop controlled intersections. No further improvements are required.

Concession Road 6 at Collector Road 7 – this intersection provides access to the approved developments in the northeast quadrant of the study area. The intersection is expected to operate well as minor street stop controlled.

Concession Road 6 at Main Street Everett – similar to the findings the traffic impact studies in support of the R&M Homes and Barzo Property developments and input from Simcoe County, a traffic signal is recommended at this location, as well as turn lanes at all approaches.

## 7. RECOMMENDED TRANSPORTATION IMPROVEMENTS

To accommodate the full build-out of the Everett Community, the proposed intersection improvements at the boundary roadways are summarized in Table 6.

Table 6 – Recommended Transportation Improvements

| <u>Intersection</u>                                            | <u>Improvement</u>                                                                                                                                                           |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| County Road 5 at Blanchards Way                                | <ul style="list-style-type: none"> <li>- Signalization</li> <li>- Left turn lanes at all approaches</li> </ul>                                                               |
| County Road 13 at Collector Road 4                             | <ul style="list-style-type: none"> <li>- Northbound right turn lane</li> <li>- Southbound left turn lane</li> <li>- Exclusive westbound left and right turn lanes</li> </ul> |
| County Road 13 at Collector Road 3 / Collector Road 5          | <ul style="list-style-type: none"> <li>- Signalization</li> <li>- Northbound and southbound opposing left turn lanes</li> </ul>                                              |
| County Road 13 at County Road 5 (Main Street Everett)          | <ul style="list-style-type: none"> <li>- Signalization</li> <li>- Left and right turn lanes at all approaches</li> </ul>                                                     |
| County Road 13 at Collector Road 6 / Dekker Street (South Leg) | <ul style="list-style-type: none"> <li>- Left turn lanes at all approaches</li> </ul>                                                                                        |
| Main Street Everett at Wales Avenue                            | <ul style="list-style-type: none"> <li>- Northbound and southbound left turn lanes</li> </ul>                                                                                |
| Concession Road 6 at Main Street Everett                       | <ul style="list-style-type: none"> <li>- Signalization</li> <li>- Northbound and southbound left turn lanes</li> <li>- Eastbound and westbound right turn lanes</li> </ul>   |



It is expected that more detailed traffic studies will be required in support of site-specific development applications in the Everett Community, at which time, the timing and need for specific roadway, site access or intersection improvements will be assessed in more detail, in addition to warrants for traffic signals, turn lanes, and the like.

In conclusion, the resulting levels of service, intersection delays and volume-to-capacity ratios resulting from the Synchro traffic analysis provide an estimate of how the road network will operate under future conditions. With the proposed roadway / intersection improvements in place by full build-out, the intersections that service the Everett Community are expected to operate at good to acceptable levels of service or better during the weekday AM and PM peak periods.

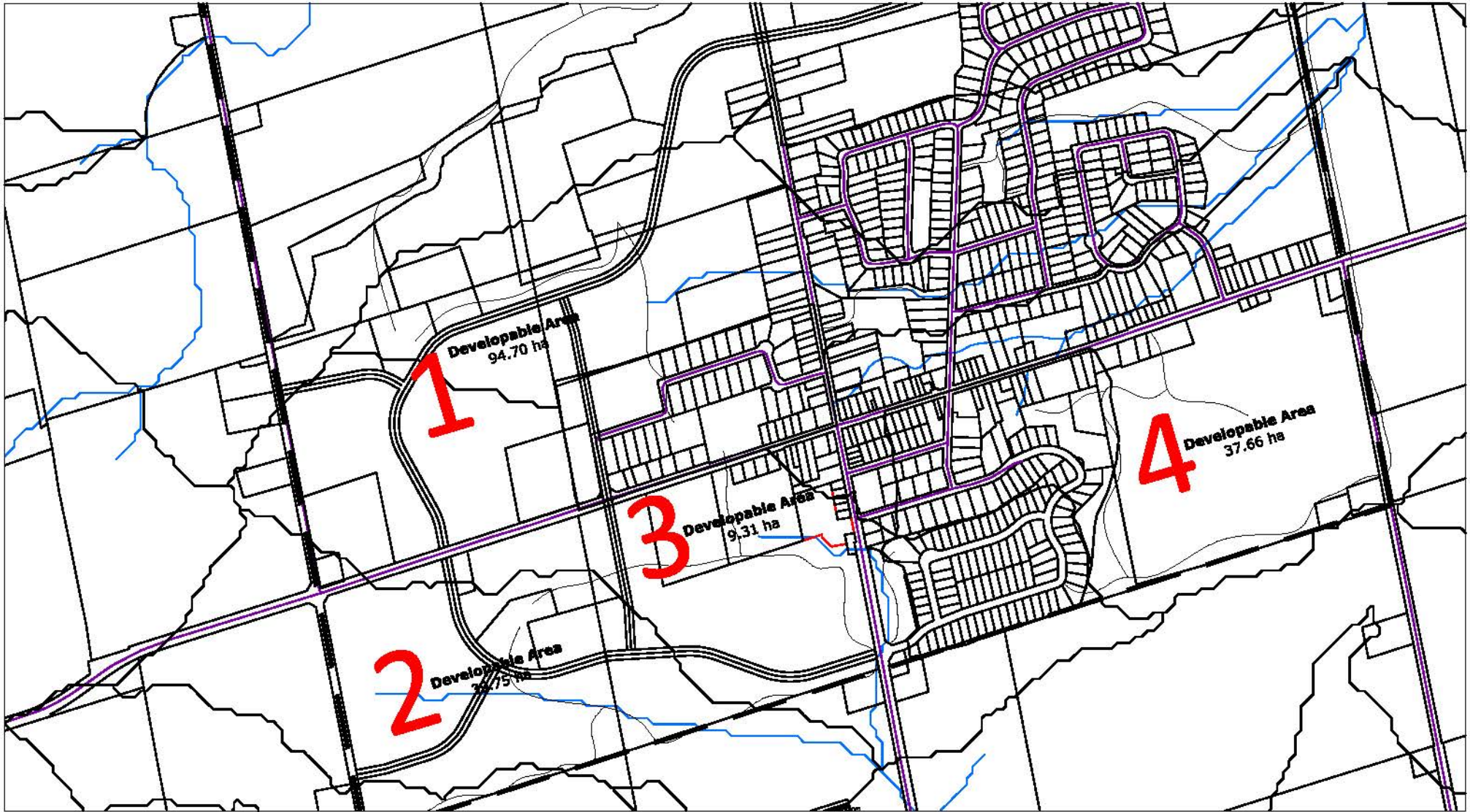


Figure 1  
Location of Future Land Area Development Parcels  
Everett Community Transportation Study

- Legend**
- Proposed Secondary Plan Boundary
  - Low Density Residential
  - Medium Density Residential
  - Convenience Commercial
  - Main Street
  - Neighbourhood Commercial
  - Community Centre
  - Existing Parks / Open Space
  - Proposed Neighbourhood Park
  - Proposed Parkette
  - Proposed Elementary School
  - Existing SWM
  - Proposed SWM
  - Natural Heritage System
  - 30.0m buffer
  - Lands for further Study
  - Proposed Local Road (20.0m)
  - Proposed Collector Road (23.0m)
  - Utilities
  - Community Improvement Areas
  - 400m Radius (5 minute walking distance)
  - Proposed Trail Network

Everett Secondary  
Plan Study

Figure 2

Figure 3 - Future Background Traffic Volumes, Weekday AM Peak Hour  
Everett Community Transportation Study

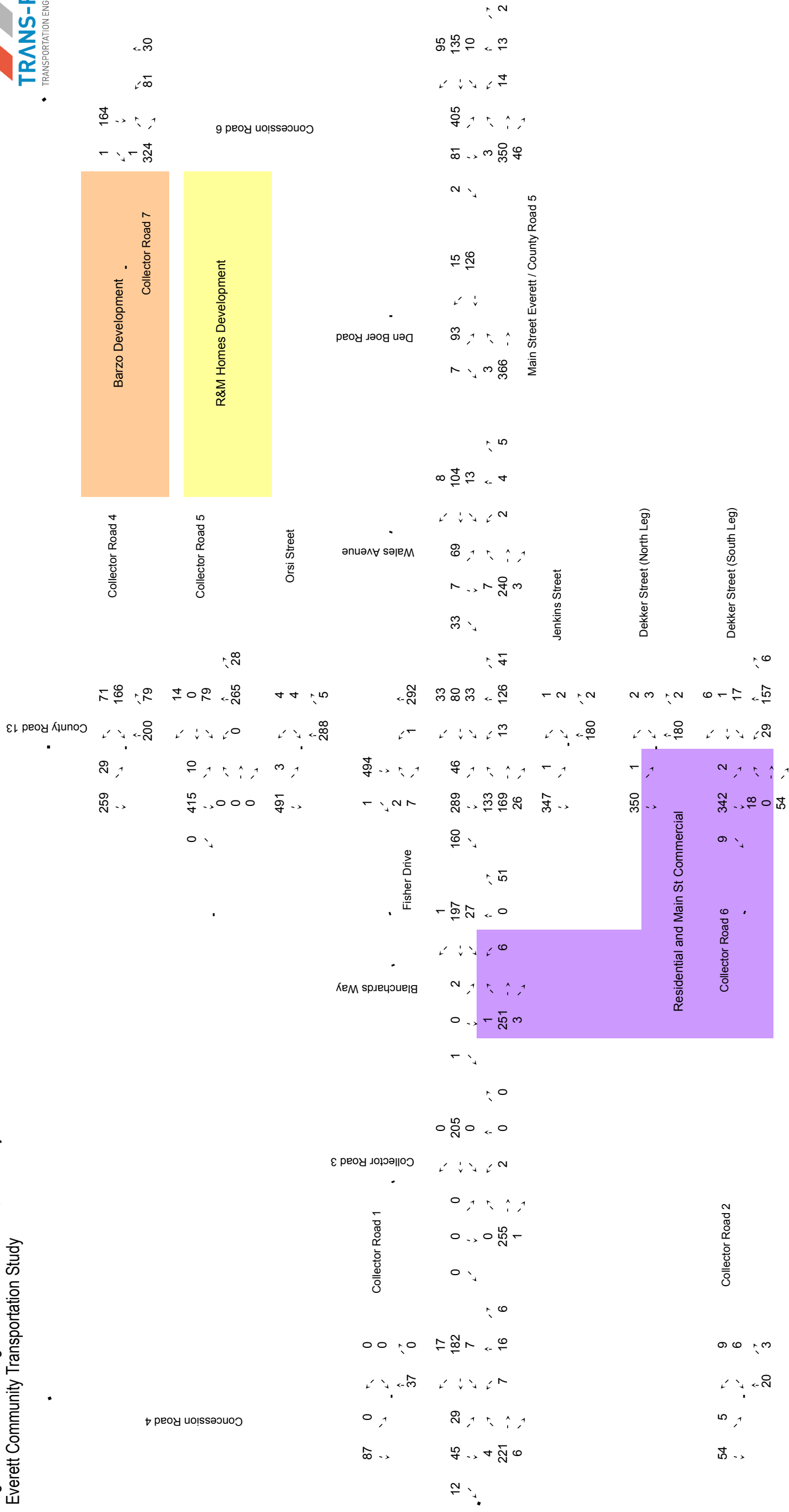




Figure 4 - Future Background Traffic Volumes, Weekday PM Peak Hour  
Everett Community Transportation Study

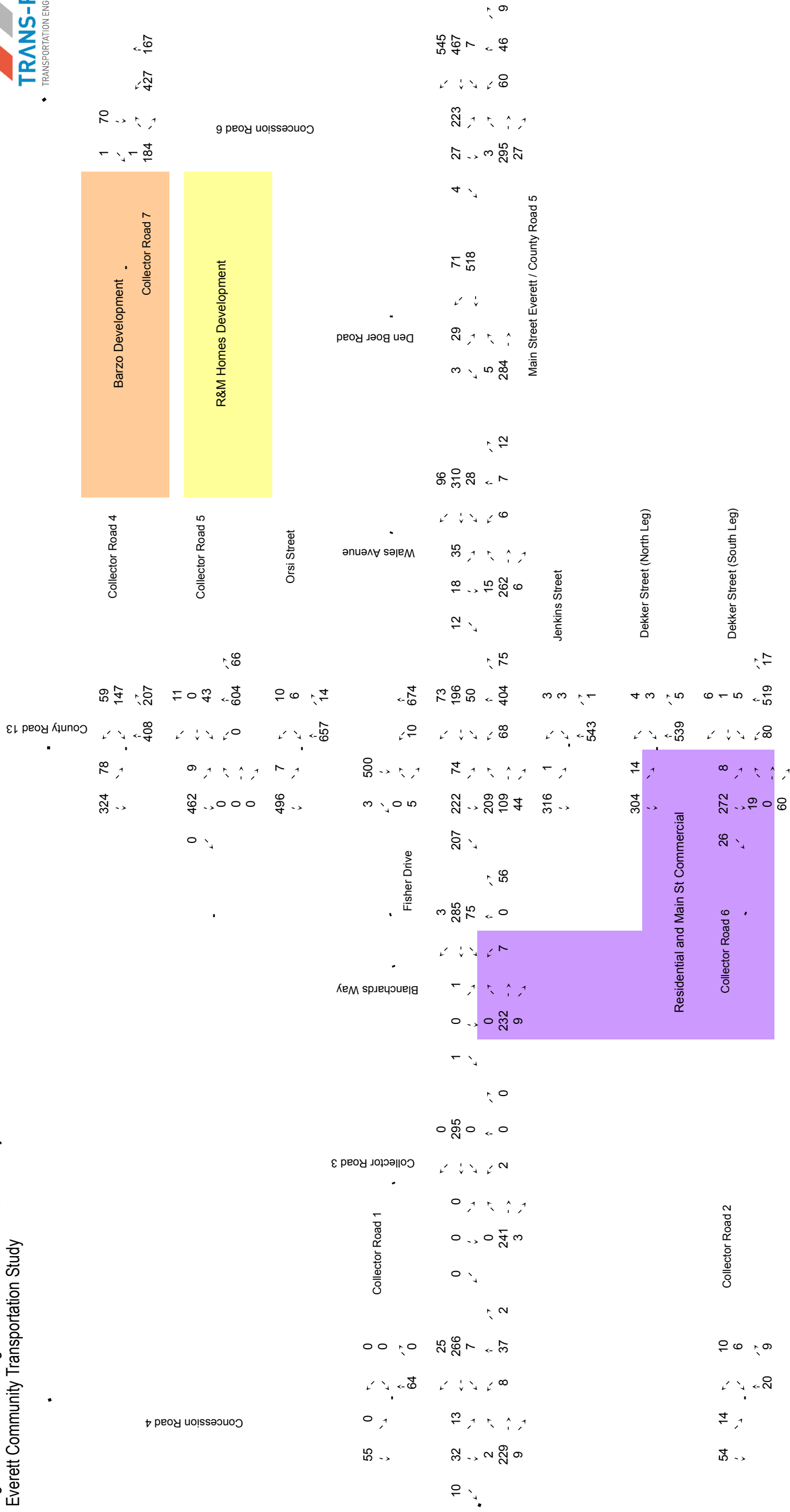


Figure 5 - Site Traffic Assignment, Weekday AM Peak Hour  
Everett Community Transportation Study

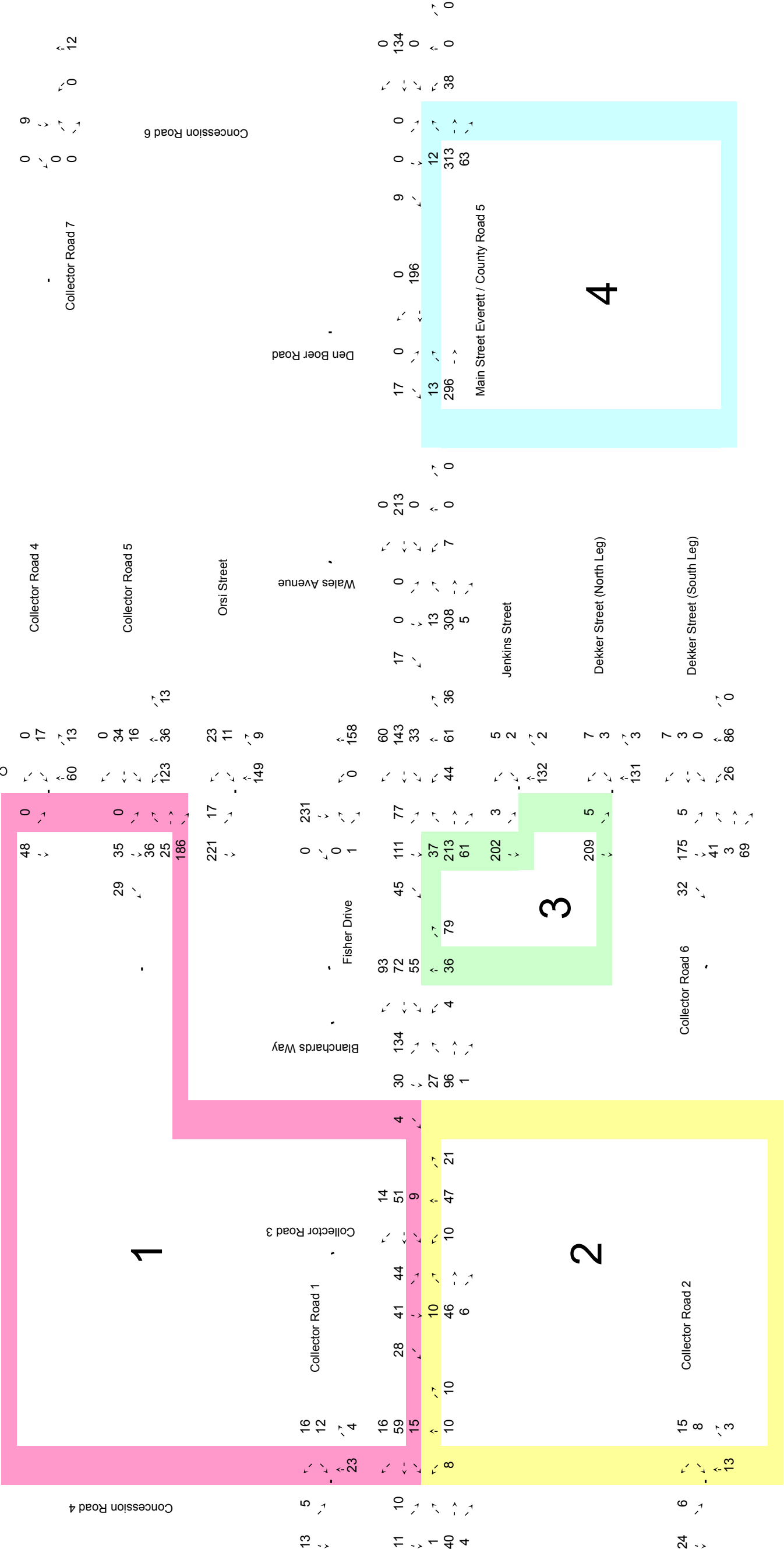




Figure 7 - Future Total Traffic Volumes, Weekday AM Peak Hour  
Everett Community Transportation Study

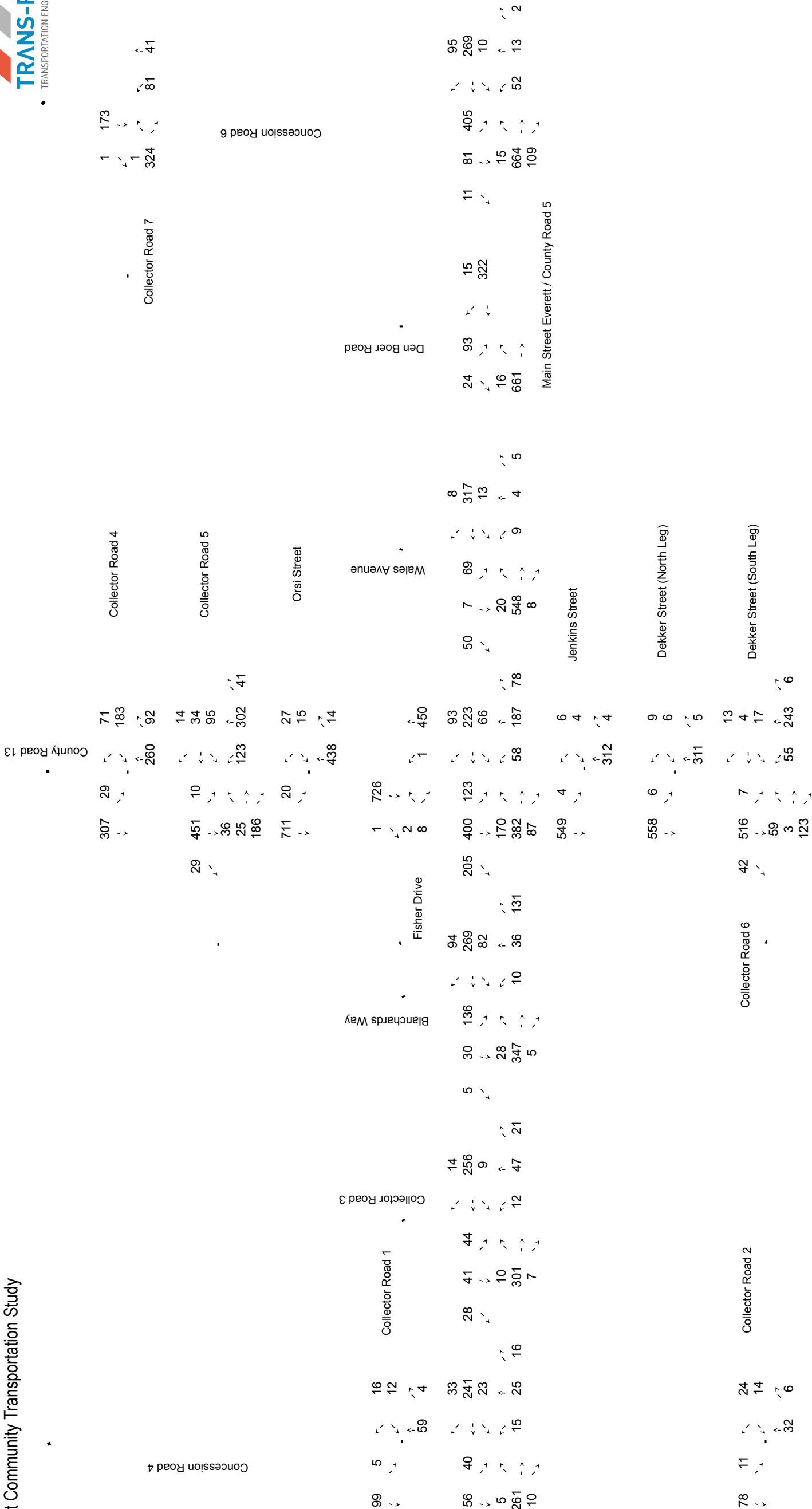
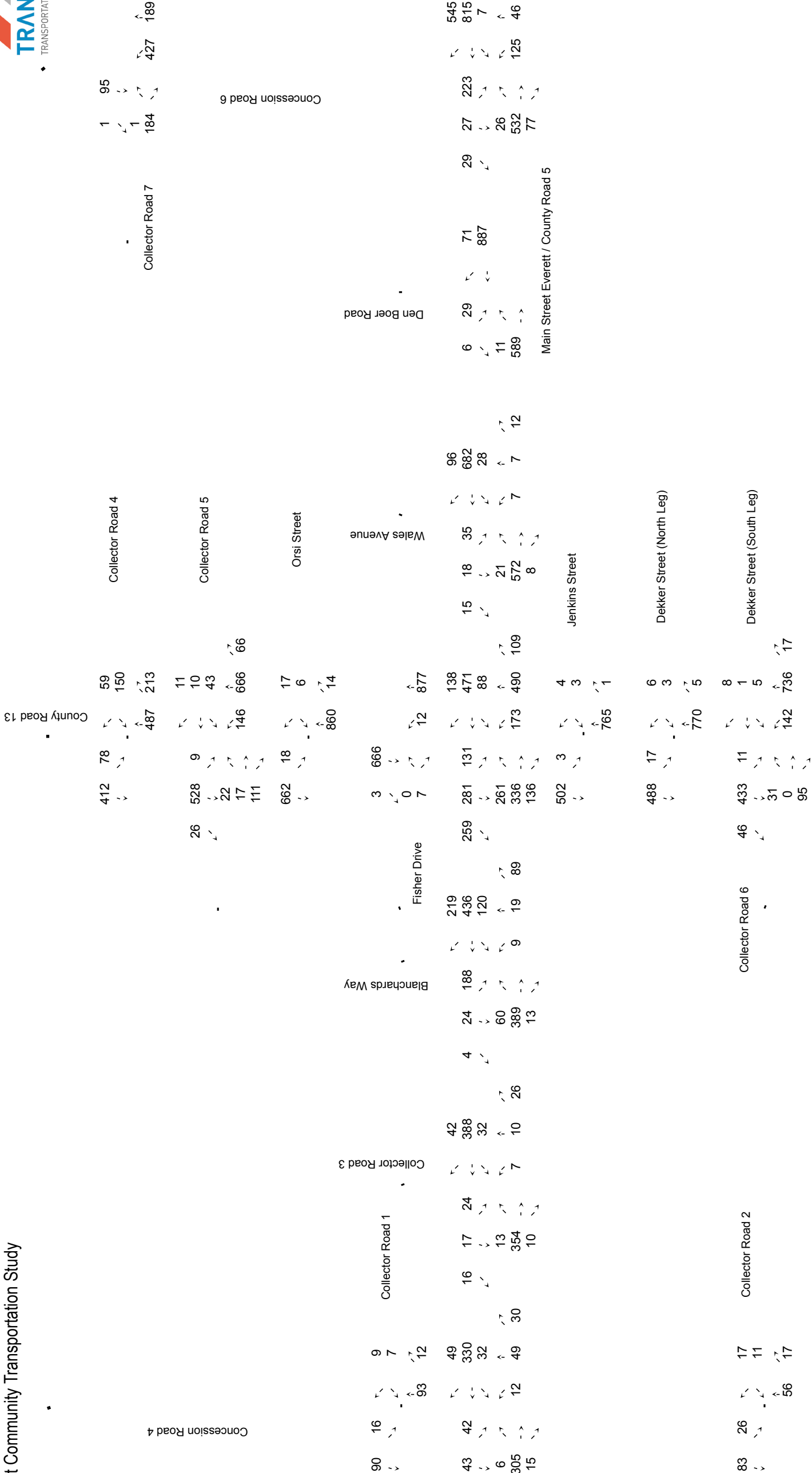




Figure 8 - Future Total Traffic Volumes, Weekday PM Peak Hour  
Everett Community Transportation Study



## **APPENDICES**

Appendix A – Transportation Tomorrow Survey Data

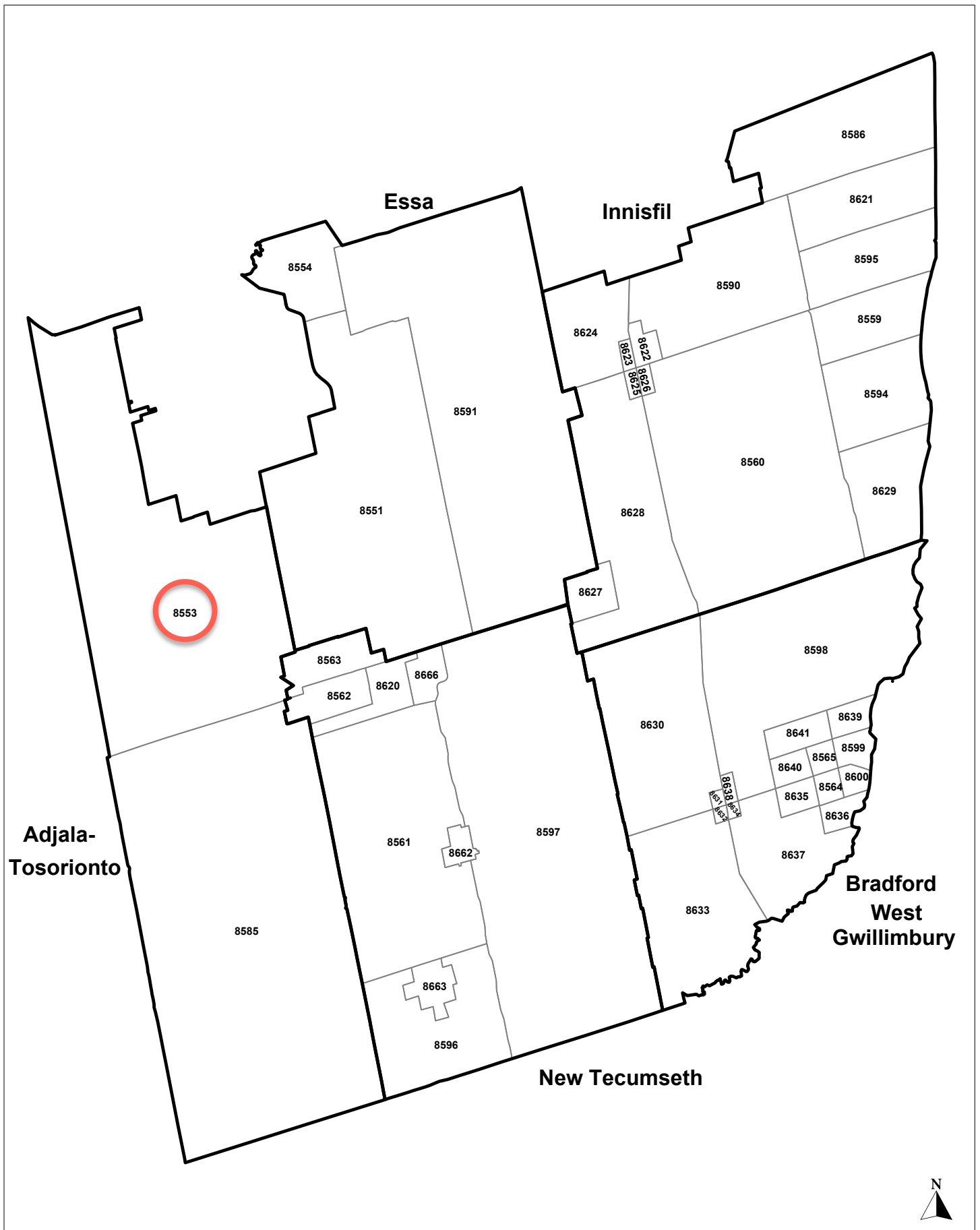
Appendix B – Detailed Site Traffic Assignment Figures

Appendix C – Capacity Analysis Summary Sheets

Appendix D – Level of Service Definitions

TRANS  
PLAN  
INC

# Appendix A



DATE : Oct 17 2012 (14:05:48)  
 DATA : 2006 TTS Vers 1.0 Trips  
 FILTER 1 : gta06\_orig => 8553  
 FILTER 2 : start\_time => 700-900  
 ROW : pd\_dest  
 COLUMN : gta06\_orig

| TTS Zone 8553     | To/From | Direction |
|-------------------|---------|-----------|
| PD 8 of Toronto   | 21      | S         |
| PD 15 of Toronto  | 21      | S         |
| Caledon           | 42      | S         |
| Barrie            | 21      | N         |
| Innisfil          | 19      | E         |
| New Tecumseth     | 796     | S         |
| Adjala-Tosorontio | 293     | I         |
| Essa              | 21      | E         |
| Clearview         | 21      | N         |
| Springwater       | 21      | N         |
| Melancthon        | 21      | W         |
| Total             | 1,297   |           |

| Direction | Trips |
|-----------|-------|
| N         | 63    |
| S         | 880   |
| E         | 40    |
| W         | 21    |
| I         | 293   |
| Total     | 1,297 |

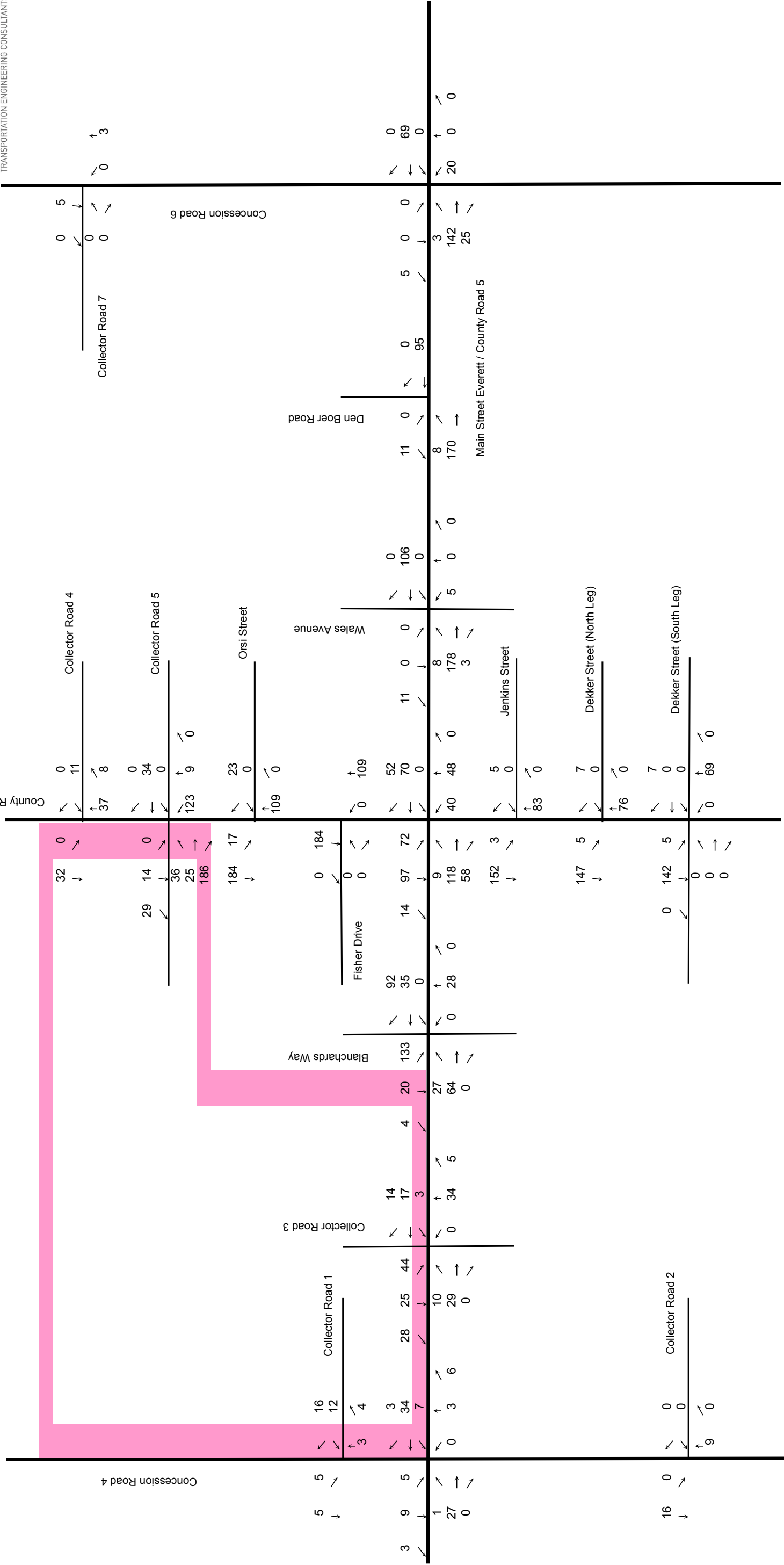
Redistribute internal trips:

| Direction | Trips | Percent |
|-----------|-------|---------|
| N         | 136   | 11%     |
| S         | 953   | 73%     |
| E         | 113   | 9%      |
| W         | 94    | 7%      |
| Total     | 1,297 | 100%    |

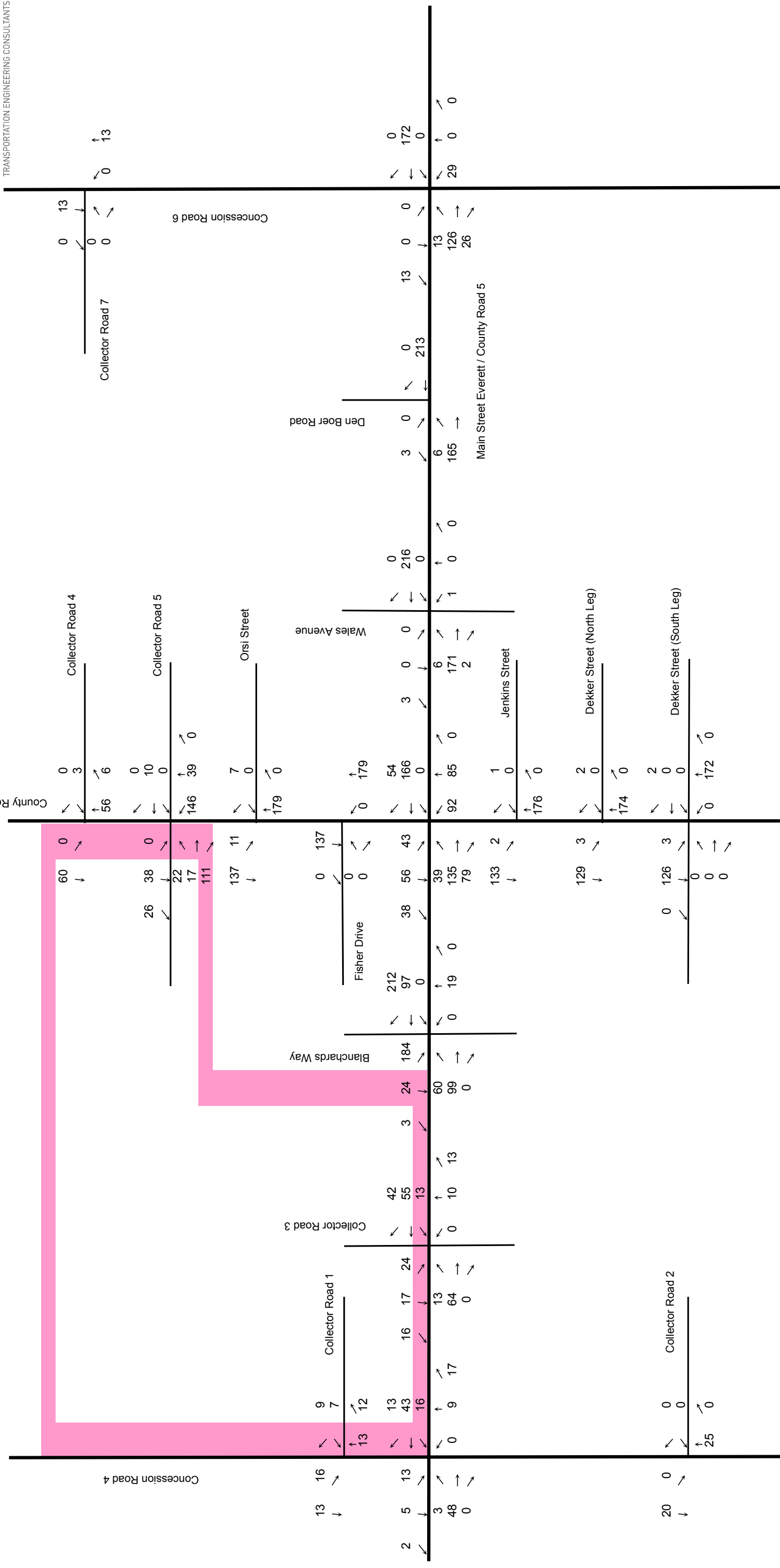
TRANS  
PLAN  
INC

# Appendix B

Parcel 1, Site Traffic Assignment, Weekday AM Peak Hour  
Everett Community Transportation Study

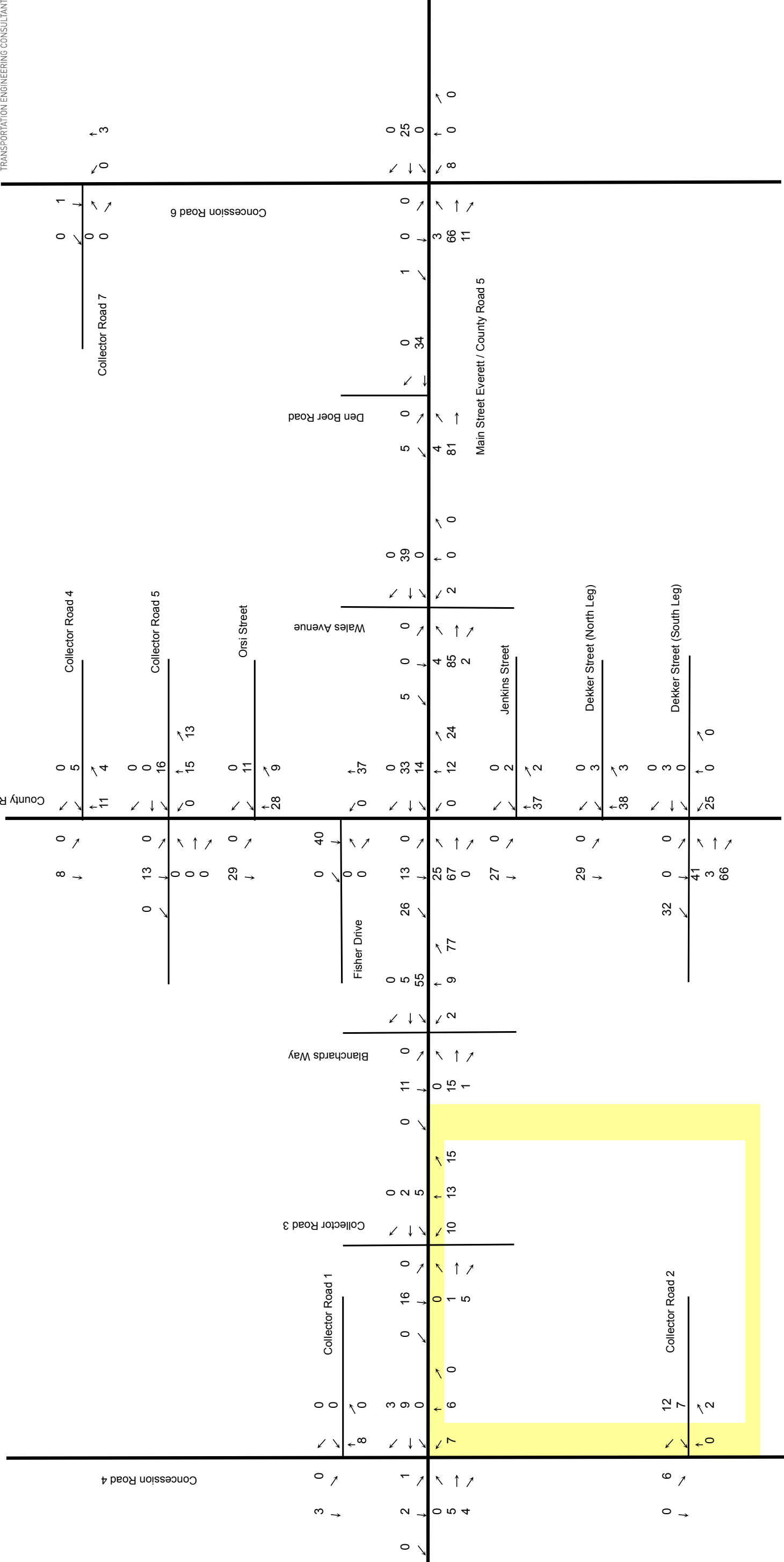


# Parcel 1, Site Traffic Assignment, Weekday PM Peak Hour Everett Community Transportation Study

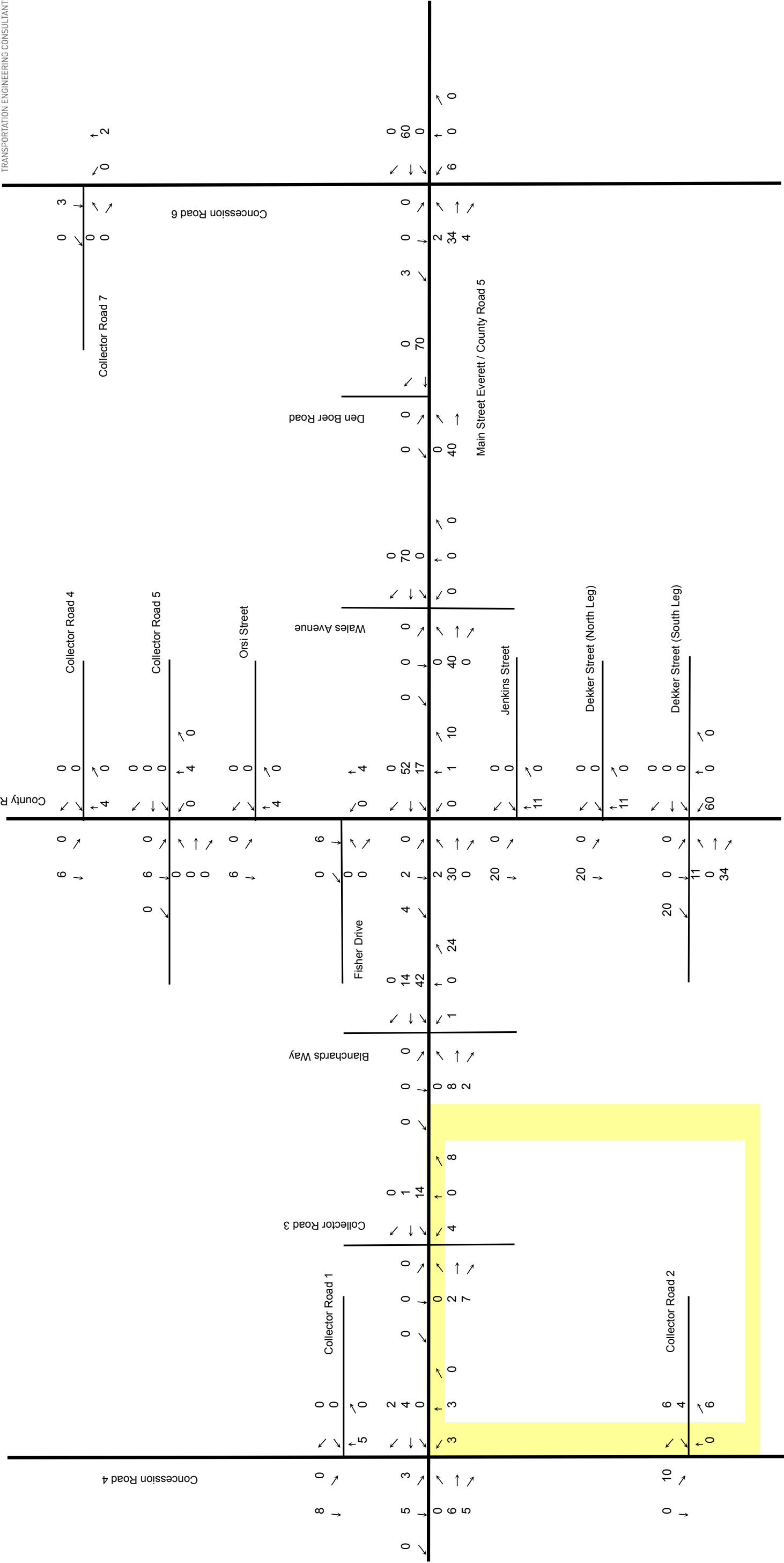




Parcel 2, Site Traffic Assignment, Weekday AM Peak Hour  
Everett Community Transportation Study



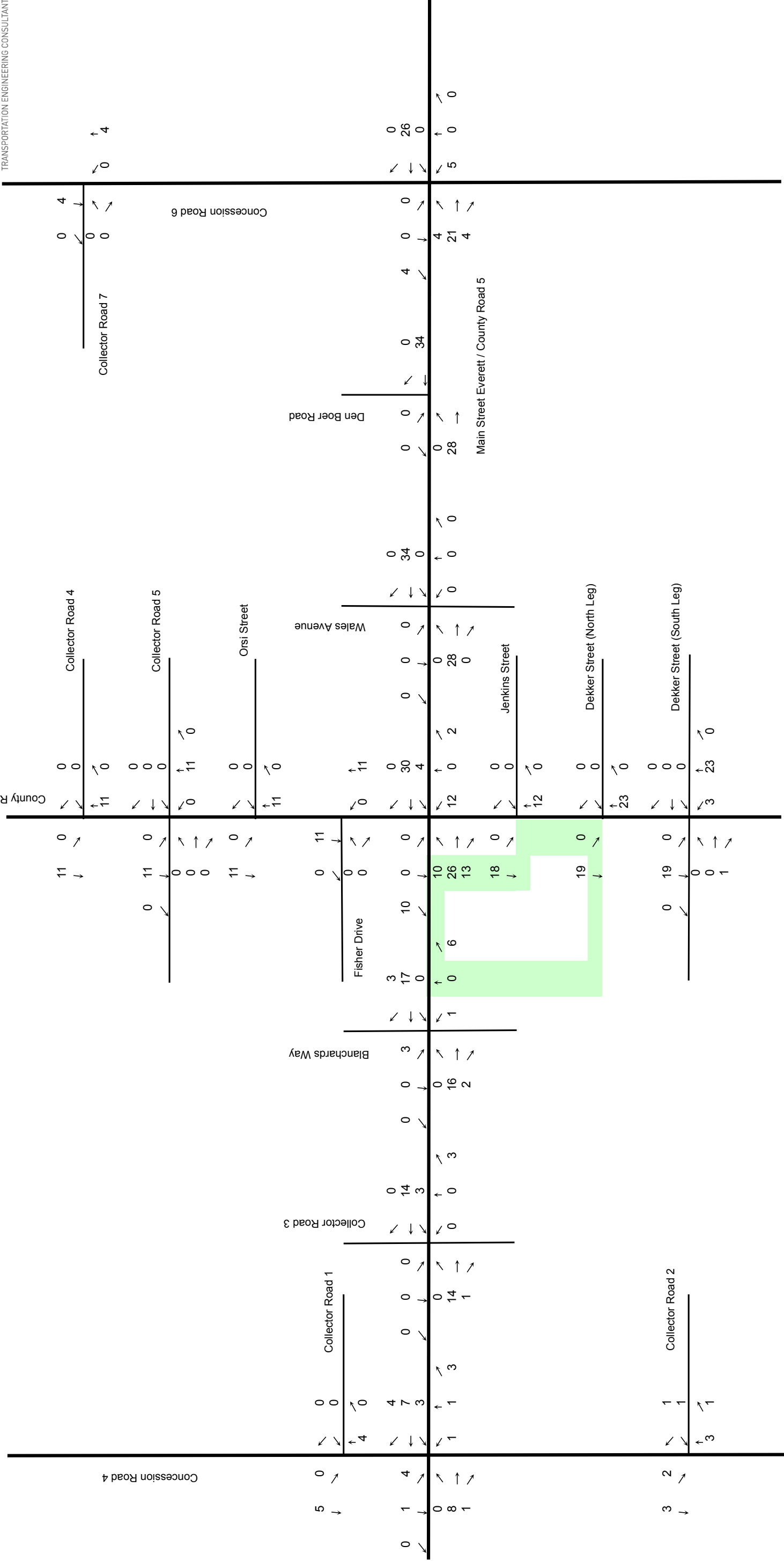
Parcel 2, Site Traffic Assignment, Weekday PM Peak Hour  
Everett Community Transportation Study



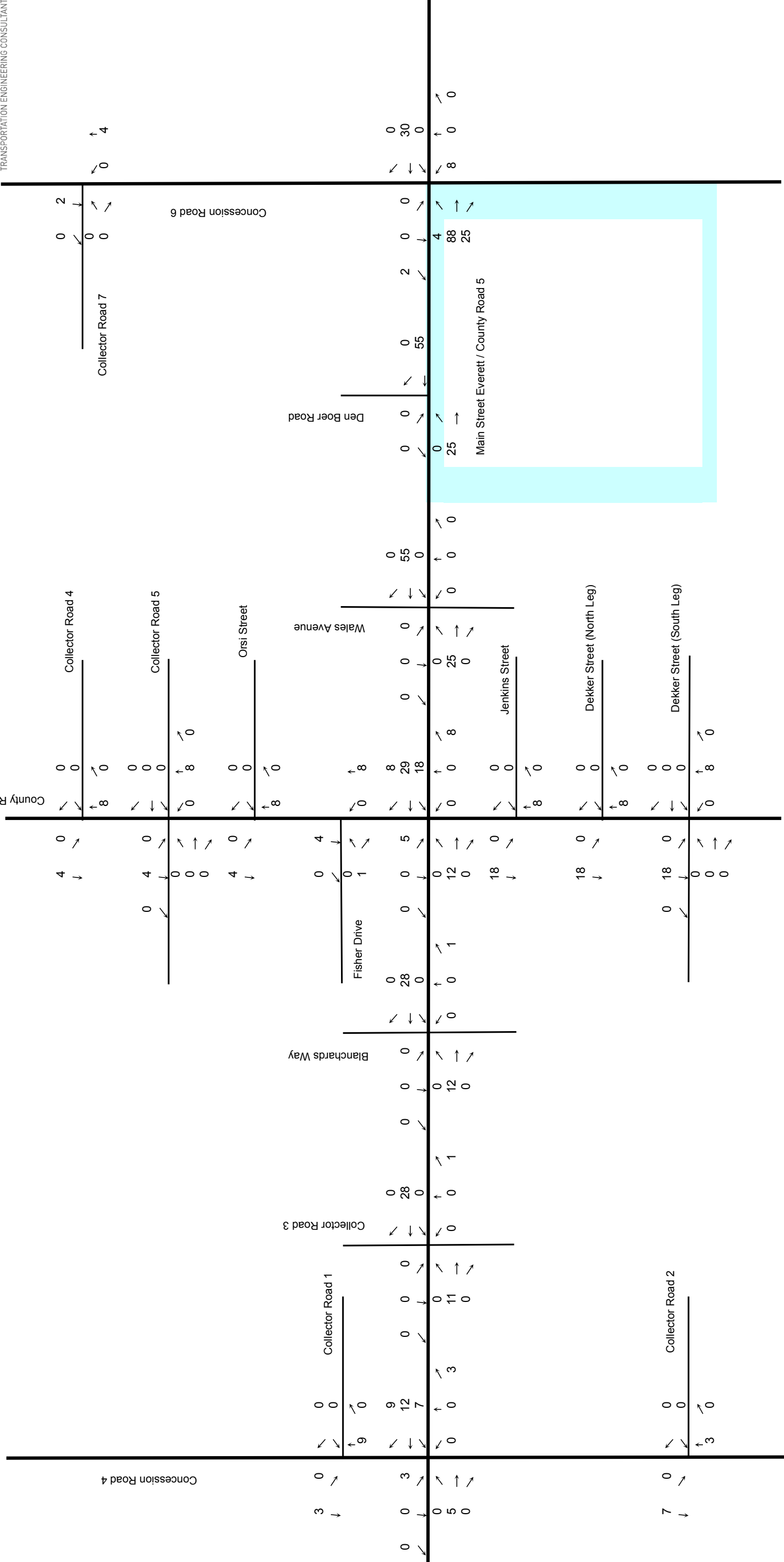
## Parcel 3, Site Traffic Assignment, Weekday AM Peak Hour Everett Community Transportation Study



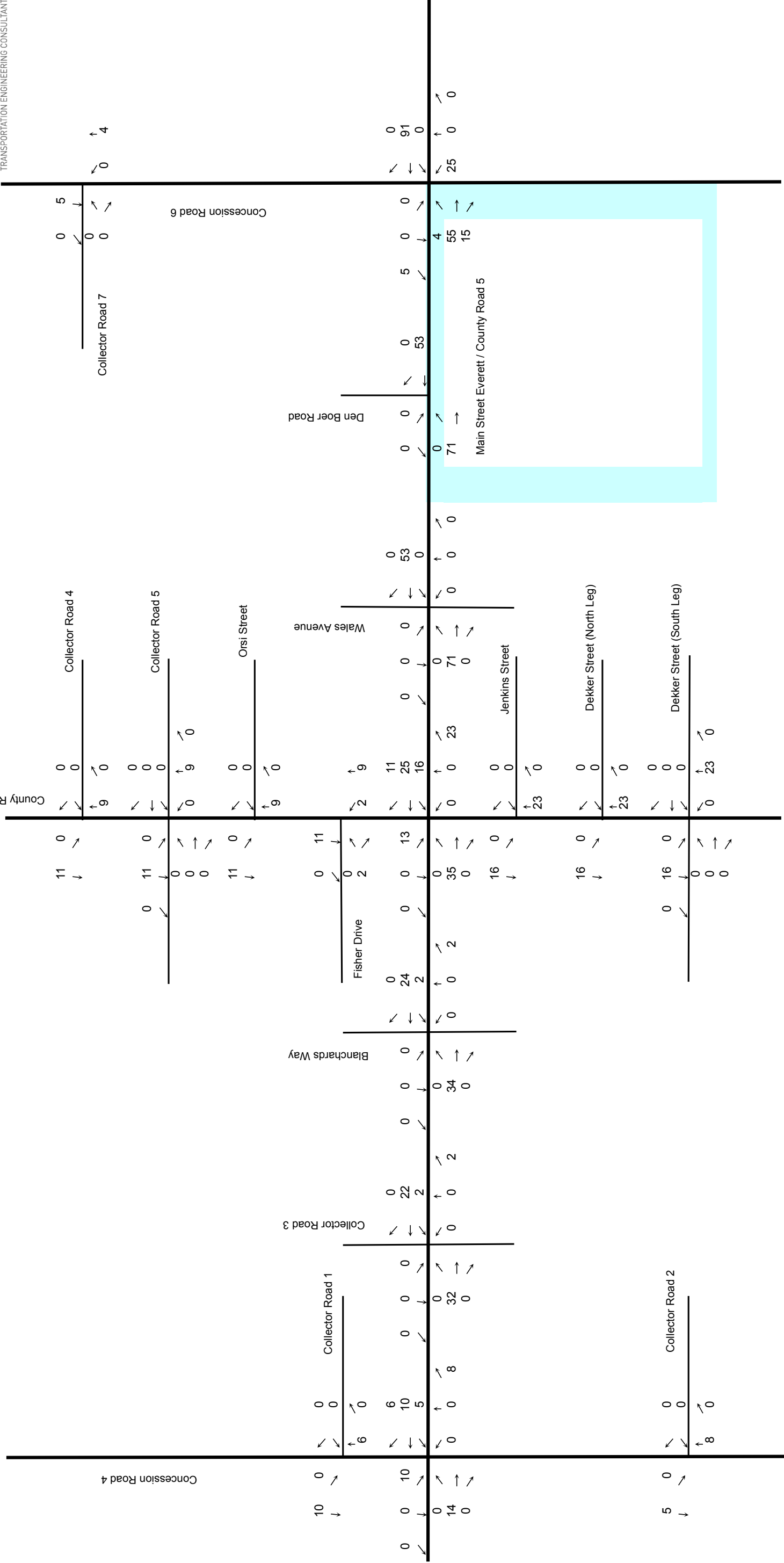
Parcel 3, Site Traffic Assignment, Weekday PM Peak Hour  
Everett Community Transportation Study



Parcel 4, Site Traffic Assignment, Weekday AM Peak Hour  
Everett Community Transportation Study



Parcel 4, Site Traffic Assignment, Weekday PM Peak Hour  
Everett Community Transportation Study





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INC

# Appendix C

Future Background Traffic, AM Peak Hour



# HCM Unsignalized Intersection Capacity Analysis

## 2: County Road 5 & Concession Road 4

Background AM  
2012-10-18

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |                                                                                     |  |                                                                                     |                                                                                     |  |                                                                                     |
| Volume (veh/h)                    | 4                                                                                 | 221                                                                               | 6                                                                                 | 7                                                                                 | 182                                                                               | 17                                                                                | 7                                                                                   | 16                                                                                  | 6                                                                                   | 29                                                                                  | 45                                                                                  | 12                                                                                  |
| Sign Control                      |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |                                                                                   |                                                                                     | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 4                                                                                 | 240                                                                               | 7                                                                                 | 8                                                                                 | 198                                                                               | 18                                                                                | 8                                                                                   | 17                                                                                  | 7                                                                                   | 32                                                                                  | 49                                                                                  | 13                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 216                                                                               |                                                                                   |                                                                                   | 247                                                                               |                                                                                   |                                                                                   | 512                                                                                 | 484                                                                                 | 243                                                                                 | 490                                                                                 | 478                                                                                 | 207                                                                                 |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 216                                                                               |                                                                                   |                                                                                   | 247                                                                               |                                                                                   |                                                                                   | 512                                                                                 | 484                                                                                 | 243                                                                                 | 490                                                                                 | 478                                                                                 | 207                                                                                 |
| tC, single (s)                    | 4.4                                                                               |                                                                                   |                                                                                   | 4.4                                                                               |                                                                                   |                                                                                   | 7.1                                                                                 | 6.9                                                                                 | 6.2                                                                                 | 7.1                                                                                 | 6.6                                                                                 | 6.5                                                                                 |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 2.5                                                                               |                                                                                   |                                                                                   | 2.5                                                                               |                                                                                   |                                                                                   | 3.5                                                                                 | 4.4                                                                                 | 3.3                                                                                 | 3.5                                                                                 | 4.1                                                                                 | 3.6                                                                                 |
| p0 queue free %                   | 100                                                                               |                                                                                   |                                                                                   | 99                                                                                |                                                                                   |                                                                                   | 98                                                                                  | 96                                                                                  | 99                                                                                  | 93                                                                                  | 90                                                                                  | 98                                                                                  |
| cM capacity (veh/h)               | 1190                                                                              |                                                                                   |                                                                                   | 1158                                                                              |                                                                                   |                                                                                   | 428                                                                                 | 422                                                                                 | 800                                                                                 | 469                                                                                 | 476                                                                                 | 768                                                                                 |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 251                                                                               | 224                                                                               | 32                                                                                | 93                                                                                |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 4                                                                                 | 8                                                                                 | 8                                                                                 | 32                                                                                |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 7                                                                                 | 18                                                                                | 7                                                                                 | 13                                                                                |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 1190                                                                              | 1158                                                                              | 470                                                                               | 500                                                                               |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.00                                                                              | 0.01                                                                              | 0.07                                                                              | 0.19                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (m)             | 0.1                                                                               | 0.2                                                                               | 1.6                                                                               | 5.2                                                                               |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 0.2                                                                               | 0.3                                                                               | 13.2                                                                              | 13.8                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | A                                                                                 | A                                                                                 | B                                                                                 | B                                                                                 |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.2                                                                               | 0.3                                                                               | 13.2                                                                              | 13.8                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      |                                                                                   |                                                                                   | B                                                                                 | B                                                                                 |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 3.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 28.3%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

## 5: County Road 5 & Blanchards Way

Background AM  
2012-10-18

|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |                                                                                     |  |                                                                                     |                                                                                     |  |                                                                                     |
| Volume (veh/h)                    | 1                                                                                 | 251                                                                               | 3                                                                                 | 27                                                                                | 197                                                                               | 1                                                                                 | 6                                                                                   | 0                                                                                   | 51                                                                                  | 2                                                                                   | 0                                                                                   | 1                                                                                   |
| Sign Control                      |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |                                                                                   |                                                                                     | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 1                                                                                 | 273                                                                               | 3                                                                                 | 29                                                                                | 214                                                                               | 1                                                                                 | 7                                                                                   | 0                                                                                   | 55                                                                                  | 2                                                                                   | 0                                                                                   | 1                                                                                   |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 215                                                                               |                                                                                   |                                                                                   | 276                                                                               |                                                                                   |                                                                                   | 551                                                                                 | 551                                                                                 | 274                                                                                 | 605                                                                                 | 552                                                                                 | 215                                                                                 |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 215                                                                               |                                                                                   |                                                                                   | 276                                                                               |                                                                                   |                                                                                   | 551                                                                                 | 551                                                                                 | 274                                                                                 | 605                                                                                 | 552                                                                                 | 215                                                                                 |
| tC, single (s)                    | 4.1                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |                                                                                   | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 2.2                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |                                                                                   | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 |
| p0 queue free %                   | 100                                                                               |                                                                                   |                                                                                   | 98                                                                                |                                                                                   |                                                                                   | 99                                                                                  | 100                                                                                 | 93                                                                                  | 99                                                                                  | 100                                                                                 | 100                                                                                 |
| cM capacity (veh/h)               | 1367                                                                              |                                                                                   |                                                                                   | 1299                                                                              |                                                                                   |                                                                                   | 436                                                                                 | 432                                                                                 | 764                                                                                 | 376                                                                                 | 432                                                                                 | 830                                                                                 |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 277                                                                               | 245                                                                               | 62                                                                                | 3                                                                                 |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 1                                                                                 | 29                                                                                | 7                                                                                 | 2                                                                                 |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 3                                                                                 | 1                                                                                 | 55                                                                                | 1                                                                                 |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 1367                                                                              | 1299                                                                              | 708                                                                               | 459                                                                               |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.00                                                                              | 0.02                                                                              | 0.09                                                                              | 0.01                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (m)             | 0.0                                                                               | 0.5                                                                               | 2.2                                                                               | 0.2                                                                               |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 0.0                                                                               | 1.1                                                                               | 10.6                                                                              | 12.9                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | A                                                                                 | A                                                                                 | B                                                                                 | B                                                                                 |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.0                                                                               | 1.1                                                                               | 10.6                                                                              | 12.9                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      |                                                                                   |                                                                                   | B                                                                                 | B                                                                                 |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 1.7                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 38.8%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

## 6: Collector Road 4 & County Road 13

Background AM

2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |  |  |  |  |  |
| Volume (veh/h)                    | 166                                                                               | 71                                                                                | 200                                                                               | 79                                                                                | 29                                                                                | 259                                                                               |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 180                                                                               | 77                                                                                | 217                                                                               | 86                                                                                | 32                                                                                | 282                                                                               |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 562                                                                               | 217                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 562                                                                               | 217                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 62                                                                                | 91                                                                                |                                                                                   |                                                                                   | 97                                                                                |                                                                                   |
| cM capacity (veh/h)               | 476                                                                               | 822                                                                               |                                                                                   |                                                                                   | 1258                                                                              |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | WB 2                                                                              | NB 1                                                                              | NB 2                                                                              | SB 1                                                                              | SB 2                                                                              |
| Volume Total                      | 180                                                                               | 77                                                                                | 217                                                                               | 86                                                                                | 32                                                                                | 282                                                                               |
| Volume Left                       | 180                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 32                                                                                | 0                                                                                 |
| Volume Right                      | 0                                                                                 | 77                                                                                | 0                                                                                 | 86                                                                                | 0                                                                                 | 0                                                                                 |
| cSH                               | 476                                                                               | 822                                                                               | 1700                                                                              | 1700                                                                              | 1258                                                                              | 1700                                                                              |
| Volume to Capacity                | 0.38                                                                              | 0.09                                                                              | 0.13                                                                              | 0.05                                                                              | 0.03                                                                              | 0.17                                                                              |
| Queue Length 95th (m)             | 13.3                                                                              | 2.4                                                                               | 0.0                                                                               | 0.0                                                                               | 0.6                                                                               | 0.0                                                                               |
| Control Delay (s)                 | 17.1                                                                              | 9.8                                                                               | 0.0                                                                               | 0.0                                                                               | 7.9                                                                               | 0.0                                                                               |
| Lane LOS                          | C                                                                                 | A                                                                                 |                                                                                   |                                                                                   | A                                                                                 |                                                                                   |
| Approach Delay (s)                | 14.9                                                                              |                                                                                   | 0.0                                                                               |                                                                                   | 0.8                                                                               |                                                                                   |
| Approach LOS                      | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   |                                                                                   | 4.7                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 33.1%                                                                             |                                                                                   | ICU Level of Service                                                              | A                                                                                 |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |

# HCM Unsignalized Intersection Capacity Analysis

## 7: Collector Road 3 & County Road 13

Background AM  
2012-10-18

|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |                                                                                     |  |                                                                                     |                                                                                     |  |                                                                                     |
| Volume (veh/h)                    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 79                                                                                | 0                                                                                 | 14                                                                                | 0                                                                                   | 265                                                                                 | 28                                                                                  | 10                                                                                  | 415                                                                                 | 0                                                                                   |
| Sign Control                      |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 86                                                                                | 0                                                                                 | 15                                                                                | 0                                                                                   | 288                                                                                 | 30                                                                                  | 11                                                                                  | 451                                                                                 | 0                                                                                   |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     | None                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 791                                                                               | 791                                                                               | 451                                                                               | 776                                                                               | 776                                                                               | 303                                                                               | 451                                                                                 |                                                                                     |                                                                                     | 318                                                                                 |                                                                                     |                                                                                     |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 791                                                                               | 791                                                                               | 451                                                                               | 776                                                                               | 776                                                                               | 303                                                                               | 451                                                                                 |                                                                                     |                                                                                     | 318                                                                                 |                                                                                     |                                                                                     |
| tC, single (s)                    | 7.1                                                                               | 6.5                                                                               | 6.2                                                                               | 7.1                                                                               | 6.5                                                                               | 6.2                                                                               | 4.1                                                                                 |                                                                                     |                                                                                     | 4.1                                                                                 |                                                                                     |                                                                                     |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 2.2                                                                                 |                                                                                     |                                                                                     | 2.2                                                                                 |                                                                                     |                                                                                     |
| p0 queue free %                   | 100                                                                               | 100                                                                               | 100                                                                               | 73                                                                                | 100                                                                               | 98                                                                                | 100                                                                                 |                                                                                     |                                                                                     | 99                                                                                  |                                                                                     |                                                                                     |
| cM capacity (veh/h)               | 299                                                                               | 319                                                                               | 608                                                                               | 312                                                                               | 326                                                                               | 736                                                                               | 1109                                                                                |                                                                                     |                                                                                     | 1242                                                                                |                                                                                     |                                                                                     |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 0                                                                                 | 101                                                                               | 318                                                                               | 462                                                                               |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 0                                                                                 | 86                                                                                | 0                                                                                 | 11                                                                                |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 0                                                                                 | 15                                                                                | 30                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 1700                                                                              | 342                                                                               | 1109                                                                              | 1242                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.00                                                                              | 0.30                                                                              | 0.00                                                                              | 0.01                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (m)             | 0.0                                                                               | 9.2                                                                               | 0.0                                                                               | 0.2                                                                               |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 0.0                                                                               | 19.9                                                                              | 0.0                                                                               | 0.3                                                                               |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | A                                                                                 | C                                                                                 |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.0                                                                               | 19.9                                                                              | 0.0                                                                               | 0.3                                                                               |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | A                                                                                 | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     | 2.4                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization | 41.8%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

## 8: Orsi Street & County Road 13

Background AM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |                                                                                   |  |                                                                                   |                                                                                   |  |
| Volume (veh/h)                    | 4                                                                                 | 4                                                                                 | 288                                                                               | 5                                                                                 | 3                                                                                 | 491                                                                               |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 4                                                                                 | 4                                                                                 | 313                                                                               | 5                                                                                 | 3                                                                                 | 534                                                                               |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 856                                                                               | 316                                                                               |                                                                                   |                                                                                   | 318                                                                               |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 856                                                                               | 316                                                                               |                                                                                   |                                                                                   | 318                                                                               |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 99                                                                                | 99                                                                                |                                                                                   |                                                                                   | 100                                                                               |                                                                                   |
| cM capacity (veh/h)               | 327                                                                               | 725                                                                               |                                                                                   |                                                                                   | 1242                                                                              |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 9                                                                                 | 318                                                                               | 537                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 4                                                                                 | 0                                                                                 | 3                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 4                                                                                 | 5                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 451                                                                               | 1700                                                                              | 1242                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.02                                                                              | 0.19                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 0.4                                                                               | 0.0                                                                               | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 13.1                                                                              | 0.0                                                                               | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | B                                                                                 |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 13.1                                                                              | 0.0                                                                               | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   |                                                                                   | 0.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 38.2%                                                                             | ICU Level of Service                                                              |                                                                                   | A                                                                                 |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |

# HCM Unsignalized Intersection Capacity Analysis

## 9: Fisher Drive & County Road 13

Background AM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBR                                                                               | NBL                                                                               | NBT                                                                               | SBT                                                                               | SBR                                                                               |
| Lane Configurations               |  |                                                                                   |                                                                                   |  |  |                                                                                   |
| Volume (veh/h)                    | 2                                                                                 | 7                                                                                 | 1                                                                                 | 292                                                                               | 494                                                                               | 1                                                                                 |
| Sign Control                      | Stop                                                                              |                                                                                   |                                                                                   | Free                                                                              | Free                                                                              |                                                                                   |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                | 0%                                                                                |                                                                                   |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 2                                                                                 | 8                                                                                 | 1                                                                                 | 317                                                                               | 537                                                                               | 1                                                                                 |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   |                                                                                   | None                                                                              | None                                                                              |                                                                                   |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   | 247                                                                               |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 857                                                                               | 538                                                                               | 538                                                                               |                                                                                   |                                                                                   |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 857                                                                               | 538                                                                               | 538                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               | 4.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               | 2.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| p0 queue free %                   | 99                                                                                | 99                                                                                | 100                                                                               |                                                                                   |                                                                                   |                                                                                   |
| cM capacity (veh/h)               | 330                                                                               | 547                                                                               | 1040                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Direction, Lane #                 | EB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 10                                                                                | 318                                                                               | 538                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 2                                                                                 | 1                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 8                                                                                 | 0                                                                                 | 1                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 478                                                                               | 1040                                                                              | 1700                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.02                                                                              | 0.00                                                                              | 0.32                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 0.5                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 12.7                                                                              | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | B                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 12.7                                                                              | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   | 0.2                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 36.1%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | A                                                                                 |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |

# HCM Signalized Intersection Capacity Analysis

## 10: County Road 5 & County Road 13

Background AM  
2012-10-18

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |  |  |  |  |  |  |  |  |  |  |
| Volume (vph)                      | 133                                                                               | 169                                                                               | 26                                                                                | 33                                                                                | 80                                                                                | 33                                                                                | 13                                                                                  | 126                                                                                 | 41                                                                                  | 46                                                                                  | 289                                                                                 | 160                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Flt                               | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (prot)                 | 1750                                                                              | 1842                                                                              | 1566                                                                              | 1750                                                                              | 1842                                                                              | 1566                                                                              | 1750                                                                                | 1842                                                                                | 1566                                                                                | 1750                                                                                | 1842                                                                                | 1566                                                                                |
| Flt Permitted                     | 0.46                                                                              | 1.00                                                                              | 1.00                                                                              | 0.64                                                                              | 1.00                                                                              | 1.00                                                                              | 0.57                                                                                | 1.00                                                                                | 1.00                                                                                | 0.64                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (perm)                 | 845                                                                               | 1842                                                                              | 1566                                                                              | 1182                                                                              | 1842                                                                              | 1566                                                                              | 1049                                                                                | 1842                                                                                | 1566                                                                                | 1170                                                                                | 1842                                                                                | 1566                                                                                |
| Peak-hour factor, PHF             | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Adj. Flow (vph)                   | 145                                                                               | 184                                                                               | 28                                                                                | 36                                                                                | 87                                                                                | 36                                                                                | 14                                                                                  | 137                                                                                 | 45                                                                                  | 50                                                                                  | 314                                                                                 | 174                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 0                                                                                 | 21                                                                                | 0                                                                                 | 0                                                                                 | 33                                                                                | 0                                                                                   | 0                                                                                   | 22                                                                                  | 0                                                                                   | 0                                                                                   | 82                                                                                  |
| Lane Group Flow (vph)             | 145                                                                               | 184                                                                               | 7                                                                                 | 36                                                                                | 87                                                                                | 3                                                                                 | 14                                                                                  | 137                                                                                 | 23                                                                                  | 50                                                                                  | 314                                                                                 | 92                                                                                  |
| Turn Type                         | pm+pt                                                                             |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases                  | 7                                                                                 | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     | 1                                                                                   | 6                                                                                   |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 2                                                                                   |                                                                                     | 2                                                                                   | 6                                                                                   |                                                                                     | 6                                                                                   |
| Actuated Green, G (s)             | 20.9                                                                              | 20.9                                                                              | 20.9                                                                              | 7.6                                                                               | 7.6                                                                               | 7.6                                                                               | 41.8                                                                                | 40.7                                                                                | 40.7                                                                                | 46.2                                                                                | 42.9                                                                                | 42.9                                                                                |
| Effective Green, g (s)            | 20.9                                                                              | 20.9                                                                              | 20.9                                                                              | 7.6                                                                               | 7.6                                                                               | 7.6                                                                               | 41.8                                                                                | 40.7                                                                                | 40.7                                                                                | 46.2                                                                                | 42.9                                                                                | 42.9                                                                                |
| Actuated g/C Ratio                | 0.26                                                                              | 0.26                                                                              | 0.26                                                                              | 0.09                                                                              | 0.09                                                                              | 0.09                                                                              | 0.52                                                                                | 0.50                                                                                | 0.50                                                                                | 0.57                                                                                | 0.53                                                                                | 0.53                                                                                |
| Clearance Time (s)                | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Vehicle Extension (s)             | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.0                                                                                 | 3.0                                                                                 | 3.0                                                                                 | 3.0                                                                                 | 3.0                                                                                 | 3.0                                                                                 |
| Lane Grp Cap (vph)                | 322                                                                               | 476                                                                               | 405                                                                               | 111                                                                               | 173                                                                               | 147                                                                               | 552                                                                                 | 927                                                                                 | 788                                                                                 | 692                                                                                 | 977                                                                                 | 830                                                                                 |
| v/s Ratio Prot                    | c0.05                                                                             | 0.10                                                                              |                                                                                   |                                                                                   | 0.05                                                                              |                                                                                   | 0.00                                                                                | 0.07                                                                                |                                                                                     | c0.00                                                                               | c0.17                                                                               |                                                                                     |
| v/s Ratio Perm                    | c0.06                                                                             |                                                                                   | 0.00                                                                              | 0.03                                                                              |                                                                                   | 0.00                                                                              | 0.01                                                                                |                                                                                     | 0.01                                                                                | 0.04                                                                                |                                                                                     | 0.06                                                                                |
| v/c Ratio                         | 0.45                                                                              | 0.39                                                                              | 0.02                                                                              | 0.32                                                                              | 0.50                                                                              | 0.02                                                                              | 0.03                                                                                | 0.15                                                                                | 0.03                                                                                | 0.07                                                                                | 0.32                                                                                | 0.11                                                                                |
| Uniform Delay, d1                 | 24.4                                                                              | 24.7                                                                              | 22.4                                                                              | 34.3                                                                              | 34.9                                                                              | 33.3                                                                              | 9.5                                                                                 | 10.8                                                                                | 10.1                                                                                | 7.7                                                                                 | 10.8                                                                                | 9.5                                                                                 |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Incremental Delay, d2             | 1.0                                                                               | 0.5                                                                               | 0.0                                                                               | 1.7                                                                               | 2.3                                                                               | 0.1                                                                               | 0.0                                                                                 | 0.3                                                                                 | 0.1                                                                                 | 0.0                                                                                 | 0.9                                                                                 | 0.3                                                                                 |
| Delay (s)                         | 25.4                                                                              | 25.2                                                                              | 22.4                                                                              | 36.0                                                                              | 37.1                                                                              | 33.3                                                                              | 9.5                                                                                 | 11.1                                                                                | 10.2                                                                                | 7.7                                                                                 | 11.6                                                                                | 9.8                                                                                 |
| Level of Service                  | C                                                                                 | C                                                                                 | C                                                                                 | D                                                                                 | D                                                                                 | C                                                                                 | A                                                                                   | B                                                                                   | B                                                                                   | A                                                                                   | B                                                                                   | A                                                                                   |
| Approach Delay (s)                |                                                                                   | 25.1                                                                              |                                                                                   |                                                                                   | 36.0                                                                              |                                                                                   |                                                                                     | 10.8                                                                                |                                                                                     |                                                                                     | 10.7                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM Average Control Delay         |                                                                                   |                                                                                   | 18.0                                                                              |                                                                                   |                                                                                   | HCM Level of Service                                                              |                                                                                     |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |                                                                                     |
| HCM Volume to Capacity ratio      |                                                                                   |                                                                                   | 0.34                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 80.9                                                                              |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                     |                                                                                     | 12.0                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 49.1%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

## 11: Jenkins St & County Road 13

Background AM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |                                                                                   |  |                                                                                   |                                                                                   |  |
| Volume (veh/h)                    | 2                                                                                 | 1                                                                                 | 180                                                                               | 2                                                                                 | 1                                                                                 | 347                                                                               |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 2                                                                                 | 1                                                                                 | 196                                                                               | 2                                                                                 | 1                                                                                 | 377                                                                               |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 225                                                                               |
| pX, platoon unblocked             | 0.93                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 576                                                                               | 197                                                                               |                                                                                   |                                                                                   | 198                                                                               |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 511                                                                               | 197                                                                               |                                                                                   |                                                                                   | 198                                                                               |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 100                                                                               | 100                                                                               |                                                                                   |                                                                                   | 100                                                                               |                                                                                   |
| cM capacity (veh/h)               | 491                                                                               | 850                                                                               |                                                                                   |                                                                                   | 1387                                                                              |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 3                                                                                 | 198                                                                               | 378                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 2                                                                                 | 0                                                                                 | 1                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 1                                                                                 | 2                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 571                                                                               | 1700                                                                              | 1387                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.01                                                                              | 0.12                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 0.1                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 11.3                                                                              | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | B                                                                                 |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 11.3                                                                              | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   |                                                                                   | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 29.1%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | A                                                                                 |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |



# HCM Unsignalized Intersection Capacity Analysis 12: Dekker St (North Leg) & County Road 13

Background AM  
2012-10-18

|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |                                                                                   |  |                                                                                   |                                                                                   |  |
| Volume (veh/h)                    | 3                                                                                 | 2                                                                                 | 180                                                                               | 2                                                                                 | 1                                                                                 | 350                                                                               |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 3                                                                                 | 2                                                                                 | 196                                                                               | 2                                                                                 | 1                                                                                 | 380                                                                               |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 579                                                                               | 197                                                                               |                                                                                   |                                                                                   | 198                                                                               |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 579                                                                               | 197                                                                               |                                                                                   |                                                                                   | 198                                                                               |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 99                                                                                | 100                                                                               |                                                                                   |                                                                                   | 100                                                                               |                                                                                   |
| cM capacity (veh/h)               | 480                                                                               | 850                                                                               |                                                                                   |                                                                                   | 1387                                                                              |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 5                                                                                 | 198                                                                               | 382                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 3                                                                                 | 0                                                                                 | 1                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 2                                                                                 | 2                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 581                                                                               | 1700                                                                              | 1387                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.01                                                                              | 0.12                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 0.2                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 11.3                                                                              | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | B                                                                                 |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 11.3                                                                              | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   |                                                                                   | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 29.2%                                                                             | ICU Level of Service                                                              | A                                                                                 |                                                                                   |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |

# HCM Unsignalized Intersection Capacity Analysis 13: Collector Road 6 & County Road 13

Background AM  
2012-10-18

|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |                                                                                    |  |                                                                                     |                                                                                     |  |                                                                                     |
| Volume (veh/h)                    | 17                                                                                | 0                                                                                 | 54                                                                                | 17                                                                                | 1                                                                                 | 6                                                                                 | 28                                                                                 | 157                                                                                 | 6                                                                                   | 2                                                                                   | 341                                                                                 | 9                                                                                   |
| Sign Control                      |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                    | Free                                                                                |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 18                                                                                | 0                                                                                 | 59                                                                                | 18                                                                                | 1                                                                                 | 7                                                                                 | 30                                                                                 | 171                                                                                 | 7                                                                                   | 2                                                                                   | 371                                                                                 | 10                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | None                                                                                |                                                                                     |                                                                                     | None                                                                                |                                                                                     |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 622                                                                               | 618                                                                               | 376                                                                               | 673                                                                               | 620                                                                               | 174                                                                               | 380                                                                                |                                                                                     |                                                                                     | 177                                                                                 |                                                                                     |                                                                                     |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 622                                                                               | 618                                                                               | 376                                                                               | 673                                                                               | 620                                                                               | 174                                                                               | 380                                                                                |                                                                                     |                                                                                     | 177                                                                                 |                                                                                     |                                                                                     |
| tC, single (s)                    | 7.1                                                                               | 6.5                                                                               | 6.2                                                                               | 7.1                                                                               | 6.5                                                                               | 6.2                                                                               | 4.1                                                                                |                                                                                     |                                                                                     | 4.1                                                                                 |                                                                                     |                                                                                     |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 2.2                                                                                |                                                                                     |                                                                                     | 2.2                                                                                 |                                                                                     |                                                                                     |
| p0 queue free %                   | 95                                                                                | 100                                                                               | 91                                                                                | 94                                                                                | 100                                                                               | 99                                                                                | 97                                                                                 |                                                                                     |                                                                                     | 100                                                                                 |                                                                                     |                                                                                     |
| cM capacity (veh/h)               | 387                                                                               | 394                                                                               | 671                                                                               | 332                                                                               | 393                                                                               | 875                                                                               | 1178                                                                               |                                                                                     |                                                                                     | 1411                                                                                |                                                                                     |                                                                                     |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 77                                                                                | 26                                                                                | 208                                                                               | 383                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 18                                                                                | 18                                                                                | 30                                                                                | 2                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 59                                                                                | 7                                                                                 | 7                                                                                 | 10                                                                                |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 571                                                                               | 396                                                                               | 1178                                                                              | 1411                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.14                                                                              | 0.07                                                                              | 0.03                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (m)             | 3.5                                                                               | 1.6                                                                               | 0.6                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 12.3                                                                              | 14.7                                                                              | 1.4                                                                               | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | B                                                                                 | B                                                                                 | A                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 12.3                                                                              | 14.7                                                                              | 1.4                                                                               | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | B                                                                                 | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 2.4                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 40.3%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                    |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

## 14: Main Street Everett & Wales Ave

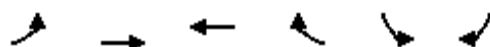
Background AM  
2012-10-18

|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (veh/h)                    | 7                                                                                 | 240                                                                               | 3                                                                                 | 13                                                                                | 104                                                                               | 8                                                                                 | 2                                                                                   | 4                                                                                   | 5                                                                                   | 69                                                                                  | 7                                                                                   | 33                                                                                  |
| Sign Control                      |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |                                                                                   |                                                                                     | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 8                                                                                 | 261                                                                               | 3                                                                                 | 14                                                                                | 113                                                                               | 9                                                                                 | 2                                                                                   | 4                                                                                   | 5                                                                                   | 75                                                                                  | 8                                                                                   | 36                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 122                                                                               |                                                                                   |                                                                                   | 264                                                                               |                                                                                   |                                                                                   | 463                                                                                 | 428                                                                                 | 262                                                                                 | 431                                                                                 | 425                                                                                 | 117                                                                                 |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 122                                                                               |                                                                                   |                                                                                   | 264                                                                               |                                                                                   |                                                                                   | 463                                                                                 | 428                                                                                 | 262                                                                                 | 431                                                                                 | 425                                                                                 | 117                                                                                 |
| tC, single (s)                    | 4.1                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |                                                                                   | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 2.2                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |                                                                                   | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 |
| p0 queue free %                   | 99                                                                                |                                                                                   |                                                                                   | 99                                                                                |                                                                                   |                                                                                   | 100                                                                                 | 99                                                                                  | 99                                                                                  | 86                                                                                  | 99                                                                                  | 96                                                                                  |
| cM capacity (veh/h)               | 1466                                                                              |                                                                                   |                                                                                   | 1300                                                                              |                                                                                   |                                                                                   | 478                                                                                 | 511                                                                                 | 776                                                                                 | 521                                                                                 | 513                                                                                 | 935                                                                                 |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | NB 2                                                                              | SB 1                                                                              | SB 2                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 272                                                                               | 136                                                                               | 2                                                                                 | 10                                                                                | 75                                                                                | 43                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 8                                                                                 | 14                                                                                | 2                                                                                 | 0                                                                                 | 75                                                                                | 0                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 3                                                                                 | 9                                                                                 | 0                                                                                 | 5                                                                                 | 0                                                                                 | 36                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 1466                                                                              | 1300                                                                              | 478                                                                               | 631                                                                               | 521                                                                               | 817                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.01                                                                              | 0.01                                                                              | 0.00                                                                              | 0.02                                                                              | 0.14                                                                              | 0.05                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (m)             | 0.1                                                                               | 0.3                                                                               | 0.1                                                                               | 0.4                                                                               | 3.8                                                                               | 1.3                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 0.3                                                                               | 0.9                                                                               | 12.6                                                                              | 10.8                                                                              | 13.1                                                                              | 9.7                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | A                                                                                 | A                                                                                 | B                                                                                 | B                                                                                 | B                                                                                 | A                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.3                                                                               | 0.9                                                                               | 11.1                                                                              |                                                                                   | 11.8                                                                              |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      |                                                                                   |                                                                                   | B                                                                                 |                                                                                   | B                                                                                 |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 3.2                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 31.4%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

## 15: Main Street Everett & Den Boer Rd

Background AM  
2012-10-18



| Movement                          | EBL  | EBT                                                                               | WBT                                                                               | WBR                  | SBL                                                                               | SBR  |
|-----------------------------------|------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------|------|
| Lane Configurations               |      |  |  |                      |  |      |
| Volume (veh/h)                    | 3    | 365                                                                               | 126                                                                               | 15                   | 93                                                                                | 7    |
| Sign Control                      |      | Free                                                                              | Free                                                                              |                      | Stop                                                                              |      |
| Grade                             |      | 0%                                                                                | 0%                                                                                |                      | 0%                                                                                |      |
| Peak Hour Factor                  | 0.92 | 0.92                                                                              | 0.92                                                                              | 0.92                 | 0.92                                                                              | 0.92 |
| Hourly flow rate (vph)            | 3    | 397                                                                               | 137                                                                               | 16                   | 101                                                                               | 8    |
| Pedestrians                       |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| Lane Width (m)                    |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| Walking Speed (m/s)               |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| Percent Blockage                  |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| Right turn flare (veh)            |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| Median type                       |      | None                                                                              | None                                                                              |                      |                                                                                   |      |
| Median storage (veh)              |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| Upstream signal (m)               |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| pX, platoon unblocked             |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| vC, conflicting volume            | 153  |                                                                                   |                                                                                   |                      | 548                                                                               | 145  |
| vC1, stage 1 conf vol             |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| vC2, stage 2 conf vol             |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| vCu, unblocked vol                | 153  |                                                                                   |                                                                                   |                      | 548                                                                               | 145  |
| tC, single (s)                    | 4.1  |                                                                                   |                                                                                   |                      | 6.4                                                                               | 6.2  |
| tC, 2 stage (s)                   |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| tF (s)                            | 2.2  |                                                                                   |                                                                                   |                      | 3.5                                                                               | 3.3  |
| p0 queue free %                   | 100  |                                                                                   |                                                                                   |                      | 80                                                                                | 99   |
| cM capacity (veh/h)               | 1427 |                                                                                   |                                                                                   |                      | 496                                                                               | 902  |
| Direction, Lane #                 | EB 1 | WB 1                                                                              | SB 1                                                                              |                      |                                                                                   |      |
| Volume Total                      | 400  | 153                                                                               | 109                                                                               |                      |                                                                                   |      |
| Volume Left                       | 3    | 0                                                                                 | 101                                                                               |                      |                                                                                   |      |
| Volume Right                      | 0    | 16                                                                                | 8                                                                                 |                      |                                                                                   |      |
| cSH                               | 1427 | 1700                                                                              | 512                                                                               |                      |                                                                                   |      |
| Volume to Capacity                | 0.00 | 0.09                                                                              | 0.21                                                                              |                      |                                                                                   |      |
| Queue Length 95th (m)             | 0.1  | 0.0                                                                               | 6.0                                                                               |                      |                                                                                   |      |
| Control Delay (s)                 | 0.1  | 0.0                                                                               | 13.9                                                                              |                      |                                                                                   |      |
| Lane LOS                          | A    |                                                                                   | B                                                                                 |                      |                                                                                   |      |
| Approach Delay (s)                | 0.1  | 0.0                                                                               | 13.9                                                                              |                      |                                                                                   |      |
| Approach LOS                      |      |                                                                                   | B                                                                                 |                      |                                                                                   |      |
| Intersection Summary              |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| Average Delay                     |      |                                                                                   | 2.3                                                                               |                      |                                                                                   |      |
| Intersection Capacity Utilization |      |                                                                                   | 33.8%                                                                             | ICU Level of Service | A                                                                                 |      |
| Analysis Period (min)             |      |                                                                                   | 15                                                                                |                      |                                                                                   |      |
|                                   |      |                                                                                   |                                                                                   |                      |                                                                                   |      |

# HCM Unsignalized Intersection Capacity Analysis

## 16: Collector Road 7 & Concession Rd 6

Background AM  
2012-10-18

|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |
| Movement                          | EBL                                                                               | EBR                                                                               | NBL                                                                               | NBT                                                                               | SBT                                                                               | SBR                                                                               |
| Lane Configurations               |  |                                                                                   |                                                                                   |  |  |                                                                                   |
| Volume (veh/h)                    | 1                                                                                 | 324                                                                               | 81                                                                                | 29                                                                                | 163                                                                               | 1                                                                                 |
| Sign Control                      | Stop                                                                              |                                                                                   |                                                                                   | Free                                                                              | Free                                                                              |                                                                                   |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                | 0%                                                                                |                                                                                   |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 1                                                                                 | 352                                                                               | 88                                                                                | 32                                                                                | 177                                                                               | 1                                                                                 |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   |                                                                                   | None                                                                              | None                                                                              |                                                                                   |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 385                                                                               | 178                                                                               | 178                                                                               |                                                                                   |                                                                                   |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 385                                                                               | 178                                                                               | 178                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               | 4.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               | 2.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| p0 queue free %                   | 100                                                                               | 59                                                                                | 94                                                                                |                                                                                   |                                                                                   |                                                                                   |
| cM capacity (veh/h)               | 579                                                                               | 865                                                                               | 1398                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Direction, Lane #                 | EB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 353                                                                               | 120                                                                               | 178                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 1                                                                                 | 88                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 352                                                                               | 0                                                                                 | 1                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 864                                                                               | 1398                                                                              | 1700                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.41                                                                              | 0.06                                                                              | 0.10                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 15.3                                                                              | 1.5                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 12.0                                                                              | 5.8                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | B                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 12.0                                                                              | 5.8                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   | 7.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 44.8%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | A                                                                                 |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |

# HCM Signalized Intersection Capacity Analysis

## 17: County Road 5 & Concession Rd 6

Background AM  
2012-10-18

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |  |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)                      | 2                                                                                 | 350                                                                               | 46                                                                                | 9                                                                                 | 135                                                                               | 94                                                                                | 14                                                                                 | 13                                                                                  | 2                                                                                   | 405                                                                                 | 81                                                                                  | 1                                                                                   |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   | 6.0                                                                               | 6.0                                                                               | 6.0                                                                                | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Lane Util. Factor                 |                                                                                   | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               |                                                                                   | 0.98                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 0.85                                                                              | 1.00                                                                               | 0.98                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flt Protected                     |                                                                                   | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 |                                                                                   | 1813                                                                              |                                                                                   |                                                                                   | 1836                                                                              | 1566                                                                              | 1750                                                                               | 1808                                                                                |                                                                                     | 1750                                                                                | 1839                                                                                |                                                                                     |
| Flt Permitted                     |                                                                                   | 1.00                                                                              |                                                                                   |                                                                                   | 0.96                                                                              | 1.00                                                                              | 0.70                                                                               | 1.00                                                                                |                                                                                     | 0.75                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 |                                                                                   | 1811                                                                              |                                                                                   |                                                                                   | 1776                                                                              | 1566                                                                              | 1288                                                                               | 1808                                                                                |                                                                                     | 1376                                                                                | 1839                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Adj. Flow (vph)                   | 2                                                                                 | 380                                                                               | 50                                                                                | 10                                                                                | 147                                                                               | 102                                                                               | 15                                                                                 | 14                                                                                  | 2                                                                                   | 440                                                                                 | 88                                                                                  | 1                                                                                   |
| RTOR Reduction (vph)              | 0                                                                                 | 6                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 65                                                                                | 0                                                                                  | 1                                                                                   | 0                                                                                   | 0                                                                                   | 1                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 0                                                                                 | 426                                                                               | 0                                                                                 | 0                                                                                 | 157                                                                               | 37                                                                                | 15                                                                                 | 15                                                                                  | 0                                                                                   | 440                                                                                 | 88                                                                                  | 0                                                                                   |
| Turn Type                         | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                               | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Protected Phases                  | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 2                                                                                  |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 2                                                                                  |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 21.2                                                                              |                                                                                   |                                                                                   | 21.2                                                                              |                                                                                   |                                                                                   | 21.2                                                                               | 25.6                                                                                | 25.6                                                                                | 25.6                                                                                |                                                                                     | 25.6                                                                                |
| Effective Green, g (s)            | 21.2                                                                              |                                                                                   |                                                                                   | 21.2                                                                              |                                                                                   |                                                                                   | 21.2                                                                               | 25.6                                                                                | 25.6                                                                                | 25.6                                                                                |                                                                                     | 25.6                                                                                |
| Actuated g/C Ratio                | 0.36                                                                              |                                                                                   |                                                                                   | 0.36                                                                              |                                                                                   |                                                                                   | 0.36                                                                               | 0.44                                                                                | 0.44                                                                                | 0.44                                                                                |                                                                                     | 0.44                                                                                |
| Clearance Time (s)                | 6.0                                                                               |                                                                                   |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   | 6.0                                                                                | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 |
| Vehicle Extension (s)             | 3.0                                                                               |                                                                                   |                                                                                   | 3.0                                                                               |                                                                                   |                                                                                   | 3.0                                                                                | 3.0                                                                                 | 3.0                                                                                 | 3.0                                                                                 |                                                                                     | 3.0                                                                                 |
| Lane Grp Cap (vph)                | 653                                                                               |                                                                                   |                                                                                   | 640                                                                               |                                                                                   |                                                                                   | 565                                                                                | 561                                                                                 | 787                                                                                 | 599                                                                                 |                                                                                     | 801                                                                                 |
| v/s Ratio Prot                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 0.01                                                                                |                                                                                     |                                                                                     | 0.05                                                                                |
| v/s Ratio Perm                    | c0.24                                                                             |                                                                                   |                                                                                   | 0.09                                                                              |                                                                                   |                                                                                   | 0.02                                                                               | 0.01                                                                                |                                                                                     | c0.32                                                                               |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.65                                                                              |                                                                                   |                                                                                   | 0.25                                                                              |                                                                                   |                                                                                   | 0.07                                                                               | 0.03                                                                                | 0.02                                                                                | 0.73                                                                                |                                                                                     | 0.11                                                                                |
| Uniform Delay, d1                 | 15.7                                                                              |                                                                                   |                                                                                   | 13.2                                                                              |                                                                                   |                                                                                   | 12.3                                                                               | 9.5                                                                                 | 9.5                                                                                 | 13.8                                                                                |                                                                                     | 9.8                                                                                 |
| Progression Factor                | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                |
| Incremental Delay, d2             | 2.3                                                                               |                                                                                   |                                                                                   | 0.2                                                                               |                                                                                   |                                                                                   | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 4.7                                                                                 |                                                                                     | 0.1                                                                                 |
| Delay (s)                         | 18.1                                                                              |                                                                                   |                                                                                   | 13.4                                                                              |                                                                                   |                                                                                   | 12.4                                                                               | 9.5                                                                                 | 9.5                                                                                 | 18.4                                                                                |                                                                                     | 9.9                                                                                 |
| Level of Service                  | B                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | B                                                                                  | A                                                                                   | A                                                                                   | B                                                                                   |                                                                                     | A                                                                                   |
| Approach Delay (s)                | 18.1                                                                              |                                                                                   |                                                                                   | 13.0                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 9.5                                                                                 | 17.0                                                                                |                                                                                     |                                                                                     |
| Approach LOS                      | B                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     | A                                                                                   | B                                                                                   |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM Average Control Delay         |                                                                                   |                                                                                   | 16.4                                                                              |                                                                                   | HCM Level of Service                                                              |                                                                                   |                                                                                    |                                                                                     | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| HCM Volume to Capacity ratio      |                                                                                   |                                                                                   | 0.70                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 58.8                                                                              |                                                                                   | Sum of lost time (s)                                                              |                                                                                   |                                                                                    |                                                                                     | 12.0                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 61.9%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                    |                                                                                     | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Future Background Traffic, PM Peak Hour

# HCM Unsignalized Intersection Capacity Analysis

## 2: County Road 5 & Concession Road 4

Background PM  
2012-10-18

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |                                                                                    |  |                                                                                     |                                                                                     |  |                                                                                     |
| Volume (veh/h)                    | 2                                                                                 | 229                                                                               | 9                                                                                 | 7                                                                                 | 266                                                                               | 25                                                                                | 8                                                                                  | 37                                                                                  | 2                                                                                   | 13                                                                                  | 32                                                                                  | 10                                                                                  |
| Sign Control                      |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |                                                                                   |                                                                                    | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 2                                                                                 | 249                                                                               | 10                                                                                | 8                                                                                 | 289                                                                               | 27                                                                                | 9                                                                                  | 40                                                                                  | 2                                                                                   | 14                                                                                  | 35                                                                                  | 11                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 316                                                                               |                                                                                   |                                                                                   | 259                                                                               |                                                                                   |                                                                                   | 604                                                                                | 590                                                                                 | 254                                                                                 | 598                                                                                 | 581                                                                                 | 303                                                                                 |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 316                                                                               |                                                                                   |                                                                                   | 259                                                                               |                                                                                   |                                                                                   | 604                                                                                | 590                                                                                 | 254                                                                                 | 598                                                                                 | 581                                                                                 | 303                                                                                 |
| tC, single (s)                    | 4.1                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |                                                                                   | 7.1                                                                                | 6.5                                                                                 | 6.2                                                                                 | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 2.2                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |                                                                                   | 3.5                                                                                | 4.0                                                                                 | 3.3                                                                                 | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 |
| p0 queue free %                   | 100                                                                               |                                                                                   |                                                                                   | 99                                                                                |                                                                                   |                                                                                   | 98                                                                                 | 90                                                                                  | 100                                                                                 | 96                                                                                  | 92                                                                                  | 99                                                                                  |
| cM capacity (veh/h)               | 1255                                                                              |                                                                                   |                                                                                   | 1318                                                                              |                                                                                   |                                                                                   | 379                                                                                | 420                                                                                 | 790                                                                                 | 383                                                                                 | 425                                                                                 | 742                                                                                 |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 261                                                                               | 324                                                                               | 51                                                                                | 60                                                                                |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 2                                                                                 | 8                                                                                 | 9                                                                                 | 14                                                                                |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 10                                                                                | 27                                                                                | 2                                                                                 | 11                                                                                |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 1255                                                                              | 1318                                                                              | 421                                                                               | 448                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.00                                                                              | 0.01                                                                              | 0.12                                                                              | 0.13                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (m)             | 0.0                                                                               | 0.1                                                                               | 3.1                                                                               | 3.5                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 0.1                                                                               | 0.2                                                                               | 14.7                                                                              | 14.3                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | A                                                                                 | A                                                                                 | B                                                                                 | B                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.1                                                                               | 0.2                                                                               | 14.7                                                                              | 14.3                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      |                                                                                   |                                                                                   | B                                                                                 | B                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 2.4                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 31.3%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                    |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



# HCM Unsignalized Intersection Capacity Analysis

## 5: County Road 5 & Blanchards Way

Background PM

2012-10-18

|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |                                                                                    |  |                                                                                     |                                                                                     |  |                                                                                     |
| Volume (veh/h)                    | 0                                                                                 | 232                                                                               | 9                                                                                 | 75                                                                                | 285                                                                               | 3                                                                                 | 7                                                                                  | 0                                                                                   | 56                                                                                  | 1                                                                                   | 0                                                                                   | 1                                                                                   |
| Sign Control                      |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |                                                                                   |                                                                                    | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 0                                                                                 | 252                                                                               | 10                                                                                | 82                                                                                | 310                                                                               | 3                                                                                 | 8                                                                                  | 0                                                                                   | 61                                                                                  | 1                                                                                   | 0                                                                                   | 1                                                                                   |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 313                                                                               |                                                                                   |                                                                                   | 262                                                                               |                                                                                   |                                                                                   | 733                                                                                | 733                                                                                 | 257                                                                                 | 792                                                                                 | 736                                                                                 | 311                                                                                 |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 313                                                                               |                                                                                   |                                                                                   | 262                                                                               |                                                                                   |                                                                                   | 733                                                                                | 733                                                                                 | 257                                                                                 | 792                                                                                 | 736                                                                                 | 311                                                                                 |
| tC, single (s)                    | 4.1                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |                                                                                   | 7.1                                                                                | 6.5                                                                                 | 6.2                                                                                 | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 2.2                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |                                                                                   | 3.5                                                                                | 4.0                                                                                 | 3.3                                                                                 | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 |
| p0 queue free %                   | 100                                                                               |                                                                                   |                                                                                   | 94                                                                                |                                                                                   |                                                                                   | 98                                                                                 | 100                                                                                 | 92                                                                                  | 100                                                                                 | 100                                                                                 | 100                                                                                 |
| cM capacity (veh/h)               | 1259                                                                              |                                                                                   |                                                                                   | 1302                                                                              |                                                                                   |                                                                                   | 320                                                                                | 326                                                                                 | 782                                                                                 | 271                                                                                 | 325                                                                                 | 733                                                                                 |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 262                                                                               | 395                                                                               | 68                                                                                | 2                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 0                                                                                 | 82                                                                                | 8                                                                                 | 1                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 10                                                                                | 3                                                                                 | 61                                                                                | 1                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 1259                                                                              | 1302                                                                              | 674                                                                               | 396                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.00                                                                              | 0.06                                                                              | 0.10                                                                              | 0.01                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (m)             | 0.0                                                                               | 1.5                                                                               | 2.6                                                                               | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 0.0                                                                               | 2.1                                                                               | 10.9                                                                              | 14.1                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          |                                                                                   | A                                                                                 | B                                                                                 | B                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.0                                                                               | 2.1                                                                               | 10.9                                                                              | 14.1                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      |                                                                                   |                                                                                   | B                                                                                 | B                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 46.0%                                                                             | ICU Level of Service                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

## 6: Collector Road 4 & County Road 13

Background PM

2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |  |  |  |  |  |
| Volume (veh/h)                    | 147                                                                               | 59                                                                                | 408                                                                               | 207                                                                               | 78                                                                                | 324                                                                               |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 160                                                                               | 64                                                                                | 443                                                                               | 225                                                                               | 85                                                                                | 352                                                                               |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 965                                                                               | 443                                                                               |                                                                                   |                                                                                   | 668                                                                               |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 965                                                                               | 443                                                                               |                                                                                   |                                                                                   | 668                                                                               |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 38                                                                                | 90                                                                                |                                                                                   |                                                                                   | 91                                                                                |                                                                                   |
| cM capacity (veh/h)               | 257                                                                               | 614                                                                               |                                                                                   |                                                                                   | 921                                                                               |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | WB 2                                                                              | NB 1                                                                              | NB 2                                                                              | SB 1                                                                              | SB 2                                                                              |
| Volume Total                      | 160                                                                               | 64                                                                                | 443                                                                               | 225                                                                               | 85                                                                                | 352                                                                               |
| Volume Left                       | 160                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 85                                                                                | 0                                                                                 |
| Volume Right                      | 0                                                                                 | 64                                                                                | 0                                                                                 | 225                                                                               | 0                                                                                 | 0                                                                                 |
| cSH                               | 257                                                                               | 614                                                                               | 1700                                                                              | 1700                                                                              | 921                                                                               | 1700                                                                              |
| Volume to Capacity                | 0.62                                                                              | 0.10                                                                              | 0.26                                                                              | 0.13                                                                              | 0.09                                                                              | 0.21                                                                              |
| Queue Length 95th (m)             | 28.7                                                                              | 2.6                                                                               | 0.0                                                                               | 0.0                                                                               | 2.3                                                                               | 0.0                                                                               |
| Control Delay (s)                 | 39.7                                                                              | 11.5                                                                              | 0.0                                                                               | 0.0                                                                               | 9.3                                                                               | 0.0                                                                               |
| Lane LOS                          | E                                                                                 | B                                                                                 |                                                                                   |                                                                                   | A                                                                                 |                                                                                   |
| Approach Delay (s)                | 31.6                                                                              |                                                                                   | 0.0                                                                               |                                                                                   | 1.8                                                                               |                                                                                   |
| Approach LOS                      | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   |                                                                                   | 5.9                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 43.9%                                                                             |                                                                                   | ICU Level of Service                                                              | A                                                                                 |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |

# HCM Unsignalized Intersection Capacity Analysis

## 7: Collector Road 3 & County Road 13

Background PM  
2012-10-18

|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |                                                                                     |  |                                                                                     |                                                                                     |  |                                                                                     |
| Volume (veh/h)                    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 43                                                                                | 0                                                                                 | 11                                                                                | 0                                                                                   | 604                                                                                 | 66                                                                                  | 9                                                                                   | 462                                                                                 | 0                                                                                   |
| Sign Control                      |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 47                                                                                | 0                                                                                 | 12                                                                                | 0                                                                                   | 657                                                                                 | 72                                                                                  | 10                                                                                  | 502                                                                                 | 0                                                                                   |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | None                                                                                |                                                                                     |                                                                                     | None                                                                                |                                                                                     |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 1226                                                                              | 1250                                                                              | 502                                                                               | 1214                                                                              | 1214                                                                              | 692                                                                               | 502                                                                                 |                                                                                     |                                                                                     | 728                                                                                 |                                                                                     |                                                                                     |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 1226                                                                              | 1250                                                                              | 502                                                                               | 1214                                                                              | 1214                                                                              | 692                                                                               | 502                                                                                 |                                                                                     |                                                                                     | 728                                                                                 |                                                                                     |                                                                                     |
| tC, single (s)                    | 7.1                                                                               | 6.5                                                                               | 6.2                                                                               | 7.1                                                                               | 6.5                                                                               | 6.2                                                                               | 4.1                                                                                 |                                                                                     |                                                                                     | 4.1                                                                                 |                                                                                     |                                                                                     |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 2.2                                                                                 |                                                                                     |                                                                                     | 2.2                                                                                 |                                                                                     |                                                                                     |
| p0 queue free %                   | 100                                                                               | 100                                                                               | 100                                                                               | 70                                                                                | 100                                                                               | 97                                                                                | 100                                                                                 |                                                                                     |                                                                                     | 99                                                                                  |                                                                                     |                                                                                     |
| cM capacity (veh/h)               | 150                                                                               | 171                                                                               | 569                                                                               | 157                                                                               | 179                                                                               | 444                                                                               | 1062                                                                                |                                                                                     |                                                                                     | 875                                                                                 |                                                                                     |                                                                                     |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 0                                                                                 | 59                                                                                | 728                                                                               | 512                                                                               |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 0                                                                                 | 47                                                                                | 0                                                                                 | 10                                                                                |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 0                                                                                 | 12                                                                                | 72                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 1700                                                                              | 181                                                                               | 1062                                                                              | 875                                                                               |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.00                                                                              | 0.32                                                                              | 0.00                                                                              | 0.01                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (m)             | 0.0                                                                               | 10.1                                                                              | 0.0                                                                               | 0.3                                                                               |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 0.0                                                                               | 34.2                                                                              | 0.0                                                                               | 0.3                                                                               |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | A                                                                                 | D                                                                                 |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.0                                                                               | 34.2                                                                              | 0.0                                                                               | 0.3                                                                               |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | A                                                                                 | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 1.7                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 45.8%                                                                             | ICU Level of Service                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

## 8: Orsi Street & County Road 13

Background PM  
2012-10-18

|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |                                                                                   |  |                                                                                   |                                                                                   |  |
| Volume (veh/h)                    | 6                                                                                 | 10                                                                                | 657                                                                               | 14                                                                                | 7                                                                                 | 496                                                                               |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 7                                                                                 | 11                                                                                | 714                                                                               | 15                                                                                | 8                                                                                 | 539                                                                               |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 1276                                                                              | 722                                                                               |                                                                                   |                                                                                   | 729                                                                               |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 1276                                                                              | 722                                                                               |                                                                                   |                                                                                   | 729                                                                               |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 96                                                                                | 97                                                                                |                                                                                   |                                                                                   | 99                                                                                |                                                                                   |
| cM capacity (veh/h)               | 182                                                                               | 427                                                                               |                                                                                   |                                                                                   | 875                                                                               |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 17                                                                                | 729                                                                               | 547                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 7                                                                                 | 0                                                                                 | 8                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 11                                                                                | 15                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 284                                                                               | 1700                                                                              | 875                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.06                                                                              | 0.43                                                                              | 0.01                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 1.5                                                                               | 0.0                                                                               | 0.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 18.5                                                                              | 0.0                                                                               | 0.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | C                                                                                 |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 18.5                                                                              | 0.0                                                                               | 0.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   |                                                                                   | 0.4                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 45.4%                                                                             | ICU Level of Service                                                              |                                                                                   | A                                                                                 |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |

# HCM Unsignalized Intersection Capacity Analysis

## 9: Fisher Drive & County Road 13

Background PM

2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBR                                                                               | NBL                                                                               | NBT                                                                               | SBT                                                                               | SBR                                                                               |
| Lane Configurations               |  |                                                                                   |                                                                                   |  |  |                                                                                   |
| Volume (veh/h)                    | 0                                                                                 | 5                                                                                 | 10                                                                                | 674                                                                               | 500                                                                               | 3                                                                                 |
| Sign Control                      | Stop                                                                              |                                                                                   |                                                                                   | Free                                                                              | Free                                                                              |                                                                                   |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                | 0%                                                                                |                                                                                   |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 0                                                                                 | 5                                                                                 | 11                                                                                | 733                                                                               | 543                                                                               | 3                                                                                 |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   |                                                                                   | None                                                                              | None                                                                              |                                                                                   |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   | 247                                                                               |                                                                                   |                                                                                   |
| pX, platoon unblocked             | 0.76                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 1299                                                                              | 545                                                                               | 547                                                                               |                                                                                   |                                                                                   |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 1236                                                                              | 545                                                                               | 547                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               | 4.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               | 2.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| p0 queue free %                   | 100                                                                               | 99                                                                                | 99                                                                                |                                                                                   |                                                                                   |                                                                                   |
| cM capacity (veh/h)               | 148                                                                               | 542                                                                               | 1033                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Direction, Lane #                 | EB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 5                                                                                 | 743                                                                               | 547                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 0                                                                                 | 11                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 5                                                                                 | 0                                                                                 | 3                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 542                                                                               | 1033                                                                              | 1700                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.01                                                                              | 0.01                                                                              | 0.32                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 0.2                                                                               | 0.2                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 11.7                                                                              | 0.3                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | B                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 11.7                                                                              | 0.3                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   | 0.2                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 53.5%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | A                                                                                 |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |

# HCM Signalized Intersection Capacity Analysis

## 10: County Road 5 & County Road 13

Background PM

2012-10-18

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |  |  |  |  |   |  |  |  |  |  |
| Volume (vph)                      | 209                                                                               | 109                                                                               | 44                                                                                | 50                                                                                | 196                                                                               | 73                                                                                | 68                                                                                  | 404                                                                                 | 75                                                                                  | 74                                                                                  | 222                                                                                 | 207                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Frt                               | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (prot)                 | 1750                                                                              | 1842                                                                              | 1566                                                                              | 1750                                                                              | 1842                                                                              | 1566                                                                              | 1750                                                                                | 1842                                                                                | 1566                                                                                | 1750                                                                                | 1842                                                                                | 1566                                                                                |
| Flt Permitted                     | 0.36                                                                              | 1.00                                                                              | 1.00                                                                              | 0.68                                                                              | 1.00                                                                              | 1.00                                                                              | 0.57                                                                                | 1.00                                                                                | 1.00                                                                                | 0.25                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (perm)                 | 666                                                                               | 1842                                                                              | 1566                                                                              | 1255                                                                              | 1842                                                                              | 1566                                                                              | 1059                                                                                | 1842                                                                                | 1566                                                                                | 465                                                                                 | 1842                                                                                | 1566                                                                                |
| Peak-hour factor, PHF             | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Adj. Flow (vph)                   | 227                                                                               | 118                                                                               | 48                                                                                | 54                                                                                | 213                                                                               | 79                                                                                | 74                                                                                  | 439                                                                                 | 82                                                                                  | 80                                                                                  | 241                                                                                 | 225                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 0                                                                                 | 28                                                                                | 0                                                                                 | 0                                                                                 | 65                                                                                | 0                                                                                   | 0                                                                                   | 57                                                                                  | 0                                                                                   | 0                                                                                   | 155                                                                                 |
| Lane Group Flow (vph)             | 227                                                                               | 118                                                                               | 20                                                                                | 54                                                                                | 213                                                                               | 14                                                                                | 74                                                                                  | 439                                                                                 | 25                                                                                  | 80                                                                                  | 241                                                                                 | 70                                                                                  |
| Turn Type                         | pm+pt                                                                             |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases                  | 7                                                                                 | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     | 1                                                                                   | 6                                                                                   |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 2                                                                                   |                                                                                     | 2                                                                                   | 6                                                                                   |                                                                                     | 6                                                                                   |
| Actuated Green, G (s)             | 31.4                                                                              | 31.4                                                                              | 31.4                                                                              | 13.8                                                                              | 13.8                                                                              | 13.8                                                                              | 25.8                                                                                | 22.9                                                                                | 22.9                                                                                | 27.4                                                                                | 23.7                                                                                | 23.7                                                                                |
| Effective Green, g (s)            | 31.4                                                                              | 31.4                                                                              | 31.4                                                                              | 13.8                                                                              | 13.8                                                                              | 13.8                                                                              | 25.8                                                                                | 22.9                                                                                | 22.9                                                                                | 27.4                                                                                | 23.7                                                                                | 23.7                                                                                |
| Actuated g/C Ratio                | 0.41                                                                              | 0.41                                                                              | 0.41                                                                              | 0.18                                                                              | 0.18                                                                              | 0.18                                                                              | 0.34                                                                                | 0.30                                                                                | 0.30                                                                                | 0.36                                                                                | 0.31                                                                                | 0.31                                                                                |
| Clearance Time (s)                | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Vehicle Extension (s)             | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.0                                                                                 | 3.0                                                                                 | 3.0                                                                                 | 3.0                                                                                 | 3.0                                                                                 | 3.0                                                                                 |
| Lane Grp Cap (vph)                | 441                                                                               | 761                                                                               | 647                                                                               | 228                                                                               | 334                                                                               | 284                                                                               | 386                                                                                 | 555                                                                                 | 472                                                                                 | 230                                                                                 | 574                                                                                 | 488                                                                                 |
| v/s Ratio Prot                    | c0.08                                                                             | 0.06                                                                              |                                                                                   |                                                                                   | c0.12                                                                             |                                                                                   | 0.01                                                                                | c0.24                                                                               |                                                                                     | c0.02                                                                               | 0.13                                                                                |                                                                                     |
| v/s Ratio Perm                    | 0.13                                                                              |                                                                                   | 0.01                                                                              | 0.04                                                                              |                                                                                   | 0.01                                                                              | 0.06                                                                                |                                                                                     | 0.02                                                                                | 0.11                                                                                |                                                                                     | 0.04                                                                                |
| v/c Ratio                         | 0.51                                                                              | 0.16                                                                              | 0.03                                                                              | 0.24                                                                              | 0.64                                                                              | 0.05                                                                              | 0.19                                                                                | 0.79                                                                                | 0.05                                                                                | 0.35                                                                                | 0.42                                                                                | 0.14                                                                                |
| Uniform Delay, d1                 | 15.6                                                                              | 14.0                                                                              | 13.3                                                                              | 26.6                                                                              | 28.8                                                                              | 25.7                                                                              | 17.3                                                                                | 24.4                                                                                | 18.8                                                                                | 17.3                                                                                | 20.7                                                                                | 18.8                                                                                |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Incremental Delay, d2             | 1.0                                                                               | 0.1                                                                               | 0.0                                                                               | 0.5                                                                               | 4.0                                                                               | 0.1                                                                               | 0.2                                                                                 | 7.6                                                                                 | 0.0                                                                                 | 0.9                                                                                 | 0.5                                                                                 | 0.1                                                                                 |
| Delay (s)                         | 16.6                                                                              | 14.1                                                                              | 13.3                                                                              | 27.1                                                                              | 32.8                                                                              | 25.8                                                                              | 17.6                                                                                | 31.9                                                                                | 18.9                                                                                | 18.2                                                                                | 21.2                                                                                | 19.0                                                                                |
| Level of Service                  | B                                                                                 | B                                                                                 | B                                                                                 | C                                                                                 | C                                                                                 | C                                                                                 | B                                                                                   | C                                                                                   | B                                                                                   | B                                                                                   | C                                                                                   | B                                                                                   |
| Approach Delay (s)                |                                                                                   | 15.5                                                                              |                                                                                   |                                                                                   | 30.3                                                                              |                                                                                   |                                                                                     | 28.3                                                                                |                                                                                     |                                                                                     | 19.8                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM Average Control Delay         |                                                                                   |                                                                                   | 23.5                                                                              |                                                                                   |                                                                                   | HCM Level of Service                                                              |                                                                                     |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| HCM Volume to Capacity ratio      |                                                                                   |                                                                                   | 0.67                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 76.0                                                                              |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                     |                                                                                     | 24.0                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 67.3%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

## 11: Jenkins St & County Road 13

Background PM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |                                                                                   |  |                                                                                   |                                                                                   |  |
| Volume (veh/h)                    | 3                                                                                 | 3                                                                                 | 543                                                                               | 1                                                                                 | 1                                                                                 | 316                                                                               |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 3                                                                                 | 3                                                                                 | 590                                                                               | 1                                                                                 | 1                                                                                 | 343                                                                               |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 225                                                                               |
| pX, platoon unblocked             | 0.93                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 936                                                                               | 591                                                                               |                                                                                   |                                                                                   | 591                                                                               |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 895                                                                               | 591                                                                               |                                                                                   |                                                                                   | 591                                                                               |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 99                                                                                | 99                                                                                |                                                                                   |                                                                                   | 100                                                                               |                                                                                   |
| cM capacity (veh/h)               | 292                                                                               | 511                                                                               |                                                                                   |                                                                                   | 994                                                                               |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 7                                                                                 | 591                                                                               | 345                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 3                                                                                 | 0                                                                                 | 1                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 3                                                                                 | 1                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 372                                                                               | 1700                                                                              | 994                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.02                                                                              | 0.35                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 0.4                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 14.9                                                                              | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | B                                                                                 |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 14.9                                                                              | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   |                                                                                   | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 38.6%                                                                             | ICU Level of Service                                                              |                                                                                   | A                                                                                 |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |

# HCM Unsignalized Intersection Capacity Analysis 12: Dekker St (North Leg) & County Road 13

Background PM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |                                                                                   |  |                                                                                   |                                                                                   |  |
| Volume (veh/h)                    | 3                                                                                 | 4                                                                                 | 539                                                                               | 5                                                                                 | 14                                                                                | 304                                                                               |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 3                                                                                 | 4                                                                                 | 586                                                                               | 5                                                                                 | 15                                                                                | 330                                                                               |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 949                                                                               | 589                                                                               |                                                                                   |                                                                                   | 591                                                                               |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 949                                                                               | 589                                                                               |                                                                                   |                                                                                   | 591                                                                               |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 99                                                                                | 99                                                                                |                                                                                   |                                                                                   | 98                                                                                |                                                                                   |
| cM capacity (veh/h)               | 287                                                                               | 512                                                                               |                                                                                   |                                                                                   | 994                                                                               |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 8                                                                                 | 591                                                                               | 346                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 3                                                                                 | 0                                                                                 | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 4                                                                                 | 5                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 383                                                                               | 1700                                                                              | 994                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.02                                                                              | 0.35                                                                              | 0.02                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 0.5                                                                               | 0.0                                                                               | 0.4                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 14.6                                                                              | 0.0                                                                               | 0.5                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | B                                                                                 |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 14.6                                                                              | 0.0                                                                               | 0.5                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   |                                                                                   | 0.3                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 38.7%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | A                                                                                 |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |



# HCM Unsignalized Intersection Capacity Analysis

## 13: Collector Road 6 & County Road 13

Background PM  
2012-10-18

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |                                                                                    |  |                                                                                     |                                                                                     |  |                                                                                     |
| Volume (veh/h)                    | 19                                                                                | 0                                                                                 | 59                                                                                | 5                                                                                 | 1                                                                                 | 6                                                                                 | 79                                                                                 | 518                                                                                 | 17                                                                                  | 8                                                                                   | 271                                                                                 | 26                                                                                  |
| Sign Control                      |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                    | Free                                                                                |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 21                                                                                | 0                                                                                 | 64                                                                                | 5                                                                                 | 1                                                                                 | 7                                                                                 | 86                                                                                 | 563                                                                                 | 18                                                                                  | 9                                                                                   | 295                                                                                 | 28                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | None                                                                                |                                                                                     |                                                                                     | None                                                                                |                                                                                     |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 1077                                                                              | 1079                                                                              | 309                                                                               | 1134                                                                              | 1084                                                                              | 572                                                                               | 323                                                                                |                                                                                     |                                                                                     | 582                                                                                 |                                                                                     |                                                                                     |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 1077                                                                              | 1079                                                                              | 309                                                                               | 1134                                                                              | 1084                                                                              | 572                                                                               | 323                                                                                |                                                                                     |                                                                                     | 582                                                                                 |                                                                                     |                                                                                     |
| tC, single (s)                    | 7.1                                                                               | 6.5                                                                               | 6.2                                                                               | 7.1                                                                               | 6.5                                                                               | 6.2                                                                               | 4.1                                                                                |                                                                                     |                                                                                     | 4.1                                                                                 |                                                                                     |                                                                                     |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 2.2                                                                                |                                                                                     |                                                                                     | 2.2                                                                                 |                                                                                     |                                                                                     |
| p0 queue free %                   | 89                                                                                | 100                                                                               | 91                                                                                | 97                                                                                | 99                                                                                | 99                                                                                | 93                                                                                 |                                                                                     |                                                                                     | 99                                                                                  |                                                                                     |                                                                                     |
| cM capacity (veh/h)               | 182                                                                               | 201                                                                               | 731                                                                               | 156                                                                               | 200                                                                               | 523                                                                               | 1237                                                                               |                                                                                     |                                                                                     | 1003                                                                                |                                                                                     |                                                                                     |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 85                                                                                | 13                                                                                | 667                                                                               | 332                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 21                                                                                | 5                                                                                 | 86                                                                                | 9                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 64                                                                                | 7                                                                                 | 18                                                                                | 28                                                                                |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 421                                                                               | 247                                                                               | 1237                                                                              | 1003                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.20                                                                              | 0.05                                                                              | 0.07                                                                              | 0.01                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (m)             | 5.6                                                                               | 1.3                                                                               | 1.7                                                                               | 0.2                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 15.7                                                                              | 20.4                                                                              | 1.8                                                                               | 0.3                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | C                                                                                 | C                                                                                 | A                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 15.7                                                                              | 20.4                                                                              | 1.8                                                                               | 0.3                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | C                                                                                 | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 2.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 64.2%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                    |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

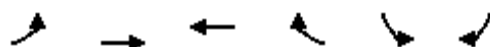
## 14: Main Street Everett & Wales Ave

Background PM  
2012-10-18

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (veh/h)                    | 15                                                                                | 261                                                                               | 6                                                                                 | 28                                                                                | 309                                                                               | 96                                                                                | 6                                                                                   | 7                                                                                   | 12                                                                                  | 35                                                                                  | 18                                                                                  | 12                                                                                  |
| Sign Control                      |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |                                                                                   |                                                                                     | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 16                                                                                | 284                                                                               | 7                                                                                 | 30                                                                                | 336                                                                               | 104                                                                               | 7                                                                                   | 8                                                                                   | 13                                                                                  | 38                                                                                  | 20                                                                                  | 13                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 440                                                                               |                                                                                   |                                                                                   | 290                                                                               |                                                                                   |                                                                                   | 791                                                                                 | 821                                                                                 | 287                                                                                 | 785                                                                                 | 772                                                                                 | 388                                                                                 |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 440                                                                               |                                                                                   |                                                                                   | 290                                                                               |                                                                                   |                                                                                   | 791                                                                                 | 821                                                                                 | 287                                                                                 | 785                                                                                 | 772                                                                                 | 388                                                                                 |
| tC, single (s)                    | 4.1                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |                                                                                   | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 2.2                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |                                                                                   | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 |
| p0 queue free %                   | 99                                                                                |                                                                                   |                                                                                   | 98                                                                                |                                                                                   |                                                                                   | 98                                                                                  | 97                                                                                  | 98                                                                                  | 87                                                                                  | 94                                                                                  | 98                                                                                  |
| cM capacity (veh/h)               | 1120                                                                              |                                                                                   |                                                                                   | 1272                                                                              |                                                                                   |                                                                                   | 279                                                                                 | 298                                                                                 | 752                                                                                 | 290                                                                                 | 318                                                                                 | 660                                                                                 |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | NB 2                                                                              | SB 1                                                                              | SB 2                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 307                                                                               | 471                                                                               | 7                                                                                 | 21                                                                                | 38                                                                                | 33                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 16                                                                                | 30                                                                                | 7                                                                                 | 0                                                                                 | 38                                                                                | 0                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 7                                                                                 | 104                                                                               | 0                                                                                 | 13                                                                                | 0                                                                                 | 13                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 1120                                                                              | 1272                                                                              | 279                                                                               | 481                                                                               | 290                                                                               | 401                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.01                                                                              | 0.02                                                                              | 0.02                                                                              | 0.04                                                                              | 0.13                                                                              | 0.08                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (m)             | 0.3                                                                               | 0.6                                                                               | 0.5                                                                               | 1.0                                                                               | 3.4                                                                               | 2.0                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 0.6                                                                               | 0.7                                                                               | 18.2                                                                              | 12.8                                                                              | 19.3                                                                              | 14.8                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | A                                                                                 | A                                                                                 | C                                                                                 | B                                                                                 | C                                                                                 | B                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.6                                                                               | 0.7                                                                               | 14.1                                                                              |                                                                                   | 17.2                                                                              |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      |                                                                                   |                                                                                   | B                                                                                 |                                                                                   | C                                                                                 |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 2.4                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 46.9%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis 15: Main Street Everett & Den Boer Rd

Background PM  
2012-10-18



| Movement                          | EBL  | EBT                                                                               | WBT                                                                               | WBR                  | SBL                                                                               | SBR  |
|-----------------------------------|------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------|------|
| Lane Configurations               |      |  |  |                      |  |      |
| Volume (veh/h)                    | 5    | 284                                                                               | 517                                                                               | 71                   | 29                                                                                | 3    |
| Sign Control                      |      | Free                                                                              | Free                                                                              |                      | Stop                                                                              |      |
| Grade                             |      | 0%                                                                                | 0%                                                                                |                      | 0%                                                                                |      |
| Peak Hour Factor                  | 0.92 | 0.92                                                                              | 0.92                                                                              | 0.92                 | 0.92                                                                              | 0.92 |
| Hourly flow rate (vph)            | 5    | 309                                                                               | 562                                                                               | 77                   | 32                                                                                | 3    |
| Pedestrians                       |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| Lane Width (m)                    |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| Walking Speed (m/s)               |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| Percent Blockage                  |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| Right turn flare (veh)            |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| Median type                       |      | None                                                                              | None                                                                              |                      |                                                                                   |      |
| Median storage (veh)              |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| Upstream signal (m)               |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| pX, platoon unblocked             |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| vC, conflicting volume            | 639  |                                                                                   |                                                                                   |                      | 920                                                                               | 601  |
| vC1, stage 1 conf vol             |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| vC2, stage 2 conf vol             |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| vCu, unblocked vol                | 639  |                                                                                   |                                                                                   |                      | 920                                                                               | 601  |
| tC, single (s)                    | 4.1  |                                                                                   |                                                                                   |                      | 6.4                                                                               | 6.2  |
| tC, 2 stage (s)                   |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| tF (s)                            | 2.2  |                                                                                   |                                                                                   |                      | 3.5                                                                               | 3.3  |
| p0 queue free %                   | 99   |                                                                                   |                                                                                   |                      | 89                                                                                | 99   |
| cM capacity (veh/h)               | 945  |                                                                                   |                                                                                   |                      | 299                                                                               | 501  |
| Direction, Lane #                 | EB 1 | WB 1                                                                              | SB 1                                                                              |                      |                                                                                   |      |
| Volume Total                      | 314  | 639                                                                               | 35                                                                                |                      |                                                                                   |      |
| Volume Left                       | 5    | 0                                                                                 | 32                                                                                |                      |                                                                                   |      |
| Volume Right                      | 0    | 77                                                                                | 3                                                                                 |                      |                                                                                   |      |
| cSH                               | 945  | 1700                                                                              | 311                                                                               |                      |                                                                                   |      |
| Volume to Capacity                | 0.01 | 0.38                                                                              | 0.11                                                                              |                      |                                                                                   |      |
| Queue Length 95th (m)             | 0.1  | 0.0                                                                               | 2.8                                                                               |                      |                                                                                   |      |
| Control Delay (s)                 | 0.2  | 0.0                                                                               | 18.0                                                                              |                      |                                                                                   |      |
| Lane LOS                          | A    |                                                                                   | C                                                                                 |                      |                                                                                   |      |
| Approach Delay (s)                | 0.2  | 0.0                                                                               | 18.0                                                                              |                      |                                                                                   |      |
| Approach LOS                      |      |                                                                                   | C                                                                                 |                      |                                                                                   |      |
| Intersection Summary              |      |                                                                                   |                                                                                   |                      |                                                                                   |      |
| Average Delay                     |      |                                                                                   | 0.7                                                                               |                      |                                                                                   |      |
| Intersection Capacity Utilization |      | 41.5%                                                                             |                                                                                   | ICU Level of Service |                                                                                   | A    |
| Analysis Period (min)             |      | 15                                                                                |                                                                                   |                      |                                                                                   |      |
|                                   |      |                                                                                   |                                                                                   |                      |                                                                                   |      |

# HCM Unsignalized Intersection Capacity Analysis

## 16: Collector Road 7 & Concession Rd 6

Background PM

2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBR                                                                               | NBL                                                                               | NBT                                                                               | SBT                                                                               | SBR                                                                               |
| Lane Configurations               |  |                                                                                   |                                                                                   |  |  |                                                                                   |
| Volume (veh/h)                    | 1                                                                                 | 184                                                                               | 427                                                                               | 166                                                                               | 70                                                                                | 1                                                                                 |
| Sign Control                      | Stop                                                                              |                                                                                   |                                                                                   | Free                                                                              | Free                                                                              |                                                                                   |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                | 0%                                                                                |                                                                                   |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 1                                                                                 | 200                                                                               | 464                                                                               | 180                                                                               | 76                                                                                | 1                                                                                 |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   |                                                                                   | None                                                                              | None                                                                              |                                                                                   |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 1185                                                                              | 77                                                                                | 77                                                                                |                                                                                   |                                                                                   |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 1185                                                                              | 77                                                                                | 77                                                                                |                                                                                   |                                                                                   |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               | 4.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               | 2.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| p0 queue free %                   | 99                                                                                | 80                                                                                | 69                                                                                |                                                                                   |                                                                                   |                                                                                   |
| cM capacity (veh/h)               | 145                                                                               | 984                                                                               | 1521                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Direction, Lane #                 | EB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 201                                                                               | 645                                                                               | 77                                                                                |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 1                                                                                 | 464                                                                               | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 200                                                                               | 0                                                                                 | 1                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 955                                                                               | 1521                                                                              | 1700                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.21                                                                              | 0.31                                                                              | 0.05                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 6.0                                                                               | 9.9                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 9.8                                                                               | 6.9                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | A                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 9.8                                                                               | 6.9                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   | 6.9                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 57.2%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | B                                                                                 |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |

# HCM Signalized Intersection Capacity Analysis

## 17: County Road 5 & Concession Rd 6

Background PM  
2012-10-18

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |  |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)                      | 3                                                                                 | 295                                                                               | 27                                                                                | 7                                                                                 | 467                                                                               | 544                                                                               | 59                                                                                 | 45                                                                                  | 8                                                                                   | 222                                                                                 | 27                                                                                  | 4                                                                                   |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   | 6.0                                                                               | 6.0                                                                               | 6.0                                                                                | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Lane Util. Factor                 |                                                                                   | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               |                                                                                   | 0.99                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 0.85                                                                              | 1.00                                                                               | 0.98                                                                                |                                                                                     | 1.00                                                                                | 0.98                                                                                |                                                                                     |
| Flt Protected                     |                                                                                   | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 |                                                                                   | 1821                                                                              |                                                                                   |                                                                                   | 1841                                                                              | 1566                                                                              | 1750                                                                               | 1799                                                                                |                                                                                     | 1750                                                                                | 1809                                                                                |                                                                                     |
| Flt Permitted                     |                                                                                   | 1.00                                                                              |                                                                                   |                                                                                   | 0.99                                                                              | 1.00                                                                              | 0.74                                                                               | 1.00                                                                                |                                                                                     | 0.72                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 |                                                                                   | 1814                                                                              |                                                                                   |                                                                                   | 1830                                                                              | 1566                                                                              | 1355                                                                               | 1799                                                                                |                                                                                     | 1325                                                                                | 1809                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Adj. Flow (vph)                   | 3                                                                                 | 321                                                                               | 29                                                                                | 8                                                                                 | 508                                                                               | 591                                                                               | 64                                                                                 | 49                                                                                  | 9                                                                                   | 241                                                                                 | 29                                                                                  | 4                                                                                   |
| RTOR Reduction (vph)              | 0                                                                                 | 4                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 313                                                                               | 0                                                                                  | 6                                                                                   | 0                                                                                   | 0                                                                                   | 3                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 0                                                                                 | 349                                                                               | 0                                                                                 | 0                                                                                 | 516                                                                               | 278                                                                               | 64                                                                                 | 52                                                                                  | 0                                                                                   | 241                                                                                 | 30                                                                                  | 0                                                                                   |
| Turn Type                         | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                               |                                                                                     | Perm                                                                                |                                                                                     | Perm                                                                                |                                                                                     |
| Protected Phases                  |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                    | 2                                                                                   |                                                                                     |                                                                                     | 6                                                                                   |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 2                                                                                  |                                                                                     |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     |
| Actuated Green, G (s)             |                                                                                   | 25.0                                                                              |                                                                                   |                                                                                   | 25.0                                                                              | 25.0                                                                              | 16.2                                                                               | 16.2                                                                                |                                                                                     | 16.2                                                                                | 16.2                                                                                |                                                                                     |
| Effective Green, g (s)            |                                                                                   | 25.0                                                                              |                                                                                   |                                                                                   | 25.0                                                                              | 25.0                                                                              | 16.2                                                                               | 16.2                                                                                |                                                                                     | 16.2                                                                                | 16.2                                                                                |                                                                                     |
| Actuated g/C Ratio                |                                                                                   | 0.47                                                                              |                                                                                   |                                                                                   | 0.47                                                                              | 0.47                                                                              | 0.30                                                                               | 0.30                                                                                |                                                                                     | 0.30                                                                                | 0.30                                                                                |                                                                                     |
| Clearance Time (s)                |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   | 6.0                                                                               | 6.0                                                                               | 6.0                                                                                | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             |                                                                                   | 3.0                                                                               |                                                                                   |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                                | 3.0                                                                                 |                                                                                     | 3.0                                                                                 | 3.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                |                                                                                   | 852                                                                               |                                                                                   |                                                                                   | 860                                                                               | 736                                                                               | 413                                                                                | 548                                                                                 |                                                                                     | 403                                                                                 | 551                                                                                 |                                                                                     |
| v/s Ratio Prot                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.03                                                                                |                                                                                     |                                                                                     | 0.02                                                                                |                                                                                     |
| v/s Ratio Perm                    |                                                                                   | 0.19                                                                              |                                                                                   |                                                                                   | 0.28                                                                              | 0.18                                                                              | 0.05                                                                               |                                                                                     |                                                                                     | 0.18                                                                                |                                                                                     |                                                                                     |
| v/c Ratio                         |                                                                                   | 0.41                                                                              |                                                                                   |                                                                                   | 0.60                                                                              | 0.38                                                                              | 0.15                                                                               | 0.09                                                                                |                                                                                     | 0.60                                                                                | 0.05                                                                                |                                                                                     |
| Uniform Delay, d1                 |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                   | 10.4                                                                              | 9.1                                                                               | 13.5                                                                               | 13.2                                                                                |                                                                                     | 15.7                                                                                | 13.1                                                                                |                                                                                     |
| Progression Factor                |                                                                                   | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             |                                                                                   | 0.3                                                                               |                                                                                   |                                                                                   | 1.1                                                                               | 0.3                                                                               | 0.2                                                                                | 0.1                                                                                 |                                                                                     | 2.4                                                                                 | 0.0                                                                                 |                                                                                     |
| Delay (s)                         |                                                                                   | 9.6                                                                               |                                                                                   |                                                                                   | 11.5                                                                              | 9.4                                                                               | 13.7                                                                               | 13.3                                                                                |                                                                                     | 18.1                                                                                | 13.1                                                                                |                                                                                     |
| Level of Service                  |                                                                                   | A                                                                                 |                                                                                   |                                                                                   | B                                                                                 | A                                                                                 | B                                                                                  | B                                                                                   |                                                                                     | B                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 9.6                                                                               |                                                                                   |                                                                                   | 10.4                                                                              |                                                                                   |                                                                                    | 13.5                                                                                |                                                                                     |                                                                                     | 17.5                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | A                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM Average Control Delay         |                                                                                   |                                                                                   | 11.5                                                                              |                                                                                   |                                                                                   |                                                                                   | HCM Level of Service                                                               |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |                                                                                     |
| HCM Volume to Capacity ratio      |                                                                                   |                                                                                   | 0.60                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 53.2                                                                              |                                                                                   |                                                                                   |                                                                                   | Sum of lost time (s)                                                               |                                                                                     |                                                                                     | 12.0                                                                                |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 69.3%                                                                             |                                                                                   |                                                                                   |                                                                                   | ICU Level of Service                                                               |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Future Total Traffic, AM Peak Hour

# HCM Unsignalized Intersection Capacity Analysis

## 1: Collector Road 1 & Concession Road 4

Total AM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |                                                                                   |  |                                                                                   |                                                                                   |  |
| Volume (veh/h)                    | 12                                                                                | 16                                                                                | 59                                                                                | 4                                                                                 | 5                                                                                 | 99                                                                                |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 13                                                                                | 17                                                                                | 64                                                                                | 4                                                                                 | 5                                                                                 | 108                                                                               |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 185                                                                               | 66                                                                                |                                                                                   |                                                                                   | 68                                                                                |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 185                                                                               | 66                                                                                |                                                                                   |                                                                                   | 68                                                                                |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 98                                                                                | 98                                                                                |                                                                                   |                                                                                   | 100                                                                               |                                                                                   |
| cM capacity (veh/h)               | 802                                                                               | 997                                                                               |                                                                                   |                                                                                   | 1533                                                                              |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 30                                                                                | 68                                                                                | 113                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 13                                                                                | 0                                                                                 | 5                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 17                                                                                | 4                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 903                                                                               | 1700                                                                              | 1533                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.03                                                                              | 0.04                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 0.8                                                                               | 0.0                                                                               | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 9.1                                                                               | 0.0                                                                               | 0.4                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | A                                                                                 |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 9.1                                                                               | 0.0                                                                               | 0.4                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 19.3%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | A                                                                                 |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |

# HCM Unsignalized Intersection Capacity Analysis

## 2: County Road 5 & Concession Road 4

Total AM  
2012-10-18

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |                                                                                    |  |                                                                                     |                                                                                     |  |                                                                                     |
| Volume (veh/h)                    | 5                                                                                 | 261                                                                               | 10                                                                                | 23                                                                                | 241                                                                               | 33                                                                                | 15                                                                                 | 25                                                                                  | 16                                                                                  | 40                                                                                  | 56                                                                                  | 15                                                                                  |
| Sign Control                      |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |                                                                                   |                                                                                    | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 5                                                                                 | 284                                                                               | 11                                                                                | 25                                                                                | 262                                                                               | 36                                                                                | 16                                                                                 | 27                                                                                  | 17                                                                                  | 43                                                                                  | 61                                                                                  | 16                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 298                                                                               |                                                                                   |                                                                                   | 295                                                                               |                                                                                   |                                                                                   | 677                                                                                | 648                                                                                 | 289                                                                                 | 661                                                                                 | 635                                                                                 | 280                                                                                 |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 298                                                                               |                                                                                   |                                                                                   | 295                                                                               |                                                                                   |                                                                                   | 677                                                                                | 648                                                                                 | 289                                                                                 | 661                                                                                 | 635                                                                                 | 280                                                                                 |
| tC, single (s)                    | 4.4                                                                               |                                                                                   |                                                                                   | 4.4                                                                               |                                                                                   |                                                                                   | 7.1                                                                                | 6.9                                                                                 | 6.2                                                                                 | 7.1                                                                                 | 6.6                                                                                 | 6.5                                                                                 |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 2.5                                                                               |                                                                                   |                                                                                   | 2.5                                                                               |                                                                                   |                                                                                   | 3.5                                                                                | 4.4                                                                                 | 3.3                                                                                 | 3.5                                                                                 | 4.1                                                                                 | 3.6                                                                                 |
| p0 queue free %                   | 100                                                                               |                                                                                   |                                                                                   | 98                                                                                |                                                                                   |                                                                                   | 95                                                                                 | 92                                                                                  | 98                                                                                  | 87                                                                                  | 84                                                                                  | 98                                                                                  |
| cM capacity (veh/h)               | 1106                                                                              |                                                                                   |                                                                                   | 1109                                                                              |                                                                                   |                                                                                   | 310                                                                                | 331                                                                                 | 755                                                                                 | 340                                                                                 | 380                                                                                 | 697                                                                                 |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 300                                                                               | 323                                                                               | 61                                                                                | 121                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 5                                                                                 | 25                                                                                | 16                                                                                | 43                                                                                |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 11                                                                                | 36                                                                                | 17                                                                                | 16                                                                                |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 1106                                                                              | 1109                                                                              | 386                                                                               | 387                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.00                                                                              | 0.02                                                                              | 0.16                                                                              | 0.31                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (m)             | 0.1                                                                               | 0.5                                                                               | 4.2                                                                               | 9.9                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 0.2                                                                               | 0.9                                                                               | 16.1                                                                              | 18.5                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | A                                                                                 | A                                                                                 | C                                                                                 | C                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.2                                                                               | 0.9                                                                               | 16.1                                                                              | 18.5                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      |                                                                                   |                                                                                   | C                                                                                 | C                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 4.4                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 43.3%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                    |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



# HCM Unsignalized Intersection Capacity Analysis

## 3: Collector Road 2 & Concession Road 4

Total AM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |                                                                                   |  |                                                                                   |                                                                                   |  |
| Volume (veh/h)                    | 14                                                                                | 24                                                                                | 32                                                                                | 6                                                                                 | 11                                                                                | 78                                                                                |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 15                                                                                | 26                                                                                | 35                                                                                | 7                                                                                 | 12                                                                                | 85                                                                                |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 147                                                                               | 38                                                                                |                                                                                   |                                                                                   | 41                                                                                |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 147                                                                               | 38                                                                                |                                                                                   |                                                                                   | 41                                                                                |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 98                                                                                | 97                                                                                |                                                                                   |                                                                                   | 99                                                                                |                                                                                   |
| cM capacity (veh/h)               | 839                                                                               | 1034                                                                              |                                                                                   |                                                                                   | 1568                                                                              |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 41                                                                                | 41                                                                                | 97                                                                                |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 15                                                                                | 0                                                                                 | 12                                                                                |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 26                                                                                | 7                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 952                                                                               | 1700                                                                              | 1568                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.04                                                                              | 0.02                                                                              | 0.01                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 1.0                                                                               | 0.0                                                                               | 0.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 9.0                                                                               | 0.0                                                                               | 1.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | A                                                                                 |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 9.0                                                                               | 0.0                                                                               | 1.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   | 2.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 21.4%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | A                                                                                 |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |

# HCM Unsignalized Intersection Capacity Analysis

## 4: County Road 5 & Collector Road 3

Total AM  
2012-10-18

|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |                                                                                    |  |                                                                                     |                                                                                     |  |                                                                                     |
| Volume (veh/h)                    | 10                                                                                | 301                                                                               | 7                                                                                 | 9                                                                                 | 256                                                                               | 14                                                                                | 12                                                                                 | 47                                                                                  | 21                                                                                  | 44                                                                                  | 41                                                                                  | 28                                                                                  |
| Sign Control                      |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |                                                                                   |                                                                                    | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 11                                                                                | 327                                                                               | 8                                                                                 | 10                                                                                | 278                                                                               | 15                                                                                | 13                                                                                 | 51                                                                                  | 23                                                                                  | 48                                                                                  | 45                                                                                  | 30                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 293                                                                               |                                                                                   |                                                                                   | 335                                                                               |                                                                                   |                                                                                   | 711                                                                                | 666                                                                                 | 331                                                                                 | 707                                                                                 | 662                                                                                 | 286                                                                                 |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 293                                                                               |                                                                                   |                                                                                   | 335                                                                               |                                                                                   |                                                                                   | 711                                                                                | 666                                                                                 | 331                                                                                 | 707                                                                                 | 662                                                                                 | 286                                                                                 |
| tC, single (s)                    | 4.1                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |                                                                                   | 7.1                                                                                | 6.5                                                                                 | 6.2                                                                                 | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 2.2                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |                                                                                   | 3.5                                                                                | 4.0                                                                                 | 3.3                                                                                 | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 |
| p0 queue free %                   | 99                                                                                |                                                                                   |                                                                                   | 99                                                                                |                                                                                   |                                                                                   | 96                                                                                 | 86                                                                                  | 97                                                                                  | 84                                                                                  | 88                                                                                  | 96                                                                                  |
| cM capacity (veh/h)               | 1268                                                                              |                                                                                   |                                                                                   | 1225                                                                              |                                                                                   |                                                                                   | 300                                                                                | 374                                                                                 | 711                                                                                 | 300                                                                                 | 376                                                                                 | 753                                                                                 |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 346                                                                               | 303                                                                               | 87                                                                                | 123                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 11                                                                                | 10                                                                                | 13                                                                                | 48                                                                                |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 8                                                                                 | 15                                                                                | 23                                                                                | 30                                                                                |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 1268                                                                              | 1225                                                                              | 410                                                                               | 386                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.01                                                                              | 0.01                                                                              | 0.21                                                                              | 0.32                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (m)             | 0.2                                                                               | 0.2                                                                               | 6.0                                                                               | 10.2                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 0.3                                                                               | 0.3                                                                               | 16.1                                                                              | 18.6                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | A                                                                                 | A                                                                                 | C                                                                                 | C                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.3                                                                               | 0.3                                                                               | 16.1                                                                              | 18.6                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      |                                                                                   |                                                                                   | C                                                                                 | C                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 4.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 40.1%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                    |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Signalized Intersection Capacity Analysis

## 5: County Road 5 & Blanchards Way

Total AM  
2012-10-18

|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)                      | 28                                                                                | 347                                                                               | 5                                                                                 | 82                                                                                | 269                                                                               | 94                                                                                | 10                                                                                  | 36                                                                                  | 131                                                                                 | 136                                                                                 | 30                                                                                  | 5                                                                                   |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 0.96                                                                              |                                                                                   | 1.00                                                                                | 0.88                                                                                |                                                                                     | 1.00                                                                                | 0.98                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1785                                                                              | 1839                                                                              |                                                                                   | 1785                                                                              | 1705                                                                              |                                                                                   | 1750                                                                                | 1625                                                                                |                                                                                     | 1785                                                                                | 1810                                                                                |                                                                                     |
| Flt Permitted                     | 0.52                                                                              | 1.00                                                                              |                                                                                   | 0.53                                                                              | 1.00                                                                              |                                                                                   | 0.73                                                                                | 1.00                                                                                |                                                                                     | 0.64                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 970                                                                               | 1839                                                                              |                                                                                   | 998                                                                               | 1705                                                                              |                                                                                   | 1349                                                                                | 1625                                                                                |                                                                                     | 1209                                                                                | 1810                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Adj. Flow (vph)                   | 30                                                                                | 377                                                                               | 5                                                                                 | 89                                                                                | 292                                                                               | 102                                                                               | 11                                                                                  | 39                                                                                  | 142                                                                                 | 148                                                                                 | 33                                                                                  | 5                                                                                   |
| RTOR Reduction (vph)              | 0                                                                                 | 1                                                                                 | 0                                                                                 | 0                                                                                 | 17                                                                                | 0                                                                                 | 0                                                                                   | 101                                                                                 | 0                                                                                   | 0                                                                                   | 4                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 30                                                                                | 381                                                                               | 0                                                                                 | 89                                                                                | 377                                                                               | 0                                                                                 | 11                                                                                  | 80                                                                                  | 0                                                                                   | 148                                                                                 | 34                                                                                  | 0                                                                                   |
| Heavy Vehicles (%)                | 0%                                                                                | 2%                                                                                | 0%                                                                                | 0%                                                                                | 8%                                                                                | 0%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 0%                                                                                  | 2%                                                                                  | 0%                                                                                  |
| Turn Type                         | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                                |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases                  | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 2                                                                                   |                                                                                     |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 2                                                                                   |                                                                                     |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 14.6                                                                              | 14.6                                                                              |                                                                                   | 14.6                                                                              | 14.6                                                                              |                                                                                   | 10.7                                                                                | 10.7                                                                                |                                                                                     | 10.7                                                                                | 10.7                                                                                |                                                                                     |
| Effective Green, g (s)            | 14.6                                                                              | 14.6                                                                              |                                                                                   | 14.6                                                                              | 14.6                                                                              |                                                                                   | 10.7                                                                                | 10.7                                                                                |                                                                                     | 10.7                                                                                | 10.7                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.39                                                                              | 0.39                                                                              |                                                                                   | 0.39                                                                              | 0.39                                                                              |                                                                                   | 0.29                                                                                | 0.29                                                                                |                                                                                     | 0.29                                                                                | 0.29                                                                                |                                                                                     |
| Clearance Time (s)                | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                                 | 3.0                                                                                 |                                                                                     | 3.0                                                                                 | 3.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 380                                                                               | 720                                                                               |                                                                                   | 391                                                                               | 667                                                                               |                                                                                   | 387                                                                                 | 466                                                                                 |                                                                                     | 347                                                                                 | 519                                                                                 |                                                                                     |
| v/s Ratio Prot                    |                                                                                   | 0.21                                                                              |                                                                                   |                                                                                   | c0.22                                                                             |                                                                                   |                                                                                     | 0.05                                                                                |                                                                                     |                                                                                     | 0.02                                                                                |                                                                                     |
| v/s Ratio Perm                    | 0.03                                                                              |                                                                                   |                                                                                   | 0.09                                                                              |                                                                                   |                                                                                   | 0.01                                                                                |                                                                                     |                                                                                     | c0.12                                                                               |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.08                                                                              | 0.53                                                                              |                                                                                   | 0.23                                                                              | 0.57                                                                              |                                                                                   | 0.03                                                                                | 0.17                                                                                |                                                                                     | 0.43                                                                                | 0.07                                                                                |                                                                                     |
| Uniform Delay, d1                 | 7.1                                                                               | 8.7                                                                               |                                                                                   | 7.6                                                                               | 8.9                                                                               |                                                                                   | 9.6                                                                                 | 10.0                                                                                |                                                                                     | 10.8                                                                                | 9.7                                                                                 |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 0.1                                                                               | 0.7                                                                               |                                                                                   | 0.3                                                                               | 1.1                                                                               |                                                                                   | 0.0                                                                                 | 0.2                                                                                 |                                                                                     | 0.8                                                                                 | 0.1                                                                                 |                                                                                     |
| Delay (s)                         | 7.2                                                                               | 9.4                                                                               |                                                                                   | 7.9                                                                               | 10.0                                                                              |                                                                                   | 9.6                                                                                 | 10.1                                                                                |                                                                                     | 11.7                                                                                | 9.7                                                                                 |                                                                                     |
| Level of Service                  | A                                                                                 | A                                                                                 |                                                                                   | A                                                                                 | A                                                                                 |                                                                                   | A                                                                                   | B                                                                                   |                                                                                     | B                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                   | 9.6                                                                               |                                                                                   |                                                                                     | 10.1                                                                                |                                                                                     |                                                                                     | 11.3                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | A                                                                                 |                                                                                   |                                                                                   | A                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM Average Control Delay         | 9.8                                                                               |                                                                                   |                                                                                   | HCM Level of Service                                                              |                                                                                   |                                                                                   | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM Volume to Capacity ratio      | 0.51                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         | 37.3                                                                              |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                   |                                                                                   | 12.0                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization | 60.7%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                   | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

## 6: Collector Road 4 & County Road 13

Total AM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |  |  |  |  |  |
| Volume (veh/h)                    | 183                                                                               | 71                                                                                | 260                                                                               | 92                                                                                | 29                                                                                | 307                                                                               |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 199                                                                               | 77                                                                                | 283                                                                               | 100                                                                               | 32                                                                                | 334                                                                               |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 679                                                                               | 283                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 679                                                                               | 283                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 51                                                                                | 90                                                                                |                                                                                   |                                                                                   | 97                                                                                |                                                                                   |
| cM capacity (veh/h)               | 406                                                                               | 756                                                                               |                                                                                   |                                                                                   | 1176                                                                              |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | WB 2                                                                              | NB 1                                                                              | NB 2                                                                              | SB 1                                                                              | SB 2                                                                              |
| Volume Total                      | 199                                                                               | 77                                                                                | 283                                                                               | 100                                                                               | 32                                                                                | 334                                                                               |
| Volume Left                       | 199                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 32                                                                                | 0                                                                                 |
| Volume Right                      | 0                                                                                 | 77                                                                                | 0                                                                                 | 100                                                                               | 0                                                                                 | 0                                                                                 |
| cSH                               | 406                                                                               | 756                                                                               | 1700                                                                              | 1700                                                                              | 1176                                                                              | 1700                                                                              |
| Volume to Capacity                | 0.49                                                                              | 0.10                                                                              | 0.17                                                                              | 0.06                                                                              | 0.03                                                                              | 0.20                                                                              |
| Queue Length 95th (m)             | 19.9                                                                              | 2.6                                                                               | 0.0                                                                               | 0.0                                                                               | 0.6                                                                               | 0.0                                                                               |
| Control Delay (s)                 | 22.1                                                                              | 10.3                                                                              | 0.0                                                                               | 0.0                                                                               | 8.1                                                                               | 0.0                                                                               |
| Lane LOS                          | C                                                                                 | B                                                                                 |                                                                                   |                                                                                   | A                                                                                 |                                                                                   |
| Approach Delay (s)                | 18.8                                                                              |                                                                                   | 0.0                                                                               |                                                                                   | 0.7                                                                               |                                                                                   |
| Approach LOS                      | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   |                                                                                   | 5.3                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 37.2%                                                                             |                                                                                   | ICU Level of Service                                                              | A                                                                                 |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |

# HCM Signalized Intersection Capacity Analysis

## 7: Collector Road 3 & County Road 13

Total AM  
2012-10-18

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)                      | 36                                                                                | 25                                                                                | 186                                                                               | 95                                                                                | 34                                                                                | 14                                                                                | 123                                                                                 | 302                                                                                 | 41                                                                                  | 10                                                                                  | 451                                                                                 | 29                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   | 6.0                                                                               |                                                                                   | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Lane Util. Factor                 |                                                                                   | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               |                                                                                   | 0.90                                                                              |                                                                                   |                                                                                   | 0.99                                                                              |                                                                                   | 1.00                                                                                | 0.98                                                                                |                                                                                     | 1.00                                                                                | 0.99                                                                                |                                                                                     |
| Flt Protected                     |                                                                                   | 0.99                                                                              |                                                                                   |                                                                                   | 0.97                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 |                                                                                   | 1643                                                                              |                                                                                   |                                                                                   | 1760                                                                              |                                                                                   | 1750                                                                                | 1809                                                                                |                                                                                     | 1750                                                                                | 1825                                                                                |                                                                                     |
| Flt Permitted                     |                                                                                   | 0.94                                                                              |                                                                                   |                                                                                   | 0.68                                                                              |                                                                                   | 0.32                                                                                | 1.00                                                                                |                                                                                     | 0.49                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 |                                                                                   | 1547                                                                              |                                                                                   |                                                                                   | 1245                                                                              |                                                                                   | 596                                                                                 | 1809                                                                                |                                                                                     | 909                                                                                 | 1825                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Adj. Flow (vph)                   | 39                                                                                | 27                                                                                | 202                                                                               | 103                                                                               | 37                                                                                | 15                                                                                | 134                                                                                 | 328                                                                                 | 45                                                                                  | 11                                                                                  | 490                                                                                 | 32                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 97                                                                                | 0                                                                                 | 0                                                                                 | 3                                                                                 | 0                                                                                 | 0                                                                                   | 10                                                                                  | 0                                                                                   | 0                                                                                   | 5                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 0                                                                                 | 171                                                                               | 0                                                                                 | 0                                                                                 | 152                                                                               | 0                                                                                 | 134                                                                                 | 363                                                                                 | 0                                                                                   | 11                                                                                  | 517                                                                                 | 0                                                                                   |
| Turn Type                         | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                                |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases                  |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     | 6                                                                                   |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 2                                                                                   |                                                                                     |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     |
| Actuated Green, G (s)             |                                                                                   | 17.2                                                                              |                                                                                   |                                                                                   | 17.2                                                                              |                                                                                   | 19.0                                                                                | 19.0                                                                                |                                                                                     | 19.0                                                                                | 19.0                                                                                |                                                                                     |
| Effective Green, g (s)            |                                                                                   | 17.2                                                                              |                                                                                   |                                                                                   | 17.2                                                                              |                                                                                   | 19.0                                                                                | 19.0                                                                                |                                                                                     | 19.0                                                                                | 19.0                                                                                |                                                                                     |
| Actuated g/C Ratio                |                                                                                   | 0.36                                                                              |                                                                                   |                                                                                   | 0.36                                                                              |                                                                                   | 0.39                                                                                | 0.39                                                                                |                                                                                     | 0.39                                                                                | 0.39                                                                                |                                                                                     |
| Clearance Time (s)                |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   | 6.0                                                                               |                                                                                   | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             |                                                                                   | 3.0                                                                               |                                                                                   |                                                                                   | 3.0                                                                               |                                                                                   | 3.0                                                                                 | 3.0                                                                                 |                                                                                     | 3.0                                                                                 | 3.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                |                                                                                   | 552                                                                               |                                                                                   |                                                                                   | 444                                                                               |                                                                                   | 235                                                                                 | 713                                                                                 |                                                                                     | 358                                                                                 | 719                                                                                 |                                                                                     |
| v/s Ratio Prot                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 0.20                                                                                |                                                                                     |                                                                                     | c0.28                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   | 0.11                                                                              |                                                                                   |                                                                                   | c0.12                                                                             |                                                                                   | 0.22                                                                                |                                                                                     |                                                                                     | 0.01                                                                                |                                                                                     |                                                                                     |
| v/c Ratio                         |                                                                                   | 0.31                                                                              |                                                                                   |                                                                                   | 0.34                                                                              |                                                                                   | 0.57                                                                                | 0.51                                                                                |                                                                                     | 0.03                                                                                | 0.72                                                                                |                                                                                     |
| Uniform Delay, d1                 |                                                                                   | 11.2                                                                              |                                                                                   |                                                                                   | 11.4                                                                              |                                                                                   | 11.4                                                                                | 11.1                                                                                |                                                                                     | 9.0                                                                                 | 12.3                                                                                |                                                                                     |
| Progression Factor                |                                                                                   | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             |                                                                                   | 0.3                                                                               |                                                                                   |                                                                                   | 0.5                                                                               |                                                                                   | 3.3                                                                                 | 0.6                                                                                 |                                                                                     | 0.0                                                                                 | 3.5                                                                                 |                                                                                     |
| Delay (s)                         |                                                                                   | 11.5                                                                              |                                                                                   |                                                                                   | 11.8                                                                              |                                                                                   | 14.7                                                                                | 11.6                                                                                |                                                                                     | 9.0                                                                                 | 15.8                                                                                |                                                                                     |
| Level of Service                  |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   | B                                                                                   | B                                                                                   |                                                                                     | A                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 11.5                                                                              |                                                                                   |                                                                                   | 11.8                                                                              |                                                                                   |                                                                                     | 12.5                                                                                |                                                                                     |                                                                                     | 15.7                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM Average Control Delay         |                                                                                   |                                                                                   | 13.4                                                                              |                                                                                   |                                                                                   |                                                                                   | HCM Level of Service                                                                |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |                                                                                     |
| HCM Volume to Capacity ratio      |                                                                                   |                                                                                   | 0.54                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 48.2                                                                              |                                                                                   |                                                                                   |                                                                                   | Sum of lost time (s)                                                                |                                                                                     |                                                                                     | 12.0                                                                                |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 73.4%                                                                             |                                                                                   |                                                                                   |                                                                                   | ICU Level of Service                                                                |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

## 8: Orsi Street & County Road 13

Total AM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |                                                                                   |  |                                                                                   |                                                                                   |  |
| Volume (veh/h)                    | 15                                                                                | 27                                                                                | 438                                                                               | 14                                                                                | 20                                                                                | 711                                                                               |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 16                                                                                | 29                                                                                | 476                                                                               | 15                                                                                | 22                                                                                | 773                                                                               |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 1300                                                                              | 484                                                                               |                                                                                   |                                                                                   | 491                                                                               |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 1300                                                                              | 484                                                                               |                                                                                   |                                                                                   | 491                                                                               |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 91                                                                                | 95                                                                                |                                                                                   |                                                                                   | 98                                                                                |                                                                                   |
| cM capacity (veh/h)               | 174                                                                               | 583                                                                               |                                                                                   |                                                                                   | 1072                                                                              |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 46                                                                                | 491                                                                               | 795                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 16                                                                                | 0                                                                                 | 22                                                                                |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 29                                                                                | 15                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 317                                                                               | 1700                                                                              | 1072                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.14                                                                              | 0.29                                                                              | 0.02                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 3.8                                                                               | 0.0                                                                               | 0.5                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 18.2                                                                              | 0.0                                                                               | 0.5                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | C                                                                                 |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 18.2                                                                              | 0.0                                                                               | 0.5                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   |                                                                                   | 0.9                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 63.5%                                                                             | ICU Level of Service                                                              |                                                                                   | B                                                                                 |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |

# HCM Unsignalized Intersection Capacity Analysis

## 9: Fisher Drive & County Road 13

Total AM  
2012-10-18

|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |
| Movement                          | EBL                                                                               | EBR                                                                               | NBL                                                                               | NBT                                                                               | SBT                                                                               | SBR                                                                               |
| Lane Configurations               |  |                                                                                   |                                                                                   |  |  |                                                                                   |
| Volume (veh/h)                    | 2                                                                                 | 8                                                                                 | 1                                                                                 | 450                                                                               | 726                                                                               | 1                                                                                 |
| Sign Control                      | Stop                                                                              |                                                                                   |                                                                                   | Free                                                                              | Free                                                                              |                                                                                   |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                | 0%                                                                                |                                                                                   |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 2                                                                                 | 9                                                                                 | 1                                                                                 | 489                                                                               | 789                                                                               | 1                                                                                 |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   |                                                                                   | None                                                                              | None                                                                              |                                                                                   |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   | 247                                                                               |                                                                                   |                                                                                   |
| pX, platoon unblocked             | 0.96                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 1281                                                                              | 790                                                                               | 790                                                                               |                                                                                   |                                                                                   |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 1271                                                                              | 790                                                                               | 790                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               | 4.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               | 2.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| p0 queue free %                   | 99                                                                                | 98                                                                                | 100                                                                               |                                                                                   |                                                                                   |                                                                                   |
| cM capacity (veh/h)               | 179                                                                               | 393                                                                               | 839                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Direction, Lane #                 | EB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 11                                                                                | 490                                                                               | 790                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 2                                                                                 | 1                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 9                                                                                 | 0                                                                                 | 1                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 317                                                                               | 839                                                                               | 1700                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.03                                                                              | 0.00                                                                              | 0.46                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 0.8                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 16.8                                                                              | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | C                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 16.8                                                                              | 0.0                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   | 0.2                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 48.3%                                                                             | ICU Level of Service                                                              | A                                                                                 |                                                                                   |                                                                                   |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |

# HCM Signalized Intersection Capacity Analysis

## 10: County Road 5 & County Road 13

Total AM  
2012-10-18

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |  |  |  |  |  |  |  |  |  |  |
| Volume (vph)                      | 170                                                                               | 382                                                                               | 87                                                                                | 66                                                                                | 223                                                                               | 93                                                                                | 58                                                                                 | 187                                                                                 | 78                                                                                  | 123                                                                                 | 400                                                                                 | 205                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                                | 6.0                                                                                 | 6.0                                                                                 | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Frt                               | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                               | 1.00                                                                                | 0.85                                                                                | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                               | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (prot)                 | 1750                                                                              | 1842                                                                              | 1566                                                                              | 1750                                                                              | 1842                                                                              | 1566                                                                              | 1750                                                                               | 1842                                                                                | 1566                                                                                | 1750                                                                                | 1842                                                                                | 1566                                                                                |
| Flt Permitted                     | 0.34                                                                              | 1.00                                                                              | 1.00                                                                              | 0.52                                                                              | 1.00                                                                              | 1.00                                                                              | 0.38                                                                               | 1.00                                                                                | 1.00                                                                                | 0.60                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (perm)                 | 618                                                                               | 1842                                                                              | 1566                                                                              | 957                                                                               | 1842                                                                              | 1566                                                                              | 705                                                                                | 1842                                                                                | 1566                                                                                | 1102                                                                                | 1842                                                                                | 1566                                                                                |
| Peak-hour factor, PHF             | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Adj. Flow (vph)                   | 185                                                                               | 415                                                                               | 95                                                                                | 72                                                                                | 242                                                                               | 101                                                                               | 63                                                                                 | 203                                                                                 | 85                                                                                  | 134                                                                                 | 435                                                                                 | 223                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 0                                                                                 | 63                                                                                | 0                                                                                 | 0                                                                                 | 82                                                                                | 0                                                                                  | 0                                                                                   | 51                                                                                  | 0                                                                                   | 0                                                                                   | 130                                                                                 |
| Lane Group Flow (vph)             | 185                                                                               | 415                                                                               | 32                                                                                | 72                                                                                | 242                                                                               | 19                                                                                | 63                                                                                 | 203                                                                                 | 34                                                                                  | 134                                                                                 | 435                                                                                 | 93                                                                                  |
| Turn Type                         | pm+pt                                                                             |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   | Perm                                                                              | pm+pt                                                                              |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases                  | 7                                                                                 | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 5                                                                                  | 2                                                                                   |                                                                                     | 1                                                                                   | 6                                                                                   |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 2                                                                                  |                                                                                     | 2                                                                                   | 6                                                                                   |                                                                                     | 6                                                                                   |
| Actuated Green, G (s)             | 29.6                                                                              | 29.6                                                                              | 29.6                                                                              | 16.0                                                                              | 16.0                                                                              | 16.0                                                                              | 39.7                                                                               | 35.0                                                                                | 35.0                                                                                | 42.3                                                                                | 36.3                                                                                | 36.3                                                                                |
| Effective Green, g (s)            | 29.6                                                                              | 29.6                                                                              | 29.6                                                                              | 16.0                                                                              | 16.0                                                                              | 16.0                                                                              | 39.7                                                                               | 35.0                                                                                | 35.0                                                                                | 42.3                                                                                | 36.3                                                                                | 36.3                                                                                |
| Actuated g/C Ratio                | 0.34                                                                              | 0.34                                                                              | 0.34                                                                              | 0.18                                                                              | 0.18                                                                              | 0.18                                                                              | 0.46                                                                               | 0.40                                                                                | 0.40                                                                                | 0.49                                                                                | 0.42                                                                                | 0.42                                                                                |
| Clearance Time (s)                | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                                | 6.0                                                                                 | 6.0                                                                                 | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Vehicle Extension (s)             | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.0                                                                                | 3.0                                                                                 | 3.0                                                                                 | 3.0                                                                                 | 3.0                                                                                 | 3.0                                                                                 |
| Lane Grp Cap (vph)                | 337                                                                               | 630                                                                               | 535                                                                               | 177                                                                               | 340                                                                               | 289                                                                               | 380                                                                                | 744                                                                                 | 633                                                                                 | 583                                                                                 | 772                                                                                 | 656                                                                                 |
| v/s Ratio Prot                    | 0.06                                                                              | c0.23                                                                             |                                                                                   |                                                                                   | 0.13                                                                              |                                                                                   | 0.01                                                                               | 0.11                                                                                |                                                                                     | c0.02                                                                               | c0.24                                                                               |                                                                                     |
| v/s Ratio Perm                    | 0.13                                                                              |                                                                                   | 0.02                                                                              | 0.08                                                                              |                                                                                   | 0.01                                                                              | 0.07                                                                               |                                                                                     | 0.02                                                                                | 0.10                                                                                |                                                                                     | 0.06                                                                                |
| v/c Ratio                         | 0.55                                                                              | 0.66                                                                              | 0.06                                                                              | 0.41                                                                              | 0.71                                                                              | 0.06                                                                              | 0.17                                                                               | 0.27                                                                                | 0.05                                                                                | 0.23                                                                                | 0.56                                                                                | 0.14                                                                                |
| Uniform Delay, d1                 | 21.5                                                                              | 24.2                                                                              | 19.2                                                                              | 31.1                                                                              | 33.1                                                                              | 29.1                                                                              | 13.6                                                                               | 17.3                                                                                | 15.7                                                                                | 12.3                                                                                | 19.1                                                                                | 15.5                                                                                |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Incremental Delay, d2             | 1.8                                                                               | 2.5                                                                               | 0.0                                                                               | 1.5                                                                               | 6.9                                                                               | 0.1                                                                               | 0.2                                                                                | 0.9                                                                                 | 0.2                                                                                 | 0.2                                                                                 | 3.0                                                                                 | 0.5                                                                                 |
| Delay (s)                         | 23.4                                                                              | 26.7                                                                              | 19.2                                                                              | 32.6                                                                              | 40.0                                                                              | 29.2                                                                              | 13.9                                                                               | 18.2                                                                                | 15.9                                                                                | 12.5                                                                                | 22.1                                                                                | 16.0                                                                                |
| Level of Service                  | C                                                                                 | C                                                                                 | B                                                                                 | C                                                                                 | D                                                                                 | C                                                                                 | B                                                                                  | B                                                                                   | B                                                                                   | B                                                                                   | C                                                                                   | B                                                                                   |
| Approach Delay (s)                |                                                                                   | 24.8                                                                              |                                                                                   |                                                                                   | 36.1                                                                              |                                                                                   |                                                                                    | 16.8                                                                                |                                                                                     |                                                                                     | 18.7                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM Average Control Delay         |                                                                                   |                                                                                   | 23.5                                                                              |                                                                                   |                                                                                   | HCM Level of Service                                                              |                                                                                    |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| HCM Volume to Capacity ratio      |                                                                                   |                                                                                   | 0.54                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 86.6                                                                              |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                    |                                                                                     | 10.0                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 66.5%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                    |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



# HCM Unsignalized Intersection Capacity Analysis

## 11: Jenkins St & County Road 13

Total AM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |                                                                                   |  |                                                                                   |                                                                                   |  |
| Volume (veh/h)                    | 4                                                                                 | 6                                                                                 | 312                                                                               | 4                                                                                 | 4                                                                                 | 549                                                                               |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 4                                                                                 | 7                                                                                 | 339                                                                               | 4                                                                                 | 4                                                                                 | 597                                                                               |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 225                                                                               |
| pX, platoon unblocked             | 0.82                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 947                                                                               | 341                                                                               |                                                                                   |                                                                                   | 343                                                                               |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 825                                                                               | 341                                                                               |                                                                                   |                                                                                   | 343                                                                               |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 98                                                                                | 99                                                                                |                                                                                   |                                                                                   | 100                                                                               |                                                                                   |
| cM capacity (veh/h)               | 282                                                                               | 706                                                                               |                                                                                   |                                                                                   | 1227                                                                              |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 11                                                                                | 343                                                                               | 601                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 4                                                                                 | 0                                                                                 | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 7                                                                                 | 4                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 441                                                                               | 1700                                                                              | 1227                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.02                                                                              | 0.20                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 0.6                                                                               | 0.0                                                                               | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 13.4                                                                              | 0.0                                                                               | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | B                                                                                 |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 13.4                                                                              | 0.0                                                                               | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   |                                                                                   | 0.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 42.1%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | A                                                                                 |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |

# HCM Unsignalized Intersection Capacity Analysis 12: Dekker St (North Leg) & County Road 13

Total AM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |                                                                                   |  |                                                                                   |                                                                                   |  |
| Volume (veh/h)                    | 6                                                                                 | 9                                                                                 | 311                                                                               | 5                                                                                 | 6                                                                                 | 558                                                                               |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 7                                                                                 | 10                                                                                | 338                                                                               | 5                                                                                 | 7                                                                                 | 607                                                                               |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 960                                                                               | 341                                                                               |                                                                                   |                                                                                   | 343                                                                               |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 960                                                                               | 341                                                                               |                                                                                   |                                                                                   | 343                                                                               |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 98                                                                                | 99                                                                                |                                                                                   |                                                                                   | 99                                                                                |                                                                                   |
| cM capacity (veh/h)               | 285                                                                               | 706                                                                               |                                                                                   |                                                                                   | 1227                                                                              |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 16                                                                                | 343                                                                               | 613                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 7                                                                                 | 0                                                                                 | 7                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 10                                                                                | 5                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 444                                                                               | 1700                                                                              | 1227                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.04                                                                              | 0.20                                                                              | 0.01                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 0.9                                                                               | 0.0                                                                               | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 13.4                                                                              | 0.0                                                                               | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | B                                                                                 |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 13.4                                                                              | 0.0                                                                               | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   |                                                                                   | 0.3                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 44.2%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | A                                                                                 |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |

# HCM Unsignalized Intersection Capacity Analysis 13: Collector Road 6 & County Road 13

Total AM  
2012-10-18

|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (veh/h)                    | 58                                                                                | 2                                                                                 | 123                                                                               | 17                                                                                | 4                                                                                 | 12                                                                                | 55                                                                                 | 243                                                                                 | 6                                                                                   | 7                                                                                   | 516                                                                                 | 41                                                                                  |
| Sign Control                      | Stop                                                                              |                                                                                   |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   | Free                                                                               |                                                                                     |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   | 0%                                                                                 |                                                                                     |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 63                                                                                | 2                                                                                 | 134                                                                               | 18                                                                                | 4                                                                                 | 13                                                                                | 60                                                                                 | 264                                                                                 | 7                                                                                   | 8                                                                                   | 561                                                                                 | 45                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | None                                                                               |                                                                                     |                                                                                     | None                                                                                |                                                                                     |                                                                                     |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 997                                                                               | 989                                                                               | 583                                                                               | 1098                                                                              | 1008                                                                              | 267                                                                               | 605                                                                                |                                                                                     |                                                                                     |                                                                                     | 271                                                                                 |                                                                                     |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 997                                                                               | 989                                                                               | 583                                                                               | 1098                                                                              | 1008                                                                              | 267                                                                               | 605                                                                                |                                                                                     |                                                                                     |                                                                                     | 271                                                                                 |                                                                                     |
| tC, single (s)                    | 7.1                                                                               | 6.5                                                                               | 6.2                                                                               | 7.1                                                                               | 6.5                                                                               | 6.2                                                                               | 4.1                                                                                |                                                                                     |                                                                                     |                                                                                     | 4.1                                                                                 |                                                                                     |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 2.2                                                                                |                                                                                     |                                                                                     |                                                                                     | 2.2                                                                                 |                                                                                     |
| p0 queue free %                   | 69                                                                                | 99                                                                                | 74                                                                                | 86                                                                                | 98                                                                                | 98                                                                                | 94                                                                                 |                                                                                     |                                                                                     |                                                                                     | 99                                                                                  |                                                                                     |
| cM capacity (veh/h)               | 205                                                                               | 230                                                                               | 512                                                                               | 134                                                                               | 224                                                                               | 776                                                                               | 973                                                                                |                                                                                     |                                                                                     |                                                                                     | 1304                                                                                |                                                                                     |
| Direction, Lane #                 | EB 1                                                                              | EB 2                                                                              | WB 1                                                                              | WB 2                                                                              | NB 1                                                                              | NB 2                                                                              | SB 1                                                                               | SB 2                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 63                                                                                | 136                                                                               | 18                                                                                | 17                                                                                | 60                                                                                | 271                                                                               | 8                                                                                  | 605                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 63                                                                                | 0                                                                                 | 18                                                                                | 0                                                                                 | 60                                                                                | 0                                                                                 | 8                                                                                  | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 0                                                                                 | 134                                                                               | 0                                                                                 | 13                                                                                | 0                                                                                 | 7                                                                                 | 0                                                                                  | 45                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 205                                                                               | 502                                                                               | 134                                                                               | 481                                                                               | 973                                                                               | 1700                                                                              | 1304                                                                               | 1700                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.31                                                                              | 0.27                                                                              | 0.14                                                                              | 0.04                                                                              | 0.06                                                                              | 0.16                                                                              | 0.01                                                                               | 0.36                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (m)             | 9.5                                                                               | 8.3                                                                               | 3.5                                                                               | 0.9                                                                               | 1.5                                                                               | 0.0                                                                               | 0.1                                                                                | 0.0                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 30.2                                                                              | 14.8                                                                              | 36.2                                                                              | 12.8                                                                              | 8.9                                                                               | 0.0                                                                               | 7.8                                                                                | 0.0                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | D                                                                                 | B                                                                                 | E                                                                                 | B                                                                                 | A                                                                                 | A                                                                                 |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 19.7                                                                              | 24.8                                                                              |                                                                                   | 1.6                                                                               |                                                                                   | 0.1                                                                               |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | C                                                                                 | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 4.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 57.1%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                    |                                                                                     | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

## 14: Main Street Everett & Wales Ave

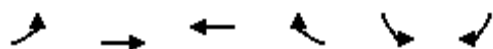
Total AM  
2012-10-18

|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (veh/h)                    | 19                                                                                | 548                                                                               | 8                                                                                 | 13                                                                                | 317                                                                               | 8                                                                                 | 8                                                                                   | 4                                                                                   | 5                                                                                   | 69                                                                                  | 7                                                                                   | 49                                                                                  |
| Sign Control                      |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |                                                                                   |                                                                                     | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 21                                                                                | 596                                                                               | 9                                                                                 | 14                                                                                | 345                                                                               | 9                                                                                 | 9                                                                                   | 4                                                                                   | 5                                                                                   | 75                                                                                  | 8                                                                                   | 53                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 353                                                                               |                                                                                   |                                                                                   | 604                                                                               |                                                                                   |                                                                                   | 1076                                                                                | 1023                                                                                | 600                                                                                 | 1026                                                                                | 1023                                                                                | 349                                                                                 |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 353                                                                               |                                                                                   |                                                                                   | 604                                                                               |                                                                                   |                                                                                   | 1076                                                                                | 1023                                                                                | 600                                                                                 | 1026                                                                                | 1023                                                                                | 349                                                                                 |
| tC, single (s)                    | 4.1                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |                                                                                   | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 2.2                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |                                                                                   | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 |
| p0 queue free %                   | 98                                                                                |                                                                                   |                                                                                   | 99                                                                                |                                                                                   |                                                                                   | 95                                                                                  | 98                                                                                  | 99                                                                                  | 63                                                                                  | 97                                                                                  | 92                                                                                  |
| cM capacity (veh/h)               | 1205                                                                              |                                                                                   |                                                                                   | 973                                                                               |                                                                                   |                                                                                   | 173                                                                                 | 228                                                                                 | 501                                                                                 | 203                                                                                 | 228                                                                                 | 694                                                                                 |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | NB 2                                                                              | SB 1                                                                              | SB 2                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 625                                                                               | 367                                                                               | 9                                                                                 | 10                                                                                | 75                                                                                | 61                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 21                                                                                | 14                                                                                | 9                                                                                 | 0                                                                                 | 75                                                                                | 0                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 9                                                                                 | 9                                                                                 | 0                                                                                 | 5                                                                                 | 0                                                                                 | 53                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 1205                                                                              | 973                                                                               | 173                                                                               | 327                                                                               | 203                                                                               | 553                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.02                                                                              | 0.01                                                                              | 0.05                                                                              | 0.03                                                                              | 0.37                                                                              | 0.11                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (m)             | 0.4                                                                               | 0.3                                                                               | 1.2                                                                               | 0.7                                                                               | 12.2                                                                              | 2.8                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 0.5                                                                               | 0.5                                                                               | 26.9                                                                              | 16.3                                                                              | 32.8                                                                              | 12.3                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | A                                                                                 | A                                                                                 | D                                                                                 | C                                                                                 | D                                                                                 | B                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.5                                                                               | 0.5                                                                               | 21.3                                                                              |                                                                                   | 23.6                                                                              |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      |                                                                                   |                                                                                   | C                                                                                 |                                                                                   | C                                                                                 |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 53.8%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

## 15: Main Street Everett & Den Boer Rd

Total AM  
2012-10-18



| Movement                          | EBL  | EBT  | WBT   | WBR                  | SBL  | SBR  |
|-----------------------------------|------|------|-------|----------------------|------|------|
| Lane Configurations               |      | ↰    | ↰     |                      | ↰    |      |
| Volume (veh/h)                    | 15   | 661  | 322   | 15                   | 93   | 23   |
| Sign Control                      |      | Free | Free  |                      | Stop |      |
| Grade                             |      | 0%   | 0%    |                      | 0%   |      |
| Peak Hour Factor                  | 0.92 | 0.92 | 0.92  | 0.92                 | 0.92 | 0.92 |
| Hourly flow rate (vph)            | 16   | 718  | 350   | 16                   | 101  | 25   |
| Pedestrians                       |      |      |       |                      |      |      |
| Lane Width (m)                    |      |      |       |                      |      |      |
| Walking Speed (m/s)               |      |      |       |                      |      |      |
| Percent Blockage                  |      |      |       |                      |      |      |
| Right turn flare (veh)            |      |      |       |                      |      |      |
| Median type                       |      | None | None  |                      |      |      |
| Median storage veh                |      |      |       |                      |      |      |
| Upstream signal (m)               |      |      |       |                      |      |      |
| pX, platoon unblocked             |      |      |       |                      |      |      |
| vC, conflicting volume            | 366  |      |       |                      | 1109 | 358  |
| vC1, stage 1 conf vol             |      |      |       |                      |      |      |
| vC2, stage 2 conf vol             |      |      |       |                      |      |      |
| vCu, unblocked vol                | 366  |      |       |                      | 1109 | 358  |
| tC, single (s)                    | 4.1  |      |       |                      | 6.4  | 6.2  |
| tC, 2 stage (s)                   |      |      |       |                      |      |      |
| tF (s)                            | 2.2  |      |       |                      | 3.5  | 3.3  |
| p0 queue free %                   | 99   |      |       |                      | 56   | 96   |
| cM capacity (veh/h)               | 1192 |      |       |                      | 229  | 686  |
|                                   |      |      |       |                      |      |      |
| Direction, Lane #                 | EB 1 | WB 1 | SB 1  |                      |      |      |
| Volume Total                      | 735  | 366  | 126   |                      |      |      |
| Volume Left                       | 16   | 0    | 101   |                      |      |      |
| Volume Right                      | 0    | 16   | 25    |                      |      |      |
| cSH                               | 1192 | 1700 | 264   |                      |      |      |
| Volume to Capacity                | 0.01 | 0.22 | 0.48  |                      |      |      |
| Queue Length 95th (m)             | 0.3  | 0.0  | 18.3  |                      |      |      |
| Control Delay (s)                 | 0.4  | 0.0  | 30.6  |                      |      |      |
| Lane LOS                          | A    |      | D     |                      |      |      |
| Approach Delay (s)                | 0.4  | 0.0  | 30.6  |                      |      |      |
| Approach LOS                      |      |      | D     |                      |      |      |
| Intersection Summary              |      |      |       |                      |      |      |
| Average Delay                     |      |      | 3.4   |                      |      |      |
| Intersection Capacity Utilization |      |      | 60.1% | ICU Level of Service |      | B    |
| Analysis Period (min)             |      |      | 15    |                      |      |      |
|                                   |      |      |       |                      |      |      |

# HCM Unsignalized Intersection Capacity Analysis

## 16: Collector Road 7 & Concession Rd 6

Total AM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBR                                                                               | NBL                                                                               | NBT                                                                               | SBT                                                                               | SBR                                                                               |
| Lane Configurations               |  |                                                                                   |                                                                                   |  |  |                                                                                   |
| Volume (veh/h)                    | 1                                                                                 | 324                                                                               | 81                                                                                | 41                                                                                | 172                                                                               | 1                                                                                 |
| Sign Control                      | Stop                                                                              |                                                                                   |                                                                                   | Free                                                                              | Free                                                                              |                                                                                   |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                | 0%                                                                                |                                                                                   |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 1                                                                                 | 352                                                                               | 88                                                                                | 45                                                                                | 187                                                                               | 1                                                                                 |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   |                                                                                   | None                                                                              | None                                                                              |                                                                                   |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 408                                                                               | 188                                                                               | 188                                                                               |                                                                                   |                                                                                   |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 408                                                                               | 188                                                                               | 188                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               | 4.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               | 2.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| p0 queue free %                   | 100                                                                               | 59                                                                                | 94                                                                                |                                                                                   |                                                                                   |                                                                                   |
| cM capacity (veh/h)               | 561                                                                               | 855                                                                               | 1386                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Direction, Lane #                 | EB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 353                                                                               | 133                                                                               | 188                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 1                                                                                 | 88                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 352                                                                               | 0                                                                                 | 1                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 853                                                                               | 1386                                                                              | 1700                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.41                                                                              | 0.06                                                                              | 0.11                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 15.6                                                                              | 1.5                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 12.2                                                                              | 5.3                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | B                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 12.2                                                                              | 5.3                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   | 7.4                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 45.9%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | A                                                                                 |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |

# HCM Signalized Intersection Capacity Analysis

## 17: County Road 5 & Concession Rd 6

Total AM  
2012-10-18

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |  |                                                                                   |  |  |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)                      | 14                                                                                | 663                                                                               | 108                                                                               | 9                                                                                 | 269                                                                               | 94                                                                                | 52                                                                                  | 13                                                                                  | 2                                                                                   | 405                                                                                 | 81                                                                                  | 10                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               |                                                                                   | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Lane Util. Factor                 |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               |                                                                                   | 1.00                                                                              | 0.85                                                                              |                                                                                   | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 0.98                                                                                |                                                                                     | 1.00                                                                                | 0.98                                                                                |                                                                                     |
| Flt Protected                     |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 |                                                                                   | 1840                                                                              | 1566                                                                              |                                                                                   | 1839                                                                              | 1566                                                                              | 1750                                                                                | 1808                                                                                |                                                                                     | 1750                                                                                | 1811                                                                                |                                                                                     |
| Flt Permitted                     |                                                                                   | 0.99                                                                              | 1.00                                                                              |                                                                                   | 0.91                                                                              | 1.00                                                                              | 0.69                                                                                | 1.00                                                                                |                                                                                     | 0.75                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 |                                                                                   | 1825                                                                              | 1566                                                                              |                                                                                   | 1682                                                                              | 1566                                                                              | 1276                                                                                | 1808                                                                                |                                                                                     | 1376                                                                                | 1811                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Adj. Flow (vph)                   | 15                                                                                | 721                                                                               | 117                                                                               | 10                                                                                | 292                                                                               | 102                                                                               | 57                                                                                  | 14                                                                                  | 2                                                                                   | 440                                                                                 | 88                                                                                  | 11                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 0                                                                                 | 49                                                                                | 0                                                                                 | 0                                                                                 | 54                                                                                | 0                                                                                   | 1                                                                                   | 0                                                                                   | 0                                                                                   | 5                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 0                                                                                 | 736                                                                               | 68                                                                                | 0                                                                                 | 302                                                                               | 48                                                                                | 57                                                                                  | 15                                                                                  | 0                                                                                   | 440                                                                                 | 94                                                                                  | 0                                                                                   |
| Turn Type                         | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                                |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases                  |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     | 6                                                                                   |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 2                                                                                   |                                                                                     |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     |
| Actuated Green, G (s)             |                                                                                   | 36.4                                                                              | 36.4                                                                              |                                                                                   | 36.4                                                                              | 36.4                                                                              | 29.3                                                                                | 29.3                                                                                |                                                                                     | 29.3                                                                                | 29.3                                                                                |                                                                                     |
| Effective Green, g (s)            |                                                                                   | 36.4                                                                              | 36.4                                                                              |                                                                                   | 36.4                                                                              | 36.4                                                                              | 29.3                                                                                | 29.3                                                                                |                                                                                     | 29.3                                                                                | 29.3                                                                                |                                                                                     |
| Actuated g/C Ratio                |                                                                                   | 0.47                                                                              | 0.47                                                                              |                                                                                   | 0.47                                                                              | 0.47                                                                              | 0.38                                                                                | 0.38                                                                                |                                                                                     | 0.38                                                                                | 0.38                                                                                |                                                                                     |
| Clearance Time (s)                |                                                                                   | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             |                                                                                   | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                                 | 3.0                                                                                 |                                                                                     | 3.0                                                                                 | 3.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                |                                                                                   | 855                                                                               | 734                                                                               |                                                                                   | 788                                                                               | 734                                                                               | 481                                                                                 | 682                                                                                 |                                                                                     | 519                                                                                 | 683                                                                                 |                                                                                     |
| v/s Ratio Prot                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 0.01                                                                                |                                                                                     |                                                                                     | 0.05                                                                                |                                                                                     |
| v/s Ratio Perm                    |                                                                                   | c0.40                                                                             | 0.04                                                                              |                                                                                   | 0.18                                                                              | 0.03                                                                              | 0.04                                                                                |                                                                                     |                                                                                     | c0.32                                                                               |                                                                                     |                                                                                     |
| v/c Ratio                         |                                                                                   | 0.86                                                                              | 0.09                                                                              |                                                                                   | 0.38                                                                              | 0.07                                                                              | 0.12                                                                                | 0.02                                                                                |                                                                                     | 0.85                                                                                | 0.14                                                                                |                                                                                     |
| Uniform Delay, d1                 |                                                                                   | 18.4                                                                              | 11.5                                                                              |                                                                                   | 13.4                                                                              | 11.3                                                                              | 15.8                                                                                | 15.2                                                                                |                                                                                     | 22.2                                                                                | 15.9                                                                                |                                                                                     |
| Progression Factor                |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             |                                                                                   | 8.9                                                                               | 0.1                                                                               |                                                                                   | 0.3                                                                               | 0.0                                                                               | 0.1                                                                                 | 0.0                                                                                 |                                                                                     | 12.2                                                                                | 0.1                                                                                 |                                                                                     |
| Delay (s)                         |                                                                                   | 27.2                                                                              | 11.5                                                                              |                                                                                   | 13.7                                                                              | 11.4                                                                              | 15.9                                                                                | 15.2                                                                                |                                                                                     | 34.4                                                                                | 16.0                                                                                |                                                                                     |
| Level of Service                  |                                                                                   | C                                                                                 | B                                                                                 |                                                                                   | B                                                                                 | B                                                                                 | B                                                                                   | B                                                                                   |                                                                                     | C                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 25.1                                                                              |                                                                                   |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                     | 15.7                                                                                |                                                                                     |                                                                                     | 31.0                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM Average Control Delay         |                                                                                   | 23.8                                                                              |                                                                                   | HCM Level of Service                                                              |                                                                                   | C                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM Volume to Capacity ratio      |                                                                                   | 0.86                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   | 77.7                                                                              |                                                                                   | Sum of lost time (s)                                                              |                                                                                   | 12.0                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   | 85.2%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | E                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Future Total Traffic, PM Peak Hour



# HCM Unsignalized Intersection Capacity Analysis

## 1: Collector Road 1 & Concession Road 4

Total PM  
2012-10-18

|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |                                                                                   |  |                                                                                   |                                                                                   |  |
| Volume (veh/h)                    | 7                                                                                 | 9                                                                                 | 93                                                                                | 12                                                                                | 16                                                                                | 90                                                                                |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 8                                                                                 | 10                                                                                | 101                                                                               | 13                                                                                | 17                                                                                | 98                                                                                |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage veh)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 240                                                                               | 108                                                                               |                                                                                   |                                                                                   | 114                                                                               |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 240                                                                               | 108                                                                               |                                                                                   |                                                                                   | 114                                                                               |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 99                                                                                | 99                                                                                |                                                                                   |                                                                                   | 99                                                                                |                                                                                   |
| cM capacity (veh/h)               | 739                                                                               | 946                                                                               |                                                                                   |                                                                                   | 1475                                                                              |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 17                                                                                | 114                                                                               | 115                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 8                                                                                 | 0                                                                                 | 17                                                                                |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 10                                                                                | 13                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 843                                                                               | 1700                                                                              | 1475                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.02                                                                              | 0.07                                                                              | 0.01                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 0.5                                                                               | 0.0                                                                               | 0.3                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 9.4                                                                               | 0.0                                                                               | 1.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | A                                                                                 |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 9.4                                                                               | 0.0                                                                               | 1.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   |                                                                                   | 1.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 22.3%                                                                             | ICU Level of Service                                                              |                                                                                   | A                                                                                 |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |

# HCM Unsignalized Intersection Capacity Analysis

## 2: County Road 5 & Concession Road 4

Total PM  
2012-10-18

|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |                                                                                     |  |                                                                                     |                                                                                     |  |                                                                                     |
| Volume (veh/h)                    | 6                                                                                 | 305                                                                               | 15                                                                                | 32                                                                                | 330                                                                               | 49                                                                                | 12                                                                                  | 49                                                                                  | 30                                                                                  | 42                                                                                  | 43                                                                                  | 12                                                                                  |
| Sign Control                      |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |                                                                                   |                                                                                     | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 7                                                                                 | 332                                                                               | 16                                                                                | 35                                                                                | 359                                                                               | 53                                                                                | 13                                                                                  | 53                                                                                  | 33                                                                                  | 46                                                                                  | 47                                                                                  | 13                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 412                                                                               |                                                                                   |                                                                                   | 348                                                                               |                                                                                   |                                                                                   | 844                                                                                 | 834                                                                                 | 340                                                                                 | 867                                                                                 | 816                                                                                 | 385                                                                                 |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 412                                                                               |                                                                                   |                                                                                   | 348                                                                               |                                                                                   |                                                                                   | 844                                                                                 | 834                                                                                 | 340                                                                                 | 867                                                                                 | 816                                                                                 | 385                                                                                 |
| tC, single (s)                    | 4.1                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |                                                                                   | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 2.2                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |                                                                                   | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 |
| p0 queue free %                   | 99                                                                                |                                                                                   |                                                                                   | 97                                                                                |                                                                                   |                                                                                   | 95                                                                                  | 82                                                                                  | 95                                                                                  | 79                                                                                  | 85                                                                                  | 98                                                                                  |
| cM capacity (veh/h)               | 1158                                                                              |                                                                                   |                                                                                   | 1222                                                                              |                                                                                   |                                                                                   | 240                                                                                 | 296                                                                                 | 707                                                                                 | 221                                                                                 | 303                                                                                 | 667                                                                                 |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 354                                                                               | 447                                                                               | 99                                                                                | 105                                                                               |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 7                                                                                 | 35                                                                                | 13                                                                                | 46                                                                                |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 16                                                                                | 53                                                                                | 33                                                                                | 13                                                                                |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 1158                                                                              | 1222                                                                              | 353                                                                               | 277                                                                               |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.01                                                                              | 0.03                                                                              | 0.28                                                                              | 0.38                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (m)             | 0.1                                                                               | 0.7                                                                               | 8.6                                                                               | 13.0                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 0.2                                                                               | 0.9                                                                               | 19.1                                                                              | 25.8                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | A                                                                                 | A                                                                                 | C                                                                                 | D                                                                                 |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.2                                                                               | 0.9                                                                               | 19.1                                                                              | 25.8                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      |                                                                                   |                                                                                   | C                                                                                 | D                                                                                 |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 5.1                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 56.8%                                                                             | ICU Level of Service                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

## 3: Collector Road 2 & Concession Road 4

Total PM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |                                                                                   |  |                                                                                   |                                                                                   |  |
| Volume (veh/h)                    | 11                                                                                | 17                                                                                | 56                                                                                | 17                                                                                | 26                                                                                | 83                                                                                |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 12                                                                                | 18                                                                                | 61                                                                                | 18                                                                                | 28                                                                                | 90                                                                                |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 217                                                                               | 70                                                                                |                                                                                   |                                                                                   | 79                                                                                |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 217                                                                               | 70                                                                                |                                                                                   |                                                                                   | 79                                                                                |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 98                                                                                | 98                                                                                |                                                                                   |                                                                                   | 98                                                                                |                                                                                   |
| cM capacity (veh/h)               | 757                                                                               | 993                                                                               |                                                                                   |                                                                                   | 1519                                                                              |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 30                                                                                | 79                                                                                | 118                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 12                                                                                | 0                                                                                 | 28                                                                                |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 18                                                                                | 18                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 884                                                                               | 1700                                                                              | 1519                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.03                                                                              | 0.05                                                                              | 0.02                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 0.8                                                                               | 0.0                                                                               | 0.4                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 9.2                                                                               | 0.0                                                                               | 1.9                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | A                                                                                 |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 9.2                                                                               | 0.0                                                                               | 1.9                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   | 2.2                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 22.5%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | A                                                                                 |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |

# HCM Unsignalized Intersection Capacity Analysis

## 4: County Road 5 & Collector Road 3

Total PM  
2012-10-18

|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |                                                                                    |  |                                                                                     |                                                                                     |  |                                                                                     |
| Volume (veh/h)                    | 13                                                                                | 354                                                                               | 10                                                                                | 32                                                                                | 388                                                                               | 42                                                                                | 7                                                                                  | 10                                                                                  | 26                                                                                  | 24                                                                                  | 17                                                                                  | 16                                                                                  |
| Sign Control                      |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |                                                                                   |                                                                                    | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 14                                                                                | 385                                                                               | 11                                                                                | 35                                                                                | 422                                                                               | 46                                                                                | 8                                                                                  | 11                                                                                  | 28                                                                                  | 26                                                                                  | 18                                                                                  | 17                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 467                                                                               |                                                                                   |                                                                                   | 396                                                                               |                                                                                   |                                                                                   | 959                                                                                | 955                                                                                 | 390                                                                                 | 966                                                                                 | 938                                                                                 | 445                                                                                 |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 467                                                                               |                                                                                   |                                                                                   | 396                                                                               |                                                                                   |                                                                                   | 959                                                                                | 955                                                                                 | 390                                                                                 | 966                                                                                 | 938                                                                                 | 445                                                                                 |
| tC, single (s)                    | 4.1                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |                                                                                   | 7.1                                                                                | 6.5                                                                                 | 6.2                                                                                 | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 2.2                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |                                                                                   | 3.5                                                                                | 4.0                                                                                 | 3.3                                                                                 | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 |
| p0 queue free %                   | 99                                                                                |                                                                                   |                                                                                   | 97                                                                                |                                                                                   |                                                                                   | 96                                                                                 | 96                                                                                  | 96                                                                                  | 88                                                                                  | 93                                                                                  | 97                                                                                  |
| cM capacity (veh/h)               | 1094                                                                              |                                                                                   |                                                                                   | 1163                                                                              |                                                                                   |                                                                                   | 210                                                                                | 247                                                                                 | 658                                                                                 | 209                                                                                 | 253                                                                                 | 613                                                                                 |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 410                                                                               | 502                                                                               | 47                                                                                | 62                                                                                |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 14                                                                                | 35                                                                                | 8                                                                                 | 26                                                                                |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 11                                                                                | 46                                                                                | 28                                                                                | 17                                                                                |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 1094                                                                              | 1163                                                                              | 380                                                                               | 274                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.01                                                                              | 0.03                                                                              | 0.12                                                                              | 0.23                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (m)             | 0.3                                                                               | 0.7                                                                               | 3.2                                                                               | 6.4                                                                               |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 0.4                                                                               | 0.9                                                                               | 15.8                                                                              | 21.9                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | A                                                                                 | A                                                                                 | C                                                                                 | C                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.4                                                                               | 0.9                                                                               | 15.8                                                                              | 21.9                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      |                                                                                   |                                                                                   | C                                                                                 | C                                                                                 |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 2.7                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 50.1%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                    |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Signalized Intersection Capacity Analysis

## 5: County Road 5 & Blanchards Way

Total PM  
2012-10-18

|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)                      | 60                                                                                | 389                                                                               | 13                                                                                | 120                                                                               | 436                                                                               | 219                                                                               | 9                                                                                   | 19                                                                                  | 89                                                                                  | 188                                                                                 | 24                                                                                  | 4                                                                                   |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 0.95                                                                              |                                                                                   | 1.00                                                                                | 0.88                                                                                |                                                                                     | 1.00                                                                                | 0.98                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1785                                                                              | 1766                                                                              |                                                                                   | 1750                                                                              | 1761                                                                              |                                                                                   | 1750                                                                                | 1615                                                                                |                                                                                     | 1785                                                                                | 1810                                                                                |                                                                                     |
| Flt Permitted                     | 0.24                                                                              | 1.00                                                                              |                                                                                   | 0.46                                                                              | 1.00                                                                              |                                                                                   | 0.74                                                                                | 1.00                                                                                |                                                                                     | 0.68                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 442                                                                               | 1766                                                                              |                                                                                   | 847                                                                               | 1761                                                                              |                                                                                   | 1359                                                                                | 1615                                                                                |                                                                                     | 1280                                                                                | 1810                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Adj. Flow (vph)                   | 65                                                                                | 423                                                                               | 14                                                                                | 130                                                                               | 474                                                                               | 238                                                                               | 10                                                                                  | 21                                                                                  | 97                                                                                  | 204                                                                                 | 26                                                                                  | 4                                                                                   |
| RTOR Reduction (vph)              | 0                                                                                 | 1                                                                                 | 0                                                                                 | 0                                                                                 | 22                                                                                | 0                                                                                 | 0                                                                                   | 71                                                                                  | 0                                                                                   | 0                                                                                   | 3                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 65                                                                                | 436                                                                               | 0                                                                                 | 130                                                                               | 690                                                                               | 0                                                                                 | 10                                                                                  | 47                                                                                  | 0                                                                                   | 204                                                                                 | 27                                                                                  | 0                                                                                   |
| Heavy Vehicles (%)                | 0%                                                                                | 6%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 0%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 0%                                                                                  | 2%                                                                                  | 0%                                                                                  |
| Turn Type                         | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                                |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases                  | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 2                                                                                   |                                                                                     |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 2                                                                                   |                                                                                     |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              |                                                                                   | 15.7                                                                                | 15.7                                                                                |                                                                                     | 15.7                                                                                | 15.7                                                                                |                                                                                     |
| Effective Green, g (s)            | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              |                                                                                   | 15.7                                                                                | 15.7                                                                                |                                                                                     | 15.7                                                                                | 15.7                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.52                                                                              | 0.52                                                                              |                                                                                   | 0.52                                                                              | 0.52                                                                              |                                                                                   | 0.27                                                                                | 0.27                                                                                |                                                                                     | 0.27                                                                                | 0.27                                                                                |                                                                                     |
| Clearance Time (s)                | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                                 | 3.0                                                                                 |                                                                                     | 3.0                                                                                 | 3.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 230                                                                               | 918                                                                               |                                                                                   | 440                                                                               | 916                                                                               |                                                                                   | 370                                                                                 | 439                                                                                 |                                                                                     | 348                                                                                 | 492                                                                                 |                                                                                     |
| v/s Ratio Prot                    |                                                                                   | 0.25                                                                              |                                                                                   |                                                                                   | c0.39                                                                             |                                                                                   |                                                                                     | 0.03                                                                                |                                                                                     |                                                                                     | 0.01                                                                                |                                                                                     |
| v/s Ratio Perm                    | 0.15                                                                              |                                                                                   |                                                                                   | 0.15                                                                              |                                                                                   |                                                                                   | 0.01                                                                                |                                                                                     |                                                                                     | c0.16                                                                               |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.28                                                                              | 0.47                                                                              |                                                                                   | 0.30                                                                              | 0.75                                                                              |                                                                                   | 0.03                                                                                | 0.11                                                                                |                                                                                     | 0.59                                                                                | 0.06                                                                                |                                                                                     |
| Uniform Delay, d1                 | 7.8                                                                               | 8.8                                                                               |                                                                                   | 7.9                                                                               | 10.9                                                                              |                                                                                   | 15.4                                                                                | 15.7                                                                                |                                                                                     | 18.2                                                                                | 15.5                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 0.7                                                                               | 0.4                                                                               |                                                                                   | 0.4                                                                               | 3.6                                                                               |                                                                                   | 0.0                                                                                 | 0.1                                                                                 |                                                                                     | 2.5                                                                                 | 0.0                                                                                 |                                                                                     |
| Delay (s)                         | 8.5                                                                               | 9.2                                                                               |                                                                                   | 8.2                                                                               | 14.5                                                                              |                                                                                   | 15.4                                                                                | 15.9                                                                                |                                                                                     | 20.7                                                                                | 15.6                                                                                |                                                                                     |
| Level of Service                  | A                                                                                 | A                                                                                 |                                                                                   | A                                                                                 | B                                                                                 |                                                                                   | B                                                                                   | B                                                                                   |                                                                                     | C                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 9.1                                                                               |                                                                                   |                                                                                   | 13.5                                                                              |                                                                                   |                                                                                     | 15.8                                                                                |                                                                                     |                                                                                     | 20.0                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | A                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM Average Control Delay         | 13.3                                                                              |                                                                                   |                                                                                   | HCM Level of Service                                                              |                                                                                   |                                                                                   | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM Volume to Capacity ratio      | 0.70                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         | 57.7                                                                              |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                   |                                                                                   | 12.0                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization | 71.7%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                   | C                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

## 6: Collector Road 4 & County Road 13

Total PM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |  |  |  |  |  |
| Volume (veh/h)                    | 150                                                                               | 59                                                                                | 487                                                                               | 213                                                                               | 78                                                                                | 412                                                                               |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 163                                                                               | 64                                                                                | 529                                                                               | 232                                                                               | 85                                                                                | 448                                                                               |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 1147                                                                              | 529                                                                               |                                                                                   |                                                                                   | 761                                                                               |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 1147                                                                              | 529                                                                               |                                                                                   |                                                                                   | 761                                                                               |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 18                                                                                | 88                                                                                |                                                                                   |                                                                                   | 90                                                                                |                                                                                   |
| cM capacity (veh/h)               | 198                                                                               | 549                                                                               |                                                                                   |                                                                                   | 851                                                                               |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | WB 2                                                                              | NB 1                                                                              | NB 2                                                                              | SB 1                                                                              | SB 2                                                                              |
| Volume Total                      | 163                                                                               | 64                                                                                | 529                                                                               | 232                                                                               | 85                                                                                | 448                                                                               |
| Volume Left                       | 163                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 85                                                                                | 0                                                                                 |
| Volume Right                      | 0                                                                                 | 64                                                                                | 0                                                                                 | 232                                                                               | 0                                                                                 | 0                                                                                 |
| cSH                               | 198                                                                               | 549                                                                               | 1700                                                                              | 1700                                                                              | 851                                                                               | 1700                                                                              |
| Volume to Capacity                | 0.82                                                                              | 0.12                                                                              | 0.31                                                                              | 0.14                                                                              | 0.10                                                                              | 0.26                                                                              |
| Queue Length 95th (m)             | 45.0                                                                              | 3.0                                                                               | 0.0                                                                               | 0.0                                                                               | 2.5                                                                               | 0.0                                                                               |
| Control Delay (s)                 | 74.4                                                                              | 12.4                                                                              | 0.0                                                                               | 0.0                                                                               | 9.7                                                                               | 0.0                                                                               |
| Lane LOS                          | F                                                                                 | B                                                                                 |                                                                                   |                                                                                   | A                                                                                 |                                                                                   |
| Approach Delay (s)                | 56.9                                                                              |                                                                                   | 0.0                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |
| Approach LOS                      | F                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   |                                                                                   | 9.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 48.3%                                                                             |                                                                                   | ICU Level of Service                                                              | A                                                                                 |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |

# HCM Signalized Intersection Capacity Analysis

## 7: Collector Road 3 & County Road 13

Total PM  
2012-10-18

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)                      | 22                                                                                | 17                                                                                | 111                                                                               | 43                                                                                | 10                                                                                | 11                                                                                | 146                                                                                | 666                                                                                 | 66                                                                                  | 9                                                                                   | 528                                                                                 | 26                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   | 6.0                                                                               |                                                                                   | 6.0                                                                                | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Lane Util. Factor                 |                                                                                   | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              |                                                                                   | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               |                                                                                   | 0.90                                                                              |                                                                                   |                                                                                   | 0.98                                                                              |                                                                                   | 1.00                                                                               | 0.99                                                                                |                                                                                     | 1.00                                                                                | 0.99                                                                                |                                                                                     |
| Flt Protected                     |                                                                                   | 0.99                                                                              |                                                                                   |                                                                                   | 0.97                                                                              |                                                                                   | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 |                                                                                   | 1645                                                                              |                                                                                   |                                                                                   | 1741                                                                              |                                                                                   | 1750                                                                               | 1817                                                                                |                                                                                     | 1750                                                                                | 1829                                                                                |                                                                                     |
| Flt Permitted                     |                                                                                   | 0.93                                                                              |                                                                                   |                                                                                   | 0.77                                                                              |                                                                                   | 0.38                                                                               | 1.00                                                                                |                                                                                     | 0.25                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 |                                                                                   | 1548                                                                              |                                                                                   |                                                                                   | 1377                                                                              |                                                                                   | 700                                                                                | 1817                                                                                |                                                                                     | 465                                                                                 | 1829                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Adj. Flow (vph)                   | 24                                                                                | 18                                                                                | 121                                                                               | 47                                                                                | 11                                                                                | 12                                                                                | 159                                                                                | 724                                                                                 | 72                                                                                  | 10                                                                                  | 574                                                                                 | 28                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 102                                                                               | 0                                                                                 | 0                                                                                 | 8                                                                                 | 0                                                                                 | 0                                                                                  | 5                                                                                   | 0                                                                                   | 0                                                                                   | 2                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 0                                                                                 | 61                                                                                | 0                                                                                 | 0                                                                                 | 62                                                                                | 0                                                                                 | 159                                                                                | 791                                                                                 | 0                                                                                   | 10                                                                                  | 600                                                                                 | 0                                                                                   |
| Turn Type                         | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                               |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases                  |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                    | 2                                                                                   |                                                                                     |                                                                                     | 6                                                                                   |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 2                                                                                  |                                                                                     |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     |
| Actuated Green, G (s)             |                                                                                   | 8.6                                                                               |                                                                                   |                                                                                   | 8.6                                                                               |                                                                                   | 33.5                                                                               | 33.5                                                                                |                                                                                     | 33.5                                                                                | 33.5                                                                                |                                                                                     |
| Effective Green, g (s)            |                                                                                   | 8.6                                                                               |                                                                                   |                                                                                   | 8.6                                                                               |                                                                                   | 33.5                                                                               | 33.5                                                                                |                                                                                     | 33.5                                                                                | 33.5                                                                                |                                                                                     |
| Actuated g/C Ratio                |                                                                                   | 0.16                                                                              |                                                                                   |                                                                                   | 0.16                                                                              |                                                                                   | 0.62                                                                               | 0.62                                                                                |                                                                                     | 0.62                                                                                | 0.62                                                                                |                                                                                     |
| Clearance Time (s)                |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   | 6.0                                                                               |                                                                                   | 6.0                                                                                | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             |                                                                                   | 3.0                                                                               |                                                                                   |                                                                                   | 3.0                                                                               |                                                                                   | 3.0                                                                                | 3.0                                                                                 |                                                                                     | 3.0                                                                                 | 3.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                |                                                                                   | 246                                                                               |                                                                                   |                                                                                   | 219                                                                               |                                                                                   | 433                                                                                | 1125                                                                                |                                                                                     | 288                                                                                 | 1133                                                                                |                                                                                     |
| v/s Ratio Prot                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | c0.44                                                                              |                                                                                     |                                                                                     |                                                                                     | 0.33                                                                                |                                                                                     |
| v/s Ratio Perm                    |                                                                                   | 0.04                                                                              |                                                                                   |                                                                                   | c0.04                                                                             |                                                                                   | 0.23                                                                               |                                                                                     |                                                                                     | 0.02                                                                                |                                                                                     |                                                                                     |
| v/c Ratio                         |                                                                                   | 0.25                                                                              |                                                                                   |                                                                                   | 0.28                                                                              |                                                                                   | 0.37                                                                               | 0.70                                                                                |                                                                                     | 0.03                                                                                | 0.53                                                                                |                                                                                     |
| Uniform Delay, d1                 |                                                                                   | 19.9                                                                              |                                                                                   |                                                                                   | 20.0                                                                              |                                                                                   | 5.1                                                                                | 6.9                                                                                 |                                                                                     | 4.0                                                                                 | 5.8                                                                                 |                                                                                     |
| Progression Factor                |                                                                                   | 1.00                                                                              |                                                                                   |                                                                                   | 1.00                                                                              |                                                                                   | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             |                                                                                   | 0.5                                                                               |                                                                                   |                                                                                   | 0.7                                                                               |                                                                                   | 0.5                                                                                | 2.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.4                                                                                 |                                                                                     |
| Delay (s)                         |                                                                                   | 20.5                                                                              |                                                                                   |                                                                                   | 20.7                                                                              |                                                                                   | 5.6                                                                                | 9.0                                                                                 |                                                                                     | 4.1                                                                                 | 6.3                                                                                 |                                                                                     |
| Level of Service                  |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   | A                                                                                  | A                                                                                   |                                                                                     | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 20.5                                                                              |                                                                                   |                                                                                   | 20.7                                                                              |                                                                                   |                                                                                    | 8.4                                                                                 |                                                                                     |                                                                                     | 6.2                                                                                 |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                    | A                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM Average Control Delay         |                                                                                   |                                                                                   | 9.2                                                                               |                                                                                   |                                                                                   |                                                                                   | HCM Level of Service                                                               |                                                                                     |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| HCM Volume to Capacity ratio      |                                                                                   |                                                                                   | 0.62                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 54.1                                                                              |                                                                                   |                                                                                   |                                                                                   | Sum of lost time (s)                                                               |                                                                                     |                                                                                     | 12.0                                                                                |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 69.3%                                                                             |                                                                                   |                                                                                   |                                                                                   | ICU Level of Service                                                               |                                                                                     |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

## 8: Orsi Street & County Road 13

Total PM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |                                                                                   |  |                                                                                   |                                                                                   |  |
| Volume (veh/h)                    | 6                                                                                 | 17                                                                                | 860                                                                               | 14                                                                                | 18                                                                                | 662                                                                               |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 7                                                                                 | 18                                                                                | 935                                                                               | 15                                                                                | 20                                                                                | 720                                                                               |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 1701                                                                              | 942                                                                               |                                                                                   |                                                                                   | 950                                                                               |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 1701                                                                              | 942                                                                               |                                                                                   |                                                                                   | 950                                                                               |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 93                                                                                | 94                                                                                |                                                                                   |                                                                                   | 97                                                                                |                                                                                   |
| cM capacity (veh/h)               | 98                                                                                | 319                                                                               |                                                                                   |                                                                                   | 723                                                                               |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 25                                                                                | 950                                                                               | 739                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 7                                                                                 | 0                                                                                 | 20                                                                                |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 18                                                                                | 15                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 201                                                                               | 1700                                                                              | 723                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.12                                                                              | 0.56                                                                              | 0.03                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 3.2                                                                               | 0.0                                                                               | 0.6                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 25.4                                                                              | 0.0                                                                               | 0.7                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | D                                                                                 |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 25.4                                                                              | 0.0                                                                               | 0.7                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   |                                                                                   | 0.7                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 59.3%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | B                                                                                 |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |



# HCM Unsignalized Intersection Capacity Analysis 9: Fisher Drive & County Road 13

Total PM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBR                                                                               | NBL                                                                               | NBT                                                                               | SBT                                                                               | SBR                                                                               |
| Lane Configurations               |  |                                                                                   |                                                                                   |  |  |                                                                                   |
| Volume (veh/h)                    | 0                                                                                 | 7                                                                                 | 12                                                                                | 877                                                                               | 666                                                                               | 3                                                                                 |
| Sign Control                      | Stop                                                                              |                                                                                   |                                                                                   | Free                                                                              | Free                                                                              |                                                                                   |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                | 0%                                                                                |                                                                                   |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 0                                                                                 | 8                                                                                 | 13                                                                                | 953                                                                               | 724                                                                               | 3                                                                                 |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   |                                                                                   | None                                                                              | None                                                                              |                                                                                   |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   | 247                                                                               |                                                                                   |                                                                                   |
| pX, platoon unblocked             | 0.66                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 1705                                                                              | 726                                                                               | 727                                                                               |                                                                                   |                                                                                   |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 1810                                                                              | 726                                                                               | 727                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               | 4.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               | 2.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| p0 queue free %                   | 100                                                                               | 98                                                                                | 99                                                                                |                                                                                   |                                                                                   |                                                                                   |
| cM capacity (veh/h)               | 57                                                                                | 428                                                                               | 885                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Direction, Lane #                 | EB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 8                                                                                 | 966                                                                               | 727                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 0                                                                                 | 13                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 8                                                                                 | 0                                                                                 | 3                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 428                                                                               | 885                                                                               | 1700                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.02                                                                              | 0.01                                                                              | 0.43                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 0.4                                                                               | 0.3                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 13.6                                                                              | 0.4                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | B                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 13.6                                                                              | 0.4                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   |                                                                                   | 0.3                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 65.7%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | C                                                                                 |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |

# HCM Signalized Intersection Capacity Analysis

## 10: County Road 5 & County Road 13

Total PM  
2012-10-18

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |  |  |  |  |  |  |  |  |  |  |
| Volume (vph)                      | 261                                                                               | 336                                                                               | 136                                                                               | 88                                                                                | 471                                                                               | 138                                                                               | 173                                                                                | 490                                                                                 | 109                                                                                 | 131                                                                                 | 281                                                                                 | 259                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                                | 6.0                                                                                 | 6.0                                                                                 | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Flt                               | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                               | 1.00                                                                                | 0.85                                                                                | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                               | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (prot)                 | 1750                                                                              | 1842                                                                              | 1566                                                                              | 1750                                                                              | 1842                                                                              | 1566                                                                              | 1750                                                                               | 1842                                                                                | 1566                                                                                | 1750                                                                                | 1842                                                                                | 1566                                                                                |
| Flt Permitted                     | 0.13                                                                              | 1.00                                                                              | 1.00                                                                              | 0.54                                                                              | 1.00                                                                              | 1.00                                                                              | 0.38                                                                               | 1.00                                                                                | 1.00                                                                                | 0.16                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (perm)                 | 239                                                                               | 1842                                                                              | 1566                                                                              | 1001                                                                              | 1842                                                                              | 1566                                                                              | 705                                                                                | 1842                                                                                | 1566                                                                                | 295                                                                                 | 1842                                                                                | 1566                                                                                |
| Peak-hour factor, PHF             | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Adj. Flow (vph)                   | 284                                                                               | 365                                                                               | 148                                                                               | 96                                                                                | 512                                                                               | 150                                                                               | 188                                                                                | 533                                                                                 | 118                                                                                 | 142                                                                                 | 305                                                                                 | 282                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 0                                                                                 | 78                                                                                | 0                                                                                 | 0                                                                                 | 90                                                                                | 0                                                                                  | 0                                                                                   | 67                                                                                  | 0                                                                                   | 0                                                                                   | 203                                                                                 |
| Lane Group Flow (vph)             | 284                                                                               | 365                                                                               | 70                                                                                | 96                                                                                | 512                                                                               | 60                                                                                | 188                                                                                | 533                                                                                 | 51                                                                                  | 142                                                                                 | 305                                                                                 | 79                                                                                  |
| Turn Type                         | pm+pt                                                                             |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   | Perm                                                                              | pm+pt                                                                              |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases                  | 7                                                                                 | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 5                                                                                  | 2                                                                                   |                                                                                     | 1                                                                                   | 6                                                                                   |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 2                                                                                  |                                                                                     | 2                                                                                   | 6                                                                                   |                                                                                     | 6                                                                                   |
| Actuated Green, G (s)             | 41.8                                                                              | 41.8                                                                              | 41.8                                                                              | 26.8                                                                              | 26.8                                                                              | 26.8                                                                              | 33.0                                                                               | 27.0                                                                                | 27.0                                                                                | 29.0                                                                                | 25.0                                                                                | 25.0                                                                                |
| Effective Green, g (s)            | 41.8                                                                              | 41.8                                                                              | 41.8                                                                              | 26.8                                                                              | 26.8                                                                              | 26.8                                                                              | 33.0                                                                               | 27.0                                                                                | 27.0                                                                                | 29.0                                                                                | 25.0                                                                                | 25.0                                                                                |
| Actuated g/C Ratio                | 0.47                                                                              | 0.47                                                                              | 0.47                                                                              | 0.30                                                                              | 0.30                                                                              | 0.30                                                                              | 0.37                                                                               | 0.30                                                                                | 0.30                                                                                | 0.33                                                                                | 0.28                                                                                | 0.28                                                                                |
| Clearance Time (s)                | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                                | 6.0                                                                                 | 6.0                                                                                 | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Vehicle Extension (s)             | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.0                                                                                | 3.0                                                                                 | 3.0                                                                                 | 3.0                                                                                 | 3.0                                                                                 | 3.0                                                                                 |
| Lane Grp Cap (vph)                | 300                                                                               | 867                                                                               | 737                                                                               | 302                                                                               | 556                                                                               | 473                                                                               | 333                                                                                | 560                                                                                 | 476                                                                                 | 162                                                                                 | 519                                                                                 | 441                                                                                 |
| v/s Ratio Prot                    | c0.12                                                                             | 0.20                                                                              |                                                                                   |                                                                                   | 0.28                                                                              |                                                                                   | c0.04                                                                              | c0.29                                                                               |                                                                                     | c0.04                                                                               | 0.17                                                                                |                                                                                     |
| v/s Ratio Perm                    | c0.33                                                                             |                                                                                   | 0.04                                                                              | 0.10                                                                              |                                                                                   | 0.04                                                                              | 0.17                                                                               |                                                                                     | 0.03                                                                                | 0.25                                                                                |                                                                                     | 0.05                                                                                |
| v/c Ratio                         | 0.95                                                                              | 0.42                                                                              | 0.09                                                                              | 0.32                                                                              | 0.92                                                                              | 0.13                                                                              | 0.56                                                                               | 0.95                                                                                | 0.11                                                                                | 0.88                                                                                | 0.59                                                                                | 0.18                                                                                |
| Uniform Delay, d1                 | 22.1                                                                              | 15.5                                                                              | 13.0                                                                              | 23.9                                                                              | 30.0                                                                              | 22.5                                                                              | 21.0                                                                               | 30.3                                                                                | 22.2                                                                                | 27.5                                                                                | 27.5                                                                                | 24.1                                                                                |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Incremental Delay, d2             | 37.5                                                                              | 0.3                                                                               | 0.1                                                                               | 0.6                                                                               | 20.8                                                                              | 0.1                                                                               | 2.2                                                                                | 27.8                                                                                | 0.5                                                                                 | 37.4                                                                                | 4.8                                                                                 | 0.9                                                                                 |
| Delay (s)                         | 59.6                                                                              | 15.8                                                                              | 13.1                                                                              | 24.6                                                                              | 50.7                                                                              | 22.6                                                                              | 23.1                                                                               | 58.1                                                                                | 22.7                                                                                | 64.9                                                                                | 32.3                                                                                | 25.0                                                                                |
| Level of Service                  | E                                                                                 | B                                                                                 | B                                                                                 | C                                                                                 | D                                                                                 | C                                                                                 | C                                                                                  | E                                                                                   | C                                                                                   | E                                                                                   | C                                                                                   | C                                                                                   |
| Approach Delay (s)                |                                                                                   | 30.9                                                                              |                                                                                   |                                                                                   | 41.9                                                                              |                                                                                   |                                                                                    | 45.3                                                                                |                                                                                     |                                                                                     | 35.8                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                    | D                                                                                   |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM Average Control Delay         |                                                                                   |                                                                                   | 38.6                                                                              |                                                                                   |                                                                                   | HCM Level of Service                                                              |                                                                                    |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |
| HCM Volume to Capacity ratio      |                                                                                   |                                                                                   | 0.88                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 88.8                                                                              |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                    |                                                                                     | 12.0                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 89.0%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                    |                                                                                     | E                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

## 11: Jenkins St & County Road 13

Total PM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |                                                                                   |  |                                                                                   |                                                                                   |  |
| Volume (veh/h)                    | 3                                                                                 | 4                                                                                 | 765                                                                               | 1                                                                                 | 3                                                                                 | 502                                                                               |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 3                                                                                 | 4                                                                                 | 832                                                                               | 1                                                                                 | 3                                                                                 | 546                                                                               |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 225                                                                               |
| pX, platoon unblocked             | 0.87                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 1384                                                                              | 832                                                                               |                                                                                   |                                                                                   | 833                                                                               |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 1367                                                                              | 832                                                                               |                                                                                   |                                                                                   | 833                                                                               |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 98                                                                                | 99                                                                                |                                                                                   |                                                                                   | 100                                                                               |                                                                                   |
| cM capacity (veh/h)               | 142                                                                               | 372                                                                               |                                                                                   |                                                                                   | 809                                                                               |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 8                                                                                 | 833                                                                               | 549                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 3                                                                                 | 0                                                                                 | 3                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 4                                                                                 | 1                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 219                                                                               | 1700                                                                              | 809                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.03                                                                              | 0.49                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 0.8                                                                               | 0.0                                                                               | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 22.0                                                                              | 0.0                                                                               | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | C                                                                                 |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 22.0                                                                              | 0.0                                                                               | 0.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   |                                                                                   | 0.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 50.3%                                                                             | ICU Level of Service                                                              |                                                                                   | A                                                                                 |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |

# HCM Unsignalized Intersection Capacity Analysis 12: Dekker St (North Leg) & County Road 13

Total PM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | WBL                                                                               | WBR                                                                               | NBT                                                                               | NBR                                                                               | SBL                                                                               | SBT                                                                               |
| Lane Configurations               |  |                                                                                   |  |                                                                                   |                                                                                   |  |
| Volume (veh/h)                    | 3                                                                                 | 6                                                                                 | 770                                                                               | 5                                                                                 | 17                                                                                | 488                                                                               |
| Sign Control                      | Stop                                                                              |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |
| Grade                             | 0%                                                                                |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 3                                                                                 | 7                                                                                 | 837                                                                               | 5                                                                                 | 18                                                                                | 530                                                                               |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 1407                                                                              | 840                                                                               |                                                                                   |                                                                                   | 842                                                                               |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 1407                                                                              | 840                                                                               |                                                                                   |                                                                                   | 842                                                                               |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |
| p0 queue free %                   | 98                                                                                | 98                                                                                |                                                                                   |                                                                                   | 98                                                                                |                                                                                   |
| cM capacity (veh/h)               | 151                                                                               | 368                                                                               |                                                                                   |                                                                                   | 802                                                                               |                                                                                   |
| Direction, Lane #                 | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 10                                                                                | 842                                                                               | 549                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 3                                                                                 | 0                                                                                 | 18                                                                                |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 7                                                                                 | 5                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 249                                                                               | 1700                                                                              | 802                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.04                                                                              | 0.50                                                                              | 0.02                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 0.9                                                                               | 0.0                                                                               | 0.5                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 20.0                                                                              | 0.0                                                                               | 0.6                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | C                                                                                 |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 20.0                                                                              | 0.0                                                                               | 0.6                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   |                                                                                   | 0.4                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 50.8%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | A                                                                                 |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |

# HCM Unsignalized Intersection Capacity Analysis 13: Collector Road 6 & County Road 13

Total PM  
2012-10-18

|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (veh/h)                    | 30                                                                                | 0                                                                                 | 95                                                                                | 5                                                                                 | 1                                                                                 | 8                                                                                 | 142                                                                                 | 736                                                                                 | 17                                                                                  | 11                                                                                  | 433                                                                                 | 45                                                                                  |
| Sign Control                      |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 33                                                                                | 0                                                                                 | 103                                                                               | 5                                                                                 | 1                                                                                 | 9                                                                                 | 154                                                                                 | 800                                                                                 | 18                                                                                  | 12                                                                                  | 471                                                                                 | 49                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | None                                                                                |                                                                                     |                                                                                     | None                                                                                |                                                                                     |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 1637                                                                              | 1646                                                                              | 495                                                                               | 1716                                                                              | 1661                                                                              | 809                                                                               | 520                                                                                 |                                                                                     |                                                                                     | 818                                                                                 |                                                                                     |                                                                                     |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 1637                                                                              | 1646                                                                              | 495                                                                               | 1716                                                                              | 1661                                                                              | 809                                                                               | 520                                                                                 |                                                                                     |                                                                                     | 818                                                                                 |                                                                                     |                                                                                     |
| tC, single (s)                    | 7.1                                                                               | 6.5                                                                               | 6.2                                                                               | 7.1                                                                               | 6.5                                                                               | 6.2                                                                               | 4.1                                                                                 |                                                                                     |                                                                                     | 4.1                                                                                 |                                                                                     |                                                                                     |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 2.2                                                                                 |                                                                                     |                                                                                     | 2.2                                                                                 |                                                                                     |                                                                                     |
| p0 queue free %                   | 52                                                                                | 100                                                                               | 82                                                                                | 89                                                                                | 99                                                                                | 98                                                                                | 85                                                                                  |                                                                                     |                                                                                     | 99                                                                                  |                                                                                     |                                                                                     |
| cM capacity (veh/h)               | 68                                                                                | 83                                                                                | 574                                                                               | 52                                                                                | 82                                                                                | 383                                                                               | 1047                                                                                |                                                                                     |                                                                                     | 819                                                                                 |                                                                                     |                                                                                     |
| Direction, Lane #                 | EB 1                                                                              | EB 2                                                                              | WB 1                                                                              | WB 2                                                                              | NB 1                                                                              | NB 2                                                                              | SB 1                                                                                | SB 2                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 33                                                                                | 103                                                                               | 5                                                                                 | 10                                                                                | 154                                                                               | 818                                                                               | 12                                                                                  | 520                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 33                                                                                | 0                                                                                 | 5                                                                                 | 0                                                                                 | 154                                                                               | 0                                                                                 | 12                                                                                  | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 0                                                                                 | 103                                                                               | 0                                                                                 | 9                                                                                 | 0                                                                                 | 18                                                                                | 0                                                                                   | 49                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 68                                                                                | 574                                                                               | 52                                                                                | 272                                                                               | 1047                                                                              | 1700                                                                              | 819                                                                                 | 1700                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.48                                                                              | 0.18                                                                              | 0.11                                                                              | 0.04                                                                              | 0.15                                                                              | 0.48                                                                              | 0.01                                                                                | 0.31                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (m)             | 14.6                                                                              | 4.9                                                                               | 2.5                                                                               | 0.8                                                                               | 3.9                                                                               | 0.0                                                                               | 0.3                                                                                 | 0.0                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 98.6                                                                              | 12.6                                                                              | 82.8                                                                              | 18.7                                                                              | 9.0                                                                               | 0.0                                                                               | 9.5                                                                                 | 0.0                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | F                                                                                 | B                                                                                 | F                                                                                 | C                                                                                 | A                                                                                 |                                                                                   | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 33.3                                                                              |                                                                                   | 41.6                                                                              |                                                                                   | 1.4                                                                               |                                                                                   | 0.2                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | D                                                                                 |                                                                                   | E                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 4.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 61.4%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis

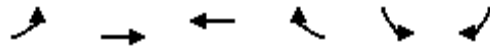
## 14: Main Street Everett & Wales Ave

Total PM  
2012-10-18

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (veh/h)                    | 20                                                                                | 572                                                                               | 8                                                                                 | 28                                                                                | 682                                                                               | 96                                                                                | 7                                                                                   | 7                                                                                   | 12                                                                                  | 35                                                                                  | 18                                                                                  | 15                                                                                  |
| Sign Control                      |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |                                                                                   |                                                                                     | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 22                                                                                | 622                                                                               | 9                                                                                 | 30                                                                                | 741                                                                               | 104                                                                               | 8                                                                                   | 8                                                                                   | 13                                                                                  | 38                                                                                  | 20                                                                                  | 16                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 846                                                                               |                                                                                   |                                                                                   | 630                                                                               |                                                                                   |                                                                                   | 1550                                                                                | 1576                                                                                | 626                                                                                 | 1541                                                                                | 1528                                                                                | 793                                                                                 |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 846                                                                               |                                                                                   |                                                                                   | 630                                                                               |                                                                                   |                                                                                   | 1550                                                                                | 1576                                                                                | 626                                                                                 | 1541                                                                                | 1528                                                                                | 793                                                                                 |
| tC, single (s)                    | 4.1                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |                                                                                   | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 2.2                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |                                                                                   | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 |
| p0 queue free %                   | 97                                                                                |                                                                                   |                                                                                   | 97                                                                                |                                                                                   |                                                                                   | 90                                                                                  | 93                                                                                  | 97                                                                                  | 54                                                                                  | 82                                                                                  | 96                                                                                  |
| cM capacity (veh/h)               | 791                                                                               |                                                                                   |                                                                                   | 952                                                                               |                                                                                   |                                                                                   | 73                                                                                  | 103                                                                                 | 484                                                                                 | 83                                                                                  | 110                                                                                 | 388                                                                                 |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | NB 2                                                                              | SB 1                                                                              | SB 2                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 652                                                                               | 876                                                                               | 8                                                                                 | 21                                                                                | 38                                                                                | 36                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 22                                                                                | 30                                                                                | 8                                                                                 | 0                                                                                 | 38                                                                                | 0                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 9                                                                                 | 104                                                                               | 0                                                                                 | 13                                                                                | 0                                                                                 | 16                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 791                                                                               | 952                                                                               | 73                                                                                | 205                                                                               | 83                                                                                | 164                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.03                                                                              | 0.03                                                                              | 0.10                                                                              | 0.10                                                                              | 0.46                                                                              | 0.22                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (m)             | 0.6                                                                               | 0.8                                                                               | 2.5                                                                               | 2.5                                                                               | 14.5                                                                              | 6.1                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 0.7                                                                               | 0.9                                                                               | 59.7                                                                              | 24.5                                                                              | 81.5                                                                              | 33.1                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | A                                                                                 | A                                                                                 | F                                                                                 | C                                                                                 | F                                                                                 | D                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.7                                                                               | 0.9                                                                               | 34.0                                                                              |                                                                                   | 58.0                                                                              |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      |                                                                                   |                                                                                   | D                                                                                 |                                                                                   | F                                                                                 |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 4.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 68.7%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Unsignalized Intersection Capacity Analysis 15: Main Street Everett & Den Boer Rd

Total PM  
2012-10-18



| Movement                          | EBL  | EBT   | WBT  | WBR                  | SBL  | SBR  |
|-----------------------------------|------|-------|------|----------------------|------|------|
| Lane Configurations               |      | ↰     | ↰    |                      | ↰    |      |
| Volume (veh/h)                    | 10   | 588   | 886  | 71                   | 29   | 6    |
| Sign Control                      |      | Free  | Free |                      | Stop |      |
| Grade                             |      | 0%    | 0%   |                      | 0%   |      |
| Peak Hour Factor                  | 0.92 | 0.92  | 0.92 | 0.92                 | 0.92 | 0.92 |
| Hourly flow rate (vph)            | 11   | 639   | 963  | 77                   | 32   | 7    |
| Pedestrians                       |      |       |      |                      |      |      |
| Lane Width (m)                    |      |       |      |                      |      |      |
| Walking Speed (m/s)               |      |       |      |                      |      |      |
| Percent Blockage                  |      |       |      |                      |      |      |
| Right turn flare (veh)            |      |       |      |                      |      |      |
| Median type                       |      | None  | None |                      |      |      |
| Median storage veh                |      |       |      |                      |      |      |
| Upstream signal (m)               |      |       |      |                      |      |      |
| pX, platoon unblocked             |      |       |      |                      |      |      |
| vC, conflicting volume            | 1040 |       |      |                      | 1662 | 1002 |
| vC1, stage 1 conf vol             |      |       |      |                      |      |      |
| vC2, stage 2 conf vol             |      |       |      |                      |      |      |
| vCu, unblocked vol                | 1040 |       |      |                      | 1662 | 1002 |
| tC, single (s)                    | 4.1  |       |      |                      | 6.4  | 6.2  |
| tC, 2 stage (s)                   |      |       |      |                      |      |      |
| tF (s)                            | 2.2  |       |      |                      | 3.5  | 3.3  |
| p0 queue free %                   | 98   |       |      |                      | 70   | 98   |
| cM capacity (veh/h)               | 668  |       |      |                      | 105  | 294  |
| Direction, Lane #                 | EB 1 | WB 1  | SB 1 |                      |      |      |
| Volume Total                      | 650  | 1040  | 38   |                      |      |      |
| Volume Left                       | 11   | 0     | 32   |                      |      |      |
| Volume Right                      | 0    | 77    | 7    |                      |      |      |
| cSH                               | 668  | 1700  | 118  |                      |      |      |
| Volume to Capacity                | 0.02 | 0.61  | 0.32 |                      |      |      |
| Queue Length 95th (m)             | 0.4  | 0.0   | 9.6  |                      |      |      |
| Control Delay (s)                 | 0.4  | 0.0   | 49.4 |                      |      |      |
| Lane LOS                          | A    |       | E    |                      |      |      |
| Approach Delay (s)                | 0.4  | 0.0   | 49.4 |                      |      |      |
| Approach LOS                      |      |       | E    |                      |      |      |
| Intersection Summary              |      |       |      |                      |      |      |
| Average Delay                     |      | 1.3   |      |                      |      |      |
| Intersection Capacity Utilization |      | 60.9% |      | ICU Level of Service |      | B    |
| Analysis Period (min)             |      | 15    |      |                      |      |      |
|                                   |      |       |      |                      |      |      |

# HCM Unsignalized Intersection Capacity Analysis

## 16: Collector Road 7 & Concession Rd 6

Total PM  
2012-10-18

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBR                                                                               | NBL                                                                               | NBT                                                                               | SBT                                                                               | SBR                                                                               |
| Lane Configurations               |  |                                                                                   |                                                                                   |  |  |                                                                                   |
| Volume (veh/h)                    | 1                                                                                 | 184                                                                               | 427                                                                               | 188                                                                               | 94                                                                                | 1                                                                                 |
| Sign Control                      | Stop                                                                              |                                                                                   |                                                                                   | Free                                                                              | Free                                                                              |                                                                                   |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                | 0%                                                                                |                                                                                   |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              |
| Hourly flow rate (vph)            | 1                                                                                 | 200                                                                               | 464                                                                               | 204                                                                               | 102                                                                               | 1                                                                                 |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (m)                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (m/s)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   |                                                                                   | None                                                                              | None                                                                              |                                                                                   |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (m)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 1235                                                                              | 103                                                                               | 103                                                                               |                                                                                   |                                                                                   |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 1235                                                                              | 103                                                                               | 103                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               | 4.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               | 2.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| p0 queue free %                   | 99                                                                                | 79                                                                                | 69                                                                                |                                                                                   |                                                                                   |                                                                                   |
| cM capacity (veh/h)               | 134                                                                               | 952                                                                               | 1489                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Direction, Lane #                 | EB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 201                                                                               | 668                                                                               | 103                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 1                                                                                 | 464                                                                               | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 200                                                                               | 0                                                                                 | 1                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 922                                                                               | 1489                                                                              | 1700                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.22                                                                              | 0.31                                                                              | 0.06                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (m)             | 6.3                                                                               | 10.2                                                                              | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 10.0                                                                              | 6.8                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | A                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 10.0                                                                              | 6.8                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   | 6.8                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 58.3%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | B                                                                                 |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |



# HCM Signalized Intersection Capacity Analysis

## 17: County Road 5 & Concession Rd 6

Total PM  
2012-10-18

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |  |                                                                                   |  |  |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)                      | 25                                                                                | 531                                                                               | 76                                                                                | 7                                                                                 | 815                                                                               | 544                                                                               | 124                                                                                 | 45                                                                                  | 8                                                                                   | 222                                                                                 | 27                                                                                  | 28                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               |                                                                                   | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Lane Util. Factor                 |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               |                                                                                   | 1.00                                                                              | 0.85                                                                              |                                                                                   | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 0.98                                                                                |                                                                                     | 1.00                                                                                | 0.92                                                                                |                                                                                     |
| Flt Protected                     |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 |                                                                                   | 1838                                                                              | 1566                                                                              |                                                                                   | 1841                                                                              | 1566                                                                              | 1750                                                                                | 1799                                                                                |                                                                                     | 1750                                                                                | 1702                                                                                |                                                                                     |
| Flt Permitted                     |                                                                                   | 0.82                                                                              | 1.00                                                                              |                                                                                   | 0.99                                                                              | 1.00                                                                              | 0.72                                                                                | 1.00                                                                                |                                                                                     | 0.72                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 |                                                                                   | 1519                                                                              | 1566                                                                              |                                                                                   | 1833                                                                              | 1566                                                                              | 1324                                                                                | 1799                                                                                |                                                                                     | 1325                                                                                | 1702                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Adj. Flow (vph)                   | 27                                                                                | 577                                                                               | 83                                                                                | 8                                                                                 | 886                                                                               | 591                                                                               | 135                                                                                 | 49                                                                                  | 9                                                                                   | 241                                                                                 | 29                                                                                  | 30                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 0                                                                                 | 34                                                                                | 0                                                                                 | 0                                                                                 | 205                                                                               | 0                                                                                   | 7                                                                                   | 0                                                                                   | 0                                                                                   | 23                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 0                                                                                 | 604                                                                               | 49                                                                                | 0                                                                                 | 894                                                                               | 386                                                                               | 135                                                                                 | 51                                                                                  | 0                                                                                   | 241                                                                                 | 36                                                                                  | 0                                                                                   |
| Turn Type                         | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                                |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases                  | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     | 6                                                                                   |                                                                                     |
| Permitted Phases                  | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 2                                                                                   |                                                                                     |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     |
| Actuated Green, G (s)             |                                                                                   | 44.3                                                                              | 44.3                                                                              |                                                                                   | 44.3                                                                              | 44.3                                                                              | 18.6                                                                                | 18.6                                                                                |                                                                                     | 18.6                                                                                | 18.6                                                                                |                                                                                     |
| Effective Green, g (s)            |                                                                                   | 44.3                                                                              | 44.3                                                                              |                                                                                   | 44.3                                                                              | 44.3                                                                              | 18.6                                                                                | 18.6                                                                                |                                                                                     | 18.6                                                                                | 18.6                                                                                |                                                                                     |
| Actuated g/C Ratio                |                                                                                   | 0.59                                                                              | 0.59                                                                              |                                                                                   | 0.59                                                                              | 0.59                                                                              | 0.25                                                                                | 0.25                                                                                |                                                                                     | 0.25                                                                                | 0.25                                                                                |                                                                                     |
| Clearance Time (s)                |                                                                                   | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             |                                                                                   | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                                 | 3.0                                                                                 |                                                                                     | 3.0                                                                                 | 3.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                |                                                                                   | 898                                                                               | 926                                                                               |                                                                                   | 1084                                                                              | 926                                                                               | 329                                                                                 | 447                                                                                 |                                                                                     | 329                                                                                 | 423                                                                                 |                                                                                     |
| v/s Ratio Prot                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0.03                                                                                |                                                                                     |                                                                                     |                                                                                     | 0.02                                                                                |                                                                                     |
| v/s Ratio Perm                    |                                                                                   | 0.40                                                                              | 0.03                                                                              |                                                                                   | 0.49                                                                              | 0.25                                                                              | 0.10                                                                                |                                                                                     |                                                                                     | 0.18                                                                                |                                                                                     |                                                                                     |
| v/c Ratio                         |                                                                                   | 0.67                                                                              | 0.05                                                                              |                                                                                   | 0.82                                                                              | 0.42                                                                              | 0.41                                                                                | 0.11                                                                                |                                                                                     | 0.73                                                                                | 0.09                                                                                |                                                                                     |
| Uniform Delay, d1                 |                                                                                   | 10.4                                                                              | 6.5                                                                               |                                                                                   | 12.2                                                                              | 8.3                                                                               | 23.6                                                                                | 21.8                                                                                |                                                                                     | 25.9                                                                                | 21.6                                                                                |                                                                                     |
| Progression Factor                |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             |                                                                                   | 2.0                                                                               | 0.0                                                                               |                                                                                   | 5.2                                                                               | 0.3                                                                               | 0.8                                                                                 | 0.1                                                                                 |                                                                                     | 8.2                                                                                 | 0.1                                                                                 |                                                                                     |
| Delay (s)                         |                                                                                   | 12.4                                                                              | 6.5                                                                               |                                                                                   | 17.4                                                                              | 8.6                                                                               | 24.4                                                                                | 21.9                                                                                |                                                                                     | 34.0                                                                                | 21.7                                                                                |                                                                                     |
| Level of Service                  |                                                                                   | B                                                                                 | A                                                                                 |                                                                                   | B                                                                                 | A                                                                                 | C                                                                                   | C                                                                                   |                                                                                     | C                                                                                   | C                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 11.7                                                                              |                                                                                   |                                                                                   | 13.9                                                                              |                                                                                   |                                                                                     | 23.6                                                                                |                                                                                     |                                                                                     | 31.6                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM Average Control Delay         |                                                                                   | 16.0                                                                              |                                                                                   |                                                                                   | HCM Level of Service                                                              |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM Volume to Capacity ratio      |                                                                                   | 0.80                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   | 74.9                                                                              |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                   |                                                                                     | 12.0                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   | 81.3%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

TRANS  
PLAN  
INC

# Appendix D

**FIGURE 1. LEVEL OF SERVICE (LOS) DEFINITIONS**



**Level of Service A:** Free-flow traffic with individual users virtually unaffected by the presence of others in the traffic stream.



**Level of Service D:** High-density flow in which speed and freedom to maneuver are severely restricted and comfort and convenience have declined even though flow remains stable.



**Level of Service B:** Stable traffic flow with a high degree of freedom to select speed and operating conditions but with some influence from other users.



**Level of Service E:** Unstable flow at or near capacity levels with poor levels of comfort and convenience.



**Level of Service C:** Restricted flow that remains stable but with significant interactions with others in the traffic stream. The general level of comfort and convenience declines noticeably at this level.



**Level of Service F:** Forced traffic flow in which the amount of traffic approaching a point exceeds the amount that can be served. LOS F is characterized by stop-and-go waves, poor travel times, low comfort and convenience, and increased accident exposure.