Community of Colgan

Master Servicing Plan Amendment
Schedule 'B' Class Environmental Assessment

Summary Report

Township of Adjala-Tosorontio
January 2016

Greenland Project No. 13-G-3099

GREENLAND® **International Consulting Ltd.**
120 Hume Street, Collingwood, Ontario, L9Y 1V5
TEL: **705 444-8805** FAX: **705 444-5482** E-MAIL: **greenland@grnland.com** WEBSITE: **www.grnland.com**
Greater Toronto • Collingwood

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

1.0 INTRODUCTION AND BACKGROUND

Greenland International Consulting Ltd. (Greenland) has been retained by the Township of Adjala-Tosorontio (Township) to complete an amendment to the 2010 Master Servicing Plan (MSP) completed by RJ Burnside and Associates (Burnside) for the Community of Colgan water and wastewater servicing. The purpose of this MSP Amendment is to investigate additional water and sanitary servicing options for Colgan and address MOE comments pertaining to the 2010 MSP completed by Burnside.

This Schedule 'B' Environmental Assessment Amendment is being prepared in accordance with the requirements of the Municipal Class Environmental Assessment (Class EA) process. As part of this Amendment to the previous Schedule 'B' Environmental Assessment (2010 MSP), Alternative Solutions will be evaluated, selected, and recommended for implementation.

1.1 BACKGROUND

Existing servicing demands within the Hamlet of Colgan include approximately 71 residential units (RU), and a school (equivalent to approximately 16 RU). The 2010 MSP identified four (4) undeveloped land parcels within the Study Area which have a total area of approximately 155 ha (Areas 1, 2 3 and 4 – see **Figure 1.1: Study Area**).
The property designated as "Development Area 1" (Area 1) by the 2010 MSP consists of 80.7 ha of land located on the northern edge of the Oak Ridges Moraine Environmental Protection Area (ORM). Due to development restrictions within the ORM, only 49.5 ha of the total site area is classified as "developable."
It should be noted, however that some portions of the property which are "undevelopable" may be available to facilitate municipal servicing requirements, subject to applicable approvals.

A Draft Plan for Area 1 is currently on file with the Township and includes development of approximately 315 residential units (RU's) within the developable portion of the site. This corresponds with a unit density of approximately 6.4 RU/ha.

In addition to Area 1, a draft plan is currently on file with the Township for "Development Area 2" (Area 2), as identified in the 2010 MSP. This property is located on the north side of County Road 14, immediately north of Area 1 and consists of approximately 34.1 ha of developable property (with a total parcel size of 39.9 ha). The Draft Plan for this property currently proposes development of 307 residential units, and a nursing home with 170 beds, which for the purposes of this assessment (and as shown in the draft plan for this development) has been considered equivalent to approximately 170 additional RU from a servicing perspective. This corresponds with a unit density of approximately 9.0 RU/ha not including the proposed nursing home.

Two (2) additional undeveloped properties (designated Area 3 and Area 4 in the Colgan MSP) are located to the east of Area's 1 and 2. No draft plans have been submitted for these properties to date. Area's 3 and 4 have approximately 9 ha of developable area (16.9 ha total), and 4.5 ha of

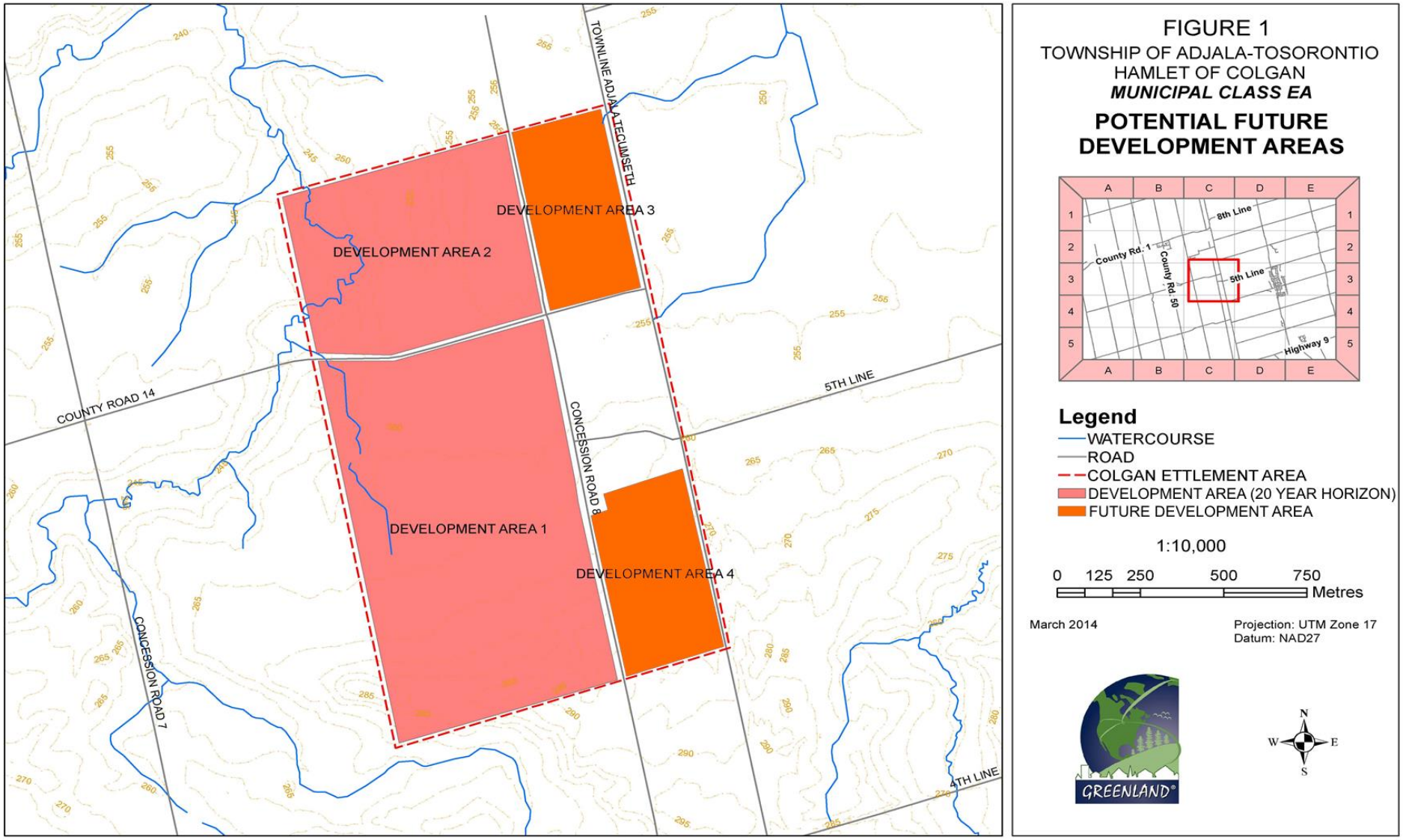


Figure 1.1: Study Area

developable area (17.6 total), respectively. For the purpose of determining servicing allotment for Area's 3 and 4, a conservative rate of 10 RU/ha has been assigned.

The distribution of developable land area and proposed population and development units by land parcel is summarized in **Table 1-1**.

Table 1-1: Land Use and Equivalent Population

Parcel #	Dev. Area (ha)	% of Total Developable	Total Area	% of Total by Area	Proposed Units (Ultimate)	Pop/ Unit	Equiv Pop.
1	49.5	51.0%	80.7	52.0%	315	2.67	841
2	34.1	35.1%	39.85	25.7%	477	2.67	1274
3	9.0	9.3%	16.9	10.9%	90	2.67	240
4	4.5	4.6%	17.6	11.4%	45	2.67	120
Existing	N/A	N/A	N/A	N/A	87	2.67	232
Total	**97**	**100.0%**	**155**	**100.0%**	**1014**	**2.67**	**2707**

It should be noted that both Area 1 and Area 2 have been approved for development by the Ontario Municipal Board (OMB) subject to the availability of servicing.

1.2 PROPOSED DEVELOPMENT PLAN

1.2.1 Description of the Study Area

The Hamlet of Colgan is a small community within the Township of Adjala-Tosorontio and is located north of Hwy. 9 and east of Hwy. 50 and is bordered on the east side by the Adjala-New Tecumseth Townline, and to the south by the Oak Ridges Moraine (ORM). Colgan is located approximately 35 km northwest of the northern border of the Greater-Toronto Area and 40 km south of the City of Barrie. The Township and its villages/towns and hamlets have been noted to 'strike a wonderful balance of lifestyle and opportunity due to their close proximity to major infrastructure while still maintaining small town characteristics. The Hamlet of Colgan and Township of Adjala-Tosorontio are located within the County of Simcoe.

1.2.2 Project Objectives and Approach

The goals of this Master Servicing Study Amendment are to provide a re-evaluation of servicing strategies for the community of Colgan and determine an environmentally friendly, economically sustainable solution which will allow for full servicing of development proposed to be constructed within the community over the next 20 years. The goal of this re-evaluation is also to determine solutions which will facilitate a complete community in a conflict free environment that will protect and enhance the rural character of the Township.

1.3 THE CLASS ENVIRONMENTAL ASSESSMENT PROCESS

The Class Environmental Assessment process is carried out in five (5) phases:

- Phase 1: The problem is identified.
- Phase 2: Alternative methods of resolving the problem are identified, environmental impacts are considered and a preferred solution is chosen.
- Phase 3: Alternative design concepts are identified for the preferred solution selected in Phase 2. Environmental impacts are considered, and a preferred design concept is chosen.
- Phase 4: The preparation of an Environmental Study Report (ESR) which summarizes the work completed in Phases 1 to 3.
- Phase 5: The project is implemented and any monitoring provisions and commitments made during the EA process must be followed.

This process is shown schematically in **Figure 1.2: Class EA Process**.

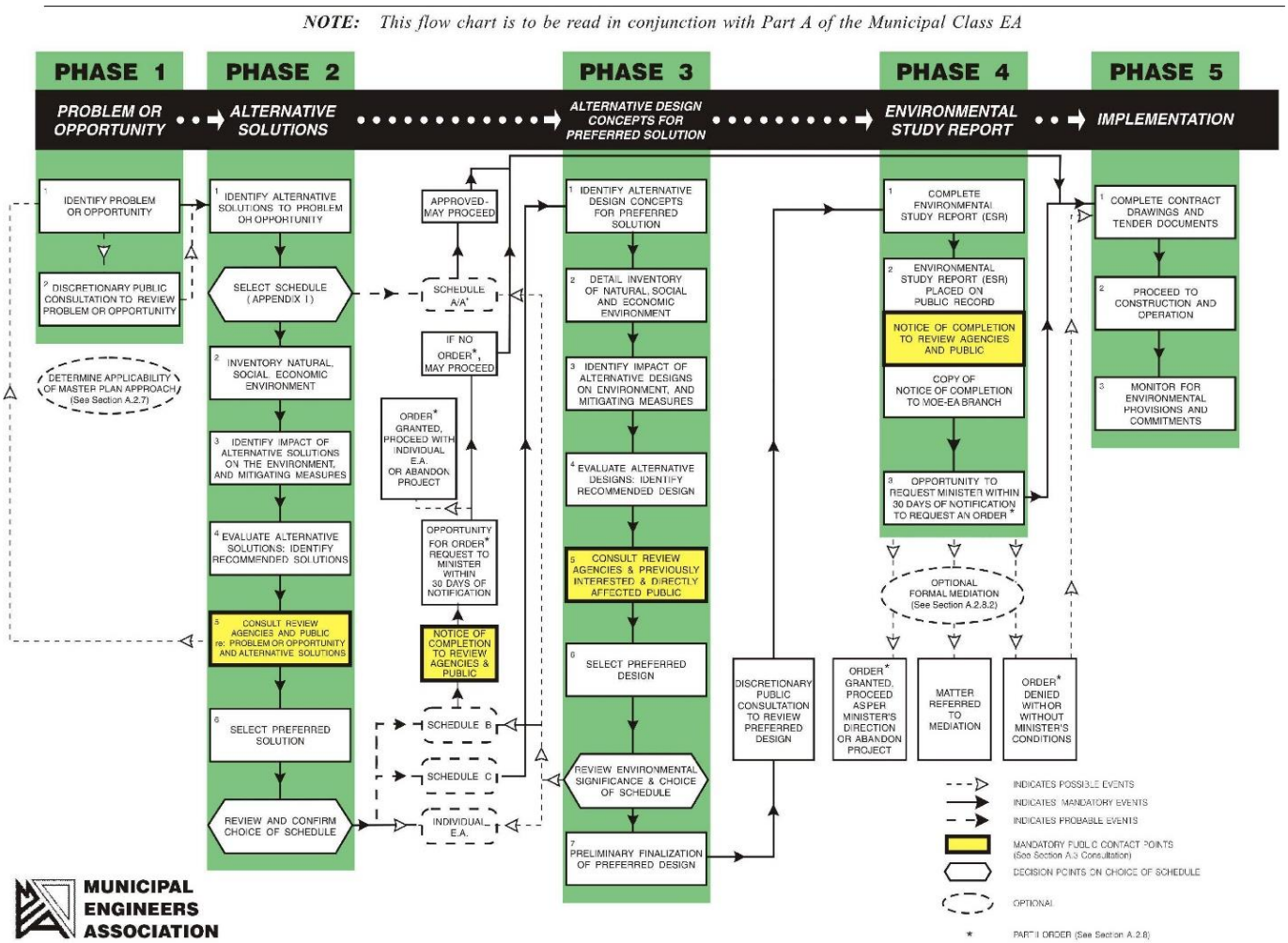


Figure 1.2: Class EA Process

Projects subject to the Class EA process are classified into four (4) possible "Schedules" depending on the degree of potential impact on the environment; Schedule 'A', Schedule A+, Schedule 'B' and Schedule 'C'.

Schedule 'A' and 'A+' projects are considered exempt from detailed evaluation requirements while Schedule 'B' projects are approved subject to agency screening. Schedule 'C' projects require the completion of a Class Environmental Assessment and the filing of an Environmental Study Report documenting the process.

Schedule 'A' Projects

Schedule 'A' type projects are considered minor operation and maintenance activities and are selected for pre-approval without requirements for further assessment. Projects that fall under this classification are typically limited in scale and present minimal adverse impacts to the surrounding environment. An example of a Schedule 'A' project would include minor upgrades or extension of existing potable water or sanitary piping systems within a municipal system. This type of project is pre-approved and the proponent may proceed without following the procedures set out in any other part of the Class EA process.

Schedule 'A+' Projects

As part of the 2007 amendments to the Municipal Class EA process, Schedule A+ was introduced. Although Schedule A+ projects are pre-approved (like Schedule A), it is required that the public be advised prior to the project implementation. The purpose of this is "to ensure some type of public notification for certain projects that are pre-approved under the Municipal Class EA" (Municipal Class EA). An example of a Schedule 'A+' project would be surface improvements made to a road and/or a road reconstruction project.

Schedule 'B' Projects

These projects require screening of alternatives for their environmental impacts and completion of Phases 1 and 2 of the Class EA planning process. If outstanding issues remain after the public review period, any party may request that the Minister of the Environment consider a Part II Order (also known as bumping-up the project) to elevate the project to a more stringent process (Schedule 'C' or an Individual Environmental Assessment). Provided no significant impacts are identified and no requests for a Part II order are received, Schedule 'B' projects are approved and may proceed directly to Phase 5: Implementation. Schedule B projects generally include improvements and minor expansions to existing facilities. An example of a Schedule 'B' wastewater project would be the establishment, extension or enhancement of a sanitary system and all required works to connect the system to an existing sanitary outlet. The facilities must not be in an existing road allowance or utility corridor.

Schedule 'C' Projects

Schedule 'C' projects have the potential for significant environmental effects and therefore must proceed under the full planning and documentation procedures of the Class EA process. Schedule C projects require that an Environmental Study Report (ESR) be prepared and filed for review by the public and review agencies and generally consist of construction of new facilities and major expansions to

existing facilities. Phase 3 involves the identifying alternative methods for carrying out the project and public consultation for the preferred conceptual design. Phase 4 includes preparation of an Environmental Study Report that is filed for public review. If no significant impacts are identified and no requests for a Part II order are received, Schedule 'C' projects are then approved and may proceed to Phase 5: Implementation. An example of a Schedule 'C' project would be construction of a new sanitary system, including the construction of treatment facility and/or an outfall to a receiving water body and/or a constructed wetland for treatment.

The Colgan Master Servicing Plan Amendment will complete Phases 1 and 2 of the Class EA process, which began as part of the initial 2010 MSP Study. As such, all Schedule 'B' projects identified in this Master Servicing Plan can proceed to Phase 5, Implementation on completion of this Master Servicing Plan Class EA. Schedule 'C' projects identified in the Master Servicing Plan will need to proceed to Phases 3 and 4 of the Class EA process prior to proceeding to Implementation (Phase 5).

1.4 PROJECT ORGANIZATION

The Township of Adjala-Tosorontio approved the project in December 2013.

1.4.1 Project Team

A project team was established at the outset to provide guidance in the decision-making process and to ensure that all issues were adequately addressed. With Greenland providing the prime consultant services, the following sub-consultants have been retained to assist in the preparation of this document:

- Golder Associates (GA): Preliminary Hydrogeological Investigations;
- Plan B Natural Heritage (PB): Natural Environment Background Report; and,
- Timmins Martelle Heritage Consultants Inc. (TMHC): Archaeological Assessment Update Report.

1.4.2 MOE Pre-Consultation Meeting

An initial pre-consultation meeting was held for the project on September 25, 2014 at the Township offices with representatives from the MOE, Township, Greenland and stakeholders in attendance. Pre-consultation was also held at the MOE offices in Toronto to discuss the Assimilative Capacity Study (ACS).

1.5 PUBLIC INVOLVEMENT

Public consultation is an important part of any Class EA Process, and extensive consultation with the affected public has been carried out throughout all stages of the Colgan Master Servicing Plan Amendment (MSPA). Notices associated with the process have been provided in **Appendix A-1**, with copies of all presentations provided in **Appendix A-2**.

A record of all comments received from members of the public and from relevant approvals agencies can be found in **Appendix A-3**.

1.5.1 Notice of Commencement

The Notice of Study Commencement (NOSC) was sent to the agency and stakeholder mailing list, posted on the Town's website (http://www.townshipadjtos.on.ca). Copies of the NOSC and associated circulation lists can be found in the Public Consultation Record (**Appendix A-1**).

1.5.2 Public Information Centre (PIC) No. 1

A notice of the Public Open House (PIC) No. 1 was sent to the agency and stakeholder mailing list as revised with individuals requesting to be kept informed throughout the project process following issuance of the Notice of Commencement. It was also published on the Township's website and in the local newspaper, the Thursday Herald two weeks prior to the hosting of the PIC. The Notice for PIC No. 1 is provided in **Appendix A-1**.

PIC No. 1 was held on Wednesday 20 May 2015 from 3:00 PM to 7:00 PM in the Public Room at 7855 30th Sideroad Adjala. The purpose of the meeting was to present:

- The Class EA process;
- The study area and a summary of existing conditions;
- The evaluation of water supply, supply, distribution and storage, and wastewater collection, treatment, and disposal alternatives and,
- The next steps in the project and the Class EA process.

The PIC No. 1 presentation, display panels and hand-out material are provided in **Appendix A-2.** The public and review agencies had the opportunity to review the Class EA material and provide input on the information provided to date. A handout summarizing the information was available together with a comment sheet to be completed and returned as desired.

Three (3) comment sheets were returned and two (2) letters from members of the public were received following PIC No. 1. Comments were also received from the Ministry of Tourism, Culture and Sport (MTCS) and the County of Simcoe following PIC No. 1. Comments from the MOE were also provided in advance of the PIC based on draft information from the pre-consultation process. Copies of received comments and responses issued by Greenland and the Township to each are provided in **Appendix A-3**.

1.5.3 Issuance of Notice of Completion

The notice of Completion for the Colgan Master Servicing Plan Amendment Environmental Class Environmental Assessment Summary Report was published on January 14, 2016.

The notice was sent to the agency and stakeholder mailing list as revised with individuals requesting to be kept informed throughout the project process following issuance of the Notice of Commencement and subsequent PIC. The notice was also published on the Township's website and in the Thursday Herald.

A copy of the Notice of Completion is provided in **Appendix A-1**.

1.6 REPORT ORGANIZATION

The purpose of this Environmental Summary Report (Report) is to provide details on the development and comprehensive evaluation of servicing alternatives for water and wastewater infrastructure within the Study Area.

In accordance with the intentions of the Class EA process, preliminary consideration was given to all potential solutions, including (but not limited to) a "do nothing" option, and servicing options which facilitate both the partial and full build-out scenarios within the study area, including those previously considered in the 2010 MSP.

The process of preliminary consideration generally included screening of the long list of options against preliminary assessment criteria to arrive at a short list of servicing solutions for additional detailed evaluation. These shortlisted solutions were then evaluated in terms of their impacts to the social and natural environments as well as on the basis of their technical and economic merits to arrive at a preferred servicing solution for each infrastructure category.

This Report has been structured in order to provide a detailed summary of this process, which can generally be summarized as follows:

- Summary of Background Information and Development of a Study Area Profile;
- Development of Evaluation Criteria and Screening Methodology for Servicing Options;
- Long List of Wastewater Collection, Conveyance Technology, Treatment and Disposal Alternatives;
- Preliminary Evaluation and Summary of Shortlisted Wastewater Collection and Treatment Alternatives;
- Detailed Evaluation and Selection of Preliminary Preferred Wastewater Collection, Conveyance Technology, Treatment and Disposal Solution;
- Long List of Water Supply, Treatment and Storage Alternatives;
- Preliminary Evaluation and Summary of Shortlisted Water Supply, Treatment and Storage Alternatives;
- Detailed Evaluation and Selection of Preliminary Preferred Water Supply, Treatment and Storage Solutions;
- Summary of Overall Preferred Servicing Solutions; and,
- Development of Mitigation Strategies for Implementation and Phasing of the Preferred Solutions.

2.0 STUDY AREA PROFILE

The following subsections expand upon the background info presented in **Chapter 1** to provide a detailed existing conditions profile of the Study Area.

2.1 EXISTING CONDITIONS LAND USE PROJECTIONS

A number of assumptions were made with respect to projected Land Use and future water and sanitary sewage servicing demands within the study area (summarized in **Section 1.1** and depicted in **Figure 1.1: Study Area**). This information is summarized in the following Tables and forms the basis of the analysis presented in this EA Amendment. **Table 2-1** presents the proposed land use within the study area under the ultimate buildout scenario.

Table 2-1: Land Use and Equivalent Population

Parcel #	Dev. Area (ha)	% of Total Developable	Total Area	% of Total by Area	Proposed Units (Ultimate)	Pop/ Unit	Equiv Pop.
1	49.5	51.0%	80.7	52.0%	315	2.67	841
2	34.1	35.1%	39.85	25.7%	477	2.67	1274
3	9.0	9.3%	16.9	10.9%	90	2.67	240
4	4.5	4.6%	17.6	11.4%	45	2.67	120
Existing	N/A	N/A	N/A	N/A	87	2.67	232
Total	**97**	**100.0%**	**155**	**100.0%**	**1014**	**2.67**	**2707**

2.2 NATURAL HERITAGE AND HYDROGEOLOGICAL FEATURES

The Study Area can be described as a mosaic of agricultural land with remnant natural areas associated with the local drainage system and low-lying depressions. Intact deciduous forest and conifer plantations are associated with sloping topography in the southern end of the study area, in conjunction with the Oak Ridges Moraine. The study area also contains a golf course, and sewage lagoons and related infrastructure of the Tottenham waste water treatment plant (WWTP).

The study area is located within the Innisfil Creek Subwatershed, which is considered the most degraded subwatershed in the NVCA jurisdiction (*Innisfil Creek Watershed Report Card*, NVCA 2013). The watercourses within the study area include Keenansville Creek and tributaries to Bailey Creek (Camplin Branch). These watercourses exhibit "below-potential" attributes due to intensive agricultural land use and the lack of riparian cover. Unimpaired reaches occur within the headwater areas associated with the Oak Ridges Moraine. Keenansville Creek is a coldwater stream that provides habitat for brook trout. Portions of the study area exhibit high groundwater vulnerability, whereas other areas (e.g. ORM portion) provide a significant groundwater recharge function, which contributes to the maintenance of stream baseflow, water quality (temperature), and wetland hydrology. The areas of high groundwater vulnerability are associated with low lying areas and riparian zones where the water table is at or near the surface.

From a topographic standpoint, the study area is gently undulating to rolling with knob/hollow relief associated with the Oak Ridges Moraine. The soils are comprised of imperfectly drained silty clay loam and well drained sandy loam associated with the Schomberg Clay Plain and the Oak Ridges Moraine. The major soil types present include Alliston sandy loam, Schomberg silty clay loam, Smithfield silty clay loam, Tioga sandy loam and Bookton sandy loam (Hoffman et al. 1962). The soils of Simcoe County are underlain by rocks of the Ordivician, Silurian and Precambrian ages. Limestones of the Black River, Trenton, Medina, Cataract and Lockport formations and shales of the Utica, Queenston and Richmond formations are also present (Hoffman et al., 1962). From a physiographic standpoint, the study area is located within the Schomberg Clay Plain and Oak Ridges Moraine physiographic regions of Southern Ontario (Chapman and Putnam 1984).

Remnant natural features within the study are mainly associated with the watercourses and associated floodplains and valley slopes. Isolated wetlands (swamp, marsh) are associated with imperfectly to poorly drained soils in low lying areas. Deciduous forest and conifer plantations occur in areas with better drained soils, namely in the southern section, in association with the sloping relief of the Oak Ridges Moraine.

The wetlands within the study area are regulated by the Nottawasaga Valley Conservation Authority (NVCA) under their *Development, Interference with Wetlands and Alterations to Shorelines and Watercourses* regulation. They occur in low lying areas and floodplains, and consist primarily of deciduous/mixed swamp communities dominated by a mixture of balsam fir, white spruce, eastern hemlock, eastern white cedar, tamarack, trembling aspen, balsam poplar, white elm, white/yellow birch and black ash. Inclusions of cattail and reed canary grass marsh, willow/dogwood thicket swamp, and cedar swamp are associated with the swamp communities. Adjacent upland habitats support a mixture of mixed and deciduous forest associations. Typical species present include sugar maple, red maple, American beech, white ash, white pine, eastern hemlock, eastern white cedar, black cherry, ironwood, basswood and white birch.

The upland and wetland communities associated with Keenansville Creek are part of a larger core natural area and corridor that provides an important linkage connection between the Oak Ridges Moraine to the south and the Nottawasaga River to the northeast. This landscape scale corridor provides an important connection between major core natural areas within the landscape.

Colgan is serviced by three Municipal wells that are located at the south end of the study area. The wellhead protection zone for these wells extends to the southwest of the hamlet. The wells are under direct influence of surface water (GUDI) and additional treatment is provided accordingly.

Due to the impaired water quality in the area, there is limited fisheries potential due to the limited quantities of good quality habitat; including the tributaries surveyed for this report. The study area does not contain provincially, federally or locally designated sensitive features or areas such as PSWs, ESAs or ANSIs. There are also no designated aquatic species at risk documented in water bodies or ponds near the existing Colgan Wells. With proper mitigation and performance monitoring, the natural heritage features and functions within the study area can be protected for the long-term, in

accordance with the policy direction of the Provincial Policy Statement (2014). For more information, including existing conditions Mapping please see the *Natural Heritage Assessment Study* (Plan B, 2015 – **Appendix B**), and *PTTW Application Report* (Golder, 2014 – **Appendix B**).

2.3 ARCHAEOLOGICAL AND CULTURAL HERITAGE FEATURES

A Stage 1 archaeological assessment was conducted by Timmins Martelle Heritage Consultants (TMHC) for potential servicing routes for the Colgan development area in Adjala and Tecumseth Geographic Townships, Simcoe County. It is anticipated that the majority of the routes will travel along existing rights-of-way or through previously assessed future development land. A map based review established that the majority of the rights-of-way had low archaeological potential due to prior disturbance, steep slopes and low-lying and wet conditions. However, some portions of visually unimpacted land exist in some right-of-way areas. Further, the majority of lands outside of the rights-of-way generally retain archaeological potential and consist of residential lots, agricultural lands and natural areas. Archaeological potential is indicated by proximity to watercourses (Beeton Creek and tributaries, Bailey and Keenansville Creeks, tributaries of the Nottawasaga River), registered archaeological sites, 19th century structures, settlement areas and thoroughfares.

Stage 2 survey is recommended for all lands exhibiting archaeological potential and that have not been previously assessed. Further concern exists for a proposed trunk sewer along St. James Lane, which runs adjacent to an active cemetery and its potter's field. This route will also require construction monitoring or a cemetery boundary investigation. Once construction plans are finalized these should be compared to the archaeological potential mapping with further field review undertaken to finalize Stage 2 assessment areas and methodologies. The TMHC report is provided in **Appendix B**.

2.4 EXISTING CONDITIONS WATER SERVICING CONDITIONS

Colgan is currently serviced by a Municipal well system with an approved average daily water taking capacity of 262,900 L/d as per MOE Permit to Take Water (PTTW) #6378-8LGM36 (expiry date, June 1, 2018). The water distribution system in Colgan consists of approximately 2,100m of 150mm diameter PVC watermain. The system currently includes 90 m^3 of water storage and no fire protection (i.e. hydrants, reservoir storage).

The 2010 MSP does not provide detailed recommendations with respect to water servicing, as construction of the above referenced well facilities (approved as part of a 2005 Water Servicing Class EA) was ongoing at the time of the 2010 MSP. The general recommendations of the 2010 MSP were to request an increase to the existing permit to take water (PTTW) for Colgan when 85% of the existing PTTW capacity is reached.

The residual servicing capacity of the current system is minimal and the Township submitted a revised PTTW application in 2010 to increase the maximum capacity of the system to approximately 1.3 Million L/d, and has since completed additional studies, in coordination with the MOE in support of a revised application to increase the capacity to 986,000 L/d – a history of this process is provided in correspondence from the MOE included as part of the Public Consultation Record for this Class EA

Amendment (see **Appendix A**). The initial correspondence indicated that the MOE is generally in agreement with the proposal to increase water taking from the aquifer, subject to additional pump-testing which accurately simulates future build-out water taking activities.

2.5 PROPOSED ULTIMATE WATER SERVICING CONDITIONS

As part of this MSP Amendment, water storage and distribution options were re-assessed for future conditions based on the updated supply system capacity and in accordance with the Class EA process. Recommendations for additional studies and approvals to support the proposed options will be provided (i.e. completion of required pump tests, acquisition of the final PTTW and mitigation and monitoring). These systems were not discussed in detail in the 2010 MSP. Modelling of the existing and proposed systems was completed by Golder Associates as part of this EA Amendment to verify aquifer capacity under interim and ultimate development conditions. In accordance with the EA process, other solutions were also considered.

Water demands required to service the ultimate buildout are presented in **Table 2-2**.

Table 2-2: Projected Water Demands - Ultimate Development Scenario

Parcel #	Proposed Units (All Phases)	Pop/ Unit	Equiv Pop.	Water L/c/d	Avg. Water Demand (cu.m/d)	Max Daily** Water Demand (cu.m/d)
1	315	2.67	841	240	202	343
2*	477	2.67	1,274	240	306	520
3	90	2.67	240	240	58	98
4	45	2.67	120	240	29	49
Existing	87	2.67	232	240	56	95
Total	**1,014**	**2.67**	**2,707**	**240**	**650**	**1105**

* Parcel 2 includes a nursing home with 170 beds, each bed being considered one equivalent unit from a water demand perspective

** Peaking Factor = 1.7

2.6 EXISTING CONDITIONS WASTEWATER SERVICING CONDITIONS

The Hamlet of Colgan is not currently serviced by any centralized wastewater treatment and disposal system, and as such, no wastewater collection infrastructure exists within the Community. All existing properties are currently serviced by onsite subsurface disposal septic systems.

The 2010 MSP preferred solution includes the construction of a subsurface wastewater treatment facility which would service all development within Colgan. Preliminary hydrogeologic assessments by Golder Associates (2006) and concept level facility design as submitted to the MOE suggest that treated effluent can be disposed at a rate of 395 m^3/d to a leaching field which is partially located within the Oak Ridges

Moraine (ORM). It should be noted that this effluent disposal rate on its own cannot facilitate the servicing needs of the entire community under ultimate development conditions.

The MOE has expressed through their comments to Burnside (see **Appendix A**), that they do not believe that adequate consideration and assessment of a surface water disposal option was carried out during the course of the 2010 MSP process. The 2010 MSP states that a detailed assimilative capacity ACS study would be required to properly assess this option, and dismisses it on this basis. As such, this Summary Report includes additional assimilative capacity assessment and study.

2.7 DETAILED ASSIMILATIVE CAPACITY STUDY

Additional assimilative capacity assessment modelling has been completed as part of the background investigation for the Colgan MSP Amendment, and accounted for four (4) potential effluent discharge scenarios:

(i.) Colgan WWTP discharging to Keenansville Creek;
(ii.) Colgan WWTP discharging via sub-surface tile bed and surface discharge with storage of flows during low flow parts of the year with treated effluent;
(iii.) Colgan WWTP discharging to Bailey Creek at Keenansville Road; and
(iv.) Expansion of Tottenham WWTP to accommodate Colgan flows with effluent concentrations consistent with proposed CofA requirements for proposed facility.

In general, the scope of work for this assessment included:

- Review and summarize previous studies by Azimuth, Stantec, R.J. Burnside and Genivar whose work have all applied mass balance approaches to nutrient loading (see **Appendix C** for detailed references);
- Compile available water quality and flow monitoring data within the Beeton, Bailey and Keenansville Creek subwatersheds;
- After evaluating all available flow and water quality data, recommend further monitoring, as needed, to validate watershed modelling and assimilative capacity assessments;
- Coordinate and undertake additional water quality sampling events and obtain analysis by Maxxam Analytics;
- From the existing Nottawasaga River watershed model, re-delineate Keenansville, Bailey and Beeton Creek drainage areas at a higher resolution and with specific node (catchment outlet) locations;
- Validate stream geometry (width, length, slope) inputs in the CANWET model derived from terrain modelling;
- Update previous CANWET calibration of the upper Nottawasaga for hydrology and water quality with specific consideration for Colgan and Tottenham locations;
- Review previous assessments of 7Q20 critical low flow conditions at Colgan and re-evaluate as necessary;
- Research and establish appropriate in-stream water quality decay coefficients and appropriate justification; and,

- Scenario analysis for short listed alternative solutions and recommended mitigation and load off-setting measures including consideration of selected approaches proposed in previous studies.
- Consultation with MOE (summarized in Appendix A) and associated updates and revisions to the ACS methodology, summarized in the ACS Report Addendum (May, 2015, see **Appendix C**)

The study confirms that capacity exists in Keenansville, Bailey and Beeton Creeks to accept treated effluent in an amount consistent with the requirements of the proposed Colgan build-out. However, the receiving water courses are constrained by high ambient phosphorus concentrations that make them Policy 2 receivers based on downstream monitoring data.

Due to the relatively low dilution potential under the design flow conditions (7Q20), it has been determined that a relatively high level of effluent treatment is required in order to prevent further degradation to a Policy 2 receiver. Phosphorus in effluent from a new Colgan facility discharging to Keenansville Creek year-round (scenario (i)) would need to achieve 0.05 mg/L total phosphorus. Use of combined storage and subsurface discharge (scenario (ii)) would permit surface discharge of a portion of the treated effluent at 0.1 mg/L during nine (9) months of the year. Discharging further downstream into Bailey Creek (scenario (iii)) where there is a higher level of available dilution would permit a 0.1 mg/L total phosphorus concentration in discharge.

Additional flow from an expanded Tottenham facility would need to achieve slightly better than the facility's current operational performance, reducing effluent concentration to 0.05 mg/L.

Given the Town of New Tecumseth's intention to upgrade and replace the Tottenham facility and to offset loads from the Tottenham, Alliston and Regional WWTPs, that it operates, at a 4:1 ratio through an agreement with the NVCA and the MOE, there may be some efficiencies of scale to be realized through further discussions with the Town of New Tecumseth. Where the proposed flows from Colgan represent less than 25% of the rated capacity of the Tottenham WWTP and a much smaller fraction of the total load from the three (3) New Tecumseth WWTPs, these additional flow and loads might easily be absorbed into the currently proposed plants.

A copy of the final *Assimilative Capacity Study Report for Keenansville and Bailey Creeks* (including the May 2015 Addendum resulting from MOE Consultation) is provided in **Appendix C**.

2.8 PROPOSED ULTIMATE WASTEWATER SERVICING CONDITIONS

In light of the ACS results, this MSP Amendment revisited the preliminary sanitary servicing options assessment stage of the EA process. This Amendment identified additional servicing alternatives for evaluation, based on the additional ACS work and with regard for servicing options which facilitate ultimate build-out of the development area.

Greenland has completed wastewater flow calculations using values derived from our review of the existing background information. Estimated flows for the ultimate full build-out scenario are summarized in **Table 2-3** below.

Table 2-3: Sanitary Flow Calculations - Ultimate Development Scenario

Parcel #	Proposed Units	Pop/ Unit	Equiv Pop.	Per Capita Flow (L/c/d)	Infiltration Allowance (L/c/d)	Avg. Sanitary Flow (cu.m/d)	Sanitary Peak** Flow (cu.m/d)
1	315	2.67	841	240	90	278	778
2*	477	2.67	1,274	240	90	420	1178
3	90	2.67	240	240	90	79	222
4	45	2.67	120	240	90	40	111
Existing	87	2.67	232	240	90	77	215
Total	**1,014**	**2.67**	**2,707**	**240**	**90**	**893**	**2505**

* Parcel 2 includes a nursing home with 170 beds, each bed being considered one equivalent unit from a water demand perspective

** Harmon Peaking factor = 3.48 (Applied only to the Per Capita Flow Component)

2.9 20 YEAR DEVELOPMENT PROJECTIONS

Although consideration will be given to the proposed ultimate development conditions throughout the course of this MSP Amendment, it is not anticipated that full build-out will occur in the near future. As such, the primary focus with respect to near term solutions within this MSP Amendment will be on growth occurring within a twenty (20) year horizon. It is anticipated that during this time, development will be contained within Area 1 and Area 2 and the nursing home facility proposed for Area 2 (approximately 170 units) will not be constructed.

Table 2-4 presents the anticipated Water demands for the 20 year horizon. Sewage flows for the 20 year horizon are presented in **Table 2-5**.

Table 2-4: Projected Water Demands – 20 Year Development Horizon

Parcel #	Proposed Units (All Phases)*	Pop/ Unit	Equiv Pop.	Water L/c/d	Avg. Water Demand (cu.m/d)	Max Daily* Water Demand (cu.m/d)
1	315	2.67	841	270	227	386
2	307	2.67	820	270	221	376
3	0	2.67	0	270	0	0
4	0	2.67	0	270	0	0
Existing	87	2.67	232	210**	49	83
Total	**709**	**2.67**	**1893**	**270**	**497**	**845**

* Peaking factor = 1.7, Based on Measured Water Use Data

** Existing ADF = 210 L/c/d, Based on Measured Water Use Data

Table 2-5: Sanitary Flow Calculations – 20 Year Development Horizon

Parcel #	Proposed Units	Pop/ Unit	Equiv Pop.	Per Capita Flow (L/c/d)	Infiltration (L/c/d)	Avg. Sanitary Flow (cu.m/d)	Sanitary Peak Flow (cu.m/d)
1	315	2.67	841	270	90	303	893
2	307	2.67	820	270	90	295	871
3	0	2.67	0	270	90	0	0
4	0	2.67	0	270	90	0	0
Existing	87	2.67	232	210**	90	70	197
Total	**709**	**2.67**	**1893**	**270**	**90**	**668**	**1960**

* Harmon Peaking factor = 3.60 (Applied only to the Per Capita Flow Component)
** Existing ADF = 210 L/c/d, Based on Measured Water Use Data

2.10 UPDATE TO MSP PROBLEM AND OPPORTUNITY STATEMENT

The problem/opportunity statement that is the basis for this study is as follows:

> *The Objective of the Colgan Master Servicing Plan Class EA Amendment is to identify and select preferred alternative water supply and storage and wastewater collection, treatment and disposal servicing strategies for the Community of Colgan's anticipated 20 year development horizon which minimizes impacts to both the natural and social environments and are both technically feasible and economically sensible.*

3.0 EVALUATION PROCESS

The purpose of this Chapter is to provide details on the methodology that was employed to develop and evaluate alternative servicing solutions for the Study Area. Critical components of the evaluation methodology discussed in this chapter include:

- Development of environmental evaluation criteria;
- Development of a long list of servicing alternatives;
- Screening of servicing alternatives;
- Development of a short-list of servicing alternatives; and,
- Detailed evaluation and selection of a recommended preferred interim wastewater servicing alternative.

3.1 EVALUATION CRITERIA

In order to evaluate proposed alternative solutions, each of the servicing alternatives presented in the MSP Amendment were assessed with respect to their strengths and weaknesses in terms of the following general criteria:

- Natural Environment Impacts:
  - Impacts of the option to vegetation, wildlife and the Natural Environment; and
  - Surface and groundwater quality and quantity implications;

- Social / Cultural Environment Impacts:
  - Land Use and Archaeological Considerations;
  - Required agreements (i.e. inter-municipal approvals)
  - Traffic impacts and interruption to residents; and
  - Visual landscape and aesthetic impacts of the option.

- Technical / Operational Considerations:
  - Difficulty to construct or implement the solution relative to other alternative solutions; and
  - Operation and maintenance efficiency.

- Economic Impacts:
  - Capital construction costs;
  - Long term operation and maintenance cost burden; and
  - Payment structure, cost recovery options for Municipality, phasing and flexibility.

Preliminary screening of servicing options for this MSP Amendment included a high-level review of all alternative solutions against these criteria within the context of the background information and calculations presented herein. Any solution which does not satisfy one or more of these criteria (i.e. options which could clearly not be implemented due to prohibitive costs, detrimental environmental

effects, or inability to meet the technical criteria such as satisfying the projected servicing demands) were eliminated without further detailed analysis.

Alternative solutions that appeared to be feasible within the context of these criteria were selected as potential "short-listed" alternative solutions and evaluated further in terms of their relative advantages and disadvantages within each evaluation criteria category.

3.2 LONG LIST OF INTERIM WWTP ALTERNATIVES

A long list of servicing alternatives was developed for each water and wastewater system. A detailed list of the options considered is provided in subsequent Chapters of this report.

3.3 SCREENING

The long lists of servicing alternatives were screened against the criteria described below in **Table 3-1.**

Table 3-1: Long List Alternative Screening Matrix

Screening Question	Screening Decision By Answer	
	Pass	Fail
1. Can the proposed solution satisfy the Class EA Problem Statement?	Proceed	Eliminate
2. Does the solution have detrimental environmental, social, technical or economic impacts (i.e. prohibitive costs, agreement or land requirements, or technical difficulty)?	Proceed	Eliminate
3. Can impacts associated with the solution be mitigated?	Proceed	Eliminate

These criteria represent mandatory or "must-have" conditions which must be met in order to be an acceptable servicing solutions. Alternative solutions were reviewed in conjunction with the noted criteria on a pass or fail basis.

3.4 SHORTLIST DEVELOPMENT

The screening exercise described in **Sub-section 3.3** produced a short list of water and wastewater servicing alternatives which were considered viable solutions. Each alternative solution was also evaluated with respect to economic, social and natural impacts as well as technical and operational considerations (details of each are outlined in subsequent chapters of this report for each system). These options then proceeded forward to the detailed evaluation stage.

3.5 DETAILED EVALUATION

Shortlisted design concept options were ranked using a colour coded system for each of the above criteria, where "green" represented the most preferred concept, "yellow" criteria represented less preferred alternatives and "red" represented the least preferred alternatives.

Servicing alternatives which receive the greatest number of "green" and "yellow" rankings (and the least "red" rankings) for each servicing category (i.e. water, wastewater) are then considered to be the preferred alternative servicing solutions.

In general, the following steps were completed for the detailed evaluations of water and wastewater servicing strategies:

- Define detailed evaluation criteria (see **sub-section 3.1**);
- Review the impacts of each alternative against each criterion;
- Review each alternative by looking at the potential impacts associated with each criterion;
- Selection of a recommended preferred Interim Wastewater Servicing Alternative Solution based on detailed evaluation results; and,
- Development of a comprehensive implementation strategy for the Recommended Preferred Alternative Solution.

4.0 WASTEWATER TRUNK COLLECTION

The purpose of this Chapter is to present the development and selection process undertaken during this study for Wastewater Conveyance solutions within the Study Area. For the purposes of this MSP Amendment, the WWTP location has been shown as the north-west corner of Area 1, as per the submitted Draft Plan for that development (See **Appendix D – Draft Plans**). This location is also located a natural low point within the study area. Flows for the existing and future development areas were accounted for but detailed sanitary collection design within future development areas which do not currently have draft plans were not explored.

Known lot configurations within Area's 1 and 2 from draft plans on file with the Township were taken into consideration as part of the options development process for wastewater collection. In addition, peak sanitary flows for ultimate development conditions were used for assessment of all sanitary sewer sizing calculations.

4.1 WASTEWATER TRUNK COLLECTION OPTIONS LONG LIST

The following Wastewater Trunk Collection Options (alternative solutions) were considered as part of this MSP Amendment.

4.1.1 Option WWC-A – Do Nothing

This Option would entail maintaining the existing conditions (status quo), which precludes any additional development within Colgan. For this reason this option will not be considered further in this study.

4.1.2 Option WWC-B – Gravity to SPS and Forcemain To WWTP

This sewage conveyance option would involve using Concession 8, County Road 14, Street "A" (Area 2 Draft Plan), and Street "G" (Area 2 Draft Plan) as the main trunk sewer alignment, for all development and existing areas in the Colgan MSP. This Option is depicted in Error! Reference source not found. Under this option, all development areas are able to gravity drain to the pumping station on Street "G", which will require a forcemain to transport effluent to the WWTP location in the approved Area 1 Draft Plan. In order to ensure gravity flow based on topography from the Area 2 Draft Plan, the pumping station would be located in the northwest corner of the SWM Block. The main constraint of this option is that the pumping station and the trunk sewer within Area 2 would need to be constructed before any development takes place in Colgan. In order to service the existing population and the development areas, the remainder of the trunk sewers will need to be constructed.

In addition, the average, minimum, and maximum depths of all required sanitary infrastructure for this option were calculated in order to ensure that the minimum depth requirement for servicing of residential lots could be met at all locations, and to provide a comparison of the relative "constructive" effort for the Option at the detailed assessment stage (i.e. options with greater average depth of sewers will be more difficult and costly to construct and maintain). This Option was shortlisted for additional evaluation.

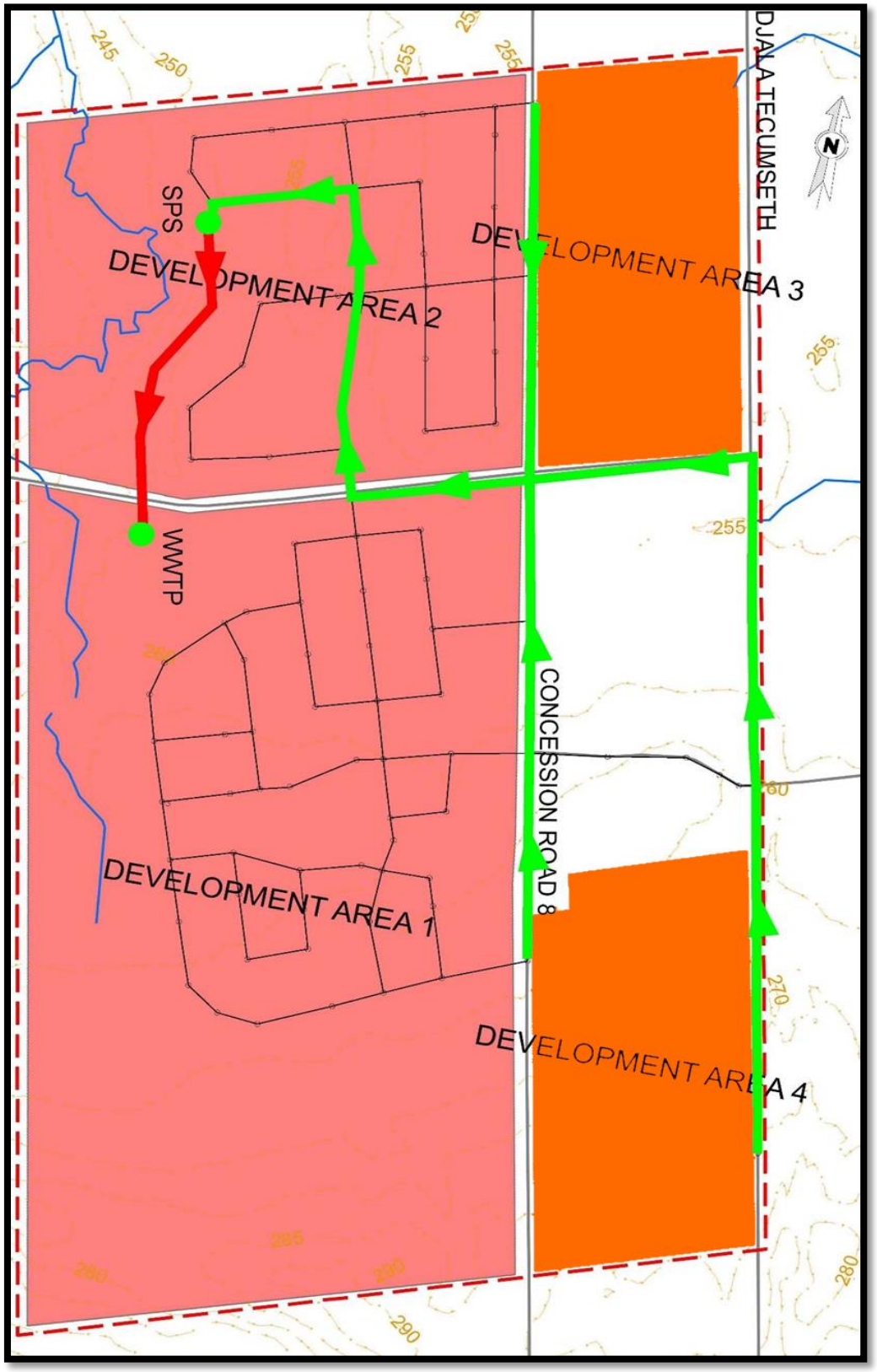


Figure 4.1: Option WWC-B

4.1.3 Option WWC-C – Split Gravity and SPS/Forcemain Flow to WWTP

The topography of Area 1 flows to County Road 14. This sewage conveyance option follows the same general collection strategy (i.e. direction of flow between catchments) as **Option WWC-B (Area 2 SPS)** with the trunk sewer on County Road 14 extended to the WWTP. This option has the advantage of allowing Area 1 to begin development with only a portion of the trunk sewer on County Road 14 constructed. This option is depicted in **Figure 4.2**.

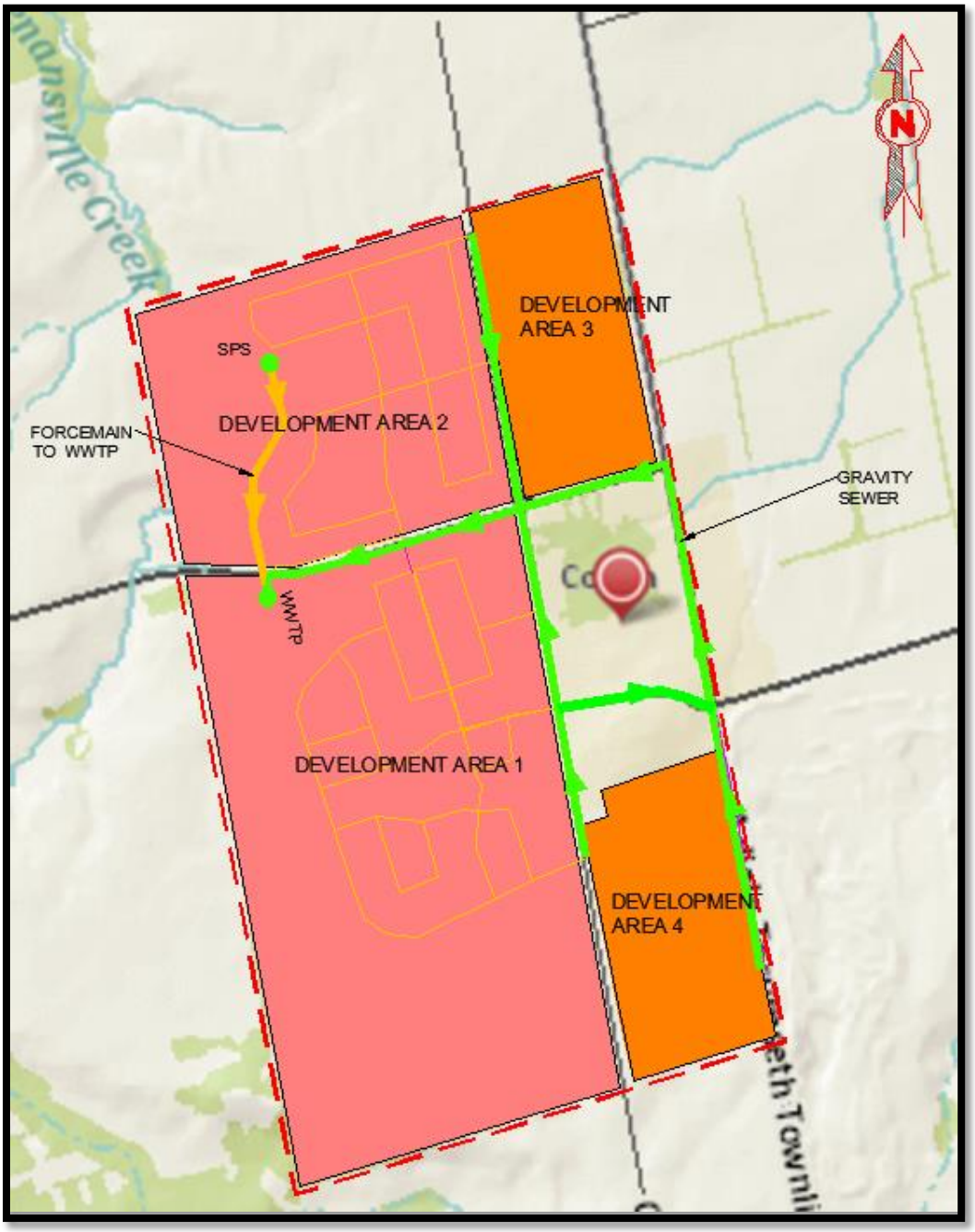


Figure 4.2: Option WWC-C

Under this option, the proposed Trunk Sewer will drain by gravity from Concession 8 to County Road 14. Fifteen (15) units from Area 1 will drain to Concession 8 while the remainder will drain through the development to County Road 14 and then on to the WWTP. The existing residences will have the option of draining to Concession 8 or County Road 14.

Area 2 will still require a pumping station to reach the WWTP; however, a trunk sewer will not be needed. All flows within Area 2 will be gravity to the pumping station and can be constructed independently from the rest of Colgan. Flows from Area 3 can be directed to the trunk sewer on County Road 14 or to Area 2. Due to the absence of proposed grading for Area 3, a forcemain may be required to reach County Road 14. Area 4 appears to be upstream and may be able to use gravity conveyance to reach Concession 8. This option has been short listed and will be examined in greater detail.

4.1.4 Option WWC-D – Gravity Flow to WWTP

This sewage conveyance option includes directing all flows by gravity to the WWTP located in the northwest corner of Area 1, including flows from the lower elevation parts of Area 2. This option would provide Municipal service via gravity to all individual lots within the two proposed draft plans and existing homes. The disadvantage of this option is that the depths of the trunk sewers on County Road 14 would need to be well beyond Township standards to service Area 2 and would significantly increase the cost of construction. For this reason this option is not short listed and will not be considered further in this study.

4.1.5 Option WWC-E – Area 1 Split Flow Through SWM Block

This option is similar to **Option WWC-B (Area 2 SPS),** but would split flows from different parts of Area 1, with the northwest side diverted directly to the WWTP via gravity through SWM Block 324. The intention of this Option was to reduce flows going to County Road 14. Pipe sizing calculations indicate the flow split would not be significant enough to reduce pipe size on County Road 14 and therefore no cost benefits will be realized by diverting flows through the SWM Block. As such, this option is not short listed and will not be considered further in this study.

4.1.6 Option WWC-F – Area 2 Gravity Trunk to County Road 14

This Option involves connecting Area 2 to the Trunk on County Road 14 via gravity. Preliminary analysis of this Option indicates that existing grades on the site would not allow for gravity drainage from north to south without adjustments to the Area 2 draft plan. Even with a reduction of nine (9) units in the high slope area at the northwest corner of the site (specifically, lots 61 through 69), a minimum of approximately 95,000 m^3 of filling would be required to facilitate this Option. In addition, this would increase the depth of sewer on County Road 14 by approximately 2.0 m. Due to the economic and environmental issues which would be associated with changing the natural topography of the site to accommodate gravity drainage against grade and the increased costs and difficulties from a construction and maintenance perspective associated with the increased sewer depth, this Option was not selected for further evaluation.

4.2 WASTEWATER TRUNK COLLECTION OPTIONS SHORTLIST

As discussed in the previous subsections, the following Wastewater Trunk Collection alternative solutions were shortlisted for detailed evaluation.

1. **Option WWC-B**: Gravity Sewer to Single Large SPS and Forcemain to WWTP
2. **Option WWC-C**: Split Gravity and SPS/Forcemain Flow to WWTP

4.3 EVALUATION OF WASTEWATER CONVEYANCE OPTIONS

The evaluation criteria used to evaluate Wastewater Conveyance alternatives were as follows:

- Natural Environment Impacts:
    - Impacts of the option to vegetation, wildlife and the natural environment; and,
    - Surface and groundwater quality and quantity implications.
- Social/Cultural Environment Impacts:
    - Land use and archaeological considerations (including First Nations);
    - Traffic impacts and interruption to residents; and,
    - Visual landscape and aesthetic impacts.
- Technical/Operational Considerations:
    - Difficulty to construct or implement the Option relative to other alternatives; and,
    - Operation and maintenance efficiency.
- Economic Impacts:
    - Capital construction costs;
    - Long term operation and maintenance cost burden; and,
    - Payment structure, cost recovery options for Municipality, phasing and flexibility.

Based on these criteria, the preferred solution was determined to be **Option WWC-C**: Split Gravity and SPS/Forcemain Flow to WWTP. The detailed evaluation process completed to arrive at this preferred solution for Wastewater Conveyance is summarized in **Table 4-1**.

Table 4-1: Colgan Trunk Collection Options and Rankings		
Evaluation Criteria	**Option WWC-B** Gravity Sewer to Single Large SPS and Forcemain to WWTP	**Option WWC-C** Split Gravity and SPS/Forcemain Flow to WWTP
Natural Environment Impacts		
Impacts of the option to vegetation, wildlife and the natural environment	Once construction is completed impacts would be minimal. A high level of treatment would ensure continued low impacts.	Similar Impacts to Option WWC-B.
Surface/groundwater quality implications	Impacts will be limited to construction activities.	Similar Impacts to Option WWC-B.
Natural Environment Overall Rating		
Social / Cultural Environment Impacts		
Land use and archaeological considerations (including First Nations)	No known Archaeological issues with proposed trunk alignment. Land required for 1 Large SPS and WWTP.	No known archaeological issues with proposed trunk alignment. Land required for 1 Smaller SPS and WWTP.
Visual landscape and aesthetic impacts, traffic impacts an interruption to residents	Construction impacts limited to County Road 14 during initial phase. Greater depths could increase disruption time.	Construction impacts limited to County Road 14 during initial phase.
Social / Cultural Environment Overall Rating		
Technical/Operational Considerations		
Difficulty to construct or implement the option relative to other alternatives	Higher difficulty as increased depth required to get all gravity flow to single SPS. Higher construction cost and mitigation requirements. SPS needed in initial phase.	Moderate difficulty – Split discharge locations allows for shallower sewers and smaller SPS.
Operation and maintenance efficiency	Single, larger SPS and WWTP will require regular maintenance.	Single SPS plus WWTP will require regular maintenance.
Technical/Operational Considerations Rating		
Economic Impacts		
Capital construction costs	Capital costs of option are expected to be approximately $7.1 Million.	Capital costs of option are expected to be approximately $7.1 Million.
Long term operation and maintenance cost burden	Moderate maintenance costs associated with single larger SPS and deep sewers.	Moderate Maintenance costs associated with Single Smaller SPS and shallower sewers.
Payment structure, cost recovery options for Municipality, phasing flexibility	All development will be dependent on Area 2 Infrastructure. Trunk and SPS located in Area 2 will need to be constructed in Initial phase.	Phasing of WWTP possible, Areas 1 and 2 can be constructed independently of each other if needed, or desired.
Economic Ranking		
Overall Ranking:		

5.0 WASTEWATER COLLECTION TECHNOLOGY

As noted in **Chapter 4.0**, it has been determined that gravity flow trunk sewers, which attempt to minimize the use of pumping systems represent the ideal wastewater collection strategy. The purpose of this chapter is to evaluate technically feasible wastewater conveyance technologies (WWCT) which can provide gravity based servicing for the preferred sanitary collection system solution identified in **Chapter 4.0**.

5.1 WASTEWATER COLLECTION TECHNOLOGY OPTIONS

Two (2) viable alternative technologies have been evaluated as part of this Amendment, specifically; conventionally sized gravity trunk sewers (**Option WWCT-A);** and, a smaller diameter low-slope gravity sewer system with lot-level pre-treatment (**Option WWCT-B**).

5.1.1 Option WWCT-A: Conventional Gravity Sewer

This sewage conveyance technology option would provide servicing to existing and proposed development via standard gravity sewers ranging in diameter from 200mm to 350mm and an average depth of approximately 5.0 m. Flows would then be pumped from the SPS via forcemain to the new community WWTP for treatment.

The main strengths of this system are flexibility of phasing, location of all infrastructure within the municipal right of way (i.e. less interruption to residents both during construction and for maintenance purposes) and the fact that construction methods associated with this system are highly standardized and widely accepted.

Weaknesses of this option include deeper sewers at the downstream end of the system and high capital costs associated with installation of the infrastructure and associated restoration. Trenchless installation methods could offset some of the restoration costs for construction in existing areas. Fused or pressure rated piping would need to be utilized for sewers located in source-water protection areas to prevent exfiltration and associated threats to source-water.

5.1.2 Option WWCT-B: Low Slope Small Diameter Sewer with Lot Level Pre-Treatment Tanks

This sewage collection technology begins with lot-level solids removal and digestion tanks. Due to the removal of solids in each tank, liquids can be conveyed to the downstream SPS using a reduced slope, small diameter gravity sewer network located within the municipal right-of-way (ROW) and then to the WWTP via forcemain. Non-enterable system access points are included in the system for maintenance as an alternative to conventional manholes.

Strengths of this system are centered on the reduced depth and slope requirements of the conveyance system. In areas where servicing is to be provided to existing residents, the system may have reduced capital costs as the smaller piping can be installed with relative ease via directional drilling (which in turn will reduce restoration costs in existing areas), at pipe slopes as low as 0.15%. Drilled pipe will also be fused which will help to mitigate exfiltration and associated source water protection issues.

Less construction spoilage associated with smaller trenches, or trenchless installation will also have positive environmental impacts as compared to conventional sewer installations which require deep excavation.

Weaknesses of this system are mainly associated with the placement of tanks on private property. In addition to the requirement for access to private property both during construction and for ongoing maintenance. Large scale implementation of lot level pre-treatment systems is not consistent with centralized treatment advocated in environmental policy objectives associated with wastewater disposal in the province of Ontario. Easements may also be required to most efficiently facilitate trunk infrastructure.

The lot level tanks are also proposed to be installed at a shallow depth to facilitate the low slope collection system. As such gravity drainage from the basements will not be possible, and sewage pumps will be required in many homes connected to the system.

The system would also require deviations from current standards in Adjala-Tosorontio, as the standard for sewage conveyance is at least 0.5% pipe slope, depth of at least 2.75 m, and manholes every 110 m.

Flexibility is limited under this option as well, as low-slope gravity trunk conveyance will require future development areas connecting to the trunks to also utilize the low-slope gravity system with pre-treatment of solids.

5.2 EVALUATION OF WASTEWATER CONVEYANCE TECHNOLOGY

The evaluation criteria used to evaluate Wastewater Conveyance Technologies were as follows:

- Natural Environment Impacts:
  - Impacts of the option to vegetation, wildlife and the natural environment; and
  - Surface and groundwater quality and quantity implications;
- Social/Cultural Environment Impacts:
  - Land use and archaeological considerations (including First Nations);
  - Visual landscape and aesthetic impacts; and,
  - Traffic impacts and interruption to residents.
- Technical/Operational Considerations:
  - Difficulty to construct or implement the option relative to other alternatives; and
  - Operation and maintenance efficiency
- Economic Impacts:
  - Capital construction costs;
  - Long term operation and maintenance cost burden; and
  - Payment structure, cost recovery options for Municipality, phasing and flexibility.

The detailed evaluation process determined that either technology option would provide an acceptable solution for gravity servicing. A summary of the evaluation completed to arrive at this conclusion is provided in **Table 5-1**.

Table 5-1: Colgan MSP Amendment – Wastewater Conveyance Technology (WWCT) Options and Evaluation		
Evaluation Criteria	**Option WWCT-A** Conventional Wastewater Conveyance Technology, Including Gravity Sewers, Manholes etc.	**Option WWCT-B** Low Slope Sewer with Lot Level Pre-Treatment Tanks for Solids, non-enterable maintenance cleanouts etc.
Natural Environment Impacts		
Impacts of the option to vegetation, wildlife and the natural environment	Minimal impacts as sewers will be installed in Municipal ROW. Greater construction spoilage due to depth of sewers.	Similar impacts to Option WWCT-A, but less construction spoilage etc. due to lower depth of installation.
Surface and groundwater quality and quantity implications	Pumping/PTTW Likely Required Due to Depth of Sewers. Typical infiltration and inflow (I/I) to pipes. Pressure rated pipe required in source-water protection areas.	Minimal groundwater impact due to shallow depth of installation and reduced infiltration due to use of fused pipe.
Natural Environment Overall Rating		
Social / Cultural Environment Impacts		
Land use and archaeological considerations (including First Nations)	All Servicing contained within Municipal ROW except services from buildings to the ROW.	Servicing to existing areas will require access to all private properties connected to the system. Easements may also be required.
Visual landscape and aesthetic impacts, traffic impacts and interruption to residents	Potentially longer construction time due to depth of sewers, but no installations on private property except services from buildings.	Shorter construction time possible for sewers but interruptions to residents as a result of tank installations on private property.
Social / Cultural Environment Overall Rating		
Technical/Operational Considerations		
Difficulty to construct or implement the option relative to other alternatives	Some deeper sewers at downstream end of system, but Option would utilize widely accepted construction methods. Trenchless options available to help reduce restoration.	Shallower sewers possible and trenchless methods preferred to help reduce restoration. Similar difficulty to implement due to complications which could arise from property access etc.
Operation and maintenance efficiency	SPS and sewers will require typical maintenance.	SPS and sewers will require typical maintenance. Lot level pre-treatment tanks will also require a maintenance program.
Technical/Operational Considerations Rating		
Economic Impacts		
Capital construction costs	Servicing costs will be typical of municipal gravity sewer installation, some savings could be possible with use of trenchless installation methods in existing areas, however the majority of servicing requirements are in "green field" areas.	Option provides some potential for cost savings for installations in existing areas due to lower road restoration and slope, small diameter sewers, smaller maintenance access points and trenchless installation opportunities - less advantageous in "green field" installation areas, which represent the majority of servicing needs in the study area.
Long term operation and maintenance cost burden	Maintenance costs will be typical of a municipal gravity sewer system.	Similar cost to Option WWCT-A, potential for less challenging maintenance on main sewers and WWTP than Option WWCT-A due to reduced solids, but added requirements for onsite tank maintenance program at lot level.
Payment structure, cost recovery options for Municipality, phasing and flexibility	Greater flexibility as downstream sewers will include capacity for upstream gravity sewer installation at any time in the future.	Less flexibility for future development as low slope gravity mains will require all future and existing developments connecting to the system to utilize the same pre-treatment systems.
Economic Ranking		
Overall Ranking:		

6.0 WASTEWATER TREATMENT AND DISPOSAL

A total of eleven (11) Wastewater Treatment and Disposal long list alternative solutions were considered as part of this MSP Amendment. These options are summarized in **Table 6-1** and discussed in detail throughout this Chapter.

Table 6-1: Community of Colgan Wastewater Treatment Alternatives

Alternative	Description
Option WWT-1 – Do Nothing	• Maintain the status quo.
Option WWT-2 – Large Subsurface Septic System	• Provide WWTP treatment using subsurface leaching beds for all existing and new development areas
Option WWT-3 – Surface Water WWTP, Discharge to Bailey Creek	• Construct New Municipal WWTP at Colgan with Surface Water Discharge to Baily Creek at Keenansville Road
Option WWT-4 – Surface Water WWTP, Discharge to Keenansville Creek	• Construct New Municipal WWTP at Colgan with Surface Water Discharge to Keenansville Creek at Colgan
Option WWT-5 – Transport Effluent to Tottenham for Treatment, Discharge to Beeton Creek	• Construct a forcemain system between Colgan and Tottenham and treat/discharge effluent using existing infrastructure located within that municipality.
Option WWT-6 – Development Specific WWTP's	• This option would involve construction of individual WWTP's for each new development Area.
Option WWT-7 – Spray Irrigation	• Dispose of treated effluent using spray irrigation over a large area such as Woodington Golf Course.
Option WWT-8 – Phased WWTP with Subsurface Disposal and Surface Water Discharge	• Hybrid Strategy - Construct New Municipal WWTP at Colgan with initial Phase of Subsurface Disposal and Surface Water Discharge in Later Phases
Option WWT-9 – New WWTP with Subsurface/Surface Disposal and Water Reclamation (Purple Pipe)	• Hybrid Strategy - Construct New Municipal WWTP at Colgan with initial Phase of Subsurface Disposal and Purple Pipe/Water Reuse System for irrigation and household use for later Phases.
Option WWT-10 – Surface Water WWTP Discharge to Beeton Creek	• Construct New Municipal WWTP at Colgan with discharge to Beeton Creek via forcemain system between Colgan and Tottenham.
Option WWT-11 – Hybrid Subsurface Disposal and Spray Irrigation	• Due to the complications associated with spray irrigation discussed in Option WWT-7, this option was not short listed (see **Section 6.1**).

6.1 WASTEWATER TREATMENT AND DISPOSAL ALTERANTIVE SOLUTIONS LONG LIST

6.1.1 Option WWT-1 - Do Nothing

This option represents the status quo with respect to wastewater treatment and disposal and if the alternative solutions were not implemented. As there is no existing servicing this option would not satisfy the goals of the Colgan MSP. As such, this option would not be a viable alternative and was not considered further in the evaluation of alternatives solutions.

6.1.2 Option WWT-2 – Large Subsurface Septic System

The Hamlet of Colgan is currently serviced by individual septic systems. In accordance with the 2010 Colgan MSP preferred solution (Burnside) and comments received to date from the MOE, a wastewater treatment facility is proposed to be constructed in the northeast corner of Area 1 which will service all development within Colgan. Preliminary hydro geologic assessments by Golder Associates (2006) and concept level facility design as submitted to the MOE suggest that treated effluent can be disposed at a rate of 395 m^3/d to a leaching field located at the south end of the subject property, within the Oak Ridges Moraine (ORM).

This treatment capacity is significantly lower than the 893 m^3/d required to service the proposed ultimate buildout conditions for Colgan as presented in **Table 6-2** and could provide servicing for approximately 400 units in total. Any proposed treatment will need to provide servicing capacity for existing properties, as maintaining the status quo (onsite septic) is against Provincial Policy. As such, the residual servicing capacity of the treatment system as proposed by the MSP is approximately 313 RU's. When the 400 RU capacity is split amongst the development areas on an area weighted basis, servicing allocation by development area is presented in **Table 6-2**:

Table 6-2: Sanitary Servicing Capacity – Colgan MSP

Parcel #	Weighting (%)	Servicing Capacity (RU)
1	51.0%	159
2	35.1%	110
3	9.3%	29
4	4.6%	14
Existing	N/A	87
Total	100.0%	400

In the updated report completed by Golder Associates in 2009, it was suggested that with effluent dilution at the treatment facility, nitrate concentrations could be reduced sufficiently to increase the treatment capacity of the leaching field to approximately 500 m^3/d (or 506 units in total). Pending approval by the MOE, this increase would create additional servicing capacity for the four (4) development properties but still well below the 1,002 m^3/d required.

As such, this Option has not been shortlisted for further evaluation, but subsurface discharge will be reviewed within the context of other "Hybrid" or complimentary options.

6.1.3 Option WWT-3 – Surface Water Discharge WWTP – 0.05 mg/L P (Bailey Creek)

Similar to Option WWT-2, this option would also involve building a new WWTP to include additional capacity for all existing and future development within the Colgan MSP. However, this alternative solution would include discharge to a surface water outfall as opposed to subsurface discharge.

Pre-consultation with the Ontario Ministry of the Environment (MOE) on this project indicated that the MOE would be supportive of discharge at Baily Creek, approximately 3.1 km from the proposed Colgan WWTP location in Area 1 (see **Figure 6.1**), subject to the results of associated background investigations. As such, assimilative capacity in this watercourse was assessed, and it was determined that capacity for discharge at this location was available, based on a WWTP total phosphorous (TP) discharge limit of 0.05 mg/L. This Option was shortlisted for further evaluation.

6.1.4 Option WWT-4 – Surface Water Discharge WWTP – 0.05 mg/L P (Keenansville Creek)

This Option would also include the Construction of a new Surface Water discharge WWTP at Colgan but with discharge to Keenansville Creek within Colgan itself. Based on the results of Assimilative Capacity investigations completed by Greenland for the Keenansville Creek at Colgan, there is capacity in the Keenansville Creek to accept effluent from the full build-out of Colgan with a total phosphorous discharge limit of 0.05 mg/L.

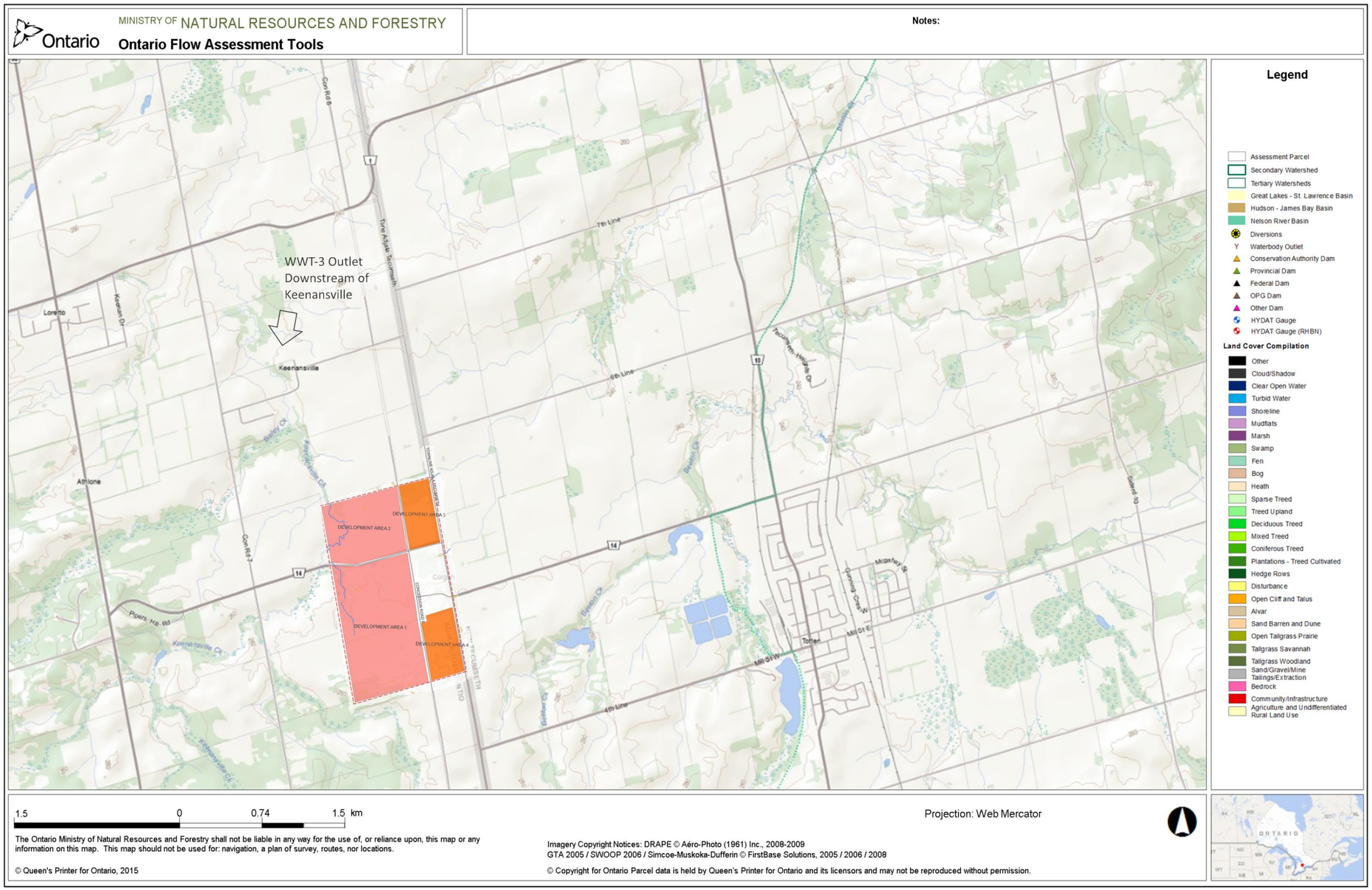
Some of the required Additional total phosphorus reduction could be achieved with phosphorous offsetting within the watershed, and may in fact be required due to Keenansville Creek being a policy two (2) receiver. Due to the stringent requirements for phosphorous reduction, expensive tertiary treatment would be required to service the proposed full build-out population and as such, this option was not short listed. This discharge location will be looked at as part of other "Hybrid" and complimentary options, however (i.e. seasonal discharge).

6.1.5 Option WWT-5 – Treatment at Tottenham WWTP (Beeton Creek Discharge)

This Option relies on co-operation with the neighboring Municipality, and will likely require additional approvals such as an Amendment to the Tottenham WWTP Expansion Class EA, or agreements related to phasing and accommodation of design flows between the two (2) municipalities. This Option would also require the construction of a centralized pumping station in Colgan with approximately 5.2 km of forcemain to transport untreated sewage to the Tottenham WWTP.

In addition to the collection and conveyance infrastructure, it is presumed that development charges (approximately $12,000 per residential unit based on 2014 development charge by-laws) would also need to be paid to the Town of New Tecumseth as a condition of approval for this Option. Based on a unit count of 1,014 residential units for the ultimate buildout of Colgan, this equates to development charges of over $12 Million.

Figure 6.1: WWT-3 Outlet Location



Despite the significant cost of development charges and the challenges associated with inter-municipal agreements and approvals, due to the shared use of existing facilities having some environmental benefits, and the assimilative capacity modelling completed in support of this option suggesting capacity in the receiving watercourse for the extra flows from Colgan, this Option, was shortlisted for further evaluation.

6.1.6 Option WWT-6 – Development Specific WWTP's

The development applications submitted to the Township for Areas 1 and 2 include provisions for construction of small scale WWTP's to service each development parcel. This option represents constructing a number of facilities as opposed to developing a more centralized wastewater treatment strategy.

Maintenance for development specific WWTP's would result in a significant operational burden on the Township, once multiple facilities were up and running (both from the perspective of on-going costs and personnel requirements) and as such, this option is not a sustainable long term wastewater treatment alternative and was not shortlisted for further evaluation.

6.1.7 Option WWT-7 – Spray Irrigation

This Option would include construction of a new WWTP but with discharge via spray irrigation. This disposal method can be appropriate for small scale use in agricultural areas. Spray irrigation at the nearby Woodington Lake Golf Course course was an Option previously explored by The Town of New Tecumseth and was deemed not beneficial to the Town. The golf course drains to Beeton Creek and new Techumseth also has concerns that spray irrigation may impact the assimilative capacity of Beeton Creek. In addition, concerns were raised over the longevity of the golf course, its storage capacity, and the weather dependent nature of spray irrigation. Spray irrigation systems must also meet the following usage criteria:

- Spraying Allowed between May and October;
- Approximately 100 days of spraying with a 7 to 8 day rest period with an average maximum discharge of 55,000 L/(ha-d);
- Grassland slopes should be no more than 3%;
- Depth of water table at site should be at least 2m;
- No irrigation in winds 15km or above or on rainy days;
- Lagoon buffer zones of 100m to any dwelling; and,
- Property line buffer of 150m for spraying.

Previous investigations completed in 2013 by Genivar indicate that seasonal water use for irrigation at the golf course between May and October is estimated to be 543,000 m^3 or approximately 3,017 m^3/d. This would exceed the required treated effluent discharge volumes at ultimate build-out of 1,002 m^3/d on a seasonal basis. Due to regulatory challenges associated with this option (i.e. conveyance of flows across municipal borders, agreements between the golf course owners and the Township/MOE etc.) spray irrigation at this location was not considered further.

As a secondary option, the feasibility of spray irrigation within the community of Colgan was also investigated. There are approximately 6.5 hectares that could be used for spray irrigation and/or lagoons in the development areas based on setback requirements and proximity to watercourses, with the majority of this space located in Area 1. The soils in this area have a high clay content and as such, a lower loading rates for spray irrigation (40,000 L/ha-d). Based on this reduced rate and on the requirement for a 7 day rest period for any given spraying area, nearly 350 ha would be required to disperse the treated effluent for the full buildout of Colgan. As such, spray irrigation was not considered for further evaluation.

6.1.8 Option WWT-8 – WWTP with Subsurface Disposal and Seasonal Surface Water Discharge

This option represents a hybrid approach, combining elements of **Option WWT-2** and **Option WWT-3**, however this option would result in the construction of a subsurface leaching bed located at the south end of Area 1 for the initial phases of development (less than the 20 year horizon, up to 400 units, including connection of existing residents). Approximately 395 m^3/d of effluent would be disposed of in these beds.

A surface water outfall expansion to nearby Keenansville Creek would need to occur prior to the number of units being serviced by the WWTP reaching 400 units, with all flows above the 395 m^3/d subsurface discharge limits being discharged to surface water. Effluent would not be discharged to surface water directly during the driest 90 days of the year but would instead go to a nearby storage lagoon which would ideally be located at the south end of the site near the subsurface beds (see conceptual location in **Figure 5**). The effluent from the lagoon would then be discharged to surface water along with the daily effluent flows during the remaining months of the year.

Assimilative capacity modelling which assumes a WWTP total phosphorous (TP) discharge limit of 0.1 mg/L indicates that seasonal discharge as described above will not increase TP concentrations beyond existing conditions. This means that a conventional WWTP design would provide adequate treatment, and more costly treatment technology such as membrane systems would not be required to provide adequate treatment from a TP perspective. The option also provides flexibility from a Phasing perspective, as a Schedule "C" Class EA would not be required for the initial subsurface Phase of development. For these reasons, this Option has been short-listed for further evaluation.

6.1.9 Option WWT-9 – New WWTP with Subsurface/Surface Water Disposal and Water Reclamation (Purple Pipe)

This "hybrid" servicing strategy would combine **Option's WWT-2, WWT-3 and WWT-7**. This approach would also represent a phased development strategy with the initial 400 units being serviced by a new, subsurface discharge WWTP as described in **Option WWT-2**. Prior to additional expansion beyond this threshold, a water reclamation (purple pipe) system, complete with storage and pumps would need to be constructed within the community and

could be used for a number of applications, such as toilet flushing and municipal/industrial service applications within the community.

In this second phase, the purple pipe system would be extended to the Woodington Lakes golf course and with adequate disinfection, spray irrigation would become the main source of effluent discharge (to an agreed, upset limit) with "additional" effluent beyond this limit being discharged into the subsurface disposal system from the initial Phase of development. Due to the high costs associated with the complicated nature of this solution and the challenges involved with spray irrigation as noted in **Option WWT-7**, this option was not short-listed for detailed evaluation.

6.1.10 Option WWT-10 – Surface Water Discharge WWTP (Beeton Creek)

This Option would require Construction of a new WWTP in Colgan with discharge to Beeton Creek via a 5.2 km forcemain. As this Option will certainly be more costly than **Option WWT-3** which proposes a shorter, 3.1 km discharge forcemain to Bailey Creek, and requires the crossing of municipal borders, this solution will not be viable compared to those presented above. As such it was not short-listed for further evaluation.

6.1.11 Option WWT-11 – Hybrid Subsurface Disposal and Spray Irrigation

This option represents a hybrid approach, combining elements of **Option WWT-2 (Subsurface)** and **Option WWT-7 (Spray Irrigation)**, and would include the construction of a new WWTP with subsurface leaching bed located at the south end of Area 1 capable of receiving treated effluent from a maximum of 400 units, with additional treated effluent being used for spray irrigation. This option could provide a great deal of phasing flexibility as either the spray irrigation or subsurface effluent discharge systems could be constructed "first" and the other system could be phased in based on measured data (i.e. actual irrigation usage).

An additional advantage of this option is that the WWTP for this system may require less stringent TP treatment than surface water Options which could further reduce capital costs, however the system would likely be more complicated to maintain. That being said, due to the complications associated with spray irrigation discussed in **Option WWT-7**, this option was not considered for further evaluation.

6.2 SUMMARY OF WASTEWATER TREATMENT/DISPOSAL ALTERNATIVE COSTS

For the purpose of comparison, Greenland has completed a preliminary order of magnitude economic evaluations for comparison of the above referenced Wastewater Treatment and Disposal alternatives which are summarized in **Table 6-3**.

Table 6-3: Wastewater Treatment and Disposal Option Order of Magnitude Costing

Option Description	Preliminary Opinion of Probable Capital Costs (OPC)*	Notes for Further Evaluation
Option WWT-3: New Surface Water Discharge WWTP (Discharge to Bailey Creek)	$15.1 Million	Lowest Capital Cost, Potentially complicated design and approvals process (requires Schedule 'C')
Option WWT-5: Treatment and Discharge via Tottenham WWTP	$17.5 Million	Higher Capital Cost due to development Charges – Less challenging technically and from an approvals perspective due to use of existing WWTP
Option WWT-7: Spray Irrigation	$15.7 Million	Lower Capital Cost, Potentially complicated design and approvals process (requires Schedule 'C'), Seasonal/phasing challenges
Option WWT-8: Ph. 1 Subsurface, Ph. 2 Seasonal Surface Discharge	$16.0 Million	Moderate Capital Cost, Potentially Complicated design and approvals process (requires Schedule 'C'). No Schedule C required for Phase 1 WWTP
Option WWT-9: Ph. 1 Subsurface, Ph. 2 Surface Discharge – with Reclamation	$18.4 Million	Highest capital cost - Complicated technically and from an approvals perspective – No Schedule C required for Phase 1 WWTP, Numerous environmental benefits.
Option WWT-11: Ph. 1 Subsurface, Ph. 2 Spray Irrigation	$16.1 Million	Moderate Capital Cost, Potentially complicated design and approvals process (Schedule C required for Phase 2 WWTP), but offers phasing flexibility.

*Note: All OPC's include $7.1 Million Lump Sum representing Wastewater Collection **Option WWC-C** and are based

6.3 WASTEWATER TREATMENT AND DISPOSAL ALTERNATIVES SHORTLIST

As discussed in the previous subsections, the following Wastewater Treatment and Disposal alternatives were shortlisted for detailed evaluation.

1. **Option WWT-3**: New Surface Water Discharge WWTP (Discharge to Bailey Creek)
2. **Option WWT-5**: Treatment and Discharge via Tottenham WWTP
3. **Option WWT-8**: Ph. 1 Subsurface, Ph. 2 Seasonal Surface Discharge

6.4 EVALUATION OF WASTEWATER TREATMENT AND DISPOSAL ALTERNATIVES

The evaluation criteria used to evaluate Wastewater Conveyance alternatives were as follows:

- Natural Environment Impacts:
    - Impacts of the option to vegetation, wildlife and the natural environment; and,
    - Surface and groundwater quality and quantity implications.
- Social/Cultural Environment Impacts:
    - Land Use and Archaeological Considerations (Including First Nations);
    - Traffic impacts and interruption to residents;
    - Visual landscape and aesthetic impacts; and,
    - Required inter-municipal agreements and infrastructure.
- Technical/Operational Considerations:
    - Difficulty to construct or implement the option relative to other alternatives; and,
    - Operation and maintenance efficiency.
- Economic Impacts:
    - Capital construction costs;
    - Long term operation and maintenance cost burden; and,
    - Payment structure, cost recovery options for Municipality, phasing and flexibility.

Based on these criteria and in accordance with discharge limit requirements as presented in the ACS Report (See **Appendix C**) and identified during MOE pre-consultation, the preferred solution was determined to be **Option WWT-3: WWTP with Treatment to 0.05 mg/L Phosphorous and Discharge to Bailey Creek**. The detailed evaluation process completed to arrive at this preferred solution for Wastewater Conveyance is summarized in **Table 6-4**.

Table 6-4: Colgan Wastewater Treatment and Disposal Alternatives and Rankings

Evaluation Criteria	**Option WWT - 3** 0.05 mg/L P Surface Water Discharge WWTP (Bailey Creek)	**Option WWT - 5** Treat Effluent at Tottenham WWTP (Beeton Creek Discharge)	**Option WWT - 8** Phased WWTP With Subsurface Disposal and 0.05 mg/L P Surface Water Discharge with Storage (Keenansville)
Natural Environment Impacts			
Impacts of the option to vegetation, wildlife and the natural environment	Once construction is completed impacts would be minimal. A high level of treatment would ensure continued low impacts.	Greater impacts during construction due to length of pipe required to reach Tottenham.	Additional built footprint and equipment required to facilitate lagoons and subsurface discharge.
Surface and groundwater quality implications	High level (0.05 mg/L) of P treatment will be required to maintain water quality in Bailey Creek. No groundwater Impacts.	Less impacts due to existing discharge location and WWTP facility.	Less assimilative capacity available in Keenansville Creek. Greater groundwater impacts than Option WWT-3 due to subsurface discharge and lagoon.
Natural Environment Overall Rating			
Social / Cultural Environment Impacts			
Land use and archaeological considerations (including First Nations)	No known Archaeological issues with proposed trunk alignment. Land required for 1 SPS and 1 WWTP.	No known archaeological issues with proposed trunk alignment. Land required for 1 SPS.	No known archaeological issues with proposed trunk alignment. Land required for 1 SPS and 1 WWTP.
Visual landscape and aesthetic impacts, traffic impacts and interruption to residents	Construction impacts limited to County Road 14 during initial phase.	Greater construction impacts due to length of pipe required to reach Tottenham WWTP.	Construction impacts limited to Area 1.
Required inter-municipal agreements and infrastructure	No inter-municipal approvals required.	Inter-municipal agreements and services required.	No inter-municipal approvals required.
Social / Cultural Environment Overall Rating			
Technical/Operational Considerations			
Difficulty to construct or implement the option relative to other alternatives	Moderate difficulty - New WWTP, SPS and single discharge location.	SPS and significant forcemain required. Least complicated solution overall.	Most complicated solution - New WWTP, SPS and multiple discharge locations.
Operation and maintenance efficiency	Single SPS and WWTP will require regular maintenance.	Single SPS will require regular maintenance.	Single SPS and WWTP will require regular maintenance.
Technical/Operational Considerations Rating			
Economic Impacts			
Capital construction costs	Capital cost of option is expected to be approximately $15.1 Million (Based on 709 Units).	Capital cost of option is expected to be approximately $17.5 Million (Based on 709 Units).	Capital cost of option is expected to be approximately $16.0 Million (Based on 709 Units).
Long term/operation and maintenance cost burden	Moderate maintenance costs associated with WWTP and SPS.	Slightly higher maintenance costs than Option WWT-3 due to larger pumps required to convey effluent to Tottenham.	Highest maintenance cost due to multiple discharge systems, lagoons, forcemain etc. which require maintenance.
Payment structure, cost recovery options for Municipality, phasing and flexibility	Phasing of WWTP possible, discharge forcemain must be constructed in Initial Phase.	No phasing opportunities. WWTP Improvements would need to be completed to accommodate flows from Colgan.	Initial subsurface discharge phase with future surface water phase possible.
Economic Ranking			
Overall Ranking:			

7.0 WATER SUPPLY AND TREATMENT

Colgan is currently serviced by a Municipal well system with limited capacity for future expansion. In order to service the 20 year and ultimate build-out scenarios additional water supply capacity will be required. In addition, water storage and fire protection infrastructure will be required as part of any viable alternative solution to service future buildout within the community of Colgan. Water supply, storage and distribution options were re-assessed for future conditions based on updated background studies in this MSP Amendment. This Chapter summarizes the process of water servicing options development, shortlisting and evaluation in accordance with the Class EA Process.

7.1 WATER SUPPLY AND TREATMENT ALTERNATIVE SOLUTION LONG LIST

The long list of water supply alternative solutions (Options) considered as part of this MSP Amendment is summarized in **Table 7-1**.

Table 7-1: Community of Colgan Water Supply Alternatives

Alternative	Description
Option W-1 – Do Nothing	• Maintain the status quo.
Option W-2 – Increase Current PTTW and Well Capacity to Supply Future Demand	• New Well (Same Location), Expanded Treatment, Booster Pumps, Storage and Fire Protection, Watermain Network.
Option W-3 – Use New Tecumseth-Collingwood Trunk Main for All Supply	• Booster Pumps, Storage and Fire Protection, Watermain Network, Connection to New Tecumseth Main.
Option W-4 – Maximize Use of Current Well (Increase PTTW) for Near Term Growth, Connect to New Tecumseth Main for Ultimate Build Out	• New Pumps, Expanded Treatment, Storage and Fire Protection, Watermain Network, Connection to New Tecumseth Main.
Option W-5 – Maximize Use of Current Well (Increase PTTW) for Near Term Growth, Construct New Well in New Location for Ultimate Build Out	• New Well (New Location), Expanded Treatment, Booster Pumps, Storage and Fire Protection, Watermain Network.
Option W-6 – Water Conservation – Construct Reclaimed Water System to Reduce Demand Within the Community	• Reclamation and Disinfection system at WWTP, Booster Pumps, Storage and Fire Protection, Second Watermain Network

7.1.1 Option W-1 - Do Nothing

This option represents the status quo with respect to water servicing. As the current system does not offer fire protection or storage capacity, this option would not satisfy the goals of the Colgan Master Servicing Plan. In addition, the existing facilities are not capable of providing the additional supply required for the proposed growth. As such, this option would not be a viable alternative and was not considered for further evaluation.

7.1.2 Option W-2 – Increase Current PTTW and Well Capacity to Supply Future Demand

Under this scenario, the existing wells and distribution system would be expanded with upgraded pumping and treatment facilities to supply the increase in demand to service projected population growth. The system would also require a reservoir and booster pumps to provide storage and fire protection to the community. The municipality has previously requested an increase to their PTTW, which is a GUDI (groundwater under direct influence of surface water) well. Comments from the MOE have been reviewed and additional studies have been completed confirming the ultimate capacity of the existing well systems. These recently completed hydrogeological investigations and natural habitat assessments have concluded that the existing well supply may be expanded through the addition of a well at the current location or through increased pumping from the existing well to achieve sufficient capacity to meet future demand without detrimental impacts to surface water.

Modelling of the existing and proposed systems was also completed to ensure viability of the system under proposed development conditions and showed that the current well has an average daily demand (ADD) production capacity of 841 m^3/d. This level of production is sufficient to meet the 20 year demand horizon (497 m^3/d) as well as servicing ADD for ultimate buildout (650 m^3/d), subject to verification through monitoring and relevant approvals. Through the aforementioned studies, particular attention was paid to the long term impact this level of production would have on the underlying aquifer, and it was determined that the seasonal demand cycle of the forecast demands of the Colgan community will not have any permanent impact on the aquifer. Further, in response to concerns over the potential impact on surrounding watercourses and nearby fauna habitat, the studies determined that there will be no significant impact to local or downstream habitat as a result of the proposed expanded water taking. This option was short listed for detailed evaluation.

7.1.3 Option W-3 – Use New Tecumseth Main Well for All Supply

This option would connect the existing community and future development to the New Tecumseth (NT) water distribution system which is supplied in part by the drinking water treatment plant (WTP) in the Town of Collingwood. The trunk main between Collingwood and Alliston is currently constructed and operational. It is proposed to construct a continuing link between Alliston and Beeton, in NT, continuing to the community of Tottenham to the east of Colgan. This link is proposed to be constructed in 2016. A 2.9 km trunk watermain between the incoming supply from Tottenham and Colgan would be constructed, and an amendment to the agreement between the municipalities governing water supply and costs to Adjala-Tosorontio would be required.

It remains to be confirmed whether the NT system has adequate capacity to provide water supply for the 20 year and Ultimate Build-Out. Booster pumping and storage facilities would be constructed within Colgan, while further study is required to confirm whether additional treatment and supply infrastructure would be required on the production side (i.e. expansion at the Collingwood WTP). For the purpose of this MSP Amendment, it is assumed that water

supply costs associated with this option would take the form of a per-unit development charge equivalent to those to connect Tottenham to the trunk supply. Although this option would limit development in Colgan to the limits of the current PTTW, it is expected that the horizon for construction of the Alliston/Beeton/Tottenham supply line is near term enough to prevent significant limits on development. This option was short-listed for further detailed analysis.

7.1.4 Option W-4 – Maximize Use of Current Well (Increase PTTW) for Near Term Growth, Connect to New Tecumseth Main for Ultimate Build Out

This alternative is hybrid of **Option W-2** and **Option W-3**. The advantage to this amalgamation of options is that the demands placed on the NT system and associated costs would be greatly reduced. Booster pumping and storage would still be required, as well as the trunk main connecting the two (2) systems, however the trunk connection may not be required to service the 20 year development horizon (subject to the findings of an adaptive management and monitoring plan). This could defer construction costs of the Colgan/Tottenham connecting watermain, though remains a cost intensive alternative.

Based on the results of the hydrogeological and natural heritage studies completed as part of this MSP Amendment, the existing well is capable of servicing the ultimate build-out. As such, the additional cost of connecting to the Tottenham system are unnecessary and this option was not selected for further analysis.

7.1.5 Option W-5 – Maximize Use of Current Well (Increase PTTW) for Near Term Growth, Construct New Well in New Location for Ultimate Build Out

Through this alternative, development would continue in Colgan until such time as additional volume is required to meet demands. At this time, a new well would be brought online to provide the additional capacity to the system. Additional treatment will be required with the new well, however this option keeps control of the system solely within the hands of the Township and does not require any inter-municipal water supply infrastructure as suggested in **Options W-3 and W-4**. As the hydrogeological and natural heritage studies completed as part of this Amendment have determined that the existing well is capable of supplying the required demands for ultimate buildout, this alternative would represent unnecessary costs and was not selected for further evaluation.

7.1.6 Option W-6 – Water Conservation – Construct Reclaimed Water System to Reduce Overall Demand Within the Community

This Option would be supplemental to **Options W-2 through W-5**. This Option proposes that treated effluent from the WWTP would be diverted to a disinfection system for use in a "Purple Pipe", non-potable, water system. Currently there are no MOE standards for water reuse other than the guidelines for toilet and urinal flushing shown in **Table 7-2**. Following the EPA standards effluent would need to be treated to levels shown in **Table 7-3**. Advanced Secondary Treatment with disinfection will be required to reach the objectives for water quality entering the purple pipe system.

Table 7-2: Guidelines for Domestic Reclaimed Water Used in Toilet and Urinal Flushing

Parameter	Units	Water quality parameters	
		Median	Maximum
BOD_5	mg/L	= 10	= 20
TSS	mg/L	≤ 10	≤ 20
Turbidity	NTU	= 2	= 5
Escherichia coli	CFU/100 mL	Not detected	= 200
Thermo-tolerant coliforms	CFU/100 mL	Not detected	= 200
Total chlorine residual	mg/L	≥ 0.5	

Table 7-3: Standards for Quality of Reclaimed Water (US EPA, 2004)

Parameter	Unrestricted Urban Use and Unrestricted Recreational Use	Restricted Urban Reuse	Industrial Reuse	Groundwater Recharge
BOD_5	5-30 mg/L	20-30 mg/L	20 mg/L	5 mg/L
TSS	5-30 mg/L	5-30 mg/L	20 mg/L	5-10 mg/L
Turbidity	0-2 NTU	2-3 NTU	3 NTU	2 NTU
Fecal Coliforms (E.coli)	0-2.2 CFU/100ml	23-200 CFU/100ml	23-200 CFU/100ml	0-2.2 CFU/100ml
Total Nitrogen	≥0.5 mg/L	-	-	12 mg/L
Total Chlorine Residual (Health Canada, 2010)	5-30 mg/L	-	-	-

The US EPA outlines ten (10) main water reuse categories based on the quality of the water required for specific and uses (USEPA 2004). The four (4) categories that pertain to Colgan based on land uses within the study area would be Unrestricted Urban and Recreational Reuse, Restricted Urban Reuse, Industrial Reuse; and, Groundwater Recharge.

Unrestricted Reuse refers to the contact the general public will have with water treated to this quality. This category would include the irrigation of parks and sports fields, decorative fountains and urban uses such as toilet flushing. This would be the main reuse type in Colgan.

The Restricted Reuse category restricts the use of reclaimed water to activities that result in no contact with the general public, or where the areas affected are restricted from the general public. This level of water quality could be used for private landscape irrigation, municipal works uses, such as street cleaning and sewer flushing, and for construction purposes, such as site dust control and concrete making.

Industrial Reuse of reclaimed water varies based on the requirements of the industry. This could include the use of reclaimed water for equipment washing, cooling towers, stack scrubbing, boiler feed and process water. This usage type will likely be minimal in Colgan.

Groundwater Recharge is used to ensure a stable, high quality, groundwater supply. This process requires reclaimed water of a high quality to be pumped into a holding area, where it is allowed to infiltrate into the water table below, replenishing the ground water supply. Available capacity for this type of use would likely be minimal within Colgan.

These uses comprise approximately 20% of all in home water demands, and could reduce the overall ADD from 497 m^3/d to 398 m^3/d at the 20 year horizon, and from 668 m^3/d to 534 m^3/d at the Ultimate Build-Out. The option will require duplication of piping (i.e. a "purple pipe" network for reclaimed water), metering and pumping to sustain system pressure. Storage volume requirements are only reduced slightly (less than 10%) due to water reclamation as storage requirements are predominantly based on fire-flow needs, and reclaimed water cannot be used for fire protection. This option enhances opportunities for wastewater treatment and disposal (**Chapter 6**) and has beneficial environmental implications. As the existing well supply limits may potentially be reached, it is recommended that this Option be considered as part of any implementation strategy, however it was not shortlisted for further evaluation as it cannot meet the requirements of the problem statement as a standalone Option.

7.2 WATER SUPPLY ALTERNATIVES SHORT LIST

The Water Supply Alternatives shortlisted for detailed evaluation were **Option W-2:** Increase Current PTTW and Well Capacity to Supply Ultimate Demand; and, **Option W-3**: Use Collingwood - New Tecumseth Watermain for All Supply.

7.3 EVALUATION OF WATER SUPPLY ALTERNATIVES

Evaluation criteria used to evaluate the shortlisted Water Supply Options were as follows:

- Natural Environment Impacts:
    - Impacts of the option to vegetation, wildlife and the natural environment; and,
    - Surface and groundwater quality and quantity implications.
- Social/Cultural Environment Impacts:
    - Land use and archaeological considerations (including First Nations);
    - Traffic impacts and interruption to residents;
    - Visual landscape and aesthetic impacts; and,
    - Required inter-municipal agreements and infrastructure.
- Technical/Operational Considerations:
    - Difficulty to construct or implement the Option relative to other alternatives; and,
    - Operation and maintenance efficiency.
- Economic Impacts:
    - Capital construction costs;
    - Long term operation and maintenance cost burden; and,
    - Payment structure, cost recovery options for Municipality, phasing and flexibility.

Based on these criteria, the preferred solution was determined to be **Option W-2**. The detailed evaluation process completed to arrive at this preferred solution for Wastewater Conveyance is summarized in **Table 7-4**.

Table 7-4: Colgan Water Supply Alternatives Evaluation		
Evaluation Criteria	**Option W-2** Increase Current PTTW and Well Capacity to Supply Ultimate Demand	**Option W-3** Use Collingwood - New Tecumseth Watermain for All Supply
Natural Environment Impacts		
Impacts of the option to vegetation, wildlife and the natural environment	Limited new watermain installation and supply changes limited to existing well site - Least impact.	Significant transmission watermain installation - Greatest impact.
Surface and groundwater quality implications	Seasonal fluctuations in groundwater level. No significant impact on quality or supply.	Eliminates demands on aquifer. No impact to groundwater quality.
Natural Environment Overall Rating		
Social / Cultural Environment Impacts		
Land use and archaeological considerations (including First Nations)	No known archaeological issues or Land use changes with proposed servicing alternative.	Requires inter-municipal right of way.
Visual landscape and aesthetic impacts, traffic impacts and interruption to residents	External works limited to Concession Rd. 8, St. James Ln., County Rd. 14. Internal works on undeveloped lands. Limited visual impacts.	Greater impact to existing residents along St. James Lane and intersection with County Rd. 14, construction along 5th Line in New Tecumseth and crossing of Rail Line. Limited visual impacts.
Required inter-municipal agreements and infrastructure	No inter-municipal infrastructure or agreements required.	Inter-municipal ROW and water supply sharing agreements and infrastructure required.
Social / Cultural Environment Overall Rating		
Technical/Operational Considerations		
Difficulty to construct or implement the option relative to other alternatives	Least complicated option - Expansion of existing facility and new well pumps required.	Most complicated option - Significant efforts required to construct inter-municipal transmission main, plus decommissioning of existing facility and booster pumping station required.
Operation and maintenance efficiency	Wells will require regular maintenance, similar to current program.	Single pumping station will require regular maintenance. Maintenance required on transmission main.
Technical/Operational Considerations Rating		
Economic Impacts		
Capital construction costs	Capital costs of option are expected to be approximately $1.0 Million, including well and pump upgrades. Excludes storage and servicing of Area's 1 and 2.	Capital costs of option are expected to be approximately $3.5 Million, including booster pump, 3.2 km watermain and connection charges of $2,156 per unit (for 709 units). Excludes storage and servicing of Area's 1 and 2.
Long term operation and maintenance cost burden	Maintenance Costs will be incurred by single pumping station and new storage reservoir.	More costly maintenance than Option W-2 due to addition of transmission main.
Payment structure, cost recovery options for Municipality, phasing and flexibility	Cost recovery and phasing will likely be development based.	Cost recovery and phasing could be more complicated due to inter-municipal infrastructure.
Economic Ranking		
Overall Ranking:		

8.0 WATER STORAGE

Based on the Ministry of the Environment design guidelines (2008) and the forecasted populations for Colgan, to address fire storage and storage capacity for Maximum Daily Demand (MDD), Colgan will require 1,210 m^3 of storage to service the 20 year growth horizon. Looking forward to the Ultimate Build-out, a total storage of 1,479 m^3 will be required.

8.1 WATER STORAGE OPTIONS LONG LIST

The 2005 RJ Burnside Water Servicing MSP recommended new watermain (already constructed) and water storage for Colgan in the form of a standpipe (see **Figure 8.1**). As part of this Addendum, Greenland reviewed the 2005 MSP and developed multiple storage alternative solutions (options). In keeping with the requirements of the MSP process, Options which included a new location were also considered as part of this MSP Amendment.

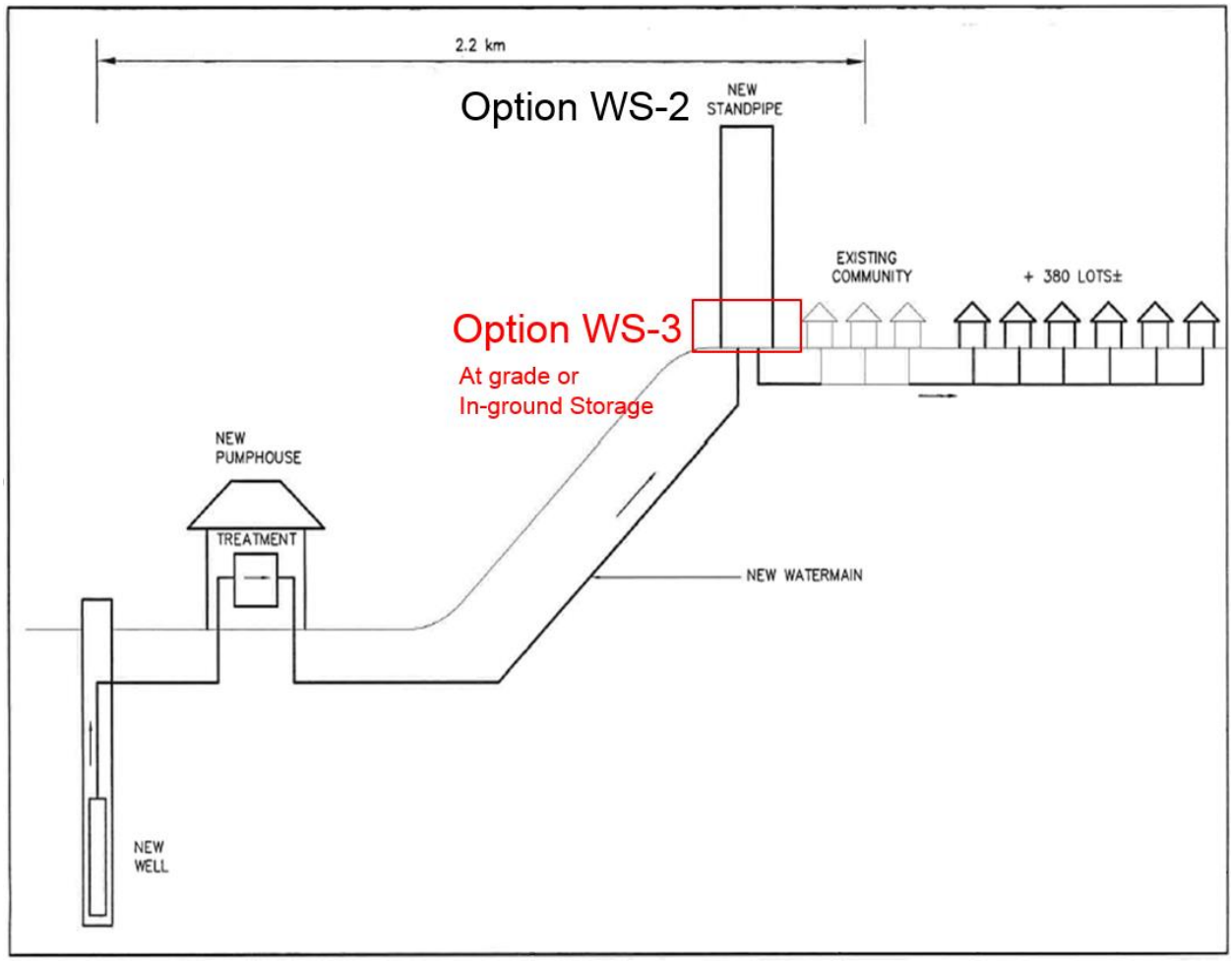


Figure 8.1: Water Storage at 2005 MSP Preferred Location

8.1.1 Option WS-1 - Do Nothing

This option represents the status quo with respect to water servicing. As the current system does not offer fire protection or storage capacity, this option would not satisfy the goals of the Colgan Master Servicing Plan. In addition, the existing facilities are not capable of providing the additional supply required for the proposed growth. As such, this option would not be a viable alternative solution and was not considered for further evaluation.

8.1.2 Option WS-2 – Elevated Storage (Standpipe) at 2005 MSP Preferred Location

This option was based on the MSP for Colgan recommendation that a standpipe be built on Concession 8 at the high point approximately 1.6 km from the Municipal Wells. The elevated storage tank would provide consistent pressure and supply security once filled as the pressure provided would be gravity/elevation based rather than pump based like the current subsurface system. This system would be difficult to expand and would have to be sized for the final anticipated level of growth at the outset. This option was shortlisted for detailed evaluation.

8.1.3 Option WS-3 – In-Ground or At Grade Storage with Booster Pumping at 2005 MSP Preferred Location

This option involves the construction of an in-ground or at grade storage facility located approximately 1.6 km from the municipal wells. This option could be phased with relative ease to accommodate various stages of development, with supply security provided via backup power systems. This option was shortlisted for detailed evaluation.

8.1.4 Option WS-4 – Elevated Storage (Standpipe) at New Location

This option would use an elevated storage tank, similar to **Option WS-2** but at a different location than proposed in the 2005 MSP. As the location proposed in the 2005 MSP is generally ideal from an elevation perspective, and new watermain has already been constructed for connection to a storage tank at the previously proposed site, this option would be more costly than necessary and has not shortlisted for further evaluation.

8.1.5 Option WS-5 – In-Ground/At Grade Storage with Booster Pumping at New Location

This option would utilize a subsurface storage system, similar to **Option WS-3** but at a different location than proposed in the 2005 MSP. This option was eliminated from further evaluation for the same reasons as **Option WS-4**.

8.2 WATER STORAGE ALTERNATIVES SHORT LIST

The water storage alternatives shortlisted for detailed evaluation were:

1) **Option WS-2:** Elevated Storage (Standpipe) at 2005 MSP Preferred Location; and,

2) **Option WS-3:** In-Ground or At-Grade Storage with Booster Pumping at 2005 MSP Preferred Location.

8.3 EVALUATION OF WATER STORAGE ALTERNATIVES

Evaluation criteria used to evaluate shortlisted Water Storage Options were as follows:

- Natural Environment Impacts:
  - Impacts of the option to vegetation, wildlife and the natural environment; and,
  - Surface and groundwater quality and quantity implications.
- Social/Cultural Environment Impacts:
  - Land use and archaeological considerations (including First Nations);
  - Visual landscape and aesthetic impacts; and,
  - Traffic impacts and interruption to residents.
- Technical/Operational Considerations:
  - Difficulty to construct or implement the Option relative to other alternatives;
  - Water supply security; and,
  - Operation and Maintenance Efficiency.
- Economic Impacts:
  - Capital construction costs;
  - Long term operation and maintenance cost burden; and,
  - Payment structure, cost recovery options for Municipality, phasing and flexibility.

Based on these criteria, the preferred solution was determined to be **Option WS-2**. The detailed evaluation process completed to arrive at this preferred solution for Wastewater Conveyance is summarized in **Table 8-1**.

Table 8-1: Colgan Water Storage Alternatives Evaluation		
Evaluation Criteria	**Option WS-2** Elevated Storage at 2005 MSP Location	**Option WS-3** In-ground/at-grade Storage with Booster Pumping at 2005 MSP Location
Natural Environment Impacts		
Impacts of the option to vegetation, wildlife and the natural environment	Moderate impacts due to construction.	Moderate impacts due to construction.
Surface and groundwater quality implications	Minimum impact expected.	Minimum impact expected.
Natural Environment Overall Rating		
Social / Cultural Environment Impacts		
Land use and archaeological considerations (including First Nations)	The property has previously been disturbed for the construction of existing watermain thus archaeological features are considered to be non-existent at this site.	The property has previously been disturbed for the construction of existing watermain thus archaeological features are considered to be non-existent at this site.
Visual landscape and aesthetic impacts, traffic impacts and interruption to residents	More significant visual impacts.	Limited visual and traffic impacts.
Social / Cultural Environment Overall Rating		
Technical/Operational Considerations		
Difficulty to construct or implement the option relative to other alternatives	Elevated storage is more difficult to construct than in-ground storage.	In-ground storage is less difficult to construct than elevated storage.
Water Supply Security	Lack of booster station will be less optimal from a supply security perspective.	Booster pumping station will provide long term supply security.
Operation and Maintenance Efficiency	More efficient from maintenance perspective due to lack of booster pump.	Booster pump will require additional maintenance.
Technical/Operational Considerations Rating		
Economic Impacts		
Capital construction costs	Elevated storage costs are estimated at approximately $1.8 Million (excluding backup power and other equipment).	In-ground storage with booster pumping and backup power is estimated at approximately $1.8 Million.
Long term operation and maintenance cost burden	Lower Life Cycle Costs as no booster pumping required.	Slightly higher life cycle costs due to booster station, pump maintenance and electricity.
Cost recovery and phasing flexibility	No phasing flexibility.	In-ground storage can be constructed in phases.
Economic Ranking		
Overall Ranking:		

9.0 SUMMARY OF PREFERRED MASTER SERVICING ALTERNATIVES

Based on the evaluations presented in this report, the recommended preferred master servicing solution for the community of Colgan includes implementation of the servicing Options summarized in **Table 9-1**.

The recommended preferred Master Wastewater Servicing Solution is shown in **Figure 9.1**.

The recommended preferred Master Drinking Water Servicing Solution can be seen in **Figure 9.2**.

Table 9-1: Summary of Recommended Preferred Master Servicing Options

Alternative	Description
Option WWC-C: Split Gravity And SPS/Forcemain Flow To WWTP, using either Conventional Gravity Sewers or Low-Slope Small Diameter Sewer with Lot Level Pre-Treatment Tanks	• The Trunk Sewer will drain by gravity from Concession 8 to County Road 14. Area 1 will Gravity drain while Area 2 will require an SPS for a small portion of the development. The existing residences will be able to gravity drain.
Option WWT-3: 0.05 mg/L P Surface Water Discharge WWTP (Baily Creek)	• Construct New Municipal WWTP at Colgan with Surface Water Discharge to Baily Creek @ Keenansville Road
Option W-2: Increase Current PTTW and Well Capacity to Supply Ultimate Demand	• Add additional Well capacity in the same location as the current well with Expanded Treatment and Booster Pump capacity.
Option WS-3: In-ground/at-grade Storage with Booster Pumping at 2005 MSP Location	• Construct new at-grade or in-ground storage tanks with sufficient pumping capacity to provide fire flow and backup power, located approximately 1.6 km from the municipal wells.

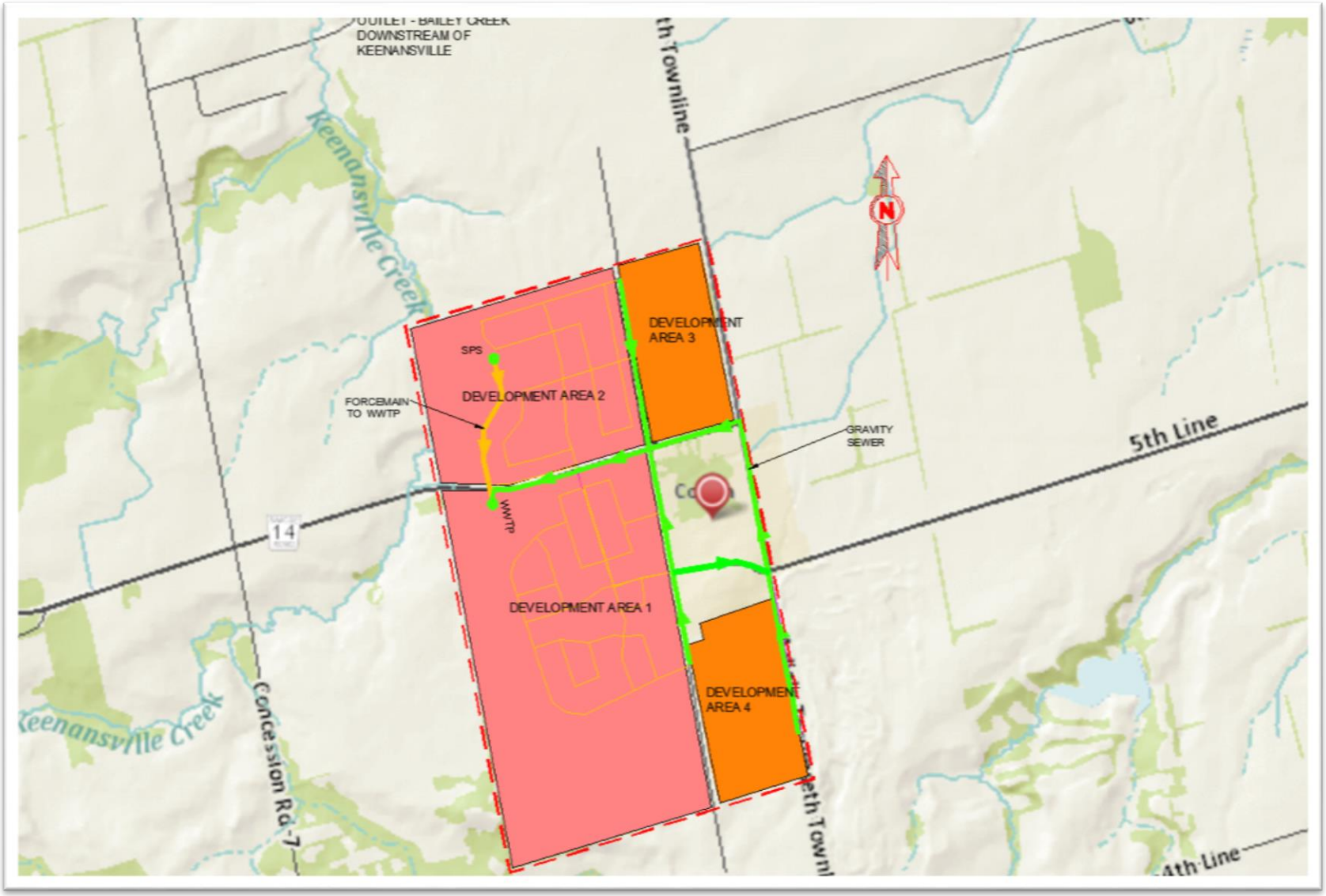


Figure 9.1: Recommended Preferred Master Wastewater Servicing Solution

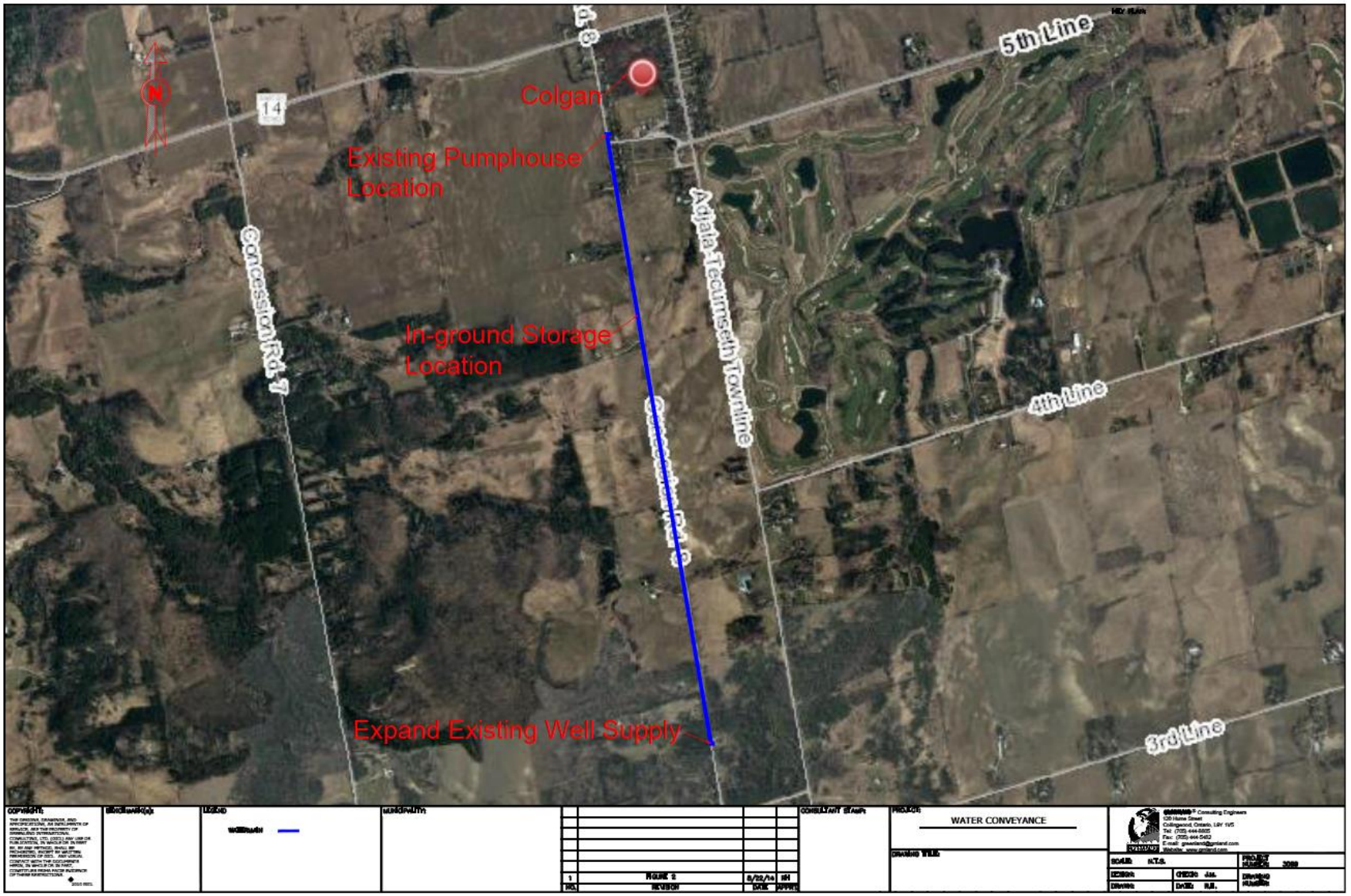


Figure 9.2: Recommended Preferred Master Water Servicing Solution

10.0 IMPLEMENTATION STRATEGY

Following completion of the relevant stages of the EA process, projects associated with the preferred Master Servicing Solutions for water and wastewater may proceed to the Implementation Stage of the Class EA Process (Phase 5). This Chapter outlines a recommended strategy for implementation of the preferred solutions, including: Required projects and their associated Class EA Schedule's and infrastructure approval requirements; Project phasing recommendations; Opinions of probable project capital costs; and, Potential impacts and mitigation and monitoring requirements to facilitate project implementation.

10.1 PREFERRED MASTER SERVICING SOLUTION PROJECTS AND APPROVAL REQUIREMENTS

In addition to meeting the intent of a Schedule 'B' Class EA process (addressed via this report), projects and approval requirements associated with the recommended preferred Master Servicing alternatives will generally include a number of additional approvals from regulatory agencies such as the Ministry of the Environment (MOE) and the Nottawasaga Conservation Authority (NVCA) as listed within this section.

10.1.1 Wastewater Project Infrastructure Approvals

It should be noted that any WWTP which utilizes surface water discharge for effluent disposal will require a Schedule C Class EA. Subsequent phased capacity improvements which may occur or may be proposed for the facility *after* the surface water outfall has already been established will also be subjected to the EA process.

Class EA and infrastructure approval requirements for wastewater projects associated with **Option WWC-C** and **Option WWT-3** are summarized in **Table 10-1**.

Table 10-1: Wastewater Project Class EA Schedules and Approval Requirements

Project Description	Class EA Schedule	Required Agency Approvals
Surface Discharge WWTP Capable of 0.05 mg/L Phosphorous Discharge.	Schedule C (To Be Completed prior to Implementation)	MOE Environmental Compliance Approval (ECA) NVCA Permit
Surface Water Outfall Forcemain to Bailey Creek	Schedule C (To Be Completed prior to Implementation)	MOE Environmental Compliance Approval (ECA) NVCA Permit
Sanitary Collection Network for New and Existing Development Areas (Conventional Gravity or Low Slope with Lot Level Pre-Treatment)	Schedule A (Addressed via this MSP Amendment)	MOE Environmental Compliance Approval (ECA)
Area 2 Sewage Pumping Station	Schedule B (Addressed via this MSP Amendment)	MOE Environmental Compliance Approval (ECA)

10.1.2 Water Servicing Project Infrastructure Approvals

The recommended preferred water servicing solutions selected as part of this MSP Amendment are generally categorized as Schedule 'B' Projects, and as such may proceed to implementation. Class EA and infrastructure approval requirements for water servicing projects associated with **Option W-2** and **Option WS-3** are summarized in **Table 10-2**.

Table 10-2: Water Project Class EA Schedules and Approval Requirements

Project Description	Class EA Schedule	Required Agency Approvals
Increase Capacity of Existing Colgan Wells at Current Location	Schedule B (Addressed via this MSP Amendment)	MOE Permit to Take Water (PTTW) and Environmental Compliance Approval (ECA)
In-ground/at-grade Water Storage with Booster Pumping and Backup Power at 2005 MSP Location	Schedule B (Addressed via this MSP Amendment)	MOE Environmental Compliance Approval (ECA)
Expand Existing Water Distribution Network for New Development Areas and Install Fire Protection Infrastructure (Hydrants) in all Areas	Schedule A (Addressed via this MSP Amendment)	MOE Environmental Compliance Approval (ECA)

10.2 PROJECT PHASING AND IMPLEMENTATION RECOMMENDATIONS

Although there is currently residual capacity within the Colgan Water systems current PTTW for approximately 300 units of new development, the initial phase of development in Colgan will be constrained by the requirement for wastewater servicing.

10.2.1 Wastewater Project Phasing

Construction of a WWTP as per **Option WWT-3** and the current Area 1 Draft Plan (see **Appendix D**) and a low-slope or conventional gravity sewer network with pumping station in Area 2 as per **Option WWC-C** must occur prior to development of new units within the study area, and will require the completion of a Schedule 'C' Class EA. It is also recommended that sewage collection infrastructure for the existing community be constructed during the initial Phase.

The WWTP should be designed to provide adequate treatment of the surface water discharge for the full buildout (20 year horizon) of Colgan, with detailed technology and phasing recommendations determined through the Schedule 'C' Process. WWTP phasing should also have consideration for the Phasing of water supply expansion (see **Section 10.2.2**) and account for oversizing of certain elements in the initial Phases (i.e. headworks) or consider the use of modular system components to facilitate expansions in later phases.

The surface water outfall will also need to be constructed in the initial Phase of development and its alignment and final discharge location will need to be verified through the Schedule 'C' Class EA.

10.2.2 Water Servicing Project Phasing

Based on the historic average daily water demand (ADD) in Colgan of approximately 49 m^3/d, there is currently an ADD residual capacity of 214 m^3/d based on the currently approved PTTW. This equates to capacity for approximately 297 units based on the population density of 2.67 persons per unit and per capita flow rate of 270 L/c/d outlined in **Chapter 2.0**.

It is recommended that Baseline hydrogeologic monitoring data be collected prior to the initial phase of development, which is recommended to be limited to 297 units of the proposed 622 units proposed for the 20 year growth horizon. Ongoing aquifer monitoring should being carried out during and after the connection of the first phase, and implementation of the recommendations of **Option W-2** should be completed in accordance with the recommendations of the Adaptive Management and Monitoring Program (AMMP). This monitoring data will serve as supporting documentation for an expanded PTTW. Please see **Section 10.4** for additional details on the proposed Mitigation and AMMP.

Subsurface or at-grade Water storage and fire protection should be constructed in accordance with **Option WS-3**, with phasing considerations (i.e. storage cell expansion, pump sizing etc.) to be carried out during the detailed design stage.

10.3 PRELIMINARY PREFERRED SERVICING ALTERNATIVE PROJECT CAPITAL COSTS

Wastewater projects associated with the preferred sanitary solution **(Option WWC-C** and **Option WWT-3)** will generally include the construction of trunk sewers along Concession 8 and County Road 14 (between development Areas 1 and 2) and east of existing residences. A sewage pumping station (SPS) will also be constructed under this option in Area 2. The preferred wastewater solution will also include the design and construction of a Wastewater Treatment Plant (WWTP) capable of discharging at 0.05 mg/L Phosphorous loading and a discharge forcemain to Bailey Creek downstream of Keenansville, in accordance with the findings of the Schedule 'C' Class EA process to be completed in support of this solution. **Table 10-4** presents the anticipated Opinion of Probable Capital Costs (OPC) for each project associated with the preliminary preferred master wastewater servicing solution.

Table 10-3: Opinion of Probable Capital Costs – Wastewater Projects

Project Description	Opinion of Probable Capital Cost
Surface Discharge WWTP Capable of 0.05 mg/L Phosphorous Discharge.	$7.0 Million
Surface Water Outfall Forcemain to Bailey Creek	$1.0 Million
Sanitary Collection Network for New and Existing Development Areas (Conventional Gravity or Low Slope with Lot Level Pre-Treatment)	$6.1 Million
Area 2 Sewage Pumping Station	$1.0 Million

Infrastructure projects associated with the preferred water servicing solution **(Option W-2** and **Option WS-3)** will generally include increasing the capacity of Colgan's existing GUDI well, constructing an in-ground or at-grade storage system (approximate capacity of 1,200 m^3 for 20 year buildout) complete with booster pumping capacity and backup power, and expansion of the municipal water system to accommodate future development Area's 1 and 2. Fire protection (hydrants) should also be installed throughout the community.

Table 10-4 summarizes the anticipated OPC for each project associated with the preferred master water servicing solution.

Table 10-4: Opinion of Probable Capital Costs – Water Projects

Project Description	Opinion of Probable Capital Cost
Increase Capacity of Existing Colgan Wells at Current Location	$1.0 Million
In-ground/at-grade Water Storage with Booster Pumping and Backup Power at 2005 MSP Location	$1.8 Million
Expand Existing Water Distribution Network for New Development Areas 1 and 2 and Install Fire Protection Infrastructure (Hydrants) in all Areas	$5.1 Million

Please Note that Opinions of Probable Capital Cost presented herein do not include costs associated with land acquisition (if required), design, approvals (including additional Phases of the Class EA process), legal fees, additional background studies or monitoring programs.

10.4 PROJECT MITIGATION AND MONITORING

Mitigation of potential impacts and monitoring the effectiveness of mitigation measures during and following implementation is a critical step of any Class EA Process. The following subsections provide recommendations for mitigation strategies pertaining to both of near and long term impacts, as well as associated recommendations for environmental monitoring. Additional information is also provided in the *Natural Heritage Background Study (Plan B, 2015)*.

The environmental impacts of the Recommended Preferred Solution can be minimized through implementation of a mitigation and monitoring strategy. For example, the WWTP should be constructed outside of environmental protection zones, in an area which is currently undeveloped but minimizes removal of existing vegetation. Routine inspections during Construction phases of all projects associated with the preferred Master Servicing Solution will need to be carried out to ensure adherence to design specifications.

10.4.1 Near-Term Impacts and Mitigation Strategies – Wastewater Projects

Potential near term impacts and associated mitigation strategies for the implementation of the preferred wastewater servicing alternative solutions are presented in **Table 10-5**.

Table 10-5: Near Term Impacts and Mitigation Strategies – Wastewater Projects

Potential Impact	Mitigation Strategy
Sediment and Erosion Control	• Sedimentation and erosion control strategies will be developed for each individual project prior to construction. • Erosion and siltation control measures need to be installed along the construction limits of adjacent wetlands (including golf course ponds).
Disturbance to Trees and Vegetation	• Recommended Solution minimizes impacts to existing vegetation. • Construction areas to be restored with native species.
Traffic	• Consultation with Ministry of Transportation, County of Simcoe, local utilities and school boards may be required prior to or during construction. • Affected Property Owners will be notified in advance of construction schedule and duration. • Recommended Solution minimizes construction traffic impacts
Infringement on Environmental Protection Areas and Hazard Setbacks	• All gravity sewer and forcemain designs should attempt to locate infrastructure within existing or future municipal ROW's. • Watercourse crossings recommended for completion by trenchless construction method.
Temporary Impacts (e.g. dust, noise and vibration)	• Construction activities should be limited to day-light hours to minimize impacts to residents. • Dust and storm water controls to be implemented during construction.
Implementation and Commissioning	• Tender should allow for adequate warranty and WWTP commissioning period • Regular site inspections during construction by qualified environmental and civil engineering site inspectors are recommended. • All work to be completed in accordance with the recommendations of the *Natural Heritage Assessment Study* (Plan B, 2015)

10.4.2 Long-Term Impacts and Mitigation Strategies – Wastewater Projects

Potential long term impacts and associated recommendations for mitigation strategies for the preferred servicing alternative solutions are presented in **Table 10-6**.

Table 10-6: Long Term Impacts and Mitigation Strategies - Wastewater

Potential Impact	Mitigation Strategy
Water Quality and Monitoring of Effluent From WWTP	• Prior to implementation of the Recommended Preferred Alternative which includes discharge to surface water, a Schedule C Class EA will need to be completed • Proposed WWTP effluent limit is 0.05 mg/L for Phosphorous, limits for other nutrients and potential contaminants should be developed and confirmed as part of the Schedule 'C' Class EA • The ECA for the WWTP will require that effluent quality is monitored and effluent limits and objectives are achieved. An environmental monitoring program should be developed at the detailed design stage
Stormwater Management and Drainage	• Engineering and Landscape design for WWTP should attempt to match existing drainage patterns and comply with all Township and NVCA Requirements for water quality and quantity control.
Removal of Trees and Vegetation	• Recommended Solution minimizes impacts to existing vegetation. • Restore Construction areas with native species.
Residential Impacts (Noise, Odour and Visual Impacts)	• WWTP and SPS Architectural Design should complement surrounding community (i.e. design building exteriors to match proposed homes) • Detailed WWTP Landscape design should include screening (i.e. berms, trees and other plantings). • Detailed WWTP Site Plan design should include adequate buffers and technological solutions for mitigation of noise and odour.
Other Environmental Impacts	• Final design should include a mitigation strategy to protect and enhance the natural heritage system in accordance with the mitigation measures recommended above and in the *Natural Heritage Assessment Study* (Plan B, 2015).

10.4.3 Water Project Impacts, Mitigation and Monitoring

Given the extensive pre-consultations completed with respect to PTTW expansion in Colgan both as part of this MSP Amendment and prior to its initiation, one of the main implementation considerations for water projects is the development and execution of an Adaptive Management and Monitoring Program (AMMP) to allow for proper collection of monitoring data to support expansion of the Township's current PTTW for Colgan in accordance with the recommended preferred water supply solution (**Option W-2**).

Although preliminary modeling supports an ADD of up to 841 m^3/day without detrimental impacts to surrounding watercourses, the AMPP should be implemented to verify the findings of the model and develop a baseline for comparison to future monitoring as development proceeds. For more information please see the AMMP Technical Memo (**Appendix E**) and PTTW Report (**Appendix B**) both completed by Golder Associates (2015). Additional information pertaining to impact mitigation is also provided in the *Natural Heritage Background Study (Plan B, 2015)* in **Appendix B**.

A summary of potential impacts and proposed mitigation strategies associated with the preferred water servicing solutions is provided in **Table 10-7**.

Table 10-7: Water Supply, Distribution and Storage Project Impacts and Mitigation

Potential Impact	Mitigation Strategy
Traffic and Interruption to Local Residents	• Affected property owners will be notified in advanced as to construction schedule and duration. • Consultation with MTO, the County of Simcoe, local utilities, local school boards and the Township may be required during construction period.
Dust, Noise and Vibration	• Construction operations will be restricted to the day time period; in addition, the contractor will be required to meet local noise by-laws. • Dust control will be implemented throughout construction.
Visual Impact	• The expanded storage is located in the same location as the existing storage tanks, and tanks will be subsurface or at grade, thereby minimizing visual impacts.
Sediment and Erosion Control	• Sedimentation and erosion control strategies will be developed for each individual site prior to construction.
Removal of Vegetation	• Recommended solution minimizes vegetation/tree removal by utilizing previously disturbed existing municipal lands
Aquifer and Aquatic Habitat Monitoring	• Baseline hydrogeological and aquatic ecosystem monitoring data should be collected prior to additional development in accordance with the recommendations of the AMMP Technical Memo (**Appendix E**) • Monitoring should continue in accordance with recommendations of the AMMP through initial stages of development.

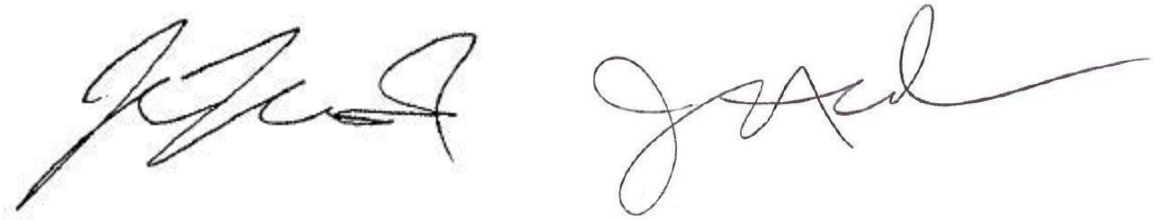
11.0 CLOSURE

Based on the foregoing information, Greenland recommends that the preferred master wastewater servicing solution for Colgan should include **Option WWC-C:** Split Gravity And SPS/Forcemain Flow To WWTP, using either Conventional Gravity Sewers or Low-Slope Small Diameter Sewer with Lot Level Pre-Treatment Tanks and **Option WWT-3:** 0.05 mg/L P Treatment with Surface Water Discharge WWTP (Bailey Creek).

Furthermore, Greenland recommends that the preferred master water servicing solution for the Community of Colgan should consist of **Option W-2:** Increasing the Current PTTW and Well Capacity to Supply Ultimate Demand and **Option WS-3:** Construction of In-ground/at-grade Storage with Booster Pumping at the 2005 MSP proposed Location.

These projects should proceed to the next Phases of the Class EA process, including implementation, in accordance with the recommendations presented in this MSP Amendment Report and appended supporting documentation.

GREENLAND INTERNATIONAL CONSULTING LTD.



Josh Maitland, P.Eng,
Project Engineer, EA Coordinator

Jim Hartman, P.Eng.
Project Manager, Senior Associate