Appendix A
MOE – Southwestern Region
Minimum Information Requirements
for contents of a
Conceptual Storm Water Management Plan to
Accompany Draft Plan Submissions

The MOE requires at, or prior to the draft plan stage, the submission of a single bound document, prepared by a qualified consultant, containing sufficient text maps and plans to contain but not be limited to, the following information:

Site Natural Features

A map of sufficient detail (usually 1:10,000 scale or less) to locate any and all significant natural features within and adjacent to the development site, to include:

- location and size of catchment in relation to entire drainage basin
- any size vegetation (trees, crops, other vegetation)
- site topography, including contours
- soils description/geology (e.g. soil profile, test pit results, etc.)
- information on the nature of the quality of any water body (stream, pond, lake, spring, wetland) within and adjacent to the development including but not limited to water chemistry, hydrology, fishery and any water uses
- any alteration (including proposed enhancements) of the natural features of the site.

The reason for this information is to assess, from a water management perspective, the feasibility of the development on a site and the possibilities for stormwater management for appropriate developments. Some or all of the required information could have been collected as part of a watershed or sub -watershed study which is preferable since there may be limitations to development other than water management considerations.

Storm Water Quantity/Quality Management Plan

A description of the stormwater management plan is required with emphasis on good site planning and at-source controls rather than primary reliance on engineered end-of-pipe (e.g. ponds) treatment solutions. In this regard, the MOE prefers a multiple best management practices (BMP) approach guided by a sub-watershed or watershed plan as the best approach to better ensure the management of the area water resources. The plan should evaluate alternatives; describe the preferred option and present rationale for the selected stormwater management plan. The report should advise the Ministry as to expected environmental impacts (e.g. thermal, suspended solids, bacteria, etc.)

The storm water management plan must demonstrate knowledge of and adherence to the concepts and philosophies outlines in I) “The Interim Stormwater Quality Control Guidelines for New management Practices, June, 1991”.

The stormwater management plan must also contain a detailed erosion and sediment control plan. Guidance can be obtained from “Guidelines on Erosion and Sediment Control for Urban Construction Sites, May 1987”. Details on the inspection and maintenance responsibilities of the erosion and sediment control plan should be emphasized.

Appendix B

TECHNICAL STANDARDS FOR STORMWATER MANAGEMENT WITHIN N.V.C.A. WATERSHED (May, 2000)

1.0 Introduction

It is envisioned that by planning the management of stormwater resources when land is being developed, that the suitability and future availability of water to consume, play in, and sustain ecosystems will be protected. It is also expected that management will protect those at risk from water-related hazards and property damage.

"Everyone is a stakeholder when it comes to water"

1.1 Background

Development pressures exist throughout the Nottawasaga Valley Watershed. In recognition of this, the Nottawasaga Valley Watershed Management Plan 1996 - 2015 was developed in cooperation with watershed municipalities, residents, development industry, government and non-government organizations, and special interest groups, with the intent to provide direction for resource management in the Nottawasaga Valley Watershed. The Watershed Management Plan outlines several water resource management objectives that reflect the significant water-related features of each municipality. The objectives are as follows:

- *a commitment to the integration and coordination of water resource management,*
- *a commitment to the preservation, conservation, enhancement, and rehabilitation of significant natural heritage features,*
- *the enhancement of water conservation practices,*
- *the maintenance and enhancement of groundwater and surface water quality and quantity,*
- *the control of discharges into surface and groundwater,*
- *the identification and protection of significant recharge/discharge areas, and headwaters areas,*
- *the protection of human life and property from water-related hazards.*

1.2 Purpose

The purpose of the Technical Standards is to provide a fair, reasonable and uniform basis for engineering and design decisions when developing residential, commercial, industrial, and institutional development within the Nottawasaga Valley Watershed. The Standards are based on the most current versions and associated amendments of the following documents:

- *Conservation Authorities Act (CAA),*
- *Provincial Policy Statement (1997) (issued under Section 3 of the Planning Act),*
- *Nottawasaga Valley Watershed Management Plan (1995),*
- *Stormwater Management Practices Planning and Design Manual, (MOE, 1994),*
- *Fish Habitat Protection Guidelines for Developing Areas, (MNR, 1994).*
- *Erosion and Sediment Control Training Manual, (MOE, 1997)*

These Standards require a systems approach to water resource management including both upstream and downstream considerations for all development as emphasized within the Nottawasaga Valley Watershed Management Plan (1995).

2.0 Stormwater Management Design Criteria

To achieve the objectives outlined in the Nottawasaga Valley Watershed Management Plan, the following stormwater management criteria have been developed for residential, commercial, industrial, and institutional developments in the absence of subwatershed level planning. All proposals must be approved by the: NVCA, Local Municipality and other approval agencies. Background technical information for any proposal must be prepared by a qualified professional engineer licensed to practise in the Province of Ontario. Pre-consultation with the NVCA and Municipal or County staff is required to confirm/clarify issues, policies and design requirements.

2.1 General

- In any new multi-lot development, major development will be defined as a developable area of more than five lots.
- In any new single structure development, major development will be defined as any large-scale proposal or site alteration with a developable area of equal to or greater than 10,000 square feet (929m^2). Special land uses such as large farm buildings are looked at on a case-by-case basis.
- Developable area means an alteration of land-use that has the potential to introduce pollution impacts, and can impact the natural and built environment through changes in the hydrologic cycle and flow regimes. Development is defined in the Conservation Authorities Act as: a) construction, reconstruction, erection or placing of a building or structure of any kind; b) any change to a building or structure that would have the effect of altering the use or potential use of the building or structure; c) increasing the size of the building or structure or increasing the number of dwelling units in the building or structure; d) site grading; or, e) the temporary or permanent placing, dumping or removal of any material originating on the site or elsewhere.
- If the developable area is deemed major as per the above criteria, the Authority will typically require a preliminary report in support of draft or site plan approval and final report and plans addressing the following items (2.2 to 2.4, and 3.0). Final reports and plans must be approved prior to issuance of an Authority permit, clearance letter and/or a Municipal building permit. *(One copy of reports or plans is required by the Authority)*
- A Municipal topsoil bylaw implemented under the "Topsoil Preservation Act R.S.O.,1990" will complement or may replace the requirements of Section 3.0.

2.2 Water Quality Control

The NVCA requires that all new development proposals are to design for, and provide water quality protection to the most stringent standards,

In all cases, maximizing undisturbed areas, maximizing pervious surfaces and minimizing directly connected impervious area is the first consideration for quality control.

- Design an integrated water management approach utilizing buffers, lot level source controls, conveyance controls, innovative approaches and/or end-of-pipe facilities to meet or exceed current provincial standards, and
- Proposals must address regional, local and in-stream concerns (both acute & cumulative) which may include: dissolved oxygen levels, microbiological contamination, eutrophication, in-stream erosion and thermal impacts on the receiving stream.

- Integrated design shall qualitatively **and** quantitatively demonstrate that the proposal meets Level 1 protection requirements, with a target total suspended solids removal of 80%, as outlined in the 1994 MOEE document titled "Stormwater Management Practices Planning and Design Manual". *EXCEPTION: When Subwatershed Study criteria are in effect*

- The Best Management Practices (BMP) selection process shall review all environmental constraints and provide rationale for the selection of alternatives for a specific site. The report is to include a selection matrix describing this process. In all cases, infiltration of stormwater from rooftops and grassed areas by using dry wells, rear yard discharge, infiltration trenches, buffer zones, enhanced grass swales, etc. shall be the first consideration for stormwater quality control within an integrated design.

- Dry-weather spill control requirements should be confirmed with the Ministry of the Environment. Spill/Hydrocarbon control will typically be required by the NVCA, County or Municipality on some types of industrial, institutional and commercial land uses.

- Input on the impacts of stormwater discharges on fisheries habitat may be obtained from the Department of Fisheries and Oceans, Ministry of Natural Resources and Ministry of Environment to address fisheries habitat impacts and potential mitigation requirements.

2.3 Water Quantity Control and Base Flow Maintenance

The Authority's overall target for water quantity and base flow maintenance is to match the pre-development hydrologic regime (surface flows and infiltration amounts) with the post-development regime by implementing the following volume and peak flow controls.

In all cases, maximizing undisturbed areas, maximizing pervious surfaces and minimizing directly connected impervious area is the first consideration for quantity control and base flow maintenance.

- Attenuation of all post development flows to pre-development levels, up to and including the 100 year storm,
- The SCS Type II, Chicago and AES rainfall distributions should be applied to the hydrologic model (along with IDF curve values for the 2, 5, 25, 100 year) and select the event which produces the greatest runoff peaks and volumes. The Regional storm should be modelled for conveyance.
    - *i) EXCEPTION: Master Drainage Plan or Subwatershed Study has been prepared, The Authority may waive this requirement in special cases, ie. discharge directly to Georgian Bay, coincident peaks in the receiving water body*
- All attempts should be made to match pre-development surface water duration and volumes,
- All attempts should be made to maintain or enhance existing (pre-development) infiltration amounts which are a function of soil type, land-use, vegetation and geology,
- All attempts should be made to maintain the existing drainage pattern(s),
- Potential effects on stream base flow due to increased development must be examined,
- The effects of cumulative impacts, such as changes in land uses and up/down stream impacts, must be examined,
- Stormwater discharge should be managed in a way that will not require any off-site requirements for erosion protection or flood control in the receiving stream,
- Preliminary reports must describe the suitability of outlets, the legal right of discharge, and include written copies of any required drainage agreements,
- Retrofitting of existing developments which do not meet current standards will be considered where feasible, and in conjunction with the Ministry of the Environment.

2.4 Detention Facilities

On-site detention facilities may be provided for both the major and minor systems (or combined) as required to reduce runoff increases (from all storm events) from post development to pre-development levels and to meet downstream flow constraints. The flows must be controlled prior to leaving the lands owned by the Developer(s) in question.
EXCEPTION : Off-site facilities may be permitted under the direction of a Subwatershed Study or Master Drainage Plan.

Both wet ponds, constructed wetlands, infiltration and batch dry detention facilities may be considered, as defined in the 1994 MOEE document titled "Stormwater Management Practices Planning and Design Manual". The characteristics of the facility are to closely match these planning guidelines. Designers shall provide appropriate reference or rationale when modifying, or improving on these guidelines.

- The construction of facilities must be within the developed lands, located outside Natural Hazard Areas, outside wetland boundaries, and located outside the Regional Storm floodplain. *EXCEPTION: Location of Facilities below the Regional Storm floodplain and the floodway will only be considered for two zone or special policy areas after appropriate studies address Public Health and Safety Policies and Natural Heritage Policies*

- Detention facilities may be used as sedimentation control during construction if the outlet is altered to allow ponding and settling of sediment particles. Separate basins are preferred. Restoration details, after the construction stage, must be provided if the detention facility is used for sedimentation control. Infiltration facilities shall **not** be used for sediment control during construction.

- A planting plan, prepared by a qualified landscape architect is required for all detention facilities utilizing the 5-zone approach and incorporating native tree, shrub and aquatic plants. The plan is to address water quality and temperature, aesthetics (blending of the facility into the natural and built environment), slope stability and public safety. The preparation of this plan is to be referenced in development agreements and is typically required prior to final clearance of conditions.

- All detention facilities shall be delineated as a Block on the Draft Plan and placed in a restrictive zone category [eg. Environmental Protection (EP)], in the implementing zoning by-law. The purpose of restricting zoning for these facilities is two-fold:
  - to reflect a potential hazardous area,
  - to ensure the long term function of the facility.

Maintenance and function of a facility with private ownership shall be provided within and controlled by Site Plan Control.

Detention facilities must include the following:

- An access route for maintenance/emergency vehicles from the roadway to the detention facility.
- Stable, vegetated side slopes under the full range of design conditions including the Regional event.
- Terraced side slope grading for safety, vegetation zones and ease of maintenance.
- An appropriate freeboard above the 100-year storm event.
- An emergency overflow structure capable of safely conveying the Regional Storm in the event the normal outlet does not function properly.
- An operations and maintenance plan.

Detention facilities may include the following:

- Allowance for permanent pool drainage for maintenance
- Maintenance by-pass system at the inlet
- An area designated for on-site sediment storage & de-watering
- Water quality inlets to reduce sediment load and extend facility storage life
- Community access and trail systems

3.0 Erosion and Sedimentation Control (In areas without a Municipal Topsoil By-law)

3.1 Purpose

The purpose of erosion and sediment control is to protect life and property and to minimize adverse impacts on water quality, and the natural environment both internal and external to the site. *(The consultant is required to inform the client of all federal, provincial and municipal issues with erosion and sediment control and the requirement for technical expertise)*

3.2 Objectives

The objectives of an erosion and sediment control plan will be to prevent soil particles first from eroding and then from moving off the development site or impacting natural features within the development.

A plan should follow these principles:

- Fit development to the topography,
- Understand the site's drainage pattern,
- Time and phase development,
- Retain existing vegetation where feasible,
- Re-vegetate or mulch immediately after construction,
- Divert runoff from exposed areas,
- Prepare outlets and conveyance to handle increased runoff,
- Minimize length and steepness of slopes,
- Keep runoff velocity low,
- Trap sediment on site,
- Inspect and maintain measures.

3.3 Requirements

Preparation of a strategy to control erosion and sedimentation is always required and the strategy is to be prepared and approved as part of the detailed SWM design submission.

- An adequate erosion and sedimentation control plan shall be prepared for each construction project. This consists of three phases, 1) during site clearing/grubbing/pre-grading, 2) during site servicing and the construction of buildings, and 3) post development erosion control. These requirements are to be incorporated into contract provisions and drawings.

- An adequate plan will consist of a narrative, layout & grading plans, construction details, contract provisions, calculations, designated contacts, and a work schedule. The Authority suggests using the "Procedure for Producing an Erosion and Sediment Control Plan" as outlined in the 1997 MOE document entitled "Erosion and Sediment Control Training Manual".

- As a minimum, the layout and grading plan shall depict the following: 1 metre existing, preliminary and final contours, soil characteristics, existing vegetation types, adjacent and internal areas and properties that are sensitive to erosion and sediment damage, zones of high erosion potential, existing, during and post development drainage patterns and outlets, all specifications and installation procedures, detailed notes, limits of clearing and grading, stockpile locations, and monitoring & maintenance requirements.

- All erosion and sedimentation control measures & facilities must be implemented according to the staging outlined in the erosion and sediment control plan (*and depicted on the contract drawings*), or must be in place prior to any development beginning.

The following sedimentation control parameters are requested:

- Use temporary sediment ponds / traps during the grading and construction phases. The minimum sizing criteria is:

  To detain the runoff from a **25 year 6 hour duration rain event (using average intensity)** and is to be based on local and up to date Intensity-Duration-Frequency (IDF) information.

  The length of retention time shall be based on settling a particle size of **0.02 mm (medium silt)**. Where grain size analysis shows a significant percent passing < 0.02mm additional measures may be required in consultation with the NVCA and Municipality. (ie. staging, vegetation and mulching)

  All temporary ponds or SWM facilities must incorporate a permanent pool of 0.6m in depth.

- All other sediment control techniques and temporary conveyance techniques shall be designed to withstand the runoff from a **25 year 6 hour duration rain event (using peak intensity)**. Particles retained shall be based on the exposed soils within the catchment area of the proposed control.

The following erosion control measures are requested:

- Development Phasing, retain existing vegetation, re-vegetation, cover practices, slope stabilization

3.4 Responsibility

- It is the responsibility of the landowner (usually represented by a designated agent) to implement, monitor and maintain all erosion/sedimentation control structures until a vegetative cover has taken hold (after construction). This would include field inspection of all structures before a predicted storm event and after each rainfall event and follow up with any required maintenance.

- A representative from the Authority **may** inspect erosion control measures prior to any on-site grading (if this has been outlined on your NVCA Fill, Construction, and Alteration to Waterways Permit). 24 hour notification should suffice.

- It is the responsibility of the project, site or construction supervisor to provide a performance report on the erosion and sediment control strategy after rainfalls in excess of 50 mm in any 24 hour period, or if any problems develop on the site. This is to include the actions taken to solve any problems. If you have an Authority permit for in-stream work or are working within registered fill-lines please fax to **705-424-2115 attn. Engineering.** , OR if you are outside fill-lines and are not working in water, please follow municpal reporting procedures.

- When an approved erosion and sediment control plan is found to be inadequate or the plan as implemented appears to be inadequate, modifications are expected.

4.0 Monitoring

The results from monitoring plans (typically requested on large scale development) may be incorporated into the design and planning of new & retrofit stormwater management practices and criteria. Monitoring programs are requested as a condition of approval. The scope of the program is to be set out during pre-consultation with the Authority and Municipality or County. Monitoring may be based on biological, fluvial, hydraulic & chemical indicators & may be integrated with DFO or MOE requirements.

5.0 Work Restrictions

Contact the NVCA Watershed Officer for current "Work Restriction Periods for Work in Water". Generally, in-stream work windows are established based on the fishery within or downstream of the stream system.

6.0 Hazard Land Management

Development within or adjacent to hazardous lands, watercourses, lakes or steep slopes may require additional studies. This information may be required in conjunction with a stormwater management report and can be included within a single document.

Examples include:

- Delineation and analysis of Regulatory floodplains
- Slope stability
- Geomorphology
- Restoration, Bioengineering and Biotechnical slope stabilization

Background technical information for any proposal must be prepared by a qualified professional licensed to practise in the Province of Ontario. Pre-consultation with NVCA and Municipal or County staff is required to confirm/clarify issues, policies and design requirements. Please reference the 1997 Ministry of Natural Resources document "Natural Hazards Training Manual" for additional details.

7.0 Implementation

Implementation of these guidelines shall be carried out through the Planning Act, Official Plans, Watershed & Subwatershed Plans and the Nottawasaga Valley Conservation Authorities current fee schedule. Some proposals within fill lines or proposals altering watercourses may be required to apply to the "Fill, Construction and Alteration to Waterways" permit process (as per Section 28 of the ***Conservation Authorities Act*** and R.R.O. 164/90, as amended).

8.0 Enforcement

Section 28 of the Conservation Authorities Act gives the NVCA the right to control certain activities in Regulated areas. Failure to comply with the Act in these areas may subject the owner to the following legal remedies:

(16) Every person who contravenes a regulation made under subsection (1) is guilty of an offence and on conviction is liable to a fine of not more than $10,000 or to a term of imprisonment of not more than three months.

(17) In addition to any other remedy or penalty provided by law, the court upon making a conviction under subsection (16), may order the person convicted to, a) remove, at that person's expense, any development within such reasonable time as the court orders; and b) rehabilitate any watercourse or wetland in the manner and within the time the court orders.

Please reference the complete text of the Act for additional clarification. Please note that the ultimate responsibility for compliance with the conditions of permit lies with the property owner.

When outside a Regulated area, the Authority may liaise with other agencies such as MNR, DFO and MOE when requested.

9.0 Dispute Resolution / Policy Exception Approval

- The Authority encourages alternative dispute resolution techniques to be applied prior to appeals,
- The Executive Committee of the Authority or its appointed members will review and rule on any and all disputes, policy appeals, etc.
- Appeals and disputes regarding NVCA Executive decisions can be made to the Minister of Natural Resources, or to the Ontario Municipal Board (OMB, Planning Act).

10.0 Updating

These standards have incorporated comments received to date, and will be reviewed from time to time (typically on a yearly basis) and revisions incorporated. Please contact the Authority for a current version of this document, or download a copy from the NVCA web site www.nvca.on.ca

GLOSSARY OF TERMS

Acute: serious or severe

AES: Atmospheric Environment Service (CANADA)

Authority: means the Nottawasaga Valley Conservation Authority.

Baseflow: means low-flow conditions in a watercourse (sustained by groundwater or wetland flow input only).

Bioengineering stabilization: is when plant parts act as the main structural and mechanical elements in slope or erosion protection system.

Biotechnical stabilization: is the use of mechanical elements in combination with biological elements to stop and prevent slope failures or erosion.

Buffer: An undisturbed or restored setback of a set distance from a feature that requires protection.

BMP: Best Management Practice

CAA: Conservation Authorities Act

Conveyance: means the directing of water flow in a certain pattern or within a structure, device or area

Criteria: principles or standards of judgement

Cumulative: increasing progressively in amount or force and is formed by successive additions.

Detention Facility: means a device, structure or technique with the ability to hold or dissipate a quantity of stormwater, the benefits include sediment settling and control of the volume, duration, peak stormwater flow from land.

Directly connected impervious area: hardened surfaces such as roads and roof tops that do not allow water to pass through them, and which drain to municipal storm sewer infrastructure.

DFO: The Department of Fisheries and Oceans

Dry-well: also soak-away pit, infiltration pit, a device used to capture rainfall in an underground rock pit and thus release it to the groundwater by infiltration.

Eutrophication: The process of nutrient enrichment in aquatic ecosystems

Enhanced grass swale: A grassed swale with a mild slope, flat bottom width and mild side slopes, and may have regularly spaced obstructions to promote infiltration.

Hydrologic cycle: the movement of water in it's various states through the atmosphere and the earth

IDF: Intensity-Duration-Frequency

Monitoring: means the regular surveillance of conditions.

MOE: The Ontario Ministry of Environment

Natural Hazard Areas: are areas impacted by flooding, erosion, dynamic beaches, unstable soils, unstable bedrock.

NVCA: Nottawasaga Valley Conservation Authority

Permit: means a "Fill, Construction and Alteration to Waterways" approval by a Conservation Authority.

Qualitative: is a description of the relative nature and attributes of things showing the degree of excellence.

Quantitative: is the measurable property of things such as size, extent, weight, volume, intensity, degree, usually expressed in numbers.

SCS: Soil Conservation Service (USA)

Selection Matrix: is a process to pick appropriate stormwater techniques based on their intended purpose and design constraints/opportunities and usually starts with a long list of BMP alternatives under consideration

Special Policy Area: means an area within a community that has historically existed in the flood plain and where specific policies concerning development have been approved.

Site Alteration: means activities such as fill, grading and excavation, that would change the landform and natural vegetative characteristics of a site.

Spill Control: is a plan or device used to prevent the movement of deleterious substances off a site.

Standard: is a quality or measure serving as a basis or example or principle to which others conform or should conform or by which others are judged, a level of excellence required or specified of a normal or prescribed quality.

Stormwater: means water that runs off the land or infiltrates into shallow aquifers. The original source of the water was a rainfall (storm) event.

SWM: Stormwater Management

Suitability of outlets: is a legal term defined through riparian common law and statutes. It defines the rights & constraints various proponents have when discharging stormwater.

Watershed: means the borders defining the jurisdiction of the NVCA. Included are the drainage areas for the Nottawasaga, Batteaux, Pretty Rivers, and the Black Ash , and Silver Creeks and a portion of the Wye River.

Appendix C

Temporary Connection, Testing and Disinfection of Watermains

The Contractor shall supply all labour, equipment and materials for the temporary connection, swabbing, hydrostatic testing, disinfection, dechlorination, flushing and final connection of watermains and services in accordance with this specification, OPSS 701 for hydrostatic testing, and AWWA C651-99 for disinfection and connection to the existing water distribution system. The specifications listed in this section represent minimum requirements. Additional requirements of the Township may also apply.

1. Temporary Connection

The new watermain shall be isolated from the existing water distribution system using a physical separation until satisfactory bacteriological testing has been completed and accepted by the Contract Administrator and the Municipality. Water required to charge the new main shall be supplied through a temporary connection between the existing water system and the new main. The temporary connection shall incorporate an appropriate cross-connection control device, consistent with the degree of hazard for backflow protection of the active distribution system (e.g. a double check valve assembly or a reduced pressure zone backflow preventer per CAN/CSA-B64.10). The cross-connection control device shall be disconnected (physically separated) from the new main during hydrostatic testing and reconnected afterwards. Refer to the attached detail drawing entitled “Typical Temporary Connection for Watermains” for items to be included and additional details.

2. Swabbing and Preliminary Flushing

The new watermain shall be cleaned with a minimum of two clean new swabs. Additional swabbing is required at the Contractor’s expense if the water is not clear after the second swab has passed through the watermain. Swab length shall be 1.5 x swab diameter. Swab diameter shall be 50 mm greater than the inside diameter of the watermain. Swab density to be 1.5 lb/board ft. (high memory foam). Supply, installation and subsequent removal of temporary swab retrieval stubs/ports and all associated costs shall be included in the lump sum price for this item.

The flow rate for swabbing/flushing should be sufficient to maintain the velocity in the main of 0.76m/s to 0.91 m/s in order to keep particles in suspension. Preliminary flushing of the main shall immediately follow the swabbing operation.

3. Hydrostatic Leakage Test

Hydrostatic leakage testing shall be undertaken in accordance with OPSS 701.07.22 under the supervision of the Contract Administrator. Prior to commencing the hydrostatic test, the Contractor shall operate all line valves for the Contract Administrator and verify that they are in the open position. The criteria for hydrostatic testing in this section pertain to all pipe materials, except polyethylene. Refer to OPSS 701.07.22.02 for polyethylene pipe testing criteria.

The test pressure shall be 1035 kPa which shall be maintained continuously for the duration of the two hour test. If necessary, additional water shall be added to the test section during the two-hour test in order to maintain the test pressure (i.e. the pressure should not be allowed to drop significantly throughout the two hour test with all of the make-up water added at the end of the test).

The allowable leakage is 0.082 litres per millimeter of pipe diameter per kilometer of watermain for the two-hour test period.

4. Disinfection

Watermains and services shall be disinfected in accordance with AWWA C651-99. The entire main shall be filled with heavily chlorinated water. The chlorinated water shall be retained in the main for at least 24 hours, during which time all valves and hydrants in the treated section shall be operated to ensure disinfection of the appurtenance. At the end of the 24 hour period, the treated water in all portions of the main shall have a residual of not less than 10 mg/L of **free** chlorine. If the chlorine residual is less than 10 mg/L of free chlorine in any portion of the test section, the disinfection procedure shall be repeated.

5. Final Flushing and Dechlorination

After the requirements of the disinfection section have been met, heavily chlorinated water shall be completely flushed from the watermain and all branches until chlorine levels in the watermain are no higher than levels generally prevailing in the distribution system.

The environment to which the chlorinated water is to be discharged shall be inspected. If there is any possibility that the chlorinated discharge will cause damage to the environment, then a neutralizing chemical shall be applied to the water to be wasted to thoroughly neutralize the residual chlorine.

The discharge of chlorinated water directly to receiving waters can be detrimental to aquatic life and therefore, should not be considered as an option. A storm sewer should be considered directly connected with the receiving water which eliminates it as an option in most cases. Discharge to an open ditch or a vegetated field are good alternatives, especially if the point of discharge is a considerable distance from the receiving water and the ditch is unlined, heavily vegetated and overrun with organic materials. Sunshine and high temperatures aid in dissipation of the chlorine. Slow discharge to a sanitary sewer, if approved by the Operating Authority, may be an option. In order to avoid upsetting the biological processes at the wastewater treatment facility, the distance between the point of discharge and the treatment facility must be taken into account along with the rate of discharge in order to sufficiently dilute the chlorinated water before it reaches the facility.

If dechlorination is necessary, there are several chemicals which can be used effectively. Adequate dosage of the chemical and mixing with the chlorinated water must be ensured.

The amount of dechlorination chemical required can be determined from the following equation:

Excess Chlorine Residual **x** Factor = Dechlorination Chemical Required

This can be calculated in mg/L or whichever unit is appropriate.

Five examples of dechlorination chemicals are listed below:

a. Hydrogen Peroxide (Factor = 0.479); This may be the best option when discharging to an environmentally sensitive receiving water. It is inexpensive and an overdose will only add more oxygen to the watercourse.

b. Sulphur Dioxide (Factor = 0.901); This chemical is inexpensive but it will slightly lower the pH in the receiving water.

c. Sodium Thiosulphate (Factor = 2.225); This will cause some sulphur turbidity but an excess is essentially harmless.

d. Sodium Sulphite (Factor = 1.775); Excess will lower the dissolved oxygen in the receiving water.

e. Sodium Pyrosulphate (Sodium Metabisulphite) (Factor = 1.338); Excess will lower the dissolved oxygen in the receiving water.

For example, a total chlorine residual of 20 mg/L measured in a disinfected watermain of 11,000 L could be neutralized with hydrogen peroxide. The dosage required would be:

$$20 \text{ mg/L} \times 0.479 = 9.6 \text{ mg/L}$$

and the total amount needed would be

$$9/.6 \text{ mg/L} \times 11{,}000 \text{ L} = 105{,}600 \text{ mg} = 105.6 \text{ gm of } H_2O_2$$

This would represent in terms of 35% commercial grade hydrogen peroxide (specific gravity 1.13 g/ml):

$$\frac{105.6}{35} \times \frac{100}{1.13} \times 1 = 267 \text{ mL of concentrate}$$

The above information is offered as a guide only. The contractor is ultimately responsible to ensure that no negative environmental impact results from the disposal of chlorinated or dechlorinated water from the disinfection process.

6. Sampling and Bacteriological Testing

Under the lump sum price bid, the Contractor shall provide sufficient blow offs/sampling ports (including their eventual removal) to accommodate the sampling requirements detailed herein. After the requirements of previous sections have been met, two consecutive sets of water samples, taken at least 24 hours apart, shall be collected at the ends of all branches, stubs and not more than 350 m apart along the length of the watermain. In addition, it is recommended that the existing distribution system be sampled for testing as well. The watermain shall **not** be flushed or disturbed during the minimum 24 hour period between sets of samples. Samples shall be taken by municipal staff using bottles provided by a provincially accredited laboratory.

Microbiological Standards

Microbiological Parameter	**Standard (expressed as a maximum)**
Escherichia Coli (E. Coli)	Not detectable.
Fecal Coliforms	Not detectable.
Total coliforms	Not detectable.
General bacteria population expressed as background colony counts on the total coliform membrane filter.	200 colony forming units (CFU) per 100 milliliters.
General bacteria population expressed as colony counts on a heterotrophic plate count.	500 colony forming units (CFU) per milliliter.

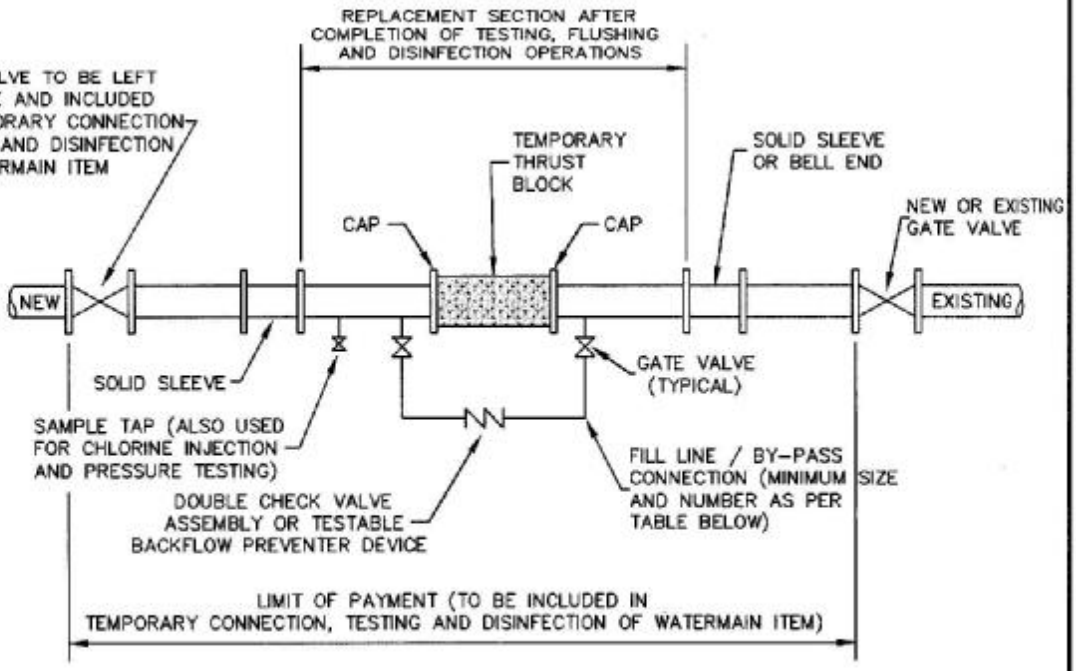
All samples from both sets of samples shall meet the above bacteriological testing criteria before the Municipality will grant approval for connection of the new watermain to the active distribution system.

7. Final Connection/Commissioning

The Contractor will be allowed to make the final connection(s) between the new watermain and the existing distribution system once the Township has granted its approval. The removal of the temporary connection apparatus and the installation of the final connection piping **must** be witnessed by the Contract Administrator.

All piping and appurtenances utilized in completing the final connection must be thoroughly disinfected with a 1 percent sodium hypochlorite solution (or equivalent).

The excavation must be maintained in a dry state in order to eliminate the possibility of trench water entering the watermain when the final connection is being made. The Contractor shall ensure that no foreign material whatsoever enters the watermain at this time. Should trench water or foreign material enter the watermain, the entire disinfection/sampling procedure shall be repeated at the Contractor’s expense.



TYPICAL TEMPORARY CONNECTION FOR WATERMAINS

NTS

PIPE DIAMETER	FLOW REQUIRED TO PRODUCE 0.76m/s (APPROX) VELOCITY IN MAIN	SIZE OF TAP (mm)			NUMBER OF OPEN 64mm HYDRANT OUTLETS
		25	38	51	
mm	l/s	NUMBER OF TAPS ON PIPE			
100	6.3	1	–	–	1
150	12.6	–	1	–	1
200	25.2	–	2	1	1
250	37.9	–	3	2	1
300	56.8	–	–	2	2
400	109.9	–	–	4	2

REQUIRED FLOW AND OPENINGS TO FLUSH PIPELINES (276 kPa/40 PSI RESIDUAL PRESSURE IN WATERMAIN)