DESIGN BRIEF - WATERWORKS

PROJECT NAME AND IDENTIFICATION
MUNICIPALITY/CITY

FOR

PROPONENT

Prepared By:
Name of Consulting Services or Division & Section Name
Authors Name and Title
Address
City/Town, ON
Postal Code

GENERAL INSTRUCTIONS:

1. **The design brief shall be stamped and signed by a Professional Engineer.**
2. **All supporting documentations/attachments shall be provided separately in the designated MECP Application folder.**
3. **Proposed alterations not meeting the MECP Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit (minimum design requirements) or not in accordance with the conditions in Schedule B of the valid DWWP particularly Sections 3, 4 or 5 are not pre-authorized and require a direct submission of the application to MECP for amendment of the DWWP Schedule C.**
4. **Specific instructions are in italics**
5. **Please adopt any or all of the example paragraphs in this template where applicable. Modifications to the sample paragraphs are welcome provided that these do not involve omissions of any information.**

Table of Contents[1]

[1] A design brief, summarizing the design criteria and presenting the design calculations used in sizing individual components of the system, should be prepared along with final plans and specifications. Where a preliminary report was not prepared or where some part of the information in the preliminary report is no longer valid or applicable, the design brief should include the applicable information outlined in Section 2.3 – Stage 2 documents or Section 1.2.2, Guide for Applying Drinking Water Works Permit Amendments, License Amendments (PIBS 7014e01).
At very least, the design brief/design basis as part of the documentation requirements for MECP Approvals pre-authorized under the Drinking Water Works Permit is a good business practice in line with the CLI ECA Documentation Requirements.

1.0 INTRODUCTION

Introduce the project by providing a brief description including the scope and purpose, location, background and of the associated existing drinking-water system which is intended to be part of and the new/expanded system. State the intent of this design brief with respect to which type of MECP Approval this is prepared for.

Project and Process Description must comply with Schedule 1 of Reg. 255/11 made under Environmental Protection Act, R.S.O. 1990, c. E.19;

Example for an Engineering and Construction state-of-good-repair (SOGR) project:

The Watermain Replacement project (under PR-ZZZZ) will serve an existing area on Third Line in the Town of Oakville. The proposed alterations involve the replacement of existing watermain in the South Halton Water Distribution System to handle the domestic and fire flow demands to service an area comprised of a mixture of residential, light commercial and light industrial contributions.

Example for a development project:

The proposed alterations involve expansion of the South Halton Water Distribution System made under a development project (DO – XXXX) to service the proposed XYZ Subdivision in the Town of Oakville. The design is for meeting the drinking water domestic and fire flow demands of an area comprising of a mixture of residential, light commercial and light industrial contributions. XYZ Subdivision – Phase I is bounded by future residential development UVW Subd Phase 1 to the north, RST Subdivision on the west, ABC Subd on the east, and Dundas Street to the south.

Example continuation for both types of projects:

This design brief[2] is prepared to support MECP Approval for the proposed drinking water works using Form 1 (or Form 2, Form 3), Exemption Memo or Amendment to the Schedule C of the Drinking Water Works Permit.

The proposed works will be part of the South Halton Water Distribution System. The drinking water supply is originating from three (3) water purification plants in Oakville, Burloak, and Burlington which draw their sources of water from Lake Ontario.

The works will run 24/7 and supply drinking water from the South Halton Water Purification Plants.

This site is not located within the Oak Ridges Moraine Conservation Plan or the Niagara Escarpment areas.[3]

The proposed alteration to the drinking water system is located within an existing municipal right of way. Zoned as low density residential and institutional[4] the site is abutted by residential lands and located within an existing municipal right of way.

The project consists of pre-approved activities under the Environmental Assessment Act, as a Schedule A, Municipal Class, Water project.[5] A Public Information Centre was held February 10, 2016, at the Oakville Public Library, Central Branch, 120 Navy St, Oakville, ON L6J 2Z.

2.0 DESCRIPTION OF THE PROPOSED ALTERATIONS

[2] Sect. 2.4.1, MECP Design Guidelines for Drinking Water System
[3] Ministry of Municipal Affairs and Housing: February 2005. The Greenbelt Plan, Appendix I - Schematic showing natural system connections among the Protected Countryside, Niagara Escarpment and Oak Ridges Moraine.
[4] Town of Halton Hills: Comprehensive Zoning By-law 2010-0050 (as amended). Accessed online Feb. 19, 2015 http://www.haltonhills.ca/bylaws/pdf/Schedule_A03-1_Georgetown.pdf .
[5] Municipal Engineers Association: 2011. Municipal Class Environmental Assessment: pg 1-10, A.1.b.8.

Briefly discuss the alternatives, if any, and project rationale. Describe the proposed works and state that the proposed alterations of the drinking water system are eligible under Schedule B or in accordance with the conditions of the applicable Drinking Water Works Permit (DWWP) issued to the Region of Halton. If the proposed alterations fall under the exemptions, state the reason citing relevant provisions covering the exemptions.

Include the following:

- *Extent, nature and anticipated population of the area to be serviced, facilities proposed to serve the area (including identification of the sources of water supply), and provisions for future expansion of the system to include additional service areas and/or population growth.*
- *Itemization and discussion of present and future domestic water consumption figures, commercial and industrial usages, and fire flows used in sizing various components of the water works system.*

Warning: Please note that proposed alterations not meeting the MECP Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit (minimum design requirements) or not in accordance with the conditions in Schedule B of the valid DWWP particularly Sections 3, 4 or 5 are not pre-authorized and require a direct submission of the application to MECP for amendment of the DWWP.

Example for a development project:

The XYZ – Phase I Subd, owned by ABC Corporation, is proposing a residential development on approximately xx.x ha. of land in the Town of Oakville, Regional Municipality of Halton, serving a population of approximately x,xxx . XYZ Subdivision – Phase I is bounded by the residential development UVW Subd Phase 1 to the north, RST Subdivision on the west, ABC Subd on the east, and Dundas Street to the south. The expansion of the existing system will comprise of a new water distribution network within the proposed development area.

The proposed works are designed for a full development of the subject area and there are no future expansions anticipated. The proposed subdivision will require an extension of the existing drinking water system to be operated and maintained by the Region of Halton. This type of alteration is pre-authorized under the DWWP # as per Schedule B, Section 3, and for which Form 1 is to be used for documentation and verification.

There will be a xx.x MLD or xx% increase in the water demand in the expanded system or the existing system to which the proposed new system will be connected to plus the proposed system.

Example for a state-of-good-repair (SOGR) project:

The proposed works involve replacement of existing watermain in a system that is serving an area of xxx.x ha or a population of approximately x,xxx. The replacement pipes will be placed parallel and within two meters to the existing one on the right of way at the south side of the street. The existing system is operated and maintained by the Region of Halton. This type of alteration is pre-authorized under the DWWP # as per Schedule B, Section 3, and for which Form 1 is to be used for documentation and verification.

There will be no increase in the water demand in the current system due to the proposed watermain replacement.

The current infrastructure has reached its maximum life span and is due for replacement. A risk registry has been prepared and updated regularly ensuring that all risks are identified and addressed accordingly. A figure illustrating the limits of the project can be found in Appendix A.

Example for State-of-Good-Repair (SOGR) – Exemption Memo:

The proposed alteration involves like-for-like replacement of two (2) sections of an existing 200mm watermain on Lakeshore Rd, in the Town of Oakville having a total length of watermain being replaced of 6.1 meters. This type of alteration is exempt from MECP

Approval requirement as per DWWP Schedule B, Section 3.4. This type of replacement is also exempt[6] from the DWWP requirements that the design of the replacement be prepared by a licensed engineering practitioner and that a licensed engineering practitioner verify on Form 1, Part 3, item No. 1 that a licensed engineering practitioner prepared the design of the replacement (DWWP, Sched B, Sect. 3.7). provided that a licensed engineering practitioner has:

a) inspected the replacement prior to it being put into service.
b) prepared a reporting confirming that the replacement satisfies clauses (b), (c) and (d) of condition 3.1.1 (i.e. "Form 1 – Record of Watermains Authorized by a Future Alteration" (Form 1), Part 3, items No. 2, 3 and 4).
    i) Has been designed only to transmit water and has not been designed to treat water.
    ii) Satisfies the design criteria set out in the Ministry publication "Watermain Design Criteria for Future Alterations Authorized under a Drinking Water Works Permit – June 2012", as amended from time to time; and
    iii) Is consistent with or otherwise addresses the design objectives contained within the Ministry publication "Design Guidelines for Drinking Water Systems, 2008", as amended from time to time.

c) appended the report referred to in condition 3.7.2[7] (or item b - (i), (ii), (iii) below) to the completed Form 1.

The current infrastructure has reached its maximum life span and is due for replacement. A risk registry has been prepared and updated regularly ensuring that all risks are identified and addressed accordingly. A figure illustrating the limits of the project can be found in Appendix A.

Example continuation for all types of projects:

The following Design Brief is prepared to support the application for an MECP approval and is submitted to demonstrate general conformance with the Region of Halton design criteria (i.e. Linear Design Manual, latest edition), the requirements of Conservation Halton (CH), and the Ministry of Environment Conservation and Parks (MECP), specifically the conditions of the DWWP #004-204 and satisfaction of other applicable legal obligations, including those arising from the Environmental Assessment Act, Niagara Escarpment Planning and Development Act, Oak Ridges Moraine Conservation Act, 2001 and Greenbelt Act, 2005.

The proposed works are summarized below:

watermain on [Street Name(s)] from approximately [X] metres north/east/south/west of [Street Name] to approximately [X] metres north/east/south/west of [Street Name], approximately x,xxx.x metres in length of 200mm diameter;

or

- Watermain approximately 1640m of 200mm diameter watermain on Delrex Boulevard from approximately 25 metres north of Mountainview Road South to approximately 50 metres south of Guelph Street.
- Watermain approximately 720m of 150mm diameter watermain on Pennington Crescent from Mountainview Road South.

or

The proposed drinking water works are summarized in the table below.

[6] For this reason, the design brief for the proposed alterations involving exemptible works only can be signed by the Project Manager (PM).

[7] The design of the watermain addition, modification, replacement, or extension:

a) Has been prepared by a licensed engineering practitioner.
b) Has been designed only to transmit water and has not been designed to treat water.
c) Satisfies the design criteria set out in the Ministry publication "Watermain Design Criteria for Future Alterations Authorized under a Drinking Water Works Permit – June 2012", as amended from time to time, and
d) Is consistent with or otherwise addresses the design objectives contained with the Ministry publication "Design Guidelines for Drinking Water Systems 2008", as amended from time to time.

Pipe Diameter (mm)	Total Length (m)	Streets
200	1945.5	Basil Crescent, Fiddlehead Lane, Foxglove Gate, Goldenrod Place, Nightshade Gate, Northumberland Court, Thistle Heights

3.0 PROPONENT & OPERATING AUTHORITY

Describe the proponent of the project and the operating authority for the works.

Example:

The proponent is the Regional Municipality of Halton for the proposed alterations. The Operating Authority for the drinking water system is:

The Regional Municipality of Halton
1151 Bronte Road, Oakville ON, L6M 3L1

If the owner is an individual or corporation proof of legal name is required, such as the Articles of Incorporation.

4.0 OFFICIAL PLANS AND ZONING

Describe the approved land-use designations based on the latest office consolidation of the Regional and Local Official Plans. Identify any constraints under those designations that are pertinent to the project.

e.g. The project area is designated as Urban Area under the Regional Official Plan and designated as Residential under the Local Official Plan. Infrastructure is a permitted use under both the regional and local official plans.

Describe the relevant zoning for the project site/area. The relevant zoning map must be provided (as a separate pdf document) with the project site/area clearly indicated (hatched or different colour).

e.g. The proposed alterations to the drinking water system are located within an existing municipal right of way. Zoned as low density residential and institutional[8] the site is abutted by residential lands and located within an existing municipal right of way.

5.0 PROVINCIAL PLANS

Describe conformity with provincial plans and policies, including the Greenbelt Plan, the Niagara Escarpment Plan and others that may apply based on location. If a Niagara Escarpment Planning and Development Act (NEPDA) permit is required, it must be described and attached to the design brief.

Example:

This site is not located within the *areas under the* Greenbelt *Act (2005)* or the Niagara Escarpment Plan*ning* and *Development Act*[9] *or Oak Ridges Moraine Conservation Act (2001).*

[8] Town of Halton Hills: Comprehensive Zoning By-law 2010-0050 (as amended). Accessed online Feb. 19, 2015 http://www.haltonhills.ca/bylaws/pdf/Schedule_A03-1_Georgetown.pdf .

[9] Ministry of Municipal Affairs and Housing: February 2005. The Greenbelt Plan, Appendix I - Schematic showing natural system connections among the Protected Countryside, Niagara Escarpment and Oak Ridges Moraine.

6.0 ENVIRONMENTAL LEGISLATIONS

Describe compliance with environmental legislation or legislation is not applicable, including the Environmental Assessment Act and others that may apply. If the project is exempt from the EAA, describe the pertinent regulations and sections providing the exemption.

Example:

The project consists of pre-approved activities under the Environmental Assessment Act, as a Schedule A, Municipal Class, Water project.[10]

7.0 MECP APPROVALS & ELIGIBILITY TO PRE-AUTHORIZED CONDITIONS

Describe compliance with the Safe Drinking Water Act. State (and preferably explain briefly how) that the proposed alterations of the drinking water system are eligible under Schedule B or in accordance with the conditions of the applicable Drinking Water Works Permit (DWWP) issued to the Region of Halton. Specify which type of MECP Approval (e.g. Form 1, Form2, or Form3) is applicable and indicate the specific provision(s) in the DWWP (specify the applicable DWWP number as the DWWP number depends on the project location) that make the proposed alterations be eligible for the specified MECP Approval type.

Example 1:

The proposed alterations to the existing drinking water system described in Section 2 of this design brief are covered and fall under the terms and conditions of the applicable Drinking Water Works Permit issued to the Regional Municipality of Halton. The proposed alterations are specifically covered by Form 1 as per Section 3.0 of Schedule B, (DWWP #004-204), Watermain Additions, Modifications, Replacements and Extensions.

Example 2:

The proposed alterations as described in Section 2 of this design brief involve replacing the following components in the drinking water system:

1.) Treated water pump or booster pump (Sect. 4.2.1)
2.) Valves (Sect. 4.2.10),
3.) Etc.

These minor modifications are covered and fall under the terms and conditions of the applicable Drinking Water Works Permit issued to the Regional Municipality of Halton. The proposed alterations are specifically covered by Form 2 as per Section 4.0 of Schedule B, (DWWP #004-204), Minor Modifications to the Drinking Water System.

Example 3:

The proposed alteration to the existing drinking water system as described in Section 2 of this design brief involve addition of components that may discharge or alter the rate or manner of a discharge of a compound of concern to the air specifically an emergency generator that fire No. 2 fuel oil (diesel fuel) with a sulphur content of 0.5 per cent or less measured by weight, natural gas, propane, gasoline or biofuel. This falls under the terms and conditions of the applicable Drinking Water Works Permit issued to the Regional Municipality of Halton. The proposed alterations are specifically covered by Form 3 as per Section 5.0 of Schedule B, (DWWP #004-204), Equipment with Emissions to the Air. Furthermore, this generator will be used for emergency duty only with periodic testing.

8.0 CONSULTATION

[10] Municipal Engineers Association: 2011. Municipal Class Environmental Assessment: pg 1-10, A.1.b.8.

Describe consultation required and/or completed for the project, including an assessment of the need for indigenous consultation. Where appropriate provide reference to consultations completed under the Environmental Assessment Act and/or Planning Act, including the Region Official Plan, Water and Wastewater Master Plan, and/or Planning Act application.

Example:

A Public Information Centre was held February 10, 2016, at the Town of Halton Hills, Council Chambers, 1 Halton Hills Drive, Town of Halton Hills (Georgetown).

The project is listed on the schedule to the Notice of Completion for the Sustainable Halton Water and Wastewater Master Plan, which underwent significant consultation with agencies and interested parties as outlined in the completed report.

9.0 LAND OWNERSHIP OR CONSENT

Describe who owns the land on which the project will be located or proposed alterations will be built on, and under what authority the works have been authorized by the owner. If permitting is required for crossing or encroachments on provincial highways, railways, or pipelines the method and status of consent must be described as well.

Example for a SOGR project:

The proposed alterations of the drinking water system will be in an existing municipal right-of-way owned by the local municipality. The works are authorized through a municipal consent process and will be subject to a road cut permit requirement. The authorized municipal consent is attached to the design brief, the road cut permit will be secured by the contractor completing the work.

Example for development projects:

The proposed alterations of the drinking water system will be entirely located in a land owned by the developer and none in an existing municipal right-of-way owned by the local municipality.

10.0 CONSERVATION AUTHORITY

Describe whether the project is located within the regulation limit of a conservation authority, what consultation occurred with the conservation authority, and if permits are required for the project.

Example 1:

The proposed alterations to the drinking water system were reviewed with the Credit Valley Conservation authority, who provided confirmation that the works are not located within regulation limit under Ontario Regulation xxxx.

Example 2:

The proposed alterations to the drinking water system are not located in an area within the regulation limit of Conservation Halton as referred to the map in the link:

https://camaps.maps.arcgis.com/apps/webappviewer/index.html?id=a2928bf280194294a4027111f8ff284a

For certainty, a communication from Conservation Halton is provided to confirm that no clearance or permit is required from the authority.

11.0 RISK ASSESSMENT[11]

This is optional as far as MECP requirements are concerned. This is suggested in this template as best business practice.

Tabulate and update the risks associated to the proposed alterations of the drinking water system to ensure that all risks are identified and addressed accordingly such as connecting to the existing system (avoidance of water supply interruption to the service area), location of the project (well head protection area), fuel oil-related issues, installation method, commissioning, etc.

Example:

The risks that are identified and are associated with the proposed alterations are summarized in the following table:

Type of Risk	Mitigating Measure	Remarks
Service disruption to existing service area due to initial connection/commissioning to the existing system	See decommissioning and isolation plan	
Source protection	See plan according to guidelines for Well Head Protection Area (WHPA)	

12.0 CRITERIA FOR DESIGN FLOWS

Briefly explain the design of the proposed alterations referring to the applicable provisions of the Region of Halton Linear Design Manual (LDM, most recent version) and the minimum requirements set out in the Ministry of Environment, Conservation and Parks (MECP) Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit, latest version. Furthermore, state the reasons and explain briefly how the design is consistent with, or otherwise addresses, the design objectives contained within the MECP Design Guidelines for Drinking Water Systems[12], 2008, as amended from time to time.

Specifically, state the bases and the respective applicable provision in the above-mentioned standards and criteria; i.e. LDM, MECP Design Criteria and MECP Design Guidelines on the following design items:

The design flows or demands: max day + fire flow (where fire protection is to be provided) or peak hour demand[13]

- *Domestic water demands: Minimum rate, maximum day and peak rate factors for the system should be based on existing flow data, where available. Table 3.1 (Peaking Factors) provides peaking factors for use with average day demand when actual data are not available or are unreliable.*
- *Institutional and commercial flows should be determined by using historical records, where available. Where no records are available, the values in Table 3.2 (Typical water demands for selected commercial and institutional users) should be used.*
- *Industrial water demands are often expressed in terms of water requirements per gross hectare of industrial development when the type of industry is unknown (e.g., new industrial parks).*
- *Basic data for watermains (to be stated in the design brief)*
    - *Nature and population of the area served (current and design);*

[11] Risk assessment is part of the Drinking Water Quality Management System; the requirement to implement the DWQMS is mandated through the Safe Drinking Water Act.

[12] Design Guidelines document shall be used with professional judgment and experience in the design of drinking-water systems and in the engineering review of applications for approval of such systems. The use of actual site-specific data is encouraged. Wherever possible, designers are encouraged to use actual data derived from the drinking-water system monitoring records and operational studies

[13] Demand Considerations for Systems Serving Fewer than 500 People: Household (Interior) Water Demands & Peaking Factors; Outdoor Water Use; Fire Protection; Campgrounds

- *Maximum water demand, including fire flows.*
- *Hydraulic grade line profile or slope.*
- *Design data and calculations for individual watermains, including the required capacity; and*
- *Capacity of the existing (or proposed) drinking-water system to meet the additional water demand without compromising the system minimum pressure requirements.*

Example for a development project:

The proposed alterations involve expansion of the existing system for the sole purpose of servicing a proposed development on XXYYZZ Phase 1-4 Subdivision, in the Town of Milton. The design of the system particularly the watermains in the expanded service area is in accordance with the Linear Design Manual (LDM), meets the minimum requirements of the MECP Watermain Design Criteria for Future Alterations Authorized under a Drinking Water Works Permit, June 2012, and is consistent with the objectives of the MECP Design Guidelines for Drinking Water System, 2008.

The design flows for the new drinking water system or the expanded service area in the proposed development area are taken as the greater of the maximum daily demand plus fire flow requirements or peak hourly demand using Halton Region's latest hydraulic model as much as possible.

With the boundaries of the proposed development being defined, the service areas per type of development can be measured. The average day, maximum day, and the peak hourly demands were determined using LDM Table 2-1 "Equivalent Population Density and Water Service Demand" to get the total number of persons with the per capita water consumption rate and peaking factors as per LDM Sect. 2.4.2. The fire flow requirement was determined using the "Water Supply for Public Fire Protection Fire Underwriters Survey (FUS) published by CGI Risk Management Services (formerly the Insurers' Advisory Organization Inc.).

These are summarized below:

1) Total number of people in the service area = xx,xxx
2) Type of development = residential and commercial
3) Design flow at the point(s) of connection = xx.x MLD (maximum day demand plus fireflow)
4) Typical design flow at branches = x.x MLD (maximum plus fireflow)

The details of the design parameters for the individual watermains are tabulated in the Appendix F – Design Calculations or Model Results.

Example for a State-of-Good-Repair (SOGR) project – Form 1:

The proposed alterations involved like-for-like replacement of two sections of an existing 200mm watermain on Lakeshore Rd, in the Town of Oakville. The design of the replacement watermains is in accordance with the LDM, meets the minimum requirements of the MECP Watermain Design Criteria for Future Alterations Authorized under a Drinking Water Works Permit, June 2012, and is consistent with the objectives of the MECP Design Guidelines for Drinking Water System, 2008, as can be shown by the design checklist.

The service area does not include any future development or intensification of the current service area. The average day, maximum day, and the peak hourly demands for the existing service area were obtained from the hydraulic model. The fire flow requirement was determined using the "Water Supply for Public Fire Protection Fire Underwriters Survey (FUS) published by CGI Risk Management Services (formerly the Insurers' Advisory Organization Inc.). Design flows are taken from the hydraulic model and tabulated below:

1) Design flow on Street A = x.x MLD (peak hourly demand)
2) Design flow on Street B = x.x MLD (maximum day demand plus fireflow)
3) Slopes of the energy grade line: On Street A = x.x %; Street B = x.x %

13.0 DESIGN ITEMS

Design must conform to MECP Watermain Design Criteria for Future Alterations Authorized under a Drinking Water Works Permit, is consistent with, or otherwise addresses, the design objectives contained within the MECP Design Guidelines for Drinking Water

Systems, 2008, as amended from time to time and ROH Linear Design Manual, standards and ROH bylaws. Describe conformity, or where gaps exist the rational (deviation memo should be attached). Please refer to the design checklist.

Items for consideration:

- *Design Period: Although a 20-year design period is most frequently used for water treatment supply systems, it is recommended that longer design periods be used based on long-term population projections, given that water distribution systems have useful life expectancies well more than 20 years. Consideration should also be given to water quality deterioration arising from potential oversizing of the initial equipment.*
- *System pressures at ground level: how max (100 psi) and minimum pressures (40 psi, 20 psi during max day + fireflow) are met, if these are being affected by the proposed alterations.*
- *Transient pressures calculation to withstand max operating pressure + transient pressures stopping at 0.6 m/s*
- *Friction factors: C from actual field tests in evaluating expansion of existing system, if available, if not, C Factors from Table 10-1 MECP Design Guidelines*
- *Pipe sizes: design calculations based on flow demands and pressure requirements.*
- *System layout: specify configuration whether arterial-loop, grid or tree system (not recommended)*
- *Depth of cover and frost protection; minimum and maximum distribution pressures, minimum depth of cover, and minimum separation distance from sewers and other utilities*
- *Pipe materials specified: rationale for selection with respect to loading requirements and pipe standards.*
- *Hydrants (if applicable): location, spacing and hydrant specifications (leads and drainage), purpose (fire protection, flushing or swabbing)*
- *Valves: locations, spacing, types, standards, etc*

Example for a development project:

The system layout is a grid-type configuration where pipe branches are looped and not creating any pipe dead-ends.

After determining the design flows, pipe sizes and materials within the system layout adopted were individually calculated using the Hazen-Williams equation:

$Q = 0.84918 * C * A * R^{0.63} S^{0.54}$ where *Q, C, A, R* and *S* are defined as per Sect. 2.5.1 of the LDM.

Note: The value of Q is determined using the procedure mentioned above. The slope of the energy grade line S can be assumed as the frictional losses along the pipe length and computed using a head-loss formula. Using MECP Design Criteria (Table 1, Section 3) and Table 2-3 of LDM, whichever is more stringent, as a guide to select the Coefficient of Roughness (C) that is applicable, the pipe size or diameter can be determined based on the given values of Q and S. Please be reminded that using roughness coefficient not following the MECP Design Criteria will result in direct submission of this application to MECP.

The watermains and components in the new drinking water system were checked for maximum pressures, i.e. maximum operating pressure plus hydraulic transient pressures, the latter analysed using (*specify method*).

The ground level static pressures anywhere in the expanded system (existing plus the new system for the proposed development area) are within the allowable minimum and maximum pressures as checked by hydraulic modelling. The additional demands to the expanded system are still within the capacity rating of the existing water treatment plants and the associated booster pumping stations and water distribution system. This subject has been demonstrated to be addressed in the Area Servicing Plan of ZZZ-Boyne Area Development.

The rest[14] of the design details are itemized in Design Checklist for Watermains. This design checklist also demonstrates that all applicable requirements of the LDM and the MECP Watermain Design Criteria for Future Alterations Authorized under a Drinking

[14] *The design brief should also include the following applicable information as per MECP Design Guidelines:*

- *Discussion of the proposed instrumentation and control strategy and level of automation.*
- *Discussion of the proposed flow metering, sampling and monitoring program, including monitoring of any waste streams.*

Water Works Permit are met, or in the case that some items in the LDM are not, these are supported with a Design Deviation Memorandum. Design calculations and/or model results are appended in this design brief. The completed design to show the location of hydrants, valves, depth of cover, separation distance from sewers and other utilities, etc. is illustrated by the plans and profiles in the engineering drawings.

Example for a State-of-Good-Repair (SOGR) project – Form 1:

Design flows are taken from the hydraulic model for the particular section of the watermain that will be replaced or upsized (one size larger) to address existing hydraulic constrictions in the system. The ground level static pressures anywhere in the expanded system are practically unchanged as a result. The proposed alteration does not result in additional demands that would affect the capacity rating of the existing water treatment plants and the associated booster pumping stations and water distribution system.

The rest of the design details are itemized in Design Checklist for Watermains. This design checklist also demonstrates that all applicable requirements of the LDM and the MECP Watermain Design Criteria for Future Alterations Authorized under a Drinking Water Works Permit are met, or in the case that some items in the LDM are not, these are supported with a Design Deviation Memorandum. Design calculations and/or model results are appended in this design brief. The completed design to show the location of hydrants, valves, depth of cover, separation distance from sewers and other utilities, etc. is illustrated by the plans and profiles in the engineering drawings.

14.0 OPERATIONAL AND CONSTRUCTABILITY REVIEW

State that the operations and maintenance group has been involved in the design and that all anticipated operational and maintenance issues including constructability have been addressed or resolved.

The Water and Wastewater System Services particularly the Linear Systems Operations/Outlying Water Facilities have been involved in the design and all their comments and issues regarding operation and maintenance of the proposed alterations have been addressed.

- *Description of the proposed pumping facilities (well pumps, and lowlift, highlift and booster pumping stations), including the number and capacities of duty and standby pumps, and discussion of the ability of the system to supply water during power failure events through either standby power facilities and/or elevated storage facilities.*
- *Preliminary design plan(s), all bearing the project title, name of the municipality/owner, name of the development or facility with which the project is associated, name of the design engineer and preparation date, and where applicable, the plan scale, north point, land surveying datum, and any municipal boundaries within the area shown, and providing the following information (where pertinent):*
    - *General layout and sizes of existing and proposed watermains, and location of major components of other existing and proposed water works and sources of water supply, and points of potential source or system contamination (e.g., sewage treatment plant discharges, sewer overflows, septic systems, runoff from agricultural/livestock rearing areas); and*
    - *General layout (line diagram) of the works (except for watermains).*
- *Basic data on the estimated water demand from the population and area to be served for a booster pumping station:*
    - *Design period.*
    - *Design service population and area (hectares), and population density.*
    - *Design per capita water consumption, and industrial and commercial water demand.*
    - *Fire flow requirements.*
    - *Total design water demand (minimum hour, average day, maximum day and peak hour).*
    - *minimum sizing requirement dictates the use of 150 mm (6 in) diameter pipes, such calculations are generally not required. However, the information is essential where (a) the designer proposes the use of pipe diameter smaller than 150 mm (6 in) for watermains not required to carry fire flow, (b) the uncommitted water supply capability of the existing system is marginal or (c) the proposed water main extension is extensive.*

Supporting Documentations:

1. **Zoning Map (project extent highlighted)**
2. **CA Clearance Letter/Permit**
3. **Hydraulic Calculations and/or Model Results**

Appendix H: - Conditions and type of alterations useful in determining if Form 1 can be used:

3.0 Watermain Additions, Modifications, Replacements and Extensions

3.1 The owner may alter the drinking water system, or permit it to be altered by a person acting on the owner's behalf, by adding, modifying, replacing or extending a watermain within the distribution system subject to the following conditions:

3.1.1 The design of the watermain addition, modification, replacement or extension:

a) Has been prepared by a licensed engineering practitioner;

b) Has been designed only to transmit water and has not been designed to treat water;

c) Satisfies the design criteria set out in the Ministry publication "Watermain Design Criteria for Future Alterations Authorized under a Drinking Water Works Permit – June 2012", as amended from time to time; and

d) Is consistent with or otherwise addresses the design objectives contained within the Ministry publication "Design Guidelines for Drinking Water Systems, 2008", as amended from time to time.

3.1.2 The maximum demand for water exerted by consumers who are serviced by the addition, modification, replacement or extension of the watermain will not result in an exceedance of the rated capacity of a treatment subsystem or the maximum flow rate for a treatment subsystem component as specified in the licence, or the creation of adverse conditions within the drinking water system.

3.1.3 The watermain addition, modification, replacement or extension will not adversely affect the distribution system's ability to maintain a minimum pressure of 140 kPa at ground level at all points in the distribution system under maximum day demand plus fire flow conditions.

3.1.4 Secondary disinfection will be provided to water within the added, modified, replaced or extended watermain to meet the requirements of O. Reg. 170/03.

3.1.5 The watermain addition, modification, replacement or extension is wholly located within the municipal boundary over which the owner has jurisdiction.

3.1.6 The owner of the drinking water system consents in writing to the watermain addition, modification, replacement or extension.

3.1.7 A licensed engineering practitioner has verified in writing that the watermain addition, modification, replacement or extension meets the requirements of condition 3.1.1.

3.1.8 The owner of the drinking water system has verified in writing that the watermain addition, modification, replacement or extension meets the requirements of conditions 3.1.2 to 3.1.6.

3.2 The authorization for the addition, modification, replacement or extension of a watermain provided for in condition 3.1 does not include the addition, modification, replacement or extension of a watermain that:

3.2.1 Passes under or through a body of surface water, unless trenchless construction methods are used;

3.2.2 Has a nominal diameter greater than 1200 mm;

3.2.3 Results in the fragmentation of the drinking water system; or

3.2.4 Connects to another drinking water system, unless:

a) Prior to construction, the owner of the drinking water system seeking the connection obtains written consent from the owner or owner's delegate of the drinking water system being connected to; and

b) The owner of the drinking water system seeking the connection retains a copy of the written consent from the owner or owner's delegate of the drinking water system being connected to as part of the record that is recorded and retained under condition 3.3.

3.3 The verifications required in conditions 3.1.7 and 3.1.8 shall be:

3.3.1 Recorded on "Form 1 – Record of Watermains Authorized as a Future Alteration", as published by the Ministry, prior to the watermain addition, modification, replacement or extension being placed into service; and

3.3.2 Retained for a period of ten (10) years by the owner.

3.4 For greater certainty, the verification requirements set out in condition 3.3 do not apply to any addition, modification, replacement or extension in respect of the drinking water system which:

3.4.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03; or

3.4.2 Constitutes maintenance or repair of the drinking water system.

3.5 The document or file referenced in Column 1 of Table 1 of Schedule A of this drinking water works permit that sets out watermains shall be retained by the owner and shall be updated to include watermain additions, modifications, replacements and extensions within 12 months of the addition, modification, replacement or extension.

3.6 The updates required by condition 3.5 shall include watermain location relative to named streets or easements and watermain diameter.

3.7 Despite clause (a) of condition 3.1.1 and condition 3.1.7, with respect to the replacement of an existing watermain or section of watermain that is 6.1 meters in length or less, if a licensed engineering practitioner has:

3.7.1 inspected the replacement prior to it being put into service;

3.7.2 prepared a reporting confirming that the replacement satisfies clauses (b), (c) and (d) of condition 3.1.1 (i.e. “Form 1 – Record of Watermains Authorized by a Future Alteration” (Form 1), Part 3, items No. 2, 3 and 4); and

3.7.3 appended the report referred to in condition 3.7.2 to the completed Form 1,

the replacement is exempt from the requirements that the design of the replacement be prepared by a licensed engineering practitioner and that a licensed engineering practitioner verify on Form 1, Part 3, item No. 1 that a licensed engineering practitioner prepared the design of the replacement.

3.8 For greater certainty, the exemption in condition 3.7 does not apply to the replacement of an existing watermain or section of watermain if two or more sections of pipe, each of which is 6.1 meters in length or less, are joined together, if the total length of replacement pipes joined together is greater than 6.1 meters.

Appendix I: Conditions and type of alterations useful in determining if Form 2 can be used:

4.0 Minor Modifications to the Drinking Water System

4.1 The drinking water system may be altered by adding, modifying or replacing the following components in the drinking water system:

4.1.1 Coagulant feed systems in the treatment system, including the location and number of dosing points:

a) Prior to making any alteration to the drinking water system under condition 4.1.1, the owner shall undertake a review of the impacts that the alteration might have on corrosion control or other treatment processes; and

b) The owner shall notify the Director in writing within thirty (30) days of any alteration made under condition 4.1.1 and shall provide the Director with a copy of the review.

c) The notification required in condition 4.1.1 b) shall be submitted using the "Director Notification Form" published by the Ministry

4.1.2 Instrumentation and controls, including new SCADA systems and upgrades to SCADA system hardware;

4.1.3 SCADA system software or programming that:

a) Measures, monitors or reports on a regulated parameter;
b) Measures, monitor or reports on a parameter that is used to calculate CT; or,
c) Calculates CT for the system or is part of the process algorithm that calculates log removal, where the impacts of addition, modification or replacement have been reviewed by a licensed engineering practitioner;

4.1.4 Filter media, backwashing equipment, filter troughs, and under-drains and associated equipment in the treatment system;

4.1.5 Spill containment works; or,

4.1.6 Coarse screens and fine screens

4.2 The drinking water system may be altered by adding, modifying, replacing or removing the following components in the drinking water system:

4.2.1 Treated water pumps, pressure tanks, and associated equipment;

4.2.2 Raw water pumps and process pumps in the treatment system;

4.2.3 Inline booster pumping stations that are not associated with distribution system storage facilities and are on a watermain with a nominal diameter not exceeding 200 mm;

4.2.4 Re-circulation devices within distribution system storage facilities;

4.2.5 In-line mixing equipment;

4.2.6 Chemical metering pumps and chemical handling pumps;

4.2.7 Chemical storage tanks (excluding fuel storage tanks) and associated equipment; or,

4.2.8 Measuring and monitoring devices that are not required by regulation, by a condition in the Drinking Water Works Permit, or by a condition otherwise imposed by the Ministry.

4.2.9 Chemical injection points.

4.2.10 Valves;

4.3 The drinking water system may be altered by replacing the following:

4.3.1 Raw water piping, treatment process piping or treated water piping within the treatment subsystem;

4.3.2 Measuring and monitoring devices that are required by regulation, by a condition in the Drinking Water Works Permit or by a condition otherwise imposed by the Ministry.

4.3.3 Coagulants and pH adjustment chemicals, where the replacement chemicals perform the same function;

a) Prior to making any alteration to the drinking water system under condition 4.3.3, the owner shall undertake a review of the impacts that the alteration might have on corrosion control or other treatment processes; and

b) The owner shall notify the Director in writing within thirty (30) days of any alteration made under condition 4.3.3 and shall provide the Director with a copy of the review.

c) The notification required in condition 4.3.3 b) shall be submitted using the "Director Notification Form" published by the Ministry

4.4 Any alteration of the drinking water system made under conditions 4.1, 4.2 or 4.3 shall not result in:

4.4.1 An exceedance of a treatment subsystem rated capacity or a treatment subsystem component maximum flow rate as specified in the licence;

4.4.2 The bypassing or removal of any unit process within a treatment subsystem;

4.4.3 The addition of any new unit process other than coagulation within a treatment subsystem;

4.4.4 A deterioration in the quality of drinking water provided to consumers;

4.4.5 A reduction in the reliability or redundancy of any component of the drinking water system;

4.4.6 A negative impact on the ability to undertake compliance and other monitoring necessary for the operation of the drinking water system; or

4.4.7 An adverse effect on the environment.

4.5 The owner shall verify in writing that any addition, modification, replacement or removal of drinking water system components in accordance with conditions 4.1, 4.2 or 4.3 has met the requirements of the conditions listed in condition 4.4.

4.6 The verifications and documentation required in condition 4.5 shall be:

4.6.1 Recorded on "Form 2 – Record of Minor Modifications or Replacements to the Drinking Water System" published by the Ministry, prior to the modified or replaced components being placed into service; and

4.6.2 Retained for a period of ten (10) years by the owner.

4.7 For greater certainty, the verification requirements set out in conditions 4.5 and 4.6 do not apply to any addition, modification, replacement or removal in respect of the drinking water system which:

4.7.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03; or

4.7.2 Constitutes maintenance or repair of the drinking water system, including software changes to a SCADA system that are not listed in condition 4.1.3

4.8 The owner shall update any drawings maintained for the drinking water system to reflect the modification or replacement of the works, where applicable.

Appendix J: Conditions and type of alterations useful in determining if Form 3 can be used:

5.0 Equipment with Emissions to the Air

5.1 The drinking water system may be altered by adding, modifying or replacing any of the following drinking water system components that may discharge or alter the rate or manner of a discharge of a compound of concern to the air:

5.1.1 Any equipment, apparatus, mechanism or thing that is used for the transfer of outdoor air into a building or structure that is not a cooling tower;

5.1.2 Any equipment, apparatus, mechanism or thing that is used for the transfer of indoor air out of a space used for the production, processing, repair, maintenance or storage of goods or materials, including chemical storage;

5.1.3 Laboratory fume hoods used for drinking water testing, quality control and quality assurance purposes;

5.1.4 Low temperature handling of compounds with a vapor pressure of less than 1 kilopascal;

5.1.5 Maintenance welding stations;

5.1.6 Minor painting operations used for maintenance purposes;

5.1.7 Parts washers for maintenance shops;

5.1.8 Emergency chlorine and ammonia gas scrubbers and absorbers;

5.1.9 Venting for activated carbon units for drinking water taste and odour control;

5.1.10 Venting for a stripping unit for methane removal from a groundwater supply;

5.1.11 Venting for an ozone treatment unit;

5.1.12 Natural gas or propane fired boilers, water heaters, space heaters and make-up air units with a total facility-wide heat input rating of less than 20 million kilojoules per hour, and with an individual fuel energy input of less than or equal to 10.5 gigajoules per hour; or

5.1.13 Emergency generators that fire No. 2 fuel oil (diesel fuel) with a sulphur content of 0.5 per cent or less measured by weight, natural gas, propane, gasoline or biofuel, and that are used for emergency duty only with periodic testing.

5.2 The owner shall not make an addition, modification, or replacement described in condition 5.1 in relation to an activity that is not related to the treatment and/or distribution of drinking water.

5.3 The emergency generators identified in condition 5.1.13 shall not be used for non-emergency purposes including the generation of electricity for sale or for peak shaving purposes.

5.4 The owner shall prepare an emission summary table for nitrogen oxides emissions only, for each addition, modification or replacement of emergency generators identified in condition 5.1.13.

Performance Limits

5.5 The owner shall ensure that a drinking water system component identified in conditions 5.1.1 to 5.1.13 is operated at all times to comply with the following limits:

5.5.1 For equipment other than emergency generators, the maximum concentration of any compound of concern at a point of impingement shall not exceed the corresponding point of impingement limit;

5.5.2 For emergency generators, the maximum concentration of nitrogen oxides at sensitive receptors shall not exceed the applicable point of impingement limit, and at non-sensitive receptors shall not exceed the Ministry half-hourly screening level of 1880 ug/m^3 as amended; and

5.5.3 The noise emissions comply at all times with the limits set out in publication NPC-300, as applicable.

5.6 The owner shall verify in writing that any addition, modification or replacement of works in accordance with condition 5.1 has met the requirements of the conditions listed in condition 5.5.

5.7 The owner shall document how compliance with the performance limits outlined in condition 5.5.3 is being achieved, through noise abatement equipment and/or operational procedures.

5.8 The verifications and documentation required in conditions 5.6 and 5.7 shall be:

5.8.1 Recorded on “Form 3 – Record of Addition, Modification or Replacement of Equipment Discharging a Contaminant of Concern to the Atmosphere”, as published by the Ministry, prior to the additional, modified or replacement equipment being placed into service; and

5.8.2 Retained for a period of ten (10) years by the owner.

5.9 For greater certainty, the verification and documentation requirements set out in conditions 5.6 and 5.8 do not apply to any addition, modification or replacement in respect of the drinking water system which:

5.9.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03; or

5.9.2 Constitutes maintenance or repair of the drinking water system.

5.10 The owner shall update any drawings maintained for the works to reflect the addition, modification or replacement of the works, where applicable.