APPENDIX

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ANNE STREET 2N AND 3N WATER BOOSTER PUMPING STATION SCHEDULE B EA

CITY OF BARRIE

ANNE STREET 2N AND 3N WATER BOOSTER PUMPING STATION

Schedule ‘B’ Class Environmental Assessment

ANNE STREET 2N AND 3N WATER BOOSTER PUMPING STATION
Schedule ‘B’ Class Environmental Assessment

CITY OF BARRIE

FINAL

PROJECT NO.: 171-07636-01
DATE: JULY 12, 2019

WSP

WSP.COM

City of Barrie
70 Collier Street, Box 400
Barrie, ON L4M 4T5

Attention: Tom Reeve, Senior Infrastructure Planning Program Coordinator

Dear Sir:

Client ref.: Anne Street Class 'B' EA Report

We are pleased to provide our Anne Street 2N and 3N Water Booster Pumping Station Schedule 'B' Class Environmental Assessment. This report was prepared, for the City of Barrie, in compliance with the requirements of a Schedule 'B' Class EA as outlined in the Ontario Municipal Class EA planning process

We would be happy to discuss this report with you at your convenience.

Yours sincerely,

Michelle Albert, P. Eng.
Senior Director, Water and Wastewater
cc:
WSP ref.: 171-07636-01

SIGNATURES

PREPARED BY

<professional stamp, if applicable>

Michelle Albert, P.Eng.
Project Manager

July 12 2019
Date

APPROVED[1] BY *(must be reviewed for technical accuracy prior to approval)*

Sinclair Garner, P.Eng.
Project Manager

July 12 2019
Date

[1] Approval of this document is an administrative function indicating readiness for release and does not impart legal liability on to the Approver for any technical content contained herein. Technical accuracy and fit-for-purpose of this content is obtained through the review process. The Approver shall ensure the applicable review process has occurred prior to signing the document.

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1 INTRODUCTION

The City of Barrie has retained WSP Canada Inc. (WSP) to conduct a Schedule B Class Environmental Assessment (EA) for the Anne Street 2N and 3N Water Booster Pumping Station in the City. The upgrades to the Anne Street Booster Station was identified in the City of Barrie Water Storage and Distribution Master Plan Update 2019 as a preferred alternative for providing additional capacity to water zones 2N and 3N.

This report being prepared in compliance with the requirements of a Schedule B Class EA as outlined in the Ontario Municipal Class EA planning process. The study will contain background information and purpose of the study, a description of the study area, an identification of current challenges and opportunities would be addressed in this EA study, alternative solutions and an evaluation of the alternative solutions to determine a preferred solution taking into account potential environmental impacts.

1.1 STUDY PURPOSE AND APPROACH

The objective of this Schedule 'B' Class EA study is to provide a comprehensive planning process that includes public participation in identifying a preferred solution for addressing deficiencies at the Anne Street Booster Pumping Station. These deficiencies are due to the age and condition of the pumping station. The new booster pumping station will supply water to pressure zone 2N and provide needed redundancy and system security to pressure zone 3N.

The scope of the work would include:

- An assessment of the existing condition of the booster station
- An identification of alternatives for upgrading the station
- Consultation with the public, other stakeholders, and review agencies
- An evaluation of the alternatives to identify a preferred solution.

The preferred solution would address social, environmental, and technical concerns, as well as any concerns raised by the public, other stakeholders and review agencies.

As this project is documented in the Water Supply and Distribution Master Plan 2019, WSP developed the Schedule 'B' Class EA report. This report is built on the technical work completed by ETO Engineering who were retained by the City to complete the preliminary and detailed design for the upgraded Anne Street Booster Pumping Station.

1.2 MUNICIPAL CLASS EA PROCESS

As required under the Ontario *Environmental Assessment Act (EAA)*, this study followed the MCEA (October 2000, as amended in 2007, 2011, and 2015) planning process. The MCEA establishes a framework by which broad environmental outcomes of public sector infrastructure projects are reviewed and evaluated. The stated purpose of the EAA is to provide *the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment*. The EAA interprets environmental outcomes to be those associated with the natural, social, cultural, built, and economic environments.

The EAA requires that municipalities complete a MCEA for public works and infrastructure projects, including those for roads, transit ventures, and water and wastewater projects. An overview of the Municipal Class Environmental Assessment process is provided in Error! Reference source not found.. Key principles of the MCEA process include:

— Consultation with stakeholders and affected parties upon study commencement, and throughout the process of the project;

- Consideration of all reasonable alternatives, including "alternatives to" and "alternative methods" of implementing a preferred solution;
- Identification and consideration of broad environmental affects, as identified previously, for each alternative under evaluation;
- The systematic evaluation of all alternative solutions and/or methods to determine the net environmental effects, based on available information; and
- The provision of clear and comprehensive documentation that demonstrates how the MCEA planning process was followed, and to ensure transparency and traceability of the decision-making process for the project.

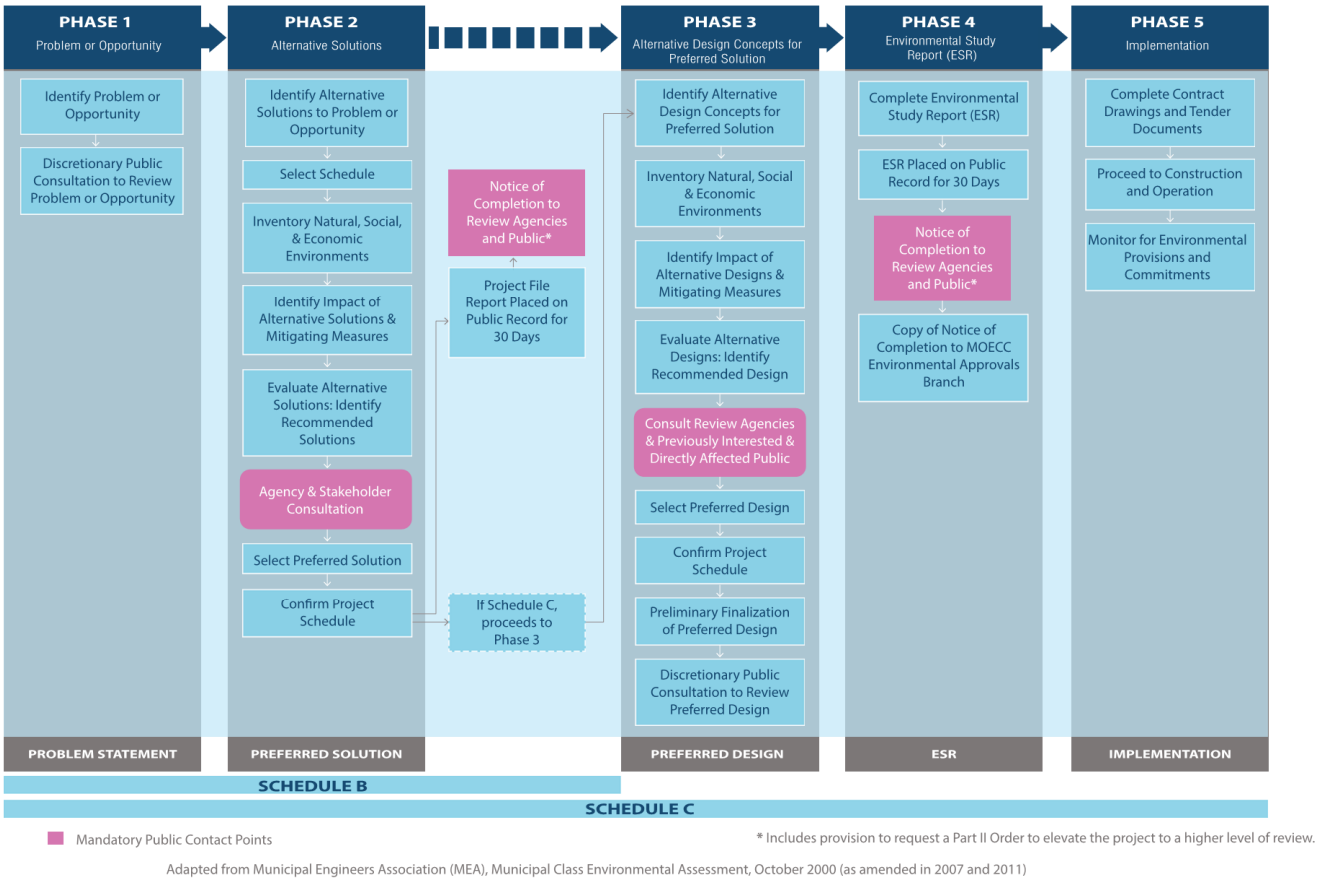


Figure 1: Municipal Environmental Assessment Process

As set out in Section 5(3) of the EAA, an EA document must include the following:

1. A description of the purpose of the undertaking including:
    a. The undertaking
    b. The alternative methods of carrying out the undertaking
    c. Alternatives to the undertaking
2. A description of:

a. The environment that will be affected or that might reasonably be expected to be affected, directly or indirectly, by the undertaking or alternatives to the undertaking

b. The effects that will be caused or that might reasonably be expected to be caused to the environment by the undertaking or alternatives to the undertaking

c. The actions necessary or that may reasonably be expected to be necessary to prevent, change, mitigate or remedy the effects upon or the effects that might reasonably be expected upon the environment by the undertaking or alternatives to the undertaking

d. An evaluation of the advantages and disadvantages to the environment of the undertaking, the alternative methods of carrying out the undertaking and the alternatives to the undertaking

A Schedule 'B' Class EA is required for projects that include improvement and minor expansion to existing facilities. Specifically, the upgrades to the Anne Street Booster Station, in the City of Barrie fits the description of Item 4 for Schedule B Water Projects in Appendix 1 of the MEA Class EA document, which states:

- Increase pumping station capacity by adding or replacing equipment and appurtenances where new equipment is located in a new building or structure.

Since there is potential for some adverse environmental impacts, a screening process is conducted which examines a number of alternatives and mandates consultation with the public and review agencies to ensure any concerns related to the project are addressed.

1.3 PUBLIC AND STAKEHOLDER CONSULTATION

Approach #2, as described in Appendix 4 of the MCEA document is being undertaken for this study. For this approach, Phase 1 involves identifying the problem, followed by Phase 2 where a preferred solution is identified taking into account comments from the public and relevant review agencies. Early consultation and throughout the process is a key feature of environmental assessment planning. The purpose of the consultation process is to notify stakeholders of the project details including presenting the problem or opportunity that will be addressed, the environmental considerations and potential impacts of each alternative, and the approach used for evaluating the alternatives. Interested parties are given the opportunity to review and submit comments related to the study.

Appendix A contains copies of all Notices, stakeholder contact lists and Public Information Centre material. This information is provided in accordance with the standards prescribed by the Class EA document, which outlines the guidelines for establishing contact with appropriate review agencies in relation to the nature of the project.

1.3.1 NOTICE OF STUDY COMMENCEMENT

A Notice of Study Commencement was issued to both the City of Barrie website, as well as in the newspaper. Notification was provided through the following means:

— By advertisement in the Barrie Examiner on August 10th and 12th, 2017;

— By posting to the City's website on August 10th and August 12th, 2017;

— Via e-mail to all agency contacts provided in the project contact list (Appendix A).

As a result, all relevant review agencies and the public were notified of the project being initiated, the problem and opportunity being addressed, and given the opportunity to provide comments.

1.3.2 NOTICE OF PUBLIC INFORMATION CENTRE (PIC)

A Notice of Public Information Centre (PIC) was issued through both the City of Barrie website, as well as in the newspaper. Notification was provided through the following mediums:

- — By advertisement in the Barrie Advance on October 18th and 25th, 2018;
- — By posting to the City's website on October 18th and 25th, 2018; and,
- — Via e-mail to all agency contacts provided in the project contact list (Appendix A).
- Directly letters to properties located immediately adjacent to the Anne Street Reservoir property.

As a result, all relevant review agencies and the public were notified of the Public Information Centre being held, the problem and opportunity being addressed, and given the opportunity to provide attend and provide comments and feedback. A record of the Notice of Public Information Centre is located in Appendix A.

1.4 SCHEDULE "B" CLASS EA TIMELINE

A review of key milestones to the Water Storage and Distribution Master Plan Study Process is shown in **Error! Reference source not found.**.

Table 1: Master Plan Study Timeline

Milestone	Timeline	Description
Notice of Study Commencement	August 2017	A Notice of Study Commencement was issued on August 10th and 12th, 2017. The Notice reviewed the purpose of the study and the study process. Contact information for the City of Barrie Project Manager was provided.
Notice of PIC	October 2018	A Notice of Public Information Centre was issued on October 18th and 25th, 2018. The Notice identified the location, time, and purpose of the PIC. Contact information for the City of Barrie Project Manager was provided.
PIC	November 2018	A Public Information Centre was held on November 1st, 2018 at the Southshore Community Centre. The PIC was 3 hours in length, from 4:00PM to 7:00PM.
Master Plan Report	April 2019	Final Draft Report released
Master Plan Approval	To be determined	Subject to City Council Input and Approval.
Notice of Study Completion	To be determined	Once Master Plan has been reviewed and approved by City Council, a Notice of Study Completion will be issued.

2 BACKGROUND AND CONTEXT

The City of Barrie is one of Ontario's fastest growing municipalities and is the largest urban center within the Simcoe County area. It is a single-tier municipality located north of the City of Toronto, traversed by Highway 400 and is located on the shores of Lake Simcoe, specifically Kempenfelt Bay. Lake Simcoe has been identified as a highly sensitive body of water due to the cold-water aquatic ecosystem that it supports. Accordingly, it is closely monitored with respect to phosphorous and nutrient loading. To protect and enhance the ecological integrity of Lake Simcoe, the Province introduced the *Lake Simcoe Protection Act* in 2008 to focus on addressing the most critical issues within the watershed.

This Master Plan has been developed to facilitate the City's current and projected growth to ensure that sufficient servicing can be provided to facilitate this growth to 2071. It is also important that the Lake Simcoe watershed be protected, as required under Provincial Legislation.

2.1 STUDY AREA

The study area for this Report encompasses the existing Anne Street Reservoir and booster station site as shown in **Figure 2 below**. The site boundaries are Anne Street North to the east, Shirley Avenue to the south, Letitia Street to the north and Callaghan Drive to the west. The reservoir is surrounded by the well established residential neighbourhood of Letitia Heights. Houses were constructed in this neighbourhood in the late 1960s.

Figure 2: Study Area

2.1.1 NATURAL ENVIRONMENT

The reservoir on the site occupies over 50% of the area on the site. The reservoir roof is covered with grass which is maintained by the City. The Anne St. Reservoir and Booster Pumping Station was constructed on this site in 1959. There have been expansions and work completed on the reservoir in 1989 when a new reservoir cell and valve chamber were added. Furthermore in 2004 work was done on the site as part of the City's re-chlorination project.

There are no natural features of significance on the site.

2.1.2 PHYSICAL (BUILT) ENVIRONMENT

A condition assessment and inventory of the structures on the site was undertaken by ETO Engineering and is documented in Technical Memorandum (TM) 1 – Condition Assessment. This TM has been included in Appendix B. Provided below is an excerpt from the memo describing the structures on site:

"Anne Street Booster Pumping Station building, a small drain/overflow valve chamber and reservoir were constructed in 1959. Some process mechanical modifications were done in 1984, but no changes to the pumping station building shell were carried out. In 1989, an additional reservoir was constructed along with a new larger valve chamber, an access/vent house on the top of the reservoir. In 2004, a new exterior door and two interior walls were constructed to create a small room at the northwest corner of the building to separate chlorinators from the Pump Room. Two new small openings were created in existing exterior walls to accommodate an exhaust fan and an intake vent."

2.1.2.1 SURFACE DRAINAGE AND GRADING AROUND THE BUILDING

As part of the Condition Assessment undertaken by ETO Engineering the following site conditions were documented:

- Reservoir cells - The reservoir cells are approximately 6.5 to 7.0m higher than the adjacent street levels. All four sides of these reservoir cells are covered with soil and sodded. It slopes approximately 3:1 on the west and north sides while it slopes approximately 2:1 on the west and west sides. On west side along the top of the reservoir, landscaping planter are created using timber cribs along the entire length. This side has double-rail guardrail system at the top of the reservoir to avoid pedestrian access. No signs of inappropriate drainage were identified at the time of inspection.
- Pumping Station Building - Grade is sloping away from the building on the south, east and north sides. The west side faces approximately 3:1 sloped grade from the top of the reservoir to the street level. There are no visible adverse effect on the exterior wall on this face due to the grade along the west face.
- Valve Chamber - Valve chamber is located at the mid-point of the slope from the top of the reservoir to the street level. The surface drainage seems to be working well as no signs of ponding were noticed and no signs of growth of unnecessary vegetation due to moisture problems were noted.
- Access/Vent House - Grade around access house is fairly flat and slightly sloping away from the building. This building sits on the flat part of the reservoir. The base of the exterior walls does not show any sign of moisture being accumulated around this building.

2.1.3 SOCIAL AND CULTURAL ENVIRONMENT

The Anne Street Reservoir and Booster Pumping Station property is zoned R2 which is single detached residential even though it is currently used for public infrastructure.

Although the site is signed 'no trespassing', the site is not fenced and therefore the community residents have been accessing the site and using it for recreational activities. For example: in the winter it has been used for tobogganing and in the summer as an observation location for community fireworks.

2.1.4 BOOSTER PUMPING STATION – MECHANICAL ASSETS

The Condition Assessment undertaken by ETO Engineering concluded (see TM 1 in Appendix B) that all process mechanical and heating ventilation and air conditioning equipment had reached the end of its expected service life and should be replaced in the next 2 to 3 years.

2.2 FINDINGS OF WATER STORAGE AND DISTRIBUTION MASTER PLAN PREPARED BY AMEC IN 2013

The 2013 Water Storage and Distribution Master Plan concluded that an additional booster pumping station was required to supply water to Pressure Zone 3N as only Leacock Pumping Station supplies water to Pressure Zone 3N. The Master Plan states that in order "to create a level of redundancy and security of supply for the pressure zone" a second pumping station is required. The Master Plan reviewed three locations:

1) Northeast of the Miller Drive / Edgehill Drive intersection
2) Northwest of the Ferndale Drive North / Edgehill Drive intersection
3) Anne Street Reservoir

It was concluded that the Anne Street Reservoir was the preferred location for the new Pressure Zone 3N Pumping Station.

3 EXISTING SYSTEM PERFORMANCE, GROWTH AND SERVICING PROJECTIONS

This section provides an overview of existing system performance, growth and servicing projections for the Anne Street Booster Station.

3.1 EXISTING SYSTEM PERFORMANCE

The City of Barrie comprises an area of approximately 10,850 ha. The water storage and distribution system is split into five (5) major pressure zones: Zone 1, Zone 2North (2N), Zone 2South (2S), Zone 3North (3N) and Zone 3South (3S). Secondary reduced pressure zones are located in zones 2N and 3S. These include the Chieftain Decreased pressure zone located in 3S. The pressure zones are separated by the topography of the City. Pressure Zone 1 is in the central area of the City which is a low-lying area. Water is pumped into this pressure zone by ground water wells and surplus water is boosted into adjacent zones. Pressure Zones 2N and 3N are located at higher elevations north of central Barrie. Water is supplied to Zone 2N by three (3) wells (3,9 and 16) directly and wells in Zone 1 via Sunnidale and Anne St. Reservoirs and Booster Pumping Station. Zone 3N is supplied from Zone 1 by nine (9) wells. It is supplied by one booster pumping station, Leacock Pumping Station. Zone 2S borders Zone 1 and continues along Kempenfelt Bay. Zone 2S contains a Surface Water Treatment Plant which pumps water from the Bay to serve the pressure zone. Additional water is supplied from Zone 1. Pressure Zone 3S is in the southwest corner of the City of Barrie and has a much higher elevation than central Barrie. Surplus water from Zone 2S is pumped to this pressure zone and is stored in the Mapleview Drive Water Tower. Additional details regarding the Barrie Water Storage and Distribution system is provided in the City of Barrie Water Storage and Distribution Master Plan Update, 2019.

3.2 EXISTING ANNE STREET BOOSTER STATION CAPACITY

The existing Anne Street Booster Station has a firm capacity of 11.60 MLD and pumps into pressure zone 2N. This firm capacity is based on rated/design capacity in accordance with MECP Drinking Water Works Guidelines. The firm capacity refers to the total pumping capacity with the largest pump out of commission.

3.3 FUTURE REQUIREMENTS

3.3.1 FUTURE SERVICING REQUIREMENTS

The known future service requirements were identified for the study which guides the development of alternative solutions for infrastructure improvement projects for the City. The primary driver for future servicing is the accommodation for increased residential and nonresidential population. The growth projections for the City were developed using City of Barrie Long-Term Scenarios Review completed by Watson and Associate's Ltd. (2017). The study divided the City into Traffic Zones which constituted locations in the City where greenfield development may occur, potential redevelopment and underutilized properties. The data represents the most current representation of growth forecasting for the City and is appropriate for infrastructure servicing recommendations tailored to linear and vertical infrastructure life expectancy.

3.3.2 DESIGN REQUIREMENTS FOR ANNE STREET BOOSTER PUMPING STATION

Anne St. Zone 2N & 3N Water Booster Pumping Station capacity requirements are presented in the table below.

Table 2: Anne St. Zone 2N & 3N Water Booster Pumping Station capacity requirements

Pressure Zone	Firm Capacity (L/s)	Total Capacity (L/s)
Zone 2N	189	252
Zone 3N	140	215

3.4 INFRASTRUCTURE GAP

There are a few areas within the City during maximum day demand (MDD) scenarios where lower pressures are noted as borderline compliant with the Level of Service (LOS) criteria for Zones 2N and 3N which is consistent with existing conditions observations. In the model simulations this is typically occurring during tank fill/drain cycles when the tanks approach their lower functional limit. In the case of Zone 2N and 3N the MDD pressures are beyond borderline only when the pressures are not maintained between pressures zones unless elevated tanks are at functional elevations under initial conditions. Once the Anne St. 2N/3N BPS upgrades are complete the pressures will become normalized and within the LOS targets.

4 PROBLEM STATEMENT

The Anne Street Booster Pumping Station, due to age and condition needs to be upgraded or replaced. The new booster station at Anne Street Reservoir needs to supply water to pressure zone 2N to ensure that all level of service criteria are attained and provide redundancy and security of supply to pressure zone 3N.

5 APPROACH TO THE PROBLEM

The approach used to identify solutions to the problem statement is shown in **Figure 4**.

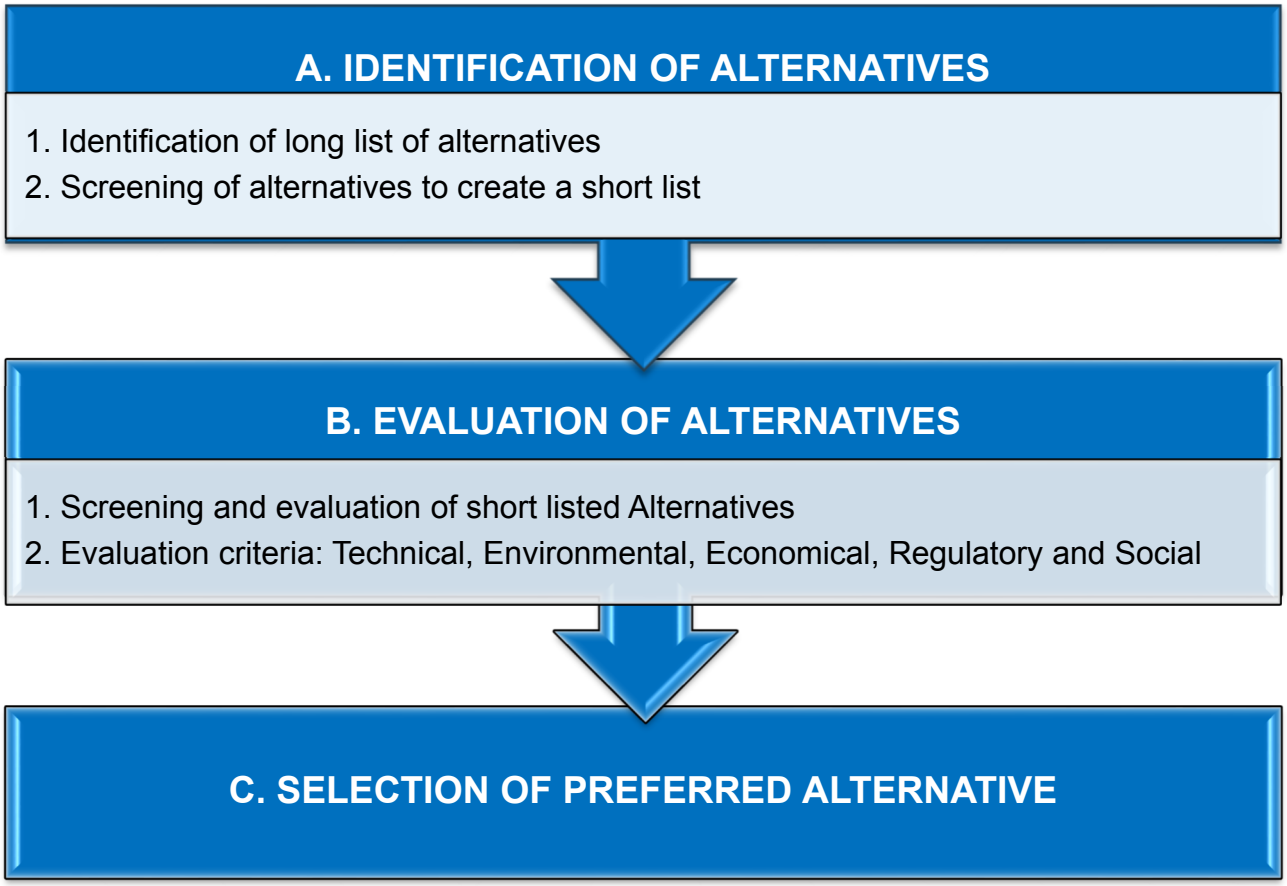


Figure 3: Overview of Approach for Identifying a Preferred Solution

The first step (Step A) involved identifying a long list of alternatives for addressing the deficiencies identified in the Problem Statement. An initial screening based on pass/fail criteria was used to generate a short-list of alternatives.

In the second step (Step B), the short-list of alternatives was then subjected to a detailed evaluation based on technical, environmental, financial, regulatory and social/cultural considerations. This evaluation was subsequently used to identify the preferred alternative or solution (Step C).

6 ALTERNATIVE SOLUTIONS

Based on consultation with the City, the alternatives identified for addressing the problem statement are as follows:

1. Do Nothing
2. Option 1 – North-West Side of Existing Reservoir
3. Option 2 – North Side of Existing Reservoir Between the Valve Chambers
4. Option 3 – On-top of Existing Reservoir Cells
5. Option 4 – South Side of Existing Reservoir

Illustrated in the figure below are all four site options evaluated.

Figure 4: Alternative Site Locations

6.1 DO NOTHING

A "Do Nothing" alternative is a required as part of the Class EA process. In this alternative, existing conditions and the current mode of operations will be maintained. However, given the existing pumping station needs replacement and redundant supply is required for Pressure Zone 3N, this alternative does not provide a solution to the problem now or in the future. This alternative was not considered further.

6.2 OPTION 1 – NORTH-EAST SIDE OF EXISTING RESERVOIR

This option locates the new Anne Street BPS north-east of the existing reservoir. This option situates the pumping station near the site lot line and caution will be needed during construction to ensure there is no impact on the adjacent property. The pumping station will also be located close to the existing reservoir and therefore the structural design will have to address potential lateral loading from the reservoir structure. This site will require the relocation of the existing transformer. See Figure 4 above.

6.3 OPTION 2 – EAST SIDE OF EXISTING RESERVOIR BETWEEN THE VALVE CHAMBERS

This option places the new pumping station between the inlet valve chamber and the reservoir. This option would be feasible in the long-term however is challenging to construct without taking the reservoir off-line for an extended time. It is due to challenges during construction that this option is not carried forward for additional evaluation and analysis.

6.4 OPTION 3 – ON-TOP OF EXISTING RESERVOIR CELLS

This option places the new pumping station on-top of the existing reservoir cells. This option will place additional load on the reservoir roof slab. This will require a comprehensive structural assessment and most probably additional columns and supports. Furthermore, this will require the reservoir to be taken out of service for a considerable amount of time to make these changes. Other challenges include:

1) The emergency generator would have to be located in a separate building or structure as the regulator would not let a generator be place above a treated water storage reservoir due to the risk of contamination
2) Vibration of equipment could impact the structure of the reservoir over time
3) The new building would have a large impact on the landscape as it would be on-top of an elevated structure.

Due to these challenges this option is not carried forward for additional evaluation and analysis.

6.5 OPTION 4 – WEST SIDE OF EXISTING RESERVOIR

This option places the pumping station on the west side of the existing reservoir away from all existing infrastructure. This option reduces the risk profile of the project as the new pumping station could be fully constructed while the existing station remains in service. Access and connections between the reservoir and the pumping station could be completed sequentially.

This option does require slightly more yard piping.

The most significant negative regarding this option is the feedback that was provided during the public information center. The community raised several significant concerns regarding this option:

1) Public safety – the community residents were concerned that the new pumping station on the south side of the reservoir could potentially attract people loitering in the area.
2) Light and Noise Pollution – the residents, especially the residents that back on to the site (live on the east side of Callaghan Drive) were concerned with light and noise pollution coming from the new pumping station. Concerns regarding light and noise pollution during construction and after construction (the permanent structure) were raised.
3) Visual Impact – Residents, especially residents on Callaghan Drive were concerned about the visual impact of the station and their loss of privacy.
4) Loss of Recreational Space – Currently the area is not fenced and is therefore used as recreational space. If the pumping station is constructed this location the recreational space will be lost.

See Figure 4 above.

7 EVALUATION OF ALTERNATIVES

The alternatives discussed in the previous section were evaluated using the criteria shown in **Figure 55**. A detailed outline of each criteria is provided in Error! Reference source not found.**4.** These criteria are based on the triple-bottom line approach described in the Class EA process and were established through consultation with the City of Barrie.

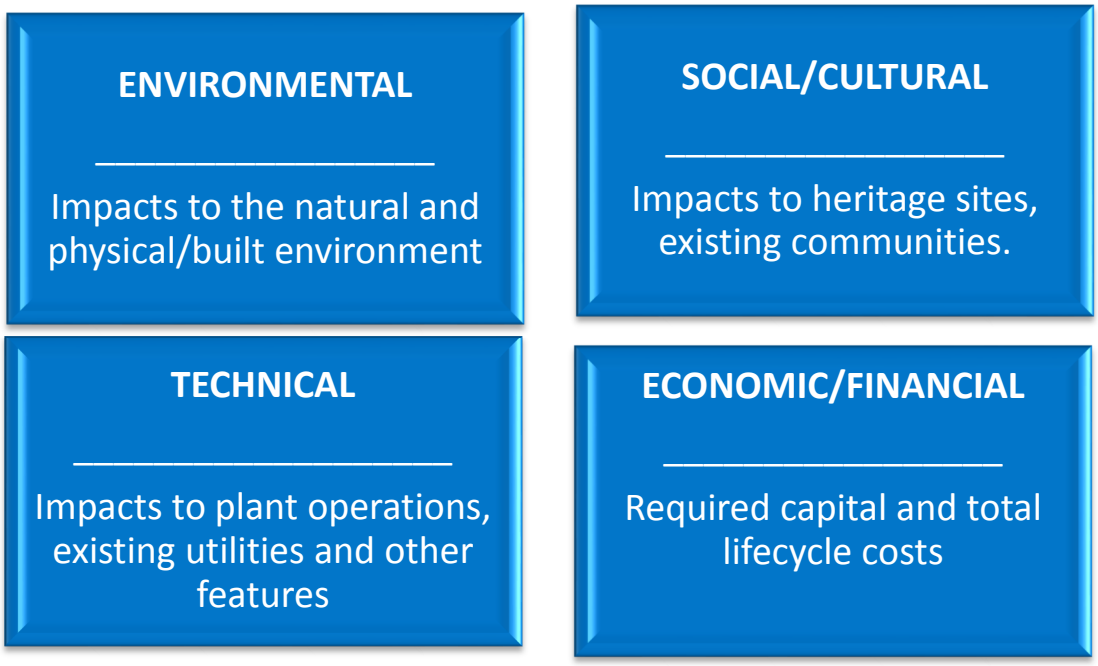


Figure 5: Evaluation Criteria for Short-Listed Alternatives

An evaluation matrix was used to conduct a comparative assessment of the alternatives to determine which solution had the greatest technical merit, had the least overall impact on the environment and resulted in the lowest cost.

The evaluation was based on a qualitative assessment of the individual impacts. Each of the alternatives was assigned a colour rating for each of the evaluation criteria. A green colour rating indicates that the alternative had a low impact (i.e. considered to be "most preferred") with respect to that criterion. An orange colour rating would denote an alternative that is considered to be "preferred." A yellow colour rating would indicate moderate impact (i.e. "less preferred"). Finally, a red colour rating indicates that the alternative would have a high impact (i.e. would be "least preferred").

The alternative with the least overall impact was recommended for implementation.

Table 3: Evaluation Criteria for Alternatives

Criteria	Key Considerations
Physical (Built) Environment	Potential adverse effects on existing utilities (water, electricity and telecommunications). Opportunity to accommodate future utilities; Impact of crossings on existing and future Land Use; The ability of the alternative to adequately handle potential adverse effects associated with climate change events such as extreme weather events;

Criteria	Key Considerations
	Impact on greenhouse gas emissions
Social and Cultural Environment	Potential impact to residents, community facilities, public parks, institutions or businesses. Potential impact to visual aesthetic; Potential effects of traffic related air and noise on residences, adjacent to the study corridor; Potential adverse impacts on archaeological resources and built heritage resources within or adjacent to the study corridor; Impact on existing transportation network within the City; Presence of First Nations heritages sites or lands that could be impacted;
Technical	Past performance of the technology in Ontario. Ability to quantify performance/measure results; Impacts on the operation of the existing facility. Ability to provide consistent and efficient operation;
Economic/Financial	Capital cost of the proposed improvements and the feasibility of phasing implementation; Life Cycle costs - The sum of the capital and operation & maintenance costs discounted at a rate of 4% to calculate the present value of the alternative

An evaluation matrix has been prepared to compare the short-listed alternatives and is provided in **Table 5.** The legend for the evaluation matrix is shown below.

Legend

- Low impact, "most preferred"
- Low to moderate impact, "preferred"
- Moderate impact, "less preferred"
- High impact, "least preferred"

Table 4: Short-listed Alternatives

ALTERNATIVE	Option 1 North-West Side of Existing Reservoir	Option 4 Southside of Existing Reservoir
Physical (Built) Environment	Requires the relocation of the existing PowerStream (Alectra) transformer prior to the construction of the booster pumping station.	There is more open space available during construction. This option requires slightly more yard piping.
Social & Cultural Environment	Lower potential that the pump station building and access will impact the usage of the open space by the neighborhood. Feedback from the community was heavily in favour of this option. Similar to the existing location. Less additional impacts on residents and the community.	High potential that the pump station building and access will impact the usage of the open space by the neighborhood. High potential that during construction the neighbours who back on to the site will be impacted.
Technical	Placement of the new pumping station at the north-each side of the existing reservoir will require additional reservoir access structures due to front and side set back requirements Improved ability to provide consistent and efficient servicing new side entry into the two reservoir cells, additional reservoir access structures will need to be constructed.	Site is away from all existing process and infrastructure. Minimal interference to the existing station operation is expected. Each reservoir cell could be isolated in sequence for access and tie-ins without interrupting BPS operation. Intercept the existing Zone 1 400mm watermain for tie-ins is available from the south east of the property. More physical space around the site to allow for traffic management during construction.
Economic	$ 9.6 million	$ 9.2 million
Overall	"most preferred"	"less preferred"

8 PREFERRED ALTERNATIVE

As presented in the evaluation table above the preferred option is to construct the pumping station on the north east side of the existing reservoir (Option 1).

Option 1 has less social and cultural implications. Per the extensive feedback received from the community during the Public Information Center, the area south of the reservoir (Option 4) is well used and valued community space. It is used extensively during all four seasons of the year. It is used by the community to play football in the fall and toboggan in the winter. There was widespread public comment about the loss of greenspace, that has been used by generations of homeowners in the area over the last 40 years. However, it is important to note that, Option 1 was not deemed as being the most preferred option from a technical perspective as it will be more challenging to construct and will require a slightly longer construction shut down period of the existing booster pumping station and reservoir.

It was these comments that the City of Barrie project team used to complete the evaluation of alternatives and determined that the social and culture advantages of Option 1 outweighed the technical disadvantages of the Option 4.

APPENDIX

A PUBLIC CONSULTATION

Ministry of Tourism, Culture and Sport

Heritage Program Unit
Programs and Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7
Tel: 416 314 7147
Fax: 416 212 1802

Ministère du Tourisme, de la Culture et du Sport

Unité des programmes patrimoine
Direction des programmes et des services
401, rue Bay, Bureau 1700
Toronto ON M7A 0A7
Tél: 416 314 7147
Téléc: 416 212 1802

Ontario

October 17, 2017 (EMAIL ONLY)

Mr. Tom Reeve, P. Eng.
Senior Infrastructure Planning Program Coordinator
City of Barrie
70 Collier Street, Box 400
Barrie, ON L4M 4T5
E: Tom.Reeve@barrie.ca

RE: MTCS file #: 0007579
Proponent: City of Barrie
Subject: Notice of Commencement
Master Plan Updates for Water Supply, Distribution and Storage, Wastewater Collection and Wastewater Treatment
Location: City of Barrie, Ontario

Dear Mr. Reeve:

Thank you for providing the Ministry of Tourism, Culture and Sport (MTCS) with the Notice of Commencement for your project. MTCS's interest in this Environmental Assessment (EA) project relates to its mandate of conserving Ontario's cultural heritage, which includes:

- Archaeological resources, including land-based and marine;
- Built heritage resources, including bridges and monuments; and,
- Cultural heritage landscapes.

Under the EA process, the proponent is required to determine a project's potential impact on cultural heritage resources. The recommendations below are for a Schedule B Municipal Class EA project, as described in the notice of study commencement. If any municipal bridges may be impacted by this project, we can provide additional screening documentation as formulated by the Municipal Engineers Association in consultation with MTCS. Realizing that this is in part a Master Plan Update, developing or reviewing inventories of known and potential cultural heritage resources within the study area can identify specific resources that may play a significant role in guiding the evaluation of alternatives for subsequent project-driven EAs.

While some cultural heritage resources may have already been formally identified, others may be identified through screening and evaluation. Aboriginal communities may have knowledge that can contribute to the identification of cultural heritage resources, and we suggest that any engagement with Aboriginal communities includes a discussion about known or potential cultural heritage resources that are of value to these communities. Municipal Heritage Committees, historical societies and other local heritage organizations may also have knowledge that contributes to the identification of cultural heritage resources.

Archaeological Resources
Your EA project may impact archaeological resources and you should screen the project with the MTCS *Criteria for Evaluating Archaeological Potential* and *Criteria for Evaluating Marine Archaeological Potential* to determine if an archaeological assessment is needed. MTCS archaeological sites data are available at *archaeology@ontario.ca*. If your EA project area exhibits archaeological potential, then an

archaeological assessment (AA) should be undertaken by an archaeologist licenced under the *OHA*, who is responsible for submitting the report directly to MTCS for review.

Built Heritage and Cultural Heritage Landscapes
The MTCS *Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes* should be completed to help determine whether your EA project may impact cultural heritage resources. The Clerk for the City of Barrie can provide information on property registered or designated under the *Ontario Heritage Act*. Municipal Heritage Planners can also provide information that will assist you in completing the checklist. The draft *MTO Ontario Heritage Bridge Guidelines for Provincially Owned Bridges* screening criteria have also been established for cultural heritage evaluation of bridges under the Class EA for Provincial Transportation Facilities.

A Cultural Heritage Evaluation Report (CHER) is used to determine the cultural heritage value or interest of a potential Provincial Heritage Property. If potential or known heritage resources exist, MTCS recommends that a Heritage Impact Assessment (HIA), prepared by a qualified consultant, should be completed to assess potential project impacts. Our Ministry's *Info Sheet #5: Heritage Impact Assessments and Conservation Plans* outlines the scope of HIAs. Please send the HIA to MTCS for review, and make it available to local organizations or individuals who have expressed interest in review.

Environmental Assessment Reporting
All technical heritage studies and their recommendations are to be addressed and incorporated into EA projects. Please advise MTCS whether any technical heritage studies will be completed for your EA project, and provide them to MTCS before issuing a Notice of Completion. If your screening has identified no known or potential cultural heritage resources, or no impacts to these resources, please include the completed checklists and supporting documentation in the EA report or file.

Thank you for consulting MTCS on this project: please continue to do so through the EA process, and contact me for any questions or clarification.

Sincerely,

Dan Minkin
Heritage Planner
dan.minkin@ontario.ca

Public Information Centre

City of Barrie Water and Wastewater Master Plan Update – Class Environmental Assessment (EA)

Welcome!

1. Please sign in at the Front Desk.
2. Feel free to review the boards and participate in the exercises.
3. Complete a comment sheet.
4. Staff are available to answer questions.

PROJECT INTRODUCTION

Purpose of the Project

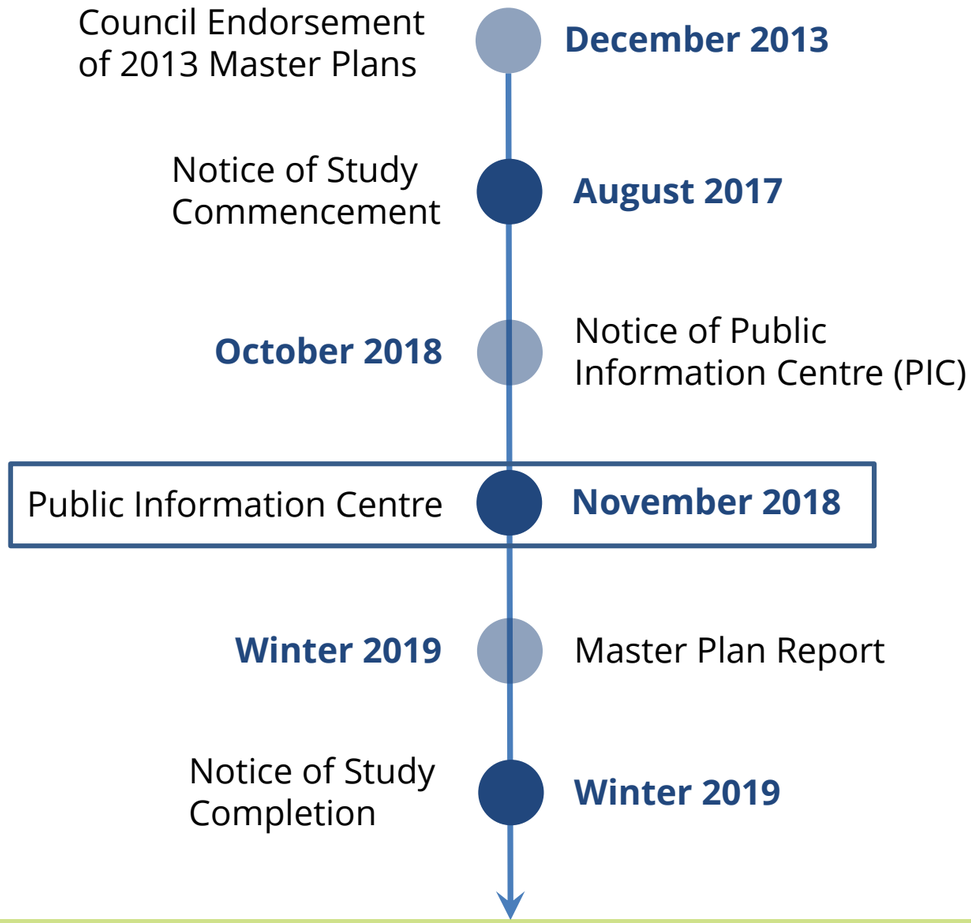
The City of Barrie is undertaking an update to the 2013 Water and Wastewater Master Plans which were approved by Council on December 2, 2013. The existing plans have a horizon of 2031 with a long term outlook to 2051. These plans can be reviewed at www.barrie.ca and by clicking on City Hall > Growth Management > Growth Management Documents & Resources.

This update is to identify the future water and wastewater servicing needs of the City. They include:

- **Wastewater Treatment Master Plan**
- **Water Supply Master Plan**
- **Wastewater Collection Master Plan**
- **Water Distribution and Storage Master Plan**

This project has been developed to facilitate Barrie's current and projected growth to ensure that sufficient servicing can be provided to 2041, as required by the Provincial Growth Plan, and to the year 2071. It will also ensure regulatory compliance, and meet regulatory requirements and policies that govern water and wastewater supply, collection and treatment, and patterns of development.

Study Timeline



Purpose of this Event

The purpose of this Public Open House is to provide an opportunity to gain public input and feedback on the water and wastewater servicing alternatives. Following this open house, the Study Team will address the public input and feedback received into the final Master Plan deliverables.

PROJECT BACKGROUND

Infrastructure & Servicing Needs

The City of Barrie is one of Ontario's fastest growing municipalities, and is the largest urban centre in the Simcoe County area. The current Master Plans have a 2031 horizon with a preliminary outlook to 2051.

Updates to the Master Plans are required in order for the City to comply with the 2017 Provincial Growth Plan to accommodate Barrie's projected growth, and to ensure that sufficient servicing can be provided to the 2041 horizon.

However, to better anticipate long-term servicing needs, projections have been forecasted to the year 2071. This allows the City to identify constraints well in advance of the next update. Master Plans are scheduled to be updated on a 5-year cycle.

In 2016

145,800 called the City of Barrie home

73,800 people worked in the City of Barrie

Policy Framework

Various laws, regulations, guidelines, and policies govern water and wastewater supply, collection, and treatment, as well as development patterns for which those systems will be expanded to service. Several of the key regulatory requirements impacting this project include:

- *Safe Drinking Water Act, 2002*
- *Ontario Water Resources Act, R.S.O 1990*
- *Ontario Environmental Protection Act, R.S.O 1990*
- *Lake Simcoe Protection Act, 2008*
- Provincial Policy Statement, 2014
- Growth Plan for the Greater Golden Horseshoe, 2017
- City of Barrie Official Plan (January 2018 Office Consolidation)

By 2031...

210,000 people will call the City of Barrie home

101,000 people will work in the City of Barrie

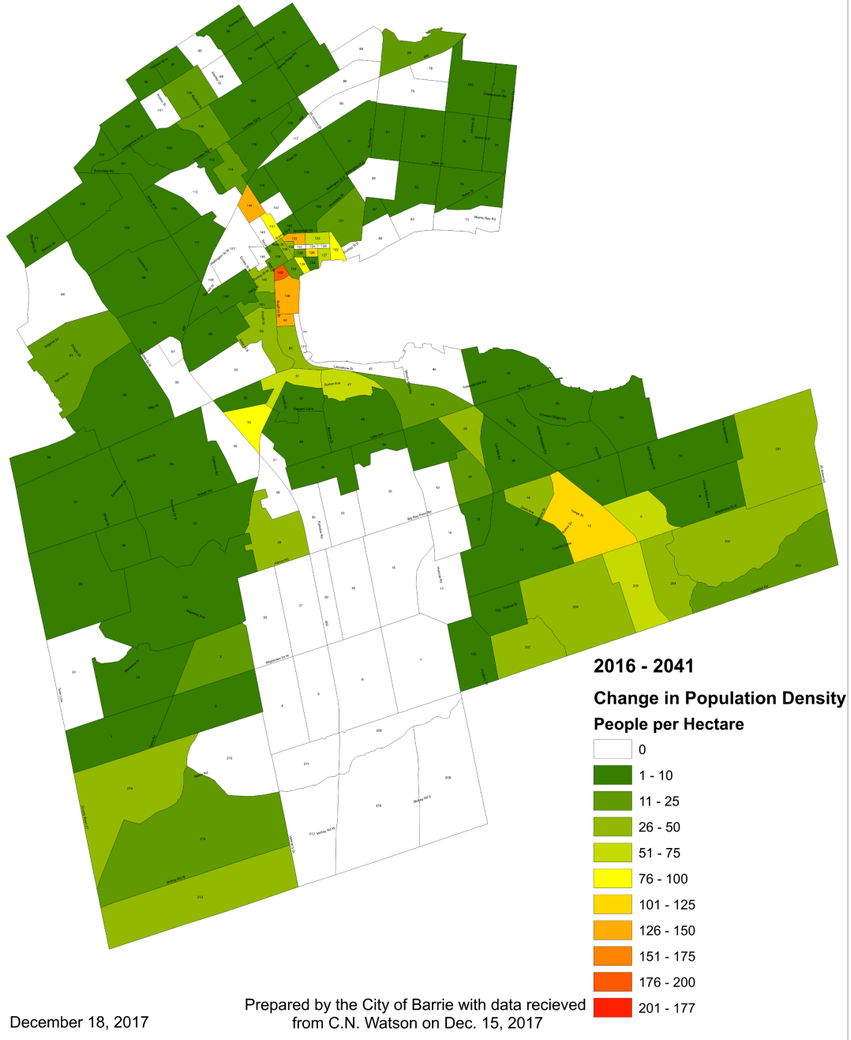
By 2041...

253,000 people will call the City of Barrie home

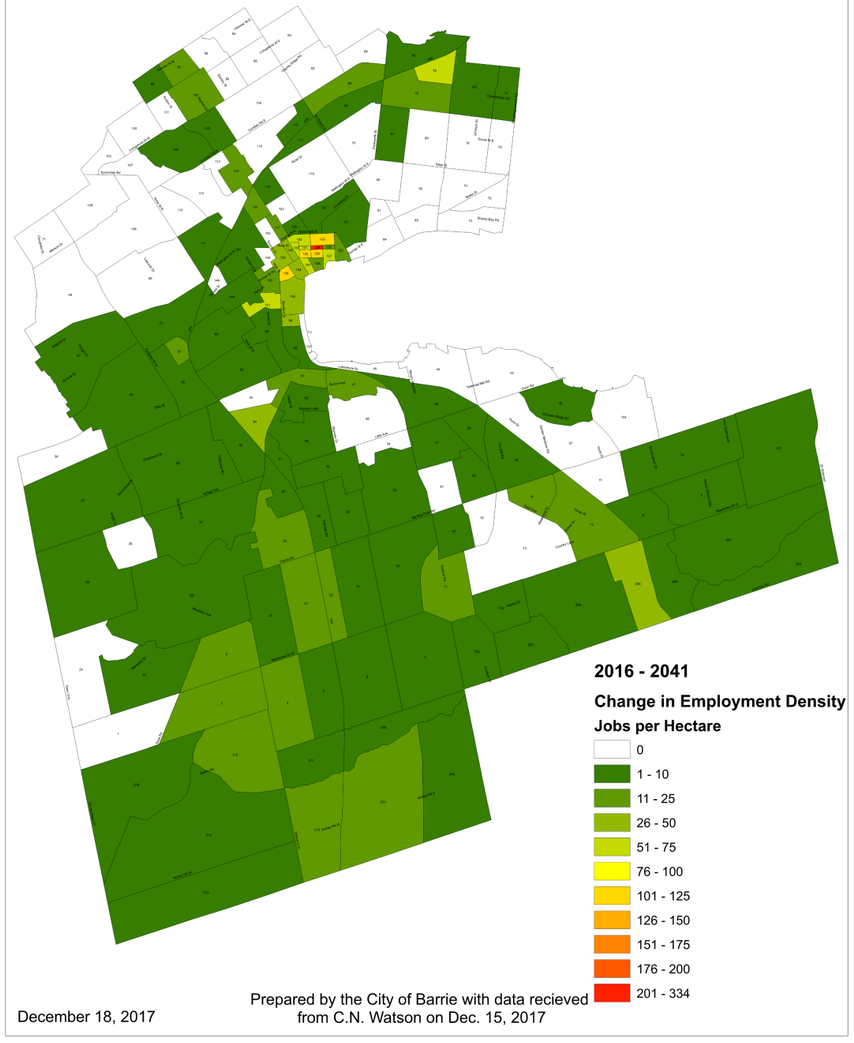
129,000 people will work in the City of Barrie

PROJECTED GROWTH

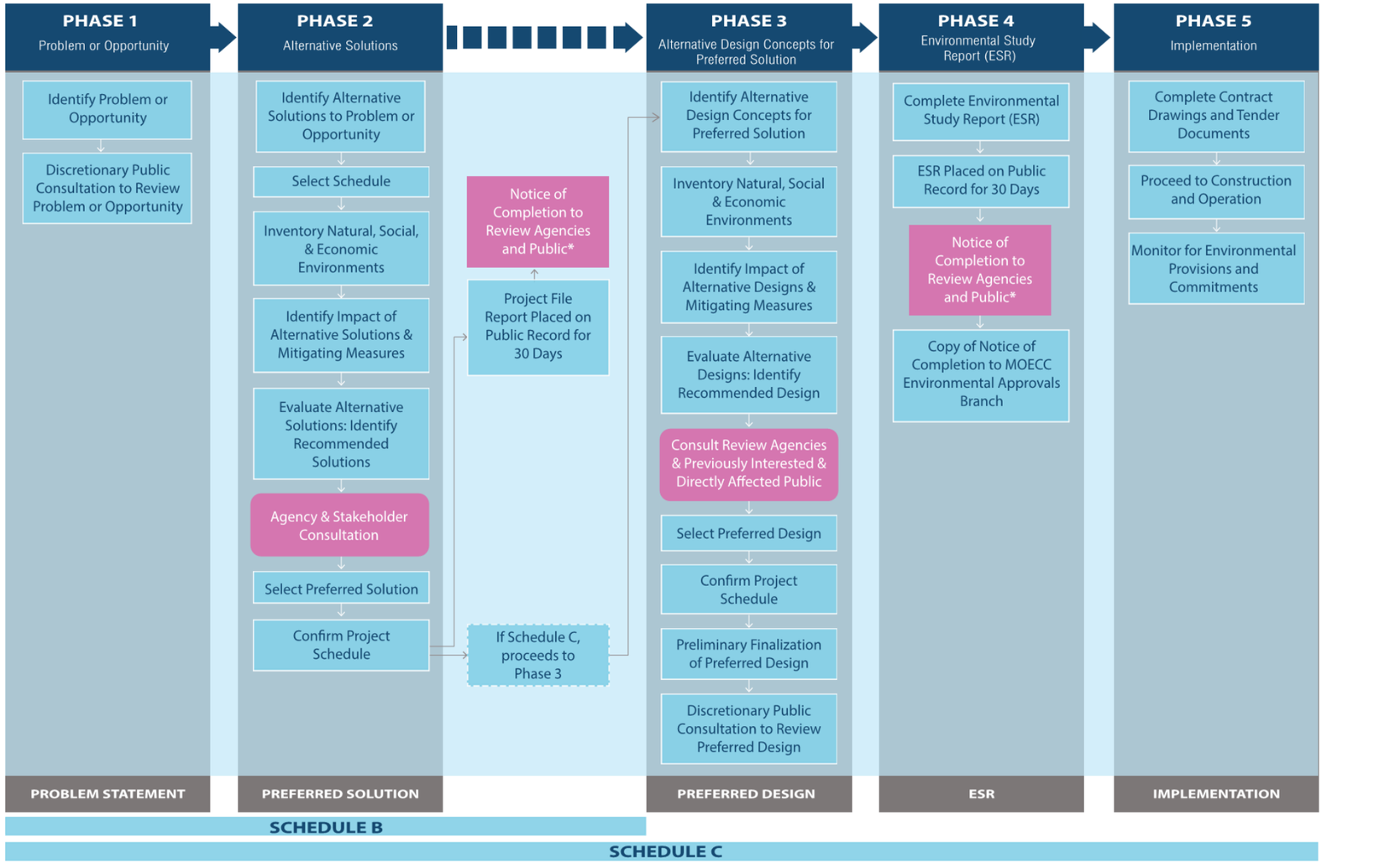
Residential Growth



Non-Residential Growth



MUNICIPAL CLASS EA PROCESS



The 2013 Master Plan and these updated Master Plans will be completed using <u>Approach 2</u> of the Class EA Master Planning Process

EA Project Schedules

Projects undertaken by the City as a result of this Master Plans Update are assigned to various project 'Schedules' according to their anticipated level of environmental impact.

Schedule A projects are limited in scale and have minimum adverse environmental effects. These projects are pre-approved and include a number of maintenance and operational activities.

Schedule A+ projects are pre-approved, however, the public is to be advised prior to project implementation.

Schedule B projects have the potential for some adverse environmental effects and require public consultation. These projects generally include improvements and minor expansions to existing facilities.

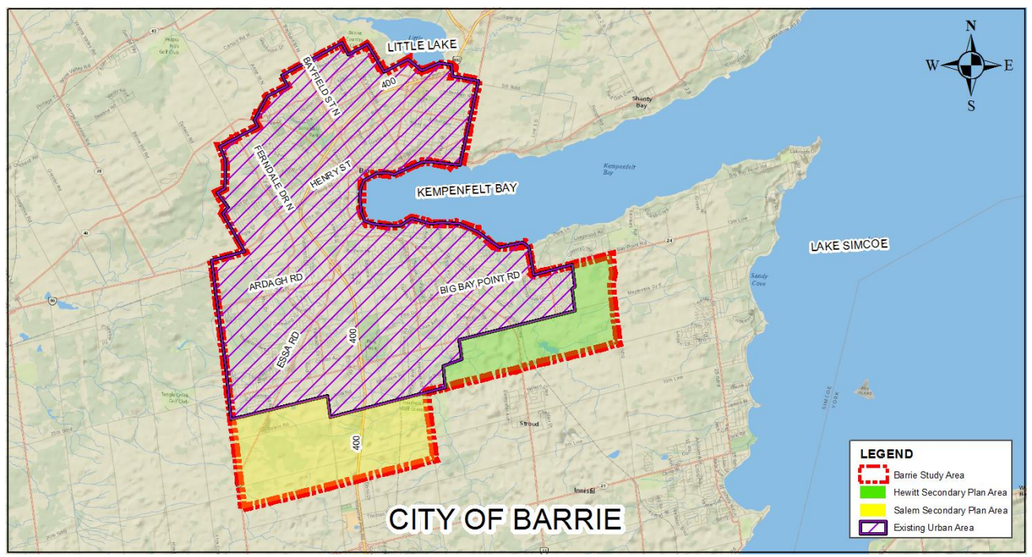
Schedule C projects have the potential for significant environmental effects and require public consultation. These projects generally include the construction of new facilities and major expansions to existing facilities.

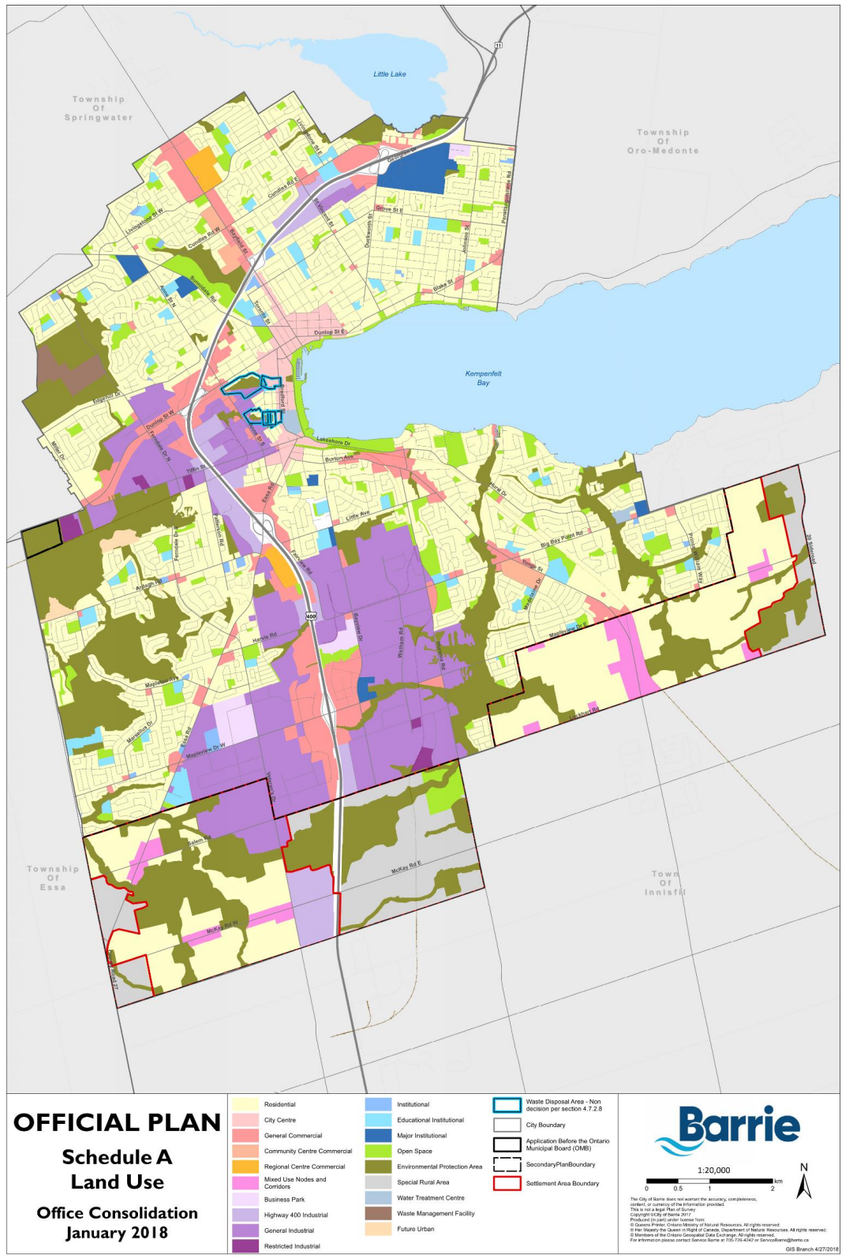
STUDY AREA

The Study Area for this project encompasses the entire City. This includes the Secondary Plan Areas located along the southern border of the City's boundary.

The City is located on the shores of Lake Simcoe and on the western extent of Kempenfelt Bay. The City boundary encompasses nearly 100 square kilometres, and as of the 2016 census, is home to about 145,800 residents. In 2010, an additional 2,293 hectares of land were annexed to the City of Barrie from the Town of Innisfil – allowing the City to accommodate a growing population.

This Project has been undertaken to facilitate Barrie's current and projected growth and to ensure that sufficient servicing can be provided to facilitate this growth to 2041. It is also important that the Lake Simcoe watershed be protected, as required under Provincial legislation.





Water Supply Master Plan

PROBLEM STATEMENT

Currently, the City water supply is provided by groundwater in the northern system zones and surface water in the southern system zones. Water demand in the southern zones will exceed the surface water treatment plant capacity prior to 2041 and **additional water supply capacity is required to accommodate the long-term growth in these zones**. Water supply in the northern zones is sufficient until approximately 2069.

Context

To provide a plan for the drinking water supply system, the system must be evaluated for its ability to meet the water demands as well as the security (redundancy) in the system. To evaluate the system, the future demands were compared to the existing supply capacities. The groundwater wells and the surface water supply drinking water system are currently operating independently and therefore, they are analyzed separately. It is important to note that there is infrastructure in place for the two systems to mix, however this only happens occasionally. Redundancy in the system is also considered.

Once the future demand and supply capacities are compared, it will be determined if the supply is sufficient or if other actions are required. This is followed by several alternatives that will be presented, evaluated, and recommended. Recommendations will also be presented for any works required to increase redundancy in the system.

LONG-LIST ALTERNATIVES

A long-list of alternative solutions to address the problem statement were identified in the early stages of the project.

1. Do Nothing
Under this alternative, the water system will continue to operate as it currently does.

2. Limit Growth
This alternative involves restricting population growth within the City. Lower growth rates would ensure the sufficient supply to accommodate future demand. However, this would include reversing past decisions regarding growth and development in the City. The province has identified Barrie as a growth center for the area.

3. Water Efficiency/Conservation
This alternative involves implementing further water conservation and reduction strategies to reduce water demand, and provide overall resiliency to the system. The focus is on reducing outdoor water usage. The City currently has a number of water conservation efforts in effect to enhance long-term sustainability.

4. Surface Water Treatment Plan (SWTP) Upgrades
This alternative involves the expansion of the SWTP to accommodate for the projected increase in water demand.

5. New Water Service Zone
This alternative considers developing a new groundwater service zone within the City. This alternative would also require significant upgrades to existing infrastructure.

6. Well Water Diversion to Southern Zones
This alternative would divert some well supply to the southern zones of the City to complement the servicing of the southern zones, but only when required to meet demand. This would be achieved using existing infrastructure.

7. Mix Surface and Groundwater Supply
This alternative would mix surface and groundwater supply to accommodate the long-term projected demand, but only when required. Since available groundwater is sufficient to meet overall water demand projections, the mixing of both water supplies would satisfy future demand. This approach has been effectively implemented in other Ontario municipalities, including York Region and the Region of Waterloo, and at times already occurs in the City of Barrie.

LONG-LIST ALTERNATIVES SCREENING

Three criteria were applied to screen the long-list of alternatives:

1. **Flexibility and Redundancy –** Flexibility and redundancy refers to alternatives that provide a foundation for future infrastructure development to service growth.

2. **Compatibility with the current policies and regulations** – An alternative that complies with Provincial and City policy related to growth and development is preferred.

3. **Addresses the problem statement** – A pass is given to an alternative that provides a solution to any of the constraints identified in the problem statement.

The screening process concluded there are three short-listed alternatives which warranted further evaluation to address the problem statement.

Alternative	Flexibility and Redundancy	Policy and Regulation Compatibility	Addresses the Problem Statement
Do Nothing	✗	✗	✗
Limit Growth	✗	✗	✗
Water Efficiency/ Conservation	✓	✓	✗
SWTP Upgrades	✓	✓	✓
New Water Service Zone	✗	✓	✗
Well Water Diversion to Southern Zones	✗	✓	✗
Mix Surface and Groundwater Supply	✓	✓	✓

SHORT-LIST ALTERNATIVES

Water Efficiency/Conservation
To further reduce the water consumption by 4%, the strategy is to focus on outdoor water usage. In addition to current programs, increased incentives to reduce outdoor water usage, promotion of automated irrigation systems, and/or the use of native and drought tolerate plants are considered.

Surface Water Treatment Plan (SWTP) Upgrades
This alternative involves the expansion of the SWTP from 60 MLD to 90 MLD to accommodate for the projected increase in water demand by 2041. Works include the addition of one low lift pump, one flocculation tank, one membrane train, and two GAC contactors. Since the SWTP design considered a modular expansion, this will occur entirely within the existing SWTP building, with minimal impacts.

Mix Surface and Groundwater Supply
This includes the diversion of groundwater supply to supplement the water needs in the southern zones using existing infrastructure. This approach was implemented successfully before the construction of the SWTP. Infrastructure required to implement this option includes minor distribution system upgrades. Mixing would require increased capacity at the Innisfill Booster Pumping Station and the addition of two wells (Wells 4A and 19). It is important to note that mixing would only occur a few days per year when the demand on the system is highest in the southern zones.

Findings from 2013 Master Plan:

Groundwater supply was sufficient to provide servicing to the northern zones through 2031. Additional water supply is needed to accommodate projected maximum day demands for the southern zones (2 MLD). Based on the detailed evaluation of five short-listed alternatives, a combination of the two highest ranking alternatives solutions were selected as preferred.:

- Alternative 1: Water Efficiency/Conservation
- Alternative 2: Phase 1 SWTP Upgrades – Optimization of Existing Processes

EVALUATION OF ALTERNATIVES

The following criteria were applied to evaluate the Alternatives.

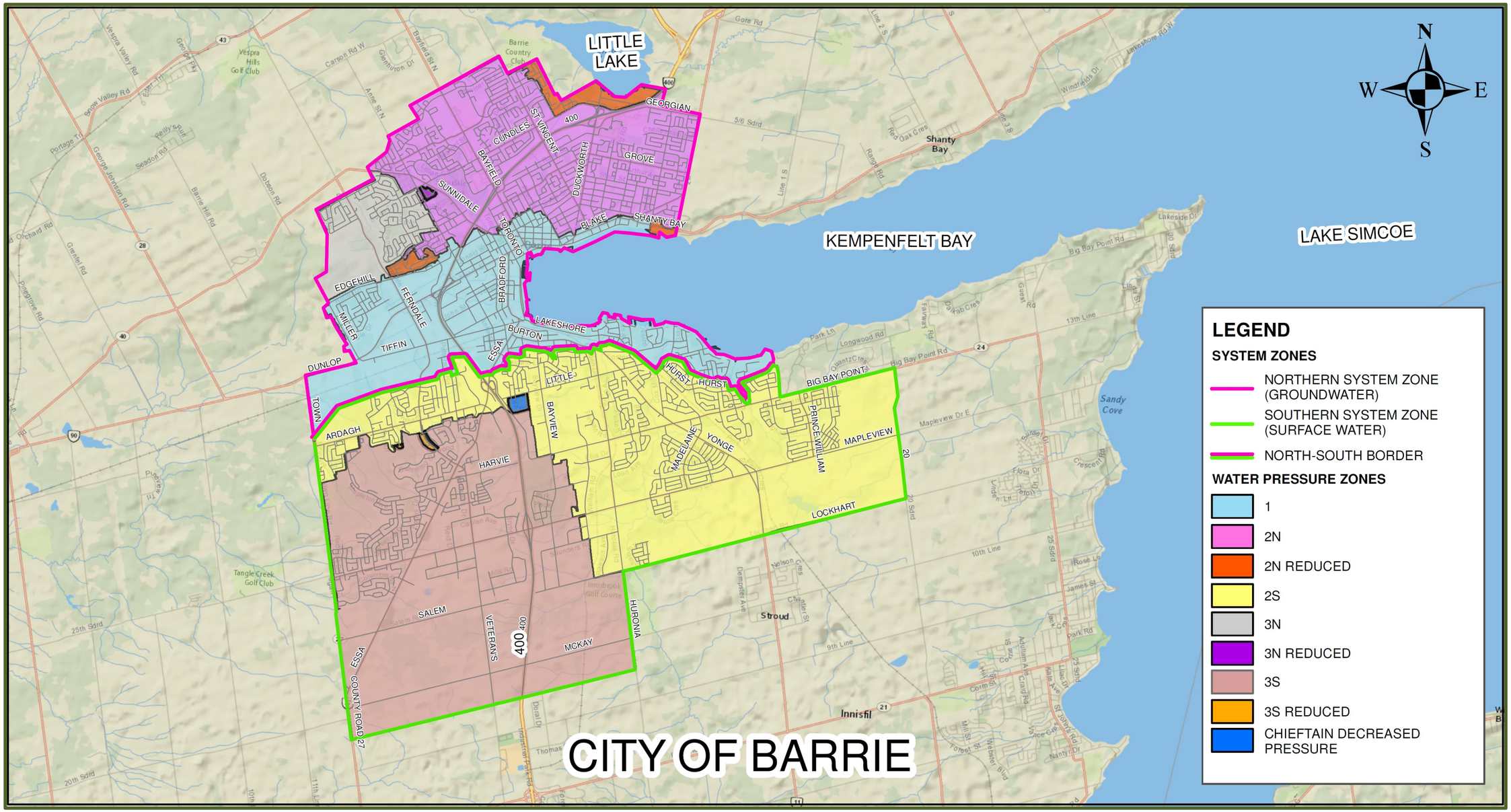
1. **Natural Environment:** Refers to any potential impact to natural areas or features, groundwater quality, surface water, erosion, and flood control.
2. **Physical/Built Environment:** Refers to any potential impact to existing utilities and infrastructure, physical structures and land uses, and ability to mitigate or adapt to climate change.
3. **Social & Cultural Environment**: Refers to any potential impact to residents, built-up areas, and regulatory requirements.
4. **Technical:** Refers to system operation, future expansion, and ability to provide consistent and efficient servicing.
5. **Economic/Financial:** Refers to the capital cost, operating cost, and phasing (implementation).

Evaluation Criteria	Water Conservation	SWTP Upgrades	Mix Surface and Groundwater
Natural Environment			
Physical/Built Environment			
Social and Cultural Environment			
Technical			
Economic/Financial			

Key
Low Impact / “Most Preferred”
Low to Moderate Impact / “Preferred”
Moderate Impact / “Less Preferred”
High Impact / “Least Preferred”

**the colour assigned to each alternative/criteria indicates a ranking*

WATER SERVICE AREAS



WE WANT YOUR INPUT!

The City wants to understand whether there are issues with the current level of water service. Please review the adjacent map to determine if your residence and/or workplace are serviced by groundwater (pink) or surface water (green).

Please use the dots to answer the questions. Use the sticky notes to provide comments.

Question	Yes	No
Is your residence/workplace located within the pink area on the map?		
While at the property, do you notice variations in the colour of your water?		
While at the property, do you notice variations in the taste of your water?		
Please provide your comments (and property address) here		

Water Distribution and Storage Master Plan

PROBLEM STATEMENT

To service the existing and future needs of the City of Barrie's Water Storage and Distribution network the following Problem Statement was adopted to guide the master planning study analysis:

To develop an infrastructure plan for the City of Barrie Water Storage and Distribution Network which meets current servicing needs and will accommodate future growth to 2041 and beyond. The Master Plan will identify a preferred solution that provides optimal design and delivery of water servicing that is maintained city-wide. The preferred alternative will also be evaluated in consideration of potential impacts to natural heritage and the environment, social and cultural considerations, technical considerations, and both economic and financial considerations. Ultimately, the Master Plan will identify the City's long-term infrastructure responsibilities to accommodate anticipated growth and resulting demand on water distribution and storage.

Existing Constraints

Future constraints, or servicing gaps, were determined to help inform the range of preliminary alternative solutions. They were identified using information gathered from available data, City consultation, and technical analysis. They include:

- Water storage: There are identified needs to accommodate growth in the existing system to the 2041 horizon.
- Water distribution: There are identified distribution gaps under the 2041 growth projections, however; infrastructure projects that are currently approved for pre-2021 construction will mitigate some of these identified distribution gaps.

DESIGN CRITERIA AND UPDATES

Design Criteria and Level of Service

The City of Barrie Water Transmission and Distribution Policies and Design Guidelines were updated in December 2017. These new design guidelines, as well as the Ministry of Environment, Conservation and Parks (MECP) guidelines and the past Master Plans design criteria were reviewed to establish the Level of Service criteria to be followed in the Water Distribution and Storage Master Plan Update. These include:

- Water storage requirements for systems to provide regular servicing and fire flow protection and sized in accordance with MECP criteria for *Total Treated Water Storage Requirements* (Fire Storage + Equalization Storage + Emergency Storage).

- Booster Station level of service is based on the rated or 'Firm Pumping Capacity' of the station. The stations are to provide for high demand conditions with floating storage and provide for peak hour demand or fire flow conditions without floating storage.

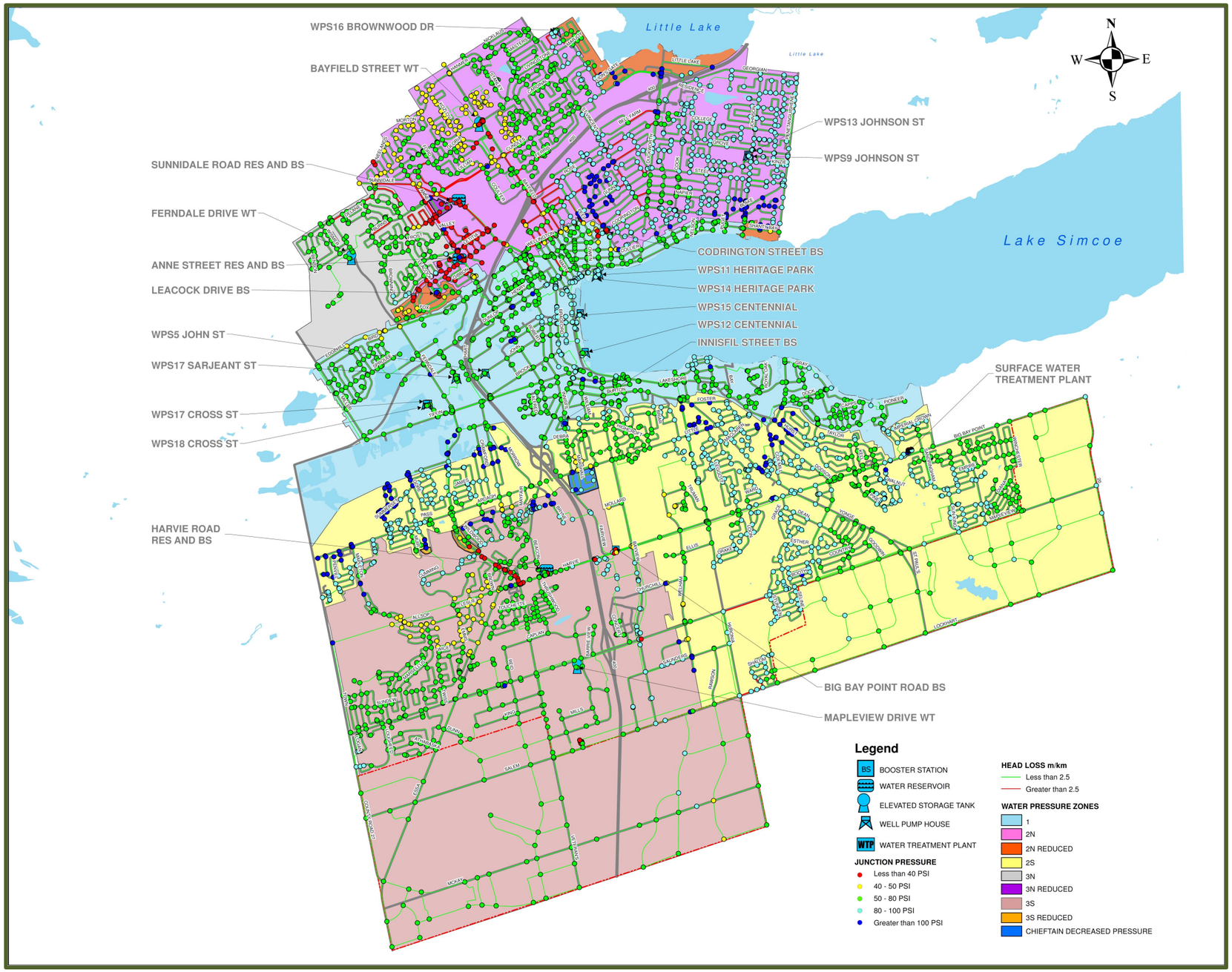
- Head loss gradient for watermain pipes are to be under 2.5m/km during normal operating conditions. Watermain velocities to are to be maintained below 5m/s during Fire Flow conditions.

- Water pressures are to be maintained above 345 kPa (50psi) during normal conditions, above 275kPA (40psi) during high demand conditions, and above 138kPa (20psi) during fire flow conditions.

2013 Master Plan Recommendations
The City has moved forward on the immediate term recommendations from the 2013 Master Plan, which includes 14 capital projects. As part of this Master Plan all projects identified in the 2013 Master Plan have been reviewed with timing adjustments per the new growth projections.

EXISTING WATER PRESSURE

This map shows water pressure throughout the City of Barrie, including where existing water pressure is below the guideline, meets the guideline, or exceeds the guideline.



LONG-LIST ALTERNATIVES

A list of alternative solutions to address the problem statement were identified in the early stages of the project.

1. Do Nothing
"Do nothing" is an alternative required by the Class EA process. It is defined as maintaining the current capacity and operating conditions of the Water Distribution System.

2. Limit Growth
This alternative involves restricting population growth within the City to minimise the impacts on existing infrastructure and resources. Lower growth rates would ensure the sufficiency of the existing infrastructure for a longer period of time and would delay any need for expansion.

3. Water Conservation and Leakage Reduction
The water conservation and leakage reduction alternative involves implementing further water conservation strategies and reducing water leakage in the system. Together, these initiatives would decrease domestic water demand. An effective water efficiency program could defer infrastructure expansions of the water distribution system required to accommodate future growth. The City has already undertaken a number of water conservation initiatives which have improved overall water efficiency.

4. Expand / Upgrade Existing Servicing Infrastructure
This alternative involves the expansion of the City's existing water distribution system to address service population growth needs through new and upgraded infrastructure. This would involve various infrastructure upgrades to accommodate future growth.

Did you know?

The City has proactively implemented several water conservation strategies which have effectively improved overall water efficiency. These include:

- Lawn & Garden Maintenance
- Water Efficiency in Homes
- Toilet Rebate Program
- *Disconnect to Protect!*

Visit **www.barrie.ca** to find out more!

LONG-LIST ALTERNATIVES SCREENING

Pass or fail criteria were used for the screening of the long-list of alternatives as follows:

1. **Complexity** – A pass is given to any alternative that could be feasibly implemented with minimal impact to operations, City operations/activities and poses minimal risks to health and safety.
2. **Compatibility with the current policies and regulations** – A pass is given to any alternative that complies with Provincial and City policy related to growth and development.
3. **Addresses the problem statement** – A pass is given to an alternative that provides a solution to any of the constraints identified in the problem statement.

Alternative	Complexity	Policy and Regulation Compatibility	Addresses the Problem Statement
Do Nothing	✓	✗	✗
Limit Growth	✗	✗	✗
Water Conservation and Leakage	✓	✓	✓
Expand and Upgrade Existing Servicing Infrastructure	✓	✓	✓

The screening process concluded that Alternatives 3 and 4 warranted further evaluation.

EVALUATION OF ALTERNATIVES

The short-list alternatives were evaluated using the following criteria, which are based on the triple-bottom line approach outlined in the Class EA process and were established in consultation with the City of Barrie.

1. **Natural Environment:** Refers to any potential impact to natural areas or features, groundwater quality, surface water, erosion, and flood control.
2. **Physical/Built Environment:** Refers to any potential impact to existing utilities and infrastructure, physical structures and land uses, and ability to mitigate or adapt to climate change.
3. **Social & Cultural Environment**: Refers to any potential impact to residents, built-up areas, and regulatory requirements.
4. **Technical:** Refers to system operation, future expansion, and ability to provide consistent and efficient servicing.
5. **Economic/Financial:** Refers to the capital cost, operating cost, and phasing (implementation).

Evaluation Criteria	Water Conservation	System Expansion
Natural Environment		
Physical/Built Environment		
Social and Cultural Environment		
Technical		
Economic/Financial		

Key
Low Impact / “Most Preferred”
Low to Moderate Impact / “Preferred”
Moderate Impact / “Less Preferred”
High Impact / “Least Preferred”

**the colour assigned to each alternative/criteria indicates a ranking*

WE WANT YOUR INPUT!

The City wants to understand if there are any issues with the water service at your residence and/or workplace.

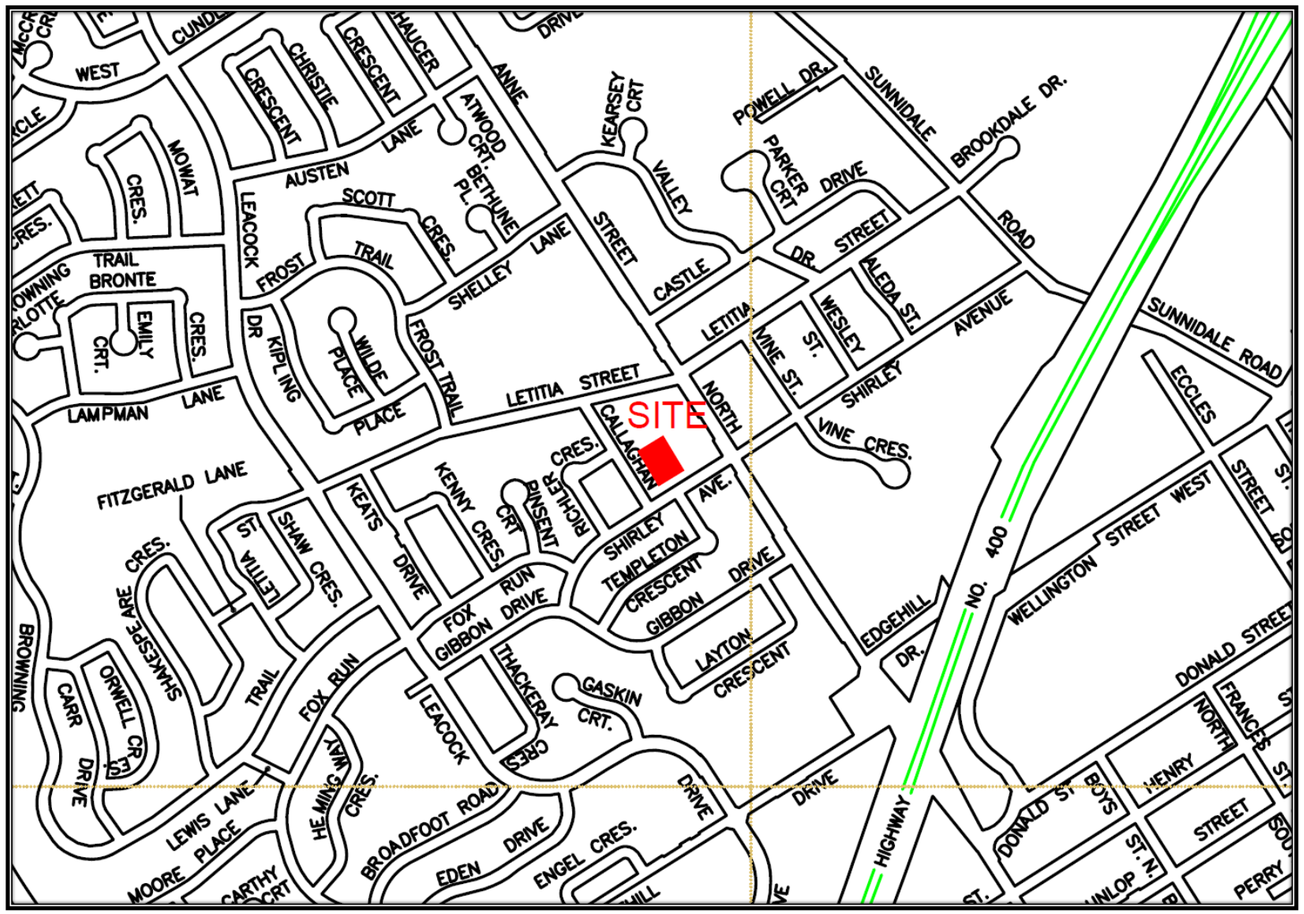
Please use the dots to answer the questions. Use the sticky notes to provide comments.

QUESTION	YES	NO	Not Applicable
Do you occasionally experience low water pressure?			
Are you aware of a water reservoir or pumping station in your neighbourhood?			
If so (above), has the water reservoir or pumping station ever caused a nuisance?			
Please provide your comments (and property address) here			

Anne Street 2N and 3N Water Booster Pumping Station

PROBLEM AND ALTERNATIVES

The Anne Street Reservoir is located within Zone 1 of the City of Barrie's Water Distribution System. There is an existing Booster Pumping Station, however due to age and condition the pumping station needs to be upgraded or replaced. The new booster station at Anne Street Reservoir will supply water to pressure zone 2N and provide redundancy and security of supply to pressure zone 3N.



LIST OF ALTERNATIVES

A list of alternative solutions to address the problem statement were identified in the early stages of the project.

1. North-East Side of Existing Reservoir

Placement of the new pumping station at the north-east side of the existing reservoir will require additional reservoir access structures due to front and side set back requirements.

2. East Side of Existing Reservoir Between the Valve Chambers

Construction of a new pumping station between the existing reservoir and inlet valve chamber, abutting the two cells in the existing reservoir. Unless the existing BPS can be completely shutdown for an extended period of time during demolition and construction (estimated to be 18 months), this option is not feasible due to the following reasons:

- The distance between the valve chamber and the reservoir is not large enough to accommodate a new structure.
- There is not enough space for shoring the deep excavation.
- The existing 400 mm watermains and 375 mm overflow lines will all need to be relocated prior to the start of excavation.

3. On-top of Existing Reservoir Cells

Placement of the new pumping station on top of the existing reservoir's two cells. This option is not recommended because the pumping station structure will add substantial load on top of the existing reservoir and therefore the existing reservoir roof would have to be strengthened.

4. West Side of Existing Reservoir

This alternative involves constructing a new pumping station against the southwest side of the existing reservoir abutting two cells.

- Construction against the exterior wall of the reservoir from the west side, abutting two cells with door access to each cell directly inside the station.
- Discharge watermains will need to be diverted around the reservoir to connect to the new and existing watermains at Anne Street.

The short-listed alternatives include Alternative 1 and Alternative 4.

EVALUATION OF ALTERNATIVES

The short-list alternatives were evaluated using the following criteria, which are based on the triple-bottom line approach outlined in the Class EA process and were established by ETO Engineering.

1. **Technical Suitability:** Refers to building footprint, estimated concrete volume, building excavation, additional structures, and additional watermain pipe.
2. **Constructability:** Refers to the potential impact of temporary work for construction staging, existing reservoir shutdown requirement, and space management.
3. **Accessibility and Operability**: Refers to the major equipment location, access to reservoir cells, and requirement of a lower level travelling bridge.
4. **Economic/Financial:** Refers to the total cost of ownership.

Evaluation Criteria	Alternative 1 - North-East Side of Existing Reservoir	Alternative 4 - Southwest Side of Existing Reservoir
Technical Suitability		
Constructability		
Accessibility and Operability		
Economic/Financial		

Key
Low Impact / “Most Preferred”
Low to Moderate Impact / “Preferred”
Moderate Impact / “Less Preferred”
High Impact / “Least Preferred”

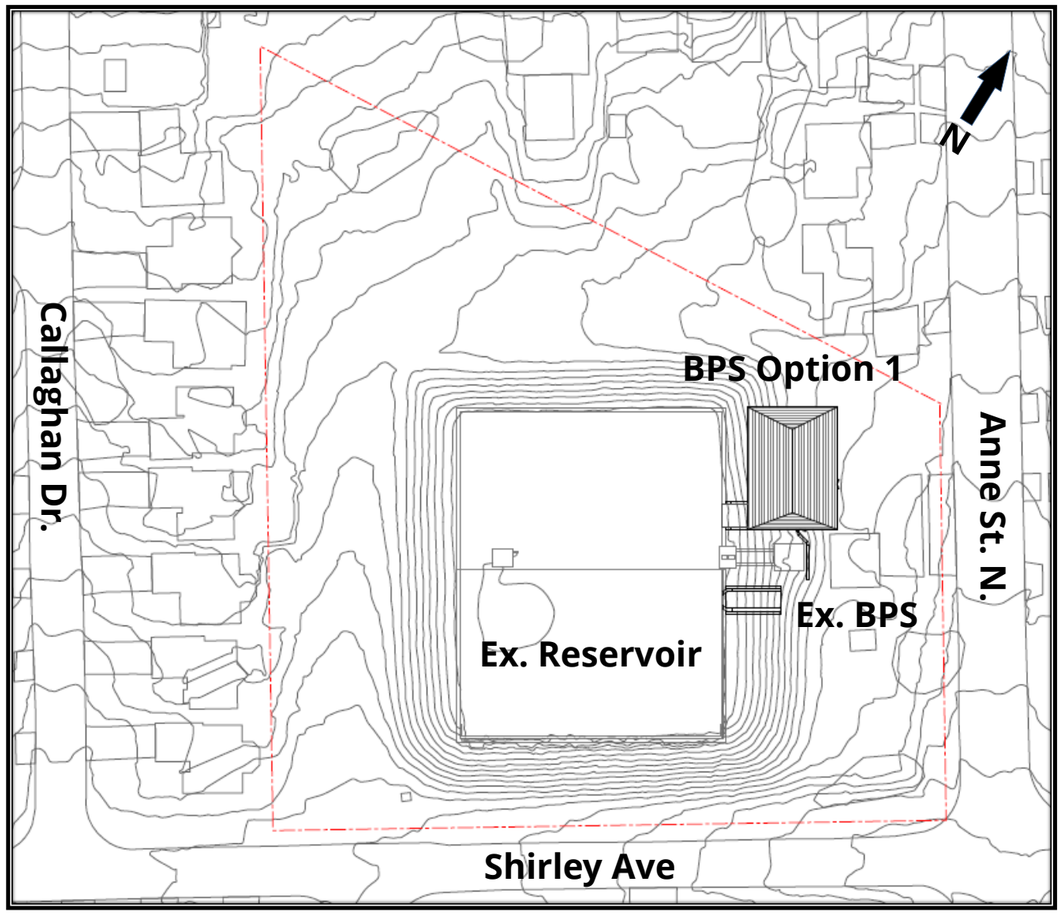
**the colour assigned to each alternative/criteria indicates a ranking*

SHORT-LISTED ALTERNATIVES

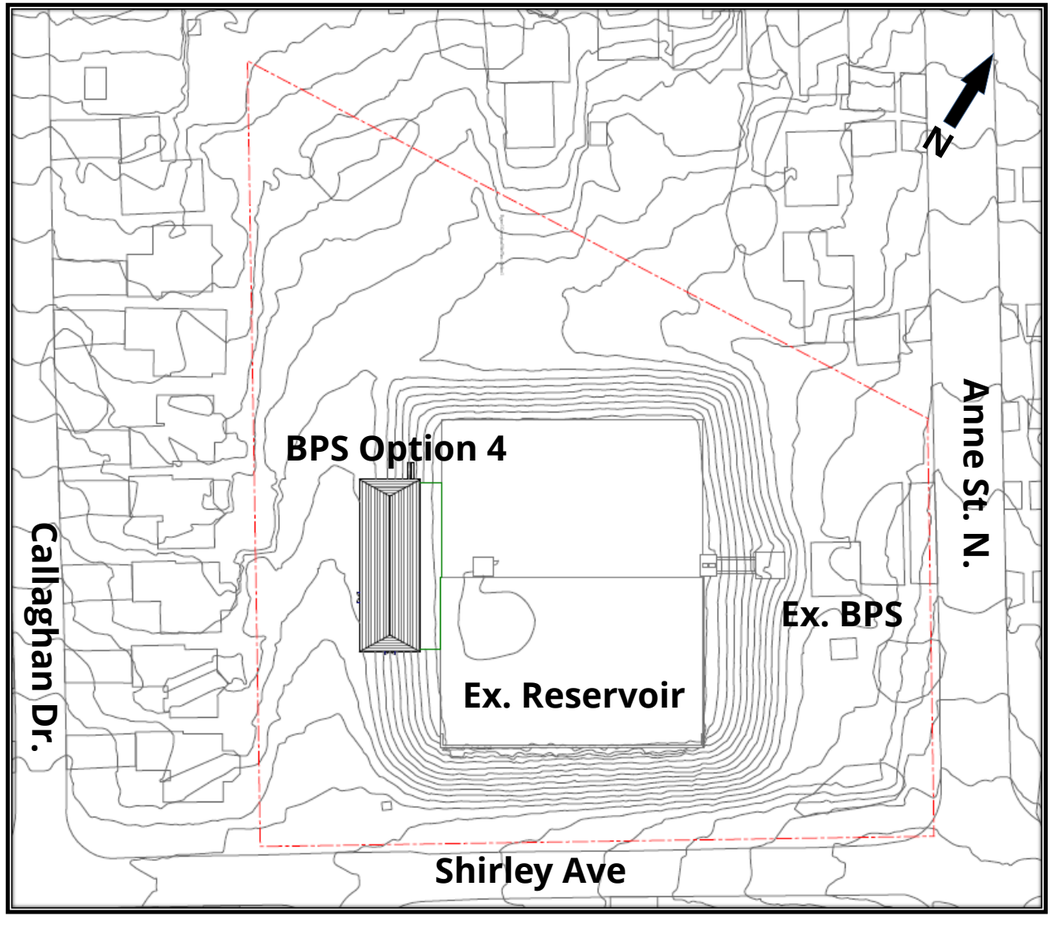
This rendering shows a conceptual design for a Booster Pumping Station, similar to what might be constructed under Alternatives 1 or 4.

SHORT LISTED ALTERNATIVES

Site Option 1 - North- East Side of Existing Reservoir



Site Option 4 - New Entry From Shirley Avenue



SHORT LISTED ALTERNATIVES

Site Option 1 - North- East Side of Existing Reservoir

Pros:
- Same orientation and entrance as the existing station facing Anne Street

Cons:
- Longer construction time overall (e.g. 6-12 months longer)
- Potential interruption to existing water services during construction
- Higher construction cost to build and maintain
- Close to 170 Anne Street

Site Option 4 - New Entry From Shirley Avenue

Pros:
- Shorter construction time overall
- No interruption to water services
- Lower construction cost to build and maintain

Cons:
- New entrance from Shirley Ave and some construction activity to occur on Shirley Ave.
- Close to existing private properties on Callaghan Drive

WE WANT YOUR INPUT!

The City wants to understand if there are any mitigating measures you would like to see included in the detailed design and construction of this project.

Please use the dots to answer the questions. Use the sticky notes to provide comments.

QUESTION	YES	NO	Not Applicable
Are you concerned about light pollution from the new booster station?			
Are you concerned about changes to recreational space?			
Are you concerned about the visual impacts of the new booster station?			
Please provide your comments (and property address) here			

NEXT STEPS

Conclusions

- The Master Plans each identify a series of projects that are required to meet the growing water and wastewater needs in the City of Barrie.
- This study has used a long-term vision to understand the future conditions and requirements of the City.

Next Steps

Winter 2018 – Master Plan Reports

- These documents summarize the overall EA process and will be available for public review and comment. People who have expressed an interest to be kept informed of the project will be notified directly. There will be an opportunity to meet with project staff individually to discuss concerns.

Winter 2019 – Master Plan Approval

- Following the public comment period, the new Master Plans will be presented to Council. Members of the public will have an opportunity to make a deputation to Council as a registered delegate.
- If Council approves the Master Plan, the City will issue a Notice of Completion. The public will have a minimum 30-day period to appeal.

More Information

Visit **www.barrie.ca** to find out more!

Contact Information

Tom Reeve

Senior Infrastructure Planning Program Coordinator

City of Barrie

70 Collier Street, Box 400

Barrie, ON L4M 4T5

Tel: (705) 739-4220 Ext. 4465

Fax: (705) 739-4247

Email: Tom.Reeve@barrie.ca

CITY OF BARRIE
WATER AND WASTEWATER MASTER PLAN UPDATE

PUBLIC INFORMATION CENTRE – NOVEMBER 1ST, 2018

PLEASE SIGN IN

NAME (Please Print)		CONTACT INFORMATION				PHONE	EMAIL
First	Last	Street #	Street Name	City/Town	Postal Code	Number	Address
[redacted]							

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Water and Wastewater Master Plans

Public Information Centre
Tuesday, November 1st, 2018
4:00 p.m. to 7:00 p.m.
Southshore Community Center (205 Lakeshore Drive, Barrie, ON)

COMMENT SHEET

Personal information on this form is collected under the authority of the Environmental Assessment Act, Chap. E18, Section 7, and will be used in the development of a Drainage Master Plan. Questions about this collection should be directed to the Director of Engineering, P.O. Box 400, 70 Collier Street, Barrie, Ontario, L4M 4T5, (705) 726-4242.

Please print all responses

NAME OF RESPONDENT: [redacted]

REPRESENTING (Agency, Municipality, Property Owner, Tenant, etc.):

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[redacted]

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☐	☒	☐	☐	☐
Poor (Much Improvement Required)	**Marginal** (Some Improvement Required)	**Good**	**Very Good**	**Excellent**

Please add a comment in support of your level of satisfaction below:

[redacted]

Do you wish to be informed of future Public Information Centers and of staff recommendation for the Preferred Alternative Solution?

☒ Yes ☐ No

Signature: [redacted] Date: [redacted]

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Engineering Department
70 Collier Street, P.O. Box 400
Barrie, ON
L4M 4T5

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Fax: (705) 739-4247

E-mail: Tom.Reeve@barrie.ca

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Water and Wastewater Master Plans

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Fax: (705) 739-4247

E-mail: Tom.Reeve@barrie.ca

Thank you for your comments

Anne Street Reservoir Project

Property Owner: 21 Callaghan Dr, Barrie, ON, L4N6E8

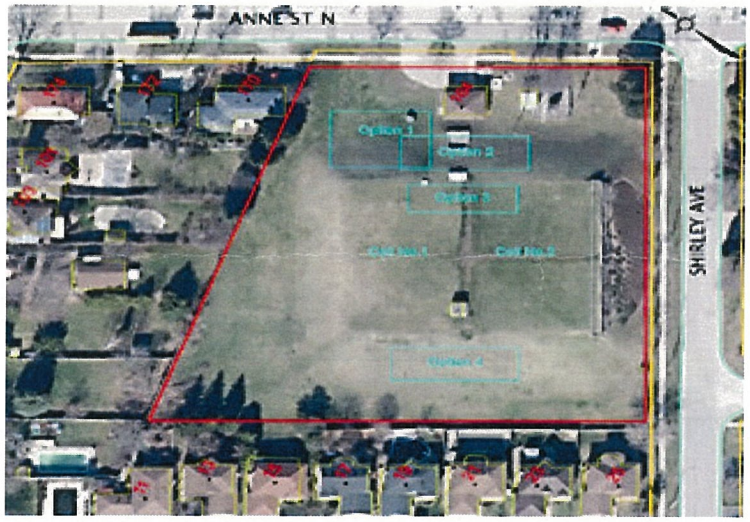
Concern: Public safety, Property Values, Neighborhood impacts

Hello

We reached out to Tom Reeve (Senior Infrastructure Planning Program Coordinator) who was able to provide us the scope of the project. We are concerned with the preliminary selection of option 4, and the impacts to our property value, public safety, and change to a 30-year tradition in our neighborhood.

We believe Option 1 or 2 would be the ideal solution to achieve the project objective to install larger pumps, and maintain the integrity and value of the neighborhood.

Scope: There will be some more information at the Public Information Centre but the main change proposed on the property is that a new pump station building is needed. The existing building on the Anne Street side houses some large pumps for distributing water but it isn't big enough for the new pumps required. Overall the property will still be a green space on top of a reservoir but a number of options for building location are being considered (see the map below). ***The preliminary preferred alternative is Option 4 due to some constraints on the Anne Street side of the property.***



Public Safety – Only safe access to the area for the public is right by option 4 proposal. As per the aerial view, the front option already has existing buildings, and Shirley avenue side has a garden and steep slopes until this entrance. Owners, including myself have pools and time from time balls, toys, etc will go over the fence and a building will add to the risk of children getting hurt. We are concerned about people hanging out behind a build at night since it will be away from the road, and out of sight from authorities.

Property Values – The first picture on the left is from 21 Callaghan backyard deck, and the proposed building will be in a direct view of the green space. We paid a premium at the time of purchase to back on to a green space, and the view will have an impact on future value if selling the property.

The distance from our house or fence to the bottom of the hill is the shortest distance, compared to the other properties surrounding the area. Note: There is no option or proposal on the North side of the property where the distance between the hill and houses are close to 200 feet away (picture on the right)

Another concern will be the lighting around the building will affect the night view, and potential impacts to sleeping habits depending on the strength of the light.

Option 1 or 2 – Has the required space to build a building without impacting any of the surrounding properties, and option 2 could hide the new building behind an existing structure.

Neighborhood Impacts: For 30 years, owners have taken their kids to play soccer, toboggan, football, school walks, and walk their dogs in the green space. Building a pump station in the middle of this area will have a negative impact to a long-standing traditions and family fun for our neighborhood.

Water and Wastewater Master Plans

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Please print all responses

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L4M 4T5

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FIRST NATIONS AND MÉTIS

FN	Alderville First Nation	Chief	James	Masden		P.O. Box 46 11696 Second Line Alderville, ON K0K 2X0	(905) 352-3000	jbmarsden@aldervillle.ca
FN	Algonquins of Ontario Consultation Office	Ms.	Janet	Stavinga	Executive Director	31 Riverside Drive, Suite 101 Pembroke, ON K8A 8R6	(613) 735-3759 ext. 202	jstavinga@nrtco.net
FN	Barrie Friendship Centre	Ms.	Samantha	Kinoshameg	Executive Director	175 Bayfield Street Barrie, ON L4M 3B4	(705) 721-7689 ext. 202	executivedirector@bnfc.ca
FN	Beausoleil First Nation	Chief	Mary	McCue-King		11 O'Gemaa Miikaan Christian Island, ON L9M 0A9	(705) 247-2239	bfnchief@chimnissing.ca
FN	Chippewas of Georgina Island	Chief	Donna	Big Canoe		R.R. #2 Box N-13 Sutton West, ON L0E 1R0	(705) 437-1337	donna.bigcanoe@georginaisland.com
FN	Chippewas of RAMA First Nation	Chief	Rodney	Noganosh		5884 Rama Road, Suite 200 Rama, ON L3V 6H6	(705) 325-3611 ext. 1240	chief@ramafirstnation.ca
FN	Curve Lake First Nation	Chief	Phyllis	Williams		Government Services Building 22 Winookeedaa Road Curve Lake, ON K0L 1R0		-
FN	Georgian Bay Métis Council	Mr.	David	Dusome	President	355 Cranston Crescent, P.O. Box 4 Midland, ON L4R 4K6	(705) 526-6335	-
FN	Hiawatha First Nation	Chief	Laurie	Carr		123 Paudash Street Hiawatha, ON K0L 2G0		chiefcarr@hiawathafn.ca
FN	Métis Nation of Ontario - Métis Consultation Unit	Sir or Madam				Métis Nation of Ontario Head Office 500 Old St. Patrick, Unit D	(613) 725-422	consultations@metisnation.org

						Ottawa, ON K1N 9G4		
FN	Mississauga's of Scugog Island First Nation	Chief	Kelly	LaRocca		Administration Building 22521 Island Road Port Perry, ON L9L 1B6		klarocca@scugogfirstnation.com
FN	Moose Deer Point First Nation	Chief	Barron	King		c/o Government Services P.O. Box 119 MacTier, ON P0C 1H0		chief@moosedeerpoint.com
FN	Moon River Métis Council		Tony	Muscat	President	820 Muskoka Road South Gravenhurst ON P1P 1K2	(705) 689-3941	moonrivermetiscouncil@outlook.com
FN	Wahta Mohawk First Nation	Chief	Philips	Franks		2664 Muskoka Road #38 P.O. Box 260 Bala, ON P0C 1A0	(705) 762-2354	-
FN	William Treaties First Nation		Karry	Sandy McKenzie	Williams Treaties First Nations Process Coordinator			inquiries@williamstreatiesfirstnations.ca
EXTERNAL AGENCIES								
UT	Bell Canada	Mr.	Robert	McKay	Network Manager	136 Bayfield Street Barrie ON L4M 3B1		-
UT	Bell Canada	Ms.	Angela	Taylor	Manager, Access Network Facilities	136 Bayfield Street, 2nd Floor Barrie ON L4M 3B1		-
UT	Enbridge				Municipal Notices	500 Consumers Road Toronto ON M2J 1P8		-
UT	Hydro One Networks Inc.	Ms.	Rossella	Fazio	Manager, Transmission Lines Sustainment Investment Planning	483 Bay Street North Tower, 15th Floor Toronto ON M5G 2P5	(416) 345-6411	rossella.fazio@HydroOne.com

UT	Innisfil Hydro Distribution Systems Ltd.	Mr.	John N.	Aseerwatham	Engineering Manager	7251 Yonge Street Innisfil ON L9S 0J3	(705) 431-6870	johna@innisfilhydro.com
UT	PowerStream	Mr.	Mark	Henderson	VP Asset Management & C.O.O.	161 Cityview Boulevard Vaughan ON L4H 0A9		mhenderson@barriehydro.com
UT	PowerStream				Engineering Clerk	161 Cityview Boulevard Vaughan ON L4H 0A9		engineeringadmin@powerstream.ca
UT	Rogers Cable In.c	Mr.	Doug	Washburn	Planning Manager	1 Sperling Drive, P.O. Box 8500 Barrie ON L4M 6B8		-
FP	Ministry of Environment and Climate Change	Mr.	Rob	Dobos	Manager, Environmental Assessment Section Environmental Protection Branch - Ontario Region	867 Lakeshore Road Burlington ON L7R 4A6	(905) 336-4953	rob.dobos@canada.ca
FP	Ministry of Environment and Climate Change	Ms.	Cindy	Hood	District Manager	54 Cedar Pointe Drive Barrie ON L4N 5R7	(705) 739-6441	-
FP	Ministry of Environment and Climate Change	Mr.	Dan	Orr	Manager, Technical Support Section	Central Region 5775 Yongew Street, 8th Floor North York ON M2M 4J1	(416) 326-3740	-
FP	Ministry of Environment and Climate Change		Chunmei	Liu	EA & Planning Coordinator	Central Region 5775 Yongew Street, 8th Floor North York ON M2M 4J1	(416) 326-4886	-
FP	Ministry of Environment and Climate Change		Halyna	Perun	Director, Legal Services Branch	135 St Clair Avenue West, 10th Floor Toronto ON M4V 1P5		-
FP	Ministry of Environment and Climate Change				Project Review Unit, Environmental	135 St Clair Avenue West, 10th Floor		-

					Approvals Branch	Toronto ON M4V 1P5		
FP	Fisheries Protection Program - Department of Fisheries and Oceans					867 Lakeshore Road Burlington ON L7R 4A6		-
FP	Indigenous and Northern Affairs Canada				Environmental Assessment Unit	25 St. Clair Avenue East, 8th Floor, Toronto ON M4T 1M2		EACoordination_ON@aandc-aadnc.gc.ca
FP	Ministry of Indigenous Relations and Reconciliation	Ms.	Rachael	Manson-Smith	Manager, Ministry Partnerships Unit	Toronto ON M4T 1M2	(416) 325-7032	mma.ea.review@ontario.ca
FP	Ministry of Agricultre, Food and Rural Affairs	Ms.	Jocelyn	Beatty	Rural Planner	Elora Resource Cetnre 6484 Wellington Road 7 Elora ON N0B 1S0	(519) 846-3405	jocelyn.beatty@ontario.ca
FP	Ministry of Agricultre, Food and Rural Affairs	Mr.	Ray	Vilaitis	Rural Planner	95 Dundas Street RR#3 Brighton ON K0K 1H0	(613) 475-1630	-
FP	Ministry of Agricultre, Food and Rural Affairs	Mr.	John	Turney	Policy Advisor	1 Stone Road W, 3rd Floor Guelph ON N1G 4Y2	(519) 826-3100	-
FP	Ministry of Economic Development and Growth	Mr.	John	Bullen	Manager, Cabinet Office and Policy Support Unit	900 Bay Street, 6th Floor Hearst Block Toronto ON M7A 2E1	(416) 325-0186	john.bullen@ontario.ca
FP	Ministry of Economic Development and Growth	Mr.	Michael	Helfinger	Senior Policy Advisor, Cabinet Office Liaison and Policy Support Unit	900 Bay Street, 6th Floor Hearst Block Toronto ON M7A 2E1	(416) 325-6519	michael.helfinger@ontaro.ca
FP	Ministry of Economic Development and Growth	Mr.	Brad	Duguid	Minister of Economic Development, Employment and Infrastructure	900 Bay Street, 6th Floor Hearst Block Toronto ON M7A 2E1	(416) 325-6900	-

FP	Ministry of Energy	Mr.	Andrea	Pastori	Cabinet Liaison and Strategic Policy Branch Coordinator, Strategic Policy and Analytics Branch, Strategic, Network and Agency Policy Division	77 Grenville Street, 6th Floor Toronto ON M7A 2C1	(416) 327-7276	andrea.pastori@ontario.ca
FP	Infrastructure Ontario	Mr.	Peter	Reed	Director, Land Use Planning	1 Dundas Street. W., Suite 2000 Toronto ON M5G 2L5	(416) 578-6740	peter.reed@infrastructureontario.ca
FP	Infrastructure Ontario	Mr.	Tate	Kelly	Planning Coordinator	1 Dundas Street. W., Suite 2000 Toronto ON M5G 2L5	(416) 327-1925	tate.kelly@infrastructureontario.ca and noticereview@infrastructureontario.ca
FP	Infrastructure Ontario	Ms.	Lisa	Myslicki	Environmental Advisory	1 Dundas Street. W., Suite 2000 Toronto ON M5G 2L5	(416) 212-3768	-
FP	Ministry of Municipal Affairs	Mr.	Victor	Doyle	Manager, Planning Innovation Section - Provincial Policy Branch	77 Bay Street, 13th Floor Toronto ON M5G 2E5	(416) 585-6109	victor.doyle2ontario.ca
FP	Ministry of Municipal Affairs and Housing	Mr.	Mark	Christie	Manager Community Planning and Development, Eastern Municipal Services Office	77 Bay Street, 3rd Floor Toronto ON M5G 2E5	(416) 585-6063	mark.christie@ontario.ca
FP	Ministry of Natural Resources and Forestry	Ms.	Kim	Benner	District Planner, Midhurst District	Kemptville District 2284 Nursery Road Midhurst ON K0G 1J0	(705) 725-7534	kim.benner@ontario.ca
FP	Ministry of Natural Resources and Forestry	Mr.	Ken	Mott	District Planner, Midhurst District	Kemptville District 2284 Nursery Road Midhurst ON K0G 1J0	(705) 725-7546	Ken.mott@ontario.ca

FP	Ministry of Natural Resources and Forestry	Ms.	Katherine	Woeller	District Planner, Midhurst District	Kemptville District 2284 Nursery Road Midhurst ON K0G 1J0	(705) 725-7546	-
FP	Ministry of Natural Resources and Forestry	Ms.	Alison	MacKenzie	Director, Legal Services Branch	Legal Services Branch, 99 Wellesley St. West Toronto ON M7A 1W3		-
FP	Ministry of Tourism, Culture & Sport	Ms.	Laura	Hatcher	Team Lead - Hertiage Land Use Planning	Culture Division 401 Bay Street, Suite 1700 Toronto ON M7A 0A7		
FP	Ministry of Tourism, Culture & Sport	Ms.	Karla	Barboza	Team Lead - Heritage Program Unit	Culture Division 401 Bay Street, Suite 1700 Toronto ON M7A 0A7	(416) 314-7120	karla.barboza@ontaro.ca
FP	Ministry of Tourism, Culture & Sport	Ms.	Rosi	Zirger	Heritage Planner	401 Bay Street, Suite 1700 Toronto ON M7A 0A7	(416) 314-7159	rosi.zirger@ontario.ca
FP	Ministry of Tourism, Culture & Sport	Mr.	Dan	Minkin	Heritage Planner	401 Bay Street, Suite 1700 Toronto ON M7A 0A7	(416) 314-7159	dan.minkin@ontario.ca
FP	Ministry of Tourism, Culture & Sport	Mr.	Chris	Rosati	Manager, Central Region	400 University Avenue, 2nd Floor	416-314-6682	christopher.rosati@ontario.ca
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APPENDIX

B TM1 (BY ETO ENGINEERING)

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Technical Memorandum

PREPARED FOR:	City of Barrie
PREPARED BY:	ETO Engineering
PROJECT:	Anne Street 2N and 3N Water Booster Pumping Station
REGION FILE:	RFP 2017-157P
PROJECT NUMBER:	ETO-17069
DATE:	September 25, 2018
SUBJECT:	TM 1 – Condition Assessment

Table of Contents

Project Quality Control Log

Version Control	Primary Author	QC Review	Submission Date
Draft 1	• **Architectural** Pratik Christian, OAA • **Structural/Site Civil** Bobby Yu, P.Eng • **Process Mechanical** Jeff Radley, P.Eng. Hailin Wang, P.Eng • **Electrical / Fire Safety** Peter Tworzyanski, P.Eng • **Instrumentation & Control/ SCADA** Shawn Xiong, P.Eng • **Building Mechanical/HVAC** Andrew Tworzyanski, P.Eng	**QA/QC Manager** Weon Seto, P.Eng.	July 27, 2018
Final	• **Architectural** Pratik Christian, OAA • **Structural/Site Civil** Bobby Yu, P.Eng • **Process Mechanical** Jeff Radley, P.Eng. Hailin Wang, P.Eng • **Electrical / Fire Safety** Peter Tworzyanski, P.Eng • **Instrumentation & Control/ SCADA** Shawn Xiong, P.Eng • **Building Mechanical/HVAC** Andrew Tworzyanski, P.Eng	**QA/QC Manager** Weon Seto, P.Eng.	September 25, 2018

1. Introduction

The City of Barrie (the City) has retained ETO Engineering (ETO) to undertake a condition assessment, and upgrades to the Anne St. Reservoir and Booster Pumping Station (BPS) located at 164 Anne St. N, Barrie, Ontario.

Anne St. Reservoir and BPS was originally constructed in 1959. The reservoir underwent a few major expansions in 1989 with an additional reservoir cell and a valve chamber. The most recent work was completed in 2004 as part of the re-chlorination of Anne Street, Bayfield and Mapleview Reservoirs.

In 2013, Amec Foster Wheeler prepared a Water Storage and Distribution Master Plan for the City of Barrie. It was identified that the Zone 2N Pumping Station was reaching the end of its life expectancy and in need of major refurbishing and retrofitting.

It is the City's intent to reaffirm the short- and long-term operational strategies and have a clear understanding of the current condition of the existing facility since their last major upgrade. A condition assessment of the facility was performed with the focus on identifying short-term process needs to achieve reliability of the BPS until the new station is fully commissioned. The outcome of the work is summarized in this Technical Memorandum (TM1) - Condition Assessment to draw a baseline for the purpose of project planning on a step by step basis towards the facility upgrade.

The assessment was based on site reviews focusing on the present physical conditions of the following major components:

- Architectural and site work (building exterior wall and roofing and site civil)
- Structural systems (building and chamber structures including reservoir interior and foundations as appropriate)
- Electrical systems
- Building mechanical and HVAC systems
- Fire protection and fire safety systems
- Process mechanical systems and equipment
- SCADA, Instrumentation and Controls

2. Objective

The purpose of this TM1 is to summarize ETO's observations from detailed inspection, outline deficiencies, and rank each deficiency for maintenance planning purpose. Findings of the assessment will be presented in conjunction with code compliance review to assist the decision-making process toward maintaining and/or upgrading essential and non-essential systems in the subsequent project design stages.

3. Review of Existing Information

3.1 Previous Reports, Drawings and Data

A preliminary review of existing reports and data on the reservoir and pumping station was performed. The following information was made available by the City:

- Record drawings for the North Cell No.1 (1959) including structural and yard piping
- Contract drawings for the Modification of the Anne St. Booster Station (1984)
- Contract drawings for the Reservoir Expansion (1989) to construct the West Cell No.2 including an additional valve chamber, process piping and building services modifications

- Contract drawings for the Anne St. Booster Station Re-chlorination Upgrade (2004)

3.2 Design Standards and Guidelines

Condition assessment of Anne St. BPS and Reservoir was conducted using current codes, design standards, and health and safety requirements. The standards were used to evaluate whether the various components or assets in the reservoir were compliant in their current conditions. Design standards were reviewed and taken into consideration during the assessment and are reflected in the recommendations. The following is a list of standards that were used:

- Ontario Ministry of the Environment (MOE) - Design Guideline for Drinking Water Systems, 2008;
- Occupational Health and Safety Act;
- American Water Works Association (AWWA) Standards;
- City of Barrie - Water Transmission and Distribution Design Guidelines; and,
- Ontario Building Code.

4. Methodology

Station record drawings were reviewed by each discipline leads prior to visiting the Anne St. BPS. The purpose of this review is to provide a desktop analysis that would be confirmed during site investigation. The review would also identify any areas that need further or more detailed investigation during the site visit.

Site visit and an interview was conducted with operational staff at the facility on June 8, 2018. Operational and maintenance issues were discussed in addition to physical condition observation and assessment.

Additional onsite inspections to the interior of the reservoir North Cell No.1 and West Cell No.2 were carried out on June 29 and July 20, 2018, respectively. The inspection team includes Bobby Yu, P.Eng and Hailin Wang, P.Eng with assistance from Trademark's Confined Space Entry rescue crew. Mr. David Truax and the City's Ground Water Operations facilitated the field work and provided background information from operational perspectives.

Structural assessment included non-invasive surveys, data collection and recording of deficiencies on the condition of the existing infrastructure to aid in the creation of a baseline of building conditions for capital and maintenance planning purposes and to track deteriorating conditions.

A rating system has been applied to each asset based on criteria listed below:

Condition Grading	Definition of Ratings
1 - Excellent	• Very good physical condition - no wear and tear, no or minimum risk of failure • Performance meets expectation • Expected to perform adequately with routing maintenance for at least another 80% of its estimated life
2 - Good	• Good physical condition - minor wear and tear, minimum risk of failure • Little to no diminished performance

Condition Grading	Definition of Ratings
	• No substantial deterioration of performance within the next 5 to 10 years • No immediate repair work required
3 - Fair	• Acceptable physical condition - moderate wear and tear, moderate risk of failure • Functionally sound but is showing signs of wear and diminished performance • Potential for further deterioration in performance over the next 5 to 10 years • Repair work is required, but asset is serviceable
4 - Poor	• Poor physical condition - heavy wear and tear, significant risk of failure • Significant reduction in performance • Immediate work required to repair or replace asset • Potential for failure within the next 5 years
5 - Critical	• Bad physical condition - heavy wear and tear, failure is imminent • Asset cannot be operated safely without major rehab or replacement • Service life has ended • Significant health and safety hazard

5. Architectural Assessment

5.1 Existing Conditions

Anne Street Booster Pumping Station building, a small drain/overflow valve chamber and reservoir were constructed in 1959. Some process mechanical modifications were done in 1984, but no changes to the pumping station building shell were carried out. In 1989, an additional reservoir was constructed along with a new larger valve chamber, an access/vent house on the top of the reservoir. In 2004, a new exterior door and two interior walls were constructed to create a small room at the northwest corner of the building to separate chlorinators from the Pump Room. Two new small openings were created in existing exterior walls to accommodate an exhaust fan and an intake vent.

The existing Booster Pumping Station building is approximately 60 m² in area and is a brick faced building with a low-pitch hip roof with asphalt shingles. This building has two levels. Access to the lower level is provided through an opening in floor on the southwest interior corner of the building via ladder rungs directly cast from the concrete foundation wall.

The valve chamber is a poured concrete structure partially above grade. This structure is located on the sloping grade between the reservoir and the Pumping Station Building. Access to this chamber is from the top through an access hatch. Ladder rungs are cast in from the concrete wall.
The existing access/vent house is an architectural split rib concrete block structure with a flat roof. The access to both the reservoir cells are through this access/vent house. Aluminum ladders to each reservoir cell extend from this Access House to the bottom of the cell.

5.1.1 Exterior Walls

Pumping Station Building: The existing exterior walls of the Pumping Station are a brick veneer and 140mm thick concrete block construction with insulation and air space. Non-destructive type of visual inspection was carried out and all the exterior walls of this building is found to be in fair to good condition. Some graffiti were noted on the north wall. No structural cracks were present and existing bricks and grout were found to be in good condition. Visual inspection indicates that some remedial work has been performed to the brickwork in an unrecorded past project.

Brick Veneer of Exterior Walls

North Wall with Graffiti

Valve Chamber: Visual inspection of the valve chamber indicates regular wear and tear to the exposed concrete and is found to be in a fair to good condition. Lifting davit socket, access hatch, are in good condition.

Exterior – Inlet Valve Chamber

Access/Vent House: Existing exterior walls show the regular wear and tear on the architectural split rib concrete blocks. Especially under the existing louvre and grille shows the signs of heavy stains of rust. The existing walls appear to be in a fair to poor condition.

Existing Vent House - West Elevation

Existing Vent House - Southwest Elevation

5.1.2 Exterior Doors and Louvers

Pumping Station Building: The existing double door and frame with a transom on the west face of the building shows regular sign of wear and tear and is in fair condition. The frames show signs of rust at the sill level and this can possibly be due to snow accumulation. Existing single door and frame of the chlorination room is in fair condition. Paint on these doors show fading due to its age and normal wear and tear. Aluminum louvers on the west and north faces are in fair condition given its age. Metal grille on the existing window on the west face shows sign on heavy rusting. The existing window with 'Georgian Wired Glass' (GWG) panes is in poor condition. Smaller opening and louvres on the exterior walls shows normal wear and tear and are in fair to good condition.

Louver and Chlorination Room – Single Door

Main Entrance – Double Door

Valve Chamber: No exterior doors or louvres are found on the valve chamber. Existing access hatch is in good condition while the concrete curb which it is mounted on shows normal wear and tear.

Valve Chamber - Access Hatch

Vent House - Louvre and Grill

Access/Vent House: An existing hollow metal door and frame on the west face appears to be in fair condition. Paint and hardware is found to be in fair to good condition. Existing louvre and grille shows sign of heavy wear and tear. The exterior grille shows heavy rusting and thus deteriorating the concrete blocks directly under it.

5.1.3 Roof

Pumping Station Building: Shingles on this roof appears to be in fair to good condition. Eavestroughs and rain water leaders are in fair condition. Painted metal fascia and soffits are in fair condition with sign of regular wear and tear.

Existing Pumping Station - Roof

Valve Chamber – Roof Slab, Retaining Wall and Guardrails

Valve Chamber: Existing concrete top slab appears to be in fair condition showing regular wear and tear. No structural cracks were noticed. Existing 2-pipe guardrails on the retaining wall sides and top appear to be in fair to good condition.

Access/Vent House: At the time of inspection, roof of the vent house was not accessible. Record drawings show this roof to be built-up roofing with 4-ply felt and gravel on rigid insulation on vapour retarder on poured concrete roof slab. This kind of roof typically has 20-25 years of life. Where the roof is not drained adequately, this life span can be much shorter. No record showed that the roof was replaced after original installation. It is expected that the roof is approaching the end of its serviceable life.

5.1.4 *Interior Walls*

Pumping Station Building: Two interior walls constructed in 2004 separating Chlorination Room appear to be in good condition and the paint on these walls is in good condition. Interior window from this room to the Pump Room is a GWG hollow metal window and is in good condition. Painted block walls in the Pump Room is in fair to poor condition. Paint is peeling in multiple locations due to high humidity within the space. Lower level concrete walls are painted and show heavy deterioration due to high humidity level.

Chlorination Room - Interior

Interior Wall – Pumping Station

Valve Chamber:
Visual inspection and hammer strike test indicated that interior concrete walls are in good condition.

Interior Wall and Ladder Rung –Valve Chamber

Interior Wall and Ceiling Access/Vent House

Access/Vent House: Existing block walls show very good condition. No concerns were reported.

5.1.5 *Interior Floors and Ceilings*

Pumping Station Building: Chlorination Room floor is a painted concrete floor and is in poor condition. Painted ceiling in this room is in good condition. Painted concrete floor in the Pump Room is in poor condition and shows heavy wear and tear. Ceilings in the Pump Room is painted and is in fair condition given the high humidity level within this space. Ceilings of the lower level is not painted and is in fair condition. At the time of the inspection, a lot of water accumulation was noted in the lower level.

Existing Pumping Station - Interior Floor

Existing Pumping Station – Access Hatch

Drain/Overflow Valve Chamber: There are two compartments inside the valve chamber. Each compartment is provided with an access hatch at the top. The original frost covers and their frames under the stainless steel hatches show heavy corrosion and require replacement.

Frost Cover and Frame

Access/Vent House: Ceiling and floor of the access/vent house show good condition. No concerns were reported.

Existing Access Vent House –Ceiling

Existing Access Vent House – Floor

5.1.6 Stairs and Ladders

Pumping Station Building: This building does not have any stairs. The lower level is accessed by ladder rungs cast directly into the foundation wall.

Existing Station Access to Lower Level - Ladder Rungs

Access to Valve Chamber

Valve Chamber: Access to the valve chamber is through an access hatch, ladder rungs directly cast into the foundation walls. All components appear in good conditions.

Access/Vent House: This building does not have any stairs. The access to the two reservoir cells is through aluminum ladders as noted on the previous contract document.

5.1.7 Surface Drainage and Grading around the Building

The reservoir cells are approximately 6.5 to 7.0m higher than the adjacent street levels. All four sides of these reservoir cells are covered with soil and sodded. It slopes approximately 3:1 on the west and north sides while it slopes approximately 2:1 on the west and west sides. On west side along the top of the reservoir, landscaping planter are created using timber cribs along the entire length. This side has double-rail guardrail system at the top of the reservoir to avoid pedestrian access. No signs of inappropriate drainage were identified at the time of inspection.

Timber Cribs Planter

Reservoir - West Embankment

Pumping Station Building: Grade is sloping away from the building on the west, west and west sides. The north side faces approximately 3:1 sloped grade from the top of the reservoir to the street level. Site visit did not indicate any adverse effect on the exterior wall on this face due to the grade along the north face.

Grading Around the Existing Station

Grading Around the Existing Station

Valve Chamber: Valve chamber is located at the mid-point of the slope from the top of the reservoir to the street level. The surface drainage seems to be working well as no signs of ponding were noticed and no signs of growth of unnecessary vegetation due to moisture problems were noted.

Access/Vent House: Grade around access house is fairly flat and slightly sloping away from the building. This building sits on the flat part of the reservoir. The base of the exterior walls does not show any sign of moisture being accumulated around this building.

Grading Around the Existing Vent House

Grading Around the Existing Station

5.2 Non-conforming Building Code Conditions

These buildings were constructed long time before the application of the current building codes and do not meet the requirements of the current code in its entirety. The insulation values of the Pumping Station are not available, but it is safe to assume based on the age of this building that it will not meet the requirements of the current standards. Detailed code compliance study is not conducted as there will be non-compliance to the current codes and standards in general.

5.3 Recommendation

Asset Name	Rating	Recommendation Remark
Exterior Walls	Fair to Good	Minor work required.
Interior Walls	Fair to Poor	Paint to be removed and power wash the interior walls. If paint is required, epoxy paint is preferable. Lower level walls to be cleaned and paint removed. Not advisable to paint walls below grade level.
Interior Ceilings	Fair to Poor	Paint to be removed and clean the ceiling. If paint is required, epoxy paint is preferable.
Interior Floors	Poor	Remove paint from the concrete floors and clean, power wash and apply epoxy coating after preparing the existing concrete to manufacturer's recommendations.
Exterior Doors	Fair to Good	In general, no work is required.
Exterior Windows	Fair to Poor	Hollow metal window with GWG panes to be cleaned and repainted. Outside grille is required to be replaced. Preferably aluminum grille to avoid rust.
Exterior Louvres	Fair to Poor	Existing Aluminum louvres are in good condition. Outside grilles are required to be replaced. Preferably aluminum grilles to avoid rust.
Roof	Good	In general, no work is required. Condition of the roof of Access House is unknown and to be reviewed further in detail if this building is to remain.
Ladders	varies	New aluminum ladders with code compliant extension at the top are recommended.
Fascia, eavestroughs and rain water leaders	Fair to Good	In general, no work is required. Minor touch ups and repair work is recommended.

6. Structural Assessment

6.1 Existing Conditions

The Anne St. Reservoir has two cells – North Cell and West Cell. The record shows that the North Cell was built in 1959 and the West Cell was constructed in 1989 abutting the West Cell. The west and north cells have a combined storage volume of 15,890 m^3. The base slab is a concrete slab on grade. The internal columns and wall are pour-in-place reinforced concrete.

The plan layout of the two reservoir cells is shown in **Appendix B** – Reservoir Plan and Inspection Log. The concrete roof of the cell is below grade. Entry to the reservoir is through the access house on top of the reservoir located on the west side of the middle dividing wall. Inside the access house, separate metal roof hatches and a ladder below each hatch are installed for access in/out of the two reservoir cells. On the west side of both reservoir cells and close by the middle wall, there are also a hatch opening for each cell and metal ladder rungs below the hatches as an emergency escape and ventilation opening from each of the reservoir cell.

6.2 North Reservoir Cell (Cell No.1)

6.2.1 Floor

A few areas have ponding water on the floor, likely due to poorly graded floor surface. The inspection of the floor was carried out by visual inspection. Striking hammer tests were performed on selected accessible areas. In general, the concrete floor appears to be in good conditions with no noticeable deficiency. Striking hammer test indicated the surface hardness of the concrete floor is sound and as well, no concrete delamination was noted. Exposed rebar (approx. 200 mm) was noted at one spot as shown in **Appendix B** - Reservoir Plan and Inspection Log.

Rebar Exposed on the Floor

6.2.2 Columns

All circular columns are in sound condition with no observable defect. Striking hammer tests were performed on two randomly selected columns within reachable distance and the test indicated that the surface concrete is sound. A chemical test performed on one of the column also indicated that the surface erosion is limited to 2-5 mm from the surface.

Chemical Indicator Test (Column)

6.2.3 Walls

No leakage from the outside wall and adjacent cell, which was in service during our inspection. The walls are in sound condition with no observable deformation. Hammer tests were performed on all four walls inside the reservoir cell within reachable distance from our inspector and the test indicated that the surface concrete is sound. Chemical tests performed on each of the four walls also indicated that the surface erosion is limited to 3-5 mm from the surface. In addition, the Schmidt Hammer test indicates the concrete has good surface hardness (Reference: Schemidt Hammer Test Results in **Appendix C**).

Chemical Indicator Test (Wall)

6.2.4 Expansion Joint

There is an expansion running in west/north direction on the roof, west and north walls and the floor slab across the middle of the reservoir cell. The joint is in good condition with no sign of leakage. However, the joint sealant appears to be a "coal tar" type of material and it does not conform to the MOECC Design Guidelines for Drinking Water Systems, which requires "all chemical additives and water contacting materials used in the construction and operation of drinking-water systems should meet all applicable quality standards set by AWWA and, in addition, the consumer safety NSF Standards (NSF/ANSI 60 and 61).

Expansion Joint Sealant (Floor and Wall)

Expansion Joint Sealant (Wall and Roof)

6.2.5 Concrete Roof

The concrete roof appears to be in good condition with no observable deformation. On the soffit (ceiling surface), there are exposed rusty reinforcement, likely metal reinforcement chairs were used for casting the reservoir roof. The exposed reinforcement has no structural concern.

There are a few cracks on the soffit of the roof (Reference: **Appendix B** - Reservoir Plan Inspection Log). Most of the cracks were repaired recently which is evident from the crack injection ports left in place. There is no sign of leakage from these cracks. The roof surface appears to be damp, but this is likely due to condensation inside the reservoir cell at the time of inspection.

Exposed reinforcement (Roof)

Previously Repaired Crack (Typical)

There are three openings on the soffit of the roof. According to recording drawings (1959), two of the smaller openings were used as vent while the larger opening was used as the original access hatch. Locations of these openings are shown on the **Appendix B** - Reservoir Plan and Inspection Log. It appears that the function of these openings had become obsoleted and were sealed by a wooden plank (vents) and metal plate (access hatch). It is unknown when these openings were sealed, the conditions of the seal were unable to be assessed at the time of inspection.

Old Vents Sealed by Wood Plank

Old Access Hatch Sealed by Metal Plate

6.2.6 Access hatch and ladder

Inside the Access House, the metal hatch and ladder rungs are in good condition. However, there is no provision for davit for confined space entry beside the hatch. The ladder rungs of the emergency access manhole on the west side of the north reservoir cell is in poor condition. Heavy rust was found on some of the rungs. Locations of the ladders are shown in **Appendix B** - Reservoir Plan and Inspection Log.

Ex. Manhole Ladder Rungs

Access Hatch Ladder Rungs

6.3 West Reservoir Cell (Cell No.2)

6.3.1 Floor

A few areas have ponding water on the floor, as shown in **Appendix B**, likely due to poorly graded floor surface. The inspection of the floor was carried out by visual inspection. Striking hammer tests were performed on selected accessible areas. In general, the concrete floor appears to be in good conditions with no noticeable deficiency. Striking hammer test indicated the surface hardness of the concrete floor is sound and as well, no concrete delamination was noted.

6.3.2 Columns

All circular columns are in sound condition with no observable defect except two columns. Locations of the two columns (C1 and C2) are depicted on **Appendix B**. Striking hammer tests were performed on two randomly selected columns within reachable distance and the test indicated that the surface concrete is sound. A chemical test performed on one of the column also indicated that the surface erosion is limited to 2-5 mm from the surface. The following deficiencies were noted on these two columns:

Column C1 – A soft spot was identified by striking hammer at location close to the bottom of the column. Wet surface emerged when hit by hammer at the soft spot indicating there is a potential void inside the column. On the other hand, chemical indicator test shows the concrete around the soft spot is in sound condition.

Column C2 – A soft spot was found close to the bottom of the column. However, chemical indicator test shows the concrete around the soft spot is in sound condition.

Column C1: soft spot near bottom

Column C2: soft spot near bottom

6.3.3 *Walls*

The north wall of this cell is the common wall between the west and north cell and the wall is the original construction of the west cell. There are two internal walls adjacent to the north common wall. These walls are for the support of the roof and as well, likely provide lateral resistance to the diaphragm load of the roof slab. The two internal wall appears to be in good conditions, re-bounding striking hammer and have only slightly surface carbonation as indicated by the chemical indicator test. There are a few vertical cracks noted on the wall surface. However, these cracks are minor and have no structural concerns.

Typical cracks on the internal wall

In general, no leakage from the outside wall and the common wall which was in service during our inspection. The walls are in sound condition with no observable deformation. Hammer tests were performed on all four walls inside the reservoir cell within reachable distance from our inspector and the test indicated that the surface concrete is sound. Chemical tests performed on each of the four walls also indicated that the surface erosion is limited to 3-5 mm from the surface. In addition, the Schmidt Hammer test indicates the concrete has good surface hardness (Reference: **Appendix C**).

6.3.4 *Expansion Joint*

There is an expansion joint running in west/north direction on the roof, west and north walls and the floor slab across the middle of the reservoir cell. Another expansion joint on the floor continuing up the west and west wall and running across the roof is the joint where the west and north cells abutting. The joints are in good condition with no sign of leakage. However, the joint sealant appears to be a "coal tar" type of material and it does not conform to the MOECC Design Guidelines for Drinking Water Systems, which requires "all chemical additives and water contacting materials used in the construction and operation of drinking-water systems should meet all applicable quality standards set by AWWA and, in addition, the consumer safety NSF Standards (NSF/ANSI 60 and 61).

Expansion joint sealant - "coal tar" type material

6.3.5 *Concrete Roof*

The concrete roof appears to be in good condition with no observable deformation. On the soffit (ceiling surface), there are exposed rusty reinforcement, likely metal reinforcement chairs were used for casting the reservoir roof. The exposed reinforcement has no structural concern.

There are a few cracks on the soffit of the roof. Most of the cracks were repaired recently which is evident from the crack injection ports left in place. There is no sign of leakage from these cracks. The roof surface appears to be damp, but this is likely due to condensation inside the reservoir cell at the time of inspection.

Previously repaired cracks on the soffit

6.3.6 *Access Hatch and Ladder*

Inside the access house, the metal hatch is in good condition. The aluminum ladder under the hatch is in poor condition. Heavy rust was found on some of the rungs and even the stringer of the ladder. Locations of the ladders are shown in **Appendix B**.

Aluminum Ladder in Cell No.2

6.3.7 *Drain/Overflow Valve Chamber*

The concrete walls appear to be in good condition with no observable deformation. On the soffit (ceiling surface), spalling of the frost insulation material was identified. A big portion of the concrete ceiling area is exposed without insulation. Calcium deposition at a few spots were identified likely due to previous small seepage in the past. No leakage was noted at the time of inspection.


Calcium deposition on the wall


Flaking off ceiling insulation

6.4 Recommendations

Hammer rebound tests shown that the concrete hardness of the existing reservoirs is within their design range (Reference **Appendix C**). The structure of reservoir is in good condition and there is no structural concern. The followings are recommended for inclusion into the Anne St. 2N/3N Pumping Station construction contract:

North Reservoir Cell No.1:

- The existing expansion joint should be replaced with NSF approved type of expansion joint material.
- The obsoleted openings of the roof should be properly sealed with concrete.
- Rusty ladder rungs on the west side of the reservoir cell should be replaced.

West Reservoir Cell No.2:

- Replace rusty aluminium ladder with stainless steel 316L ladder.
- The existing expansion joint should be replaced with NSF approved type of expansion joint material.
- Repair the soft spots of the two internal columns. Remove defected concrete (Note: temporary support the reservoir roof if the depth of the defective concrete is deeper than 50mm) and patch the area to restore the original profile by non-shrinkable and non-metallic grout.

After the interior inspection of the reservoir, the City determines to dig up the soil cover at a few selected spots on top of the reservoir in order to verify the conditions of the roof membrane (if any), the conditions of the roof slab (if that can be exposed) and as well, the conditions of the roof openings of the west cell. Findings of such inspection activity are not available to be included in this TM #1.

7. Electrical Assessment

7.1 Existing Condition

The station is serviced electrically from an outdoor pad mounted transformer which feeds a 400A, 600V, 3Ph, 3W main breaker located in a motor control center (MCC). The MCC houses the main service entrance breaker, utility metering, and feeder breakers, for pumps and lighting panel transformer. The MCC is a Moeller Electric MCC which is no longer manufactured. The MCC has 3 ground fault indicating lights suggesting the electrical service may be 3 wire and not 4 wire. The MCC, generator and automatic transfer switch are old with an in an install date most likely in the

1980's. The MCC feeds power to the 3 pumps which are rated as follows; P1: 100Hp, P2: 75Hp, and P3: 75Hp.

7.1.1 Power Distribution

Power distribution within the station is in surface mounted conduit. The conduit is a combination of PVC and EMT. Cable tray is used in the lower level of the station. Both the conduit and cable tray are approximately 35 years old but are serviceable.

Cable Tray and Conduit at Lower Level

7.1.2 MCCs and VFDs

The MCC is a Moeller Electrical consisting of 2-508mm sections. The main breaker is rated 400Amps. The internal components are no longer manufactured, and spares do not exist.

Pump P2 and P3 have VFDs in wall mounted enclosures which appear to be relatively new. Actual date of installation is unknown. The VFD's are SQ-D Alvitar Model 61. There are no dv/dt filters on the VFD output which limits distance the VFD can be from the pump motor. The existing pump motors are general purpose motors and not NEMA MG1 Part 31 –VFD purpose specific motors.

7.1.3 Lighting

Lighting is fluorescent and appears to be dating back to original construction in 1984. Replacement is needed as parts are no longer available.

7.1.4 Life Safety Equipment

Life safety is limited to emergency lighting. There are no exit lights, which is not compliant with the current building code.

There is also a strobe light for chlorine gas alarm on top of the door of the Chlorine Room.

Chlorine Gas Alarm Strobe Light

7.1.5 Emergency Power System

The emergency power system is based on a diesel electric generator rated 375kVA, 600V, 3Ph. The generator is a Volvo engine package supplied by Atlas Polar, who are no longer in business. Maintenance and spare parts become an issue.

The engine is water cooled using municipal water and heat exchanger. The fuel system is comprised of an and outdoor fuel storage tank with supply and return lines to the generator. The automatic transfer switch is an ASCO switch in a free-standing enclosure with engine generator controls and generator breaker (300Amps). In general, the installation is at the end of its serviceable life and non-compliant with current TSSA CSA B139-15 code requirements.

7.2 Non-conforming Applicable Code Conditions

a) If the main electrical service is 3-wire then it does not comply with the OESC
b) TSSA-CSA-B139-15-Fuel Oil Burning Equipment Installation Code

7.3 Recommendations

Asset Name	Rating	Recommendation Remark
MCC	Fair	The MCC does not have nameplate and looks to be old which suggest that the availability of spare parts for servicing may be problematic. To be replaced.
ATS	Fair	To be replaced
Motor Starters (VFD)	Good	Could be salvaged
Power Distribution	Fair	Replace with new
Lighting	Poor	Replace with new LED's

8. Building Mechanical and HVAC Assessment

8.1 Existing Condition

The ventilation system is based on an axial wall fan and an air intake louver/damper and temperature controls to mitigate room temperature rise due to operation of the generator and/or pumps. Heating is based on wall mounted resistive heaters with remote thermostats. There is no noise attenuation on any building wall opening.

All building mechanical and HVAC equipment, except for in the Chlorine Room, appears to be original as part of the 1984 modification and most likely spares are not readily available. Two of the resistive heaters show signs of heavy corrosion indicating they have exceeded their serviceable life.

Water was ponding in the basement at the time of inspection, likely due to poorly sloped flooring. A small sump pump was installed in a metal lined sump, which appears to be inadequate to manage the services required.

Electrical Heater

Wall Mount Elec Heater

Wall Mount Ventilation

Sump Pump

Diesel Combustion Exhaust

8.2 Non-conforming Applicable Code Conditions

a) CSA-B135-15 as applicable to ventilation and combustion air for the generator. The combustion air and ventilation system of the generator are not TSSA compliant with CSA B139-15.

b) MOECC noise criteria for noise at property line. No test run and noise assessment were performed at the time of inspection.

8.3 Recommendations

Asset Name	Rating	Recommendation Remark
Ventilation	Fair	The combustion air and ventilation system is not TSSA compliant with CSA B139-15. It is also at the end of its service life. Replacement is required.
Heating	Fair	At the end of its serviceable life
Sump Pump	Poor	Poorly graded floor surface, inadequate sump size

9. Process Mechanical Assessment

The process mechanical assessment included visual inspection of all assets and review of the drawings and process flow diagrams. Process mechanical assets were identified in four locations throughout the site; the booster station, valve chamber, reservoir valve chamber, and the west and north reservoir cells. Generally, the assets may be divided into four categories based on their age and time of installation as follows:

- Initial Construction – this equipment was installed in 1959 during the initial construction of the north reservoir cell and includes the booster station, and the drain/overflow valve chamber. Equipment from this installation is approximately 60 years old and is nearing the end of its useful life.
- Booster Station Modification – this equipment was installed in 1984 during modification of the process mechanical systems and includes the diesel generator refurbishment and new booster pumps. Equipment from this installation is approximately 35 years old and many of it is nearing the end of its useful life.
- West Cell Construction – this equipment was installed in 1989 during the expansion of the west reservoir cell and includes the vent house, and the valve chamber. Equipment from this installation is approximately 30 years old and is operating in good condition.
- Re-chlorination System – this equipment was installed in 2004 during the addition of a re-chlorination room in the existing booster station. Equipment from this installation is approximately 14 years old and is operating in good condition.

9.1 Existing Condition

9.1.1 Booster Station

According to the Anne St. Reservoir record drawings (1959), the Booster Pumping Station appears to be constructed around the same time as the north reservoir cell was built under a separate contract. There were five (5) centrifugal pumps and one (1) diesel electric pump at one point, providing services to Pressure Zone 2N and 3N. All had been replaced by the three (3) vertical centrifugal turbine pumps and a diesel generator in 1984 as part of a major process mechanical upgrade. Many of the equipment and process piping installed in 1984 are still in service to date.

The three (3) vertical turbine pumps are showing signs of heavy corrosion in their head assemblies. Leakage is noticeable which indicates that the axial load taken by the bearing inside the thrust

assembly can no longer seal. No visual is obtained to the internal condition of the pump impellers, however, there was no abnormal noise noted when pump was in operation at the time of inspection. The bowl assemblies are also showing corrosion at different level. No leakages were noted at the time of inspection.

Process valves are generally in very good conditions. It appears that some of the valves have been replaced after their original installation. Actual age of each valve is unknown, but no deficiencies were noted and reported by the operational staff.

Zone 2N and Zone 1 chlorinators, PVC lines and injection quills were added in 2004. Gas chlorinators, automatic rate control valves, chlorine weight scale, gas monitor, visual gas flowmeter and remote chlorine injectors in good conditions and no deficiencies were noted.

Many of the building service pluming equipment appear to be installed in 1989. Floor drains, domestic water lines and sampling lines are showing signs of deterioration. Some individual pressure sensing lines require minor repair and replacement. Based on visual observation, it is expected that the building service equipment is able to provide their services for another 3-5 years.


Vertical Turbine Head Assembly


Gas Chlorination System


Vertical Turbine Motor and Pump Control Valves


Bowl Assembly

Asset Name	Rating	Recommendation Remark
Vertical Turbine Pumps	Poor	Reaching the end of serviceable life. Major overhaul or to be replaced with new
S.S Process Piping	Good	Minor corrosion possibly due to mix use of different metal contact
Injectors	Good	Retain
Gate Valves	Good	Regular preventative maintenance
Butterfly Valves	Good	Regular preventative maintenance
Pump Control Valves	Excellent	Retain

Asset Name	Rating	Recommendation Remark
Vacuum Chlorinator	Good	Retain
Auto Control Valve	Good	Retain
Gas Flowmeter	Good	Retain
Gas Monitor	Good	Retain
Chlorine Weigh Scale	Good	Retain
PVC Piping	Excellent	Retain
Copper Lines	Poor/Fair	Regular maintenance and replacement as required
Solenoid Valves	Good	Retain

9.1.2 Valve Chamber

The valve chamber was constructed in 1989 and is used to direct water from the Pressure Zone 1 supply to the West Cell No.2 through the 400 mm watermain. The valve chamber contains six (6) butterfly valves, two (2) deflector check valves, and cast-iron process piping. A chlorination injection point was added in 2014 as part of the re-chlorination upgrade.

Like most ferrous materials, cast iron is susceptible to corrosion, therefore its useful life depends on the impact of corrosion. Typical cast iron piping and valves have an average expected lifespan of 60 years. The existing piping and valves have been in services for almost 30 years and show signs of corrosion on surface. However, no deficiencies were noted, and all process mechanical assets are in fair to good conditions with no problems reported to date.

Asset Name	Rating	Recommendation Remark
Gate Valves	Fair to Good	Valve and operator needs exercise
Deflector Check Valves	Fair to Good	Valve and operator needs exercise
C.I. Piping	Fair to Good	Rust appears on surface not affecting its services
Victaulic Couplings	Fair to Good	Rust appears on surface not affecting its services
Injection Quills	Excellent	Retain
Corp Stop	Excellent	Retain


Gate Valve with Gear Operator


Deflector Check Valve

9.1.3 Drain/Overflow Valve Chamber

The drain/overflow valve chamber was constructed during the initial construction of the reservoir in 1959 and is used to house overflow and drain/overflow valves for the reservoir cells, sending water

into an adjacent storm sewer. Process modification was carried out in 1984. The chamber contains two 150mm gate valves, one for each reservoir cell for tank drain, one 300 mm and one 400 mm gate valve connected to North Cell No.1 acting as intake isolation valves.

The gate valves are all original equipment which have been in services for 60 years since 1959 and are reaching their end of serviceable life. No signs of valve leakage at the time of inspection. Their stems and extensions show heavy corrosion. The original cast iron piping show signs corrosion and aging but appears to be in acceptable condition. Deposition of calcium can be found on the interior concrete walls, indicating small seepage has occurred in the past. No leakage was identified at the time of inspection.


Intake Gate Valves (300mm and 400mm)

Intak and Drain pipe connections inside Cell No. 1

Intake pipe penetrate reservoir wall

400 mm and 300 mm intake valve stem extensions

Overflow pipe and two Drain Valves

Asset Name	Rating	Recommendation Remark
400mm Gate Valve	Poor	To be replaced
300mm Gate Valve	Poor	To be replaced

150mm Gate Valves	Poor	To be replaced
C.I. Piping	Fair	Expect to have 10-20 years life. Retain or replace as necessary
Grating	Poor	To be replaced
Frost Covers	Poor	To be replaced
Perlite insulation	Poor	To be replaced
Perlite insulation	Poor	To be replaced

9.1.4 Overflow System

The exiting overflow system is a 400 mm (16 in) cast iron pipe from each reservoir cell and extends to the drain/overflow valve chamber at the elevation of 281.18 m. A 125 mm (5 in) of driving head was used to calculate the maximum overflow rate. Based on Francis formula, calculation results show that there is an approximate 103 L/s overflow capacity when water level in the reservoir exceeds the overflow elevation (281.18 m) by 125 mm. The combined overflow rate from the two cells is 212 L/s. Detailed overflow calculation is provided in **Appendix A.**

Overflow pipe from the reservoir cell

Overflow pipe opening

9.1.5 Interior of Reservoir Cells No.1 and 2

West Cell No.2 was constructed in 1989 as an expansion to the original reservoir Cell No.1. Process piping was modified so that water supply is from Zone 1 to West Cell No.2 via a 400mm watermain. A sluice gate was added to allow water to circulate from Cell No.2 to Cell No.1 to maintain appropriate water age. Anne St. BPS intake water from the North Cell No.1 with a 400mm and a 300mm watermains.

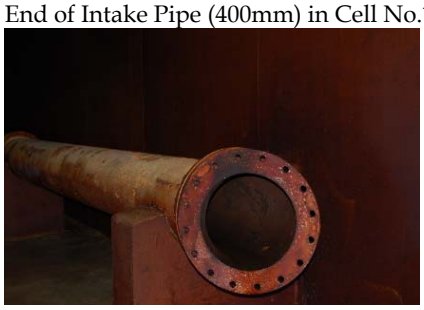
The following were noted from the inside of the two reservoir cells:

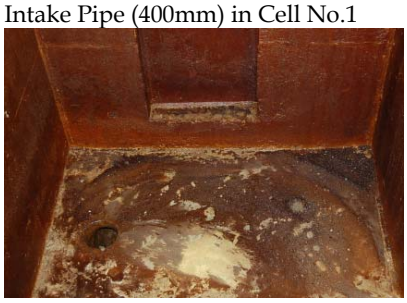
- Intake piping in the West Cell No.1 is a 400mm cast iron pipe, and is showing signs of mild corrosion though not affecting its normal service. No signs of leakage can be identified at the time of inspection and no problems with operation have been reported.
- Feed piping in the West Cell No.2 was constructed in 1990s. The condition appears much better than intaking piping in Cell No.1. No operational concerns were noted
- Overflow connections inside Cells No.1 and No. 2 show normal condition. No blockage was noted and no operational issues were reported.
- Water leakage from the sluice gate isolating Cell No.1 and No.2 is noted during inspection. Isolation appears to be acceptable with seating head (when Cell No.1 is emptied). Unseating

leakage rate from Cell No.1 to Cell No.2 appeared to be exceeding the leakage rate allowed by AWWA-C560 (0.2 gpm/ft or 0.04L/s/m).


End of Intake Pipe (400mm) in Cell No.1


Intake Pipe (400mm) in Cell No.1


End of Feed Pipe (400mm) in Cell No.2


Existing Knockout and Drainage Sump in Cell No.2


Overflow Connection in Cell No.1


Overflow Connection in Cell No.2


Sluice Gate Between Rsvr Cells

9.2 Recommendations

- Existing vertical turbine pumps is approaching its serviceable life should be replaced
- The cast iron process piping originally installed in 1959 as part of the North Cell No.1 construction needs replacement.
- The cast iron process piping installed in 1984 and 1989 are still in fair to good conditions. Conservatively, there is another 20-year serviceable life remaining. Preventative maintenance and cathodic protection are recommended.
- Building mechanical and plumbing system in the booster station are approaching their serviceable life.
- Existing overflow system is capable of providing enough capacity to prevent the possible detrimental over-pressurization of the reservoir cells.
- The sluice gate between Cell No.1 and Cell No.2 shows excessive unseating leakage. Its wedges may need to be repaired and replaced. Repair work is to be scheduled when both reservoir cells are allowed to be emptied.

10. Instrumentation and Control Assessment

10.1 Existing Condition

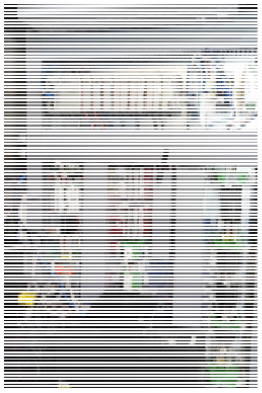
A summary of the major components of the control system is listed in Table below. Conditions of major components are discussed.

10.1.1 Network

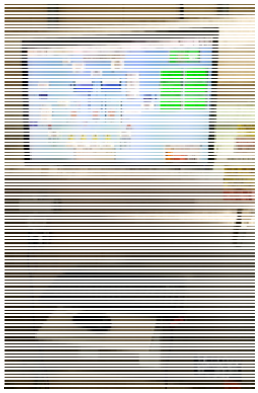
Connection to City's SCADA network is provided through a wireless radio link. The equipment appears to be in good condition.

10.1.2 PLC Control Panel

The pumping station is controlled by an Allen Bradley CompactLogix PLC. The existing PLC panel appears new and in good condition. An HMI screen is located on the front of the PLC panel.



PLC Panel - Interior



PLC Panel – Exterior and HMI

10.1.3 Instrumentation

There are a number of instrumentation at the facility.

Pressure and flow instruments for Zone 2N discharge probably were installed in the 1984 upgrades. Flow for Zone 2N is measured by a Venturi, which is buried and not available for inspection. The transmitter is located inside the pump house basement and is in poor condition.

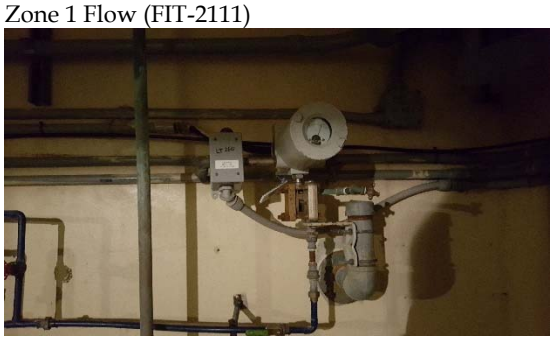
Zone 1 flow is measured by an ABB magnetic flow meter installed in 2004 under the Rechlorination Project. The flow tube is buried and is not available for assessment. Flow transmitter located inside the pump room appears to be in good condition. Two chlorine analyzers, for Zone 1 and 2N, also are in good condition.

There are two types of level instruments for the reservoir cells. There is a pressure type level sensor installed in the basement of the pumping station building. This instrument appears to be old and is in poor condition. The ultrasonic sensor installed in the access opening of the reservoir cell is in good condition. The ultrasonic level sensors transmitter measurements to the PLC panel via a wireless link.

Zone 2N Pressure (PIT-2117) and Flow (FIT-2118)

Zone 1 and 2N Chlorine Analyzer (AIT-2113, AIT-2119); Zone 1 Flow (FIT-2111)

Reservoir Level - Ultrasonic



Reservoir Level - Pressure Type (LIT-2110A)

10.2 Recommendations

Asset Name	Rating	Recommendation Remark
Wireless Network	Good	Retain
PLC Panel	Good	Retain
Zone 2N Pressure	Poor	Replace
Zone 2N Flow – Venturi Tube	Unknown	N/A
Zone 2N Flow – Transmitter	Poor	Replace
Zone 1 Flow – Magnetic Flow Tube	Unknown	N/A
Zone 1 Flow – Transmitter	Good	Retain
Zone 1 Chlorine Analyzer	Good	Retain
Zone 2N Chlorine Analyzer	Good	Retain
Reservoir Level – Pressure Type	Poor	Replace or discard
Reservoir Level – Ultrasonic	Good	Retain, or upgrade to hardwired type

11. Conclusions

The overall conditions of structures of the existing reservoirs, valve chambers and booster pumping stations are well maintained and remain in good condition. No significant concerns and issues that may require immediate attention. Process mechanical and building service mechanical equipment in the booster pumping station are generally reaching the end of their serviceable life and need replacement in the next 2-3 years. Conditions of the existing watermains inside the valve chamber

appear to be good expect for some surface corrosion due to normal aging. The watermains should still have approximately 20-30 years of remaining life.

All equipment inside the existing booster pumping station, including process mechanical, HVAC, generator, plumbing, and associated electrical system will require replacement. Existing valve chamber could be retained.

Upgrading the facility to meet future flow demand for both Zone 2N and Zone 3N will require a building with a much larger footprint. This larger building could be implemented either by constructing a brand-new building at a separate location or by modifying/expanding the existing booster pumping station "in-situ". There is some residual value of the existing building shell, however it will be offset by the complexity and significant cost associated with construction staging for temporary equipment, if the "in-situ" modification/upgrade option is to be implemented. Given that there is not enough space in the existing station for any additional capacity, a brand-new station with space to house pumping systems for both Zone 2N and 3N is the most cost-effective approach to the City of Barrie.

Appendix A.

Existing Overflow Capacity Calculation

ETO Engineering
Engineering & Process Specialist

9030 Leslie St, Suite 229, Richmond Hill

CALCULATION

PROJECT NO.	**Anne St 2N 3N BPS**
OBJECTIVE	**Evaluate Existing Overflow Capacity**
CLIENT	**City of Barrie**
SUBJECT	**Rsvr Overflow Compacity Calcuation**
ISSUED TO	
FILENAME	**Appendix A. Anne Overflow Calcs.xlsx**

REASON FOR ISSUE

☐ FOR COSTING ☑ FOR REVIEW ☐ FOR CONSTRUCTION
☐ FOR INFORMATION ☐ FOR APPROVAL

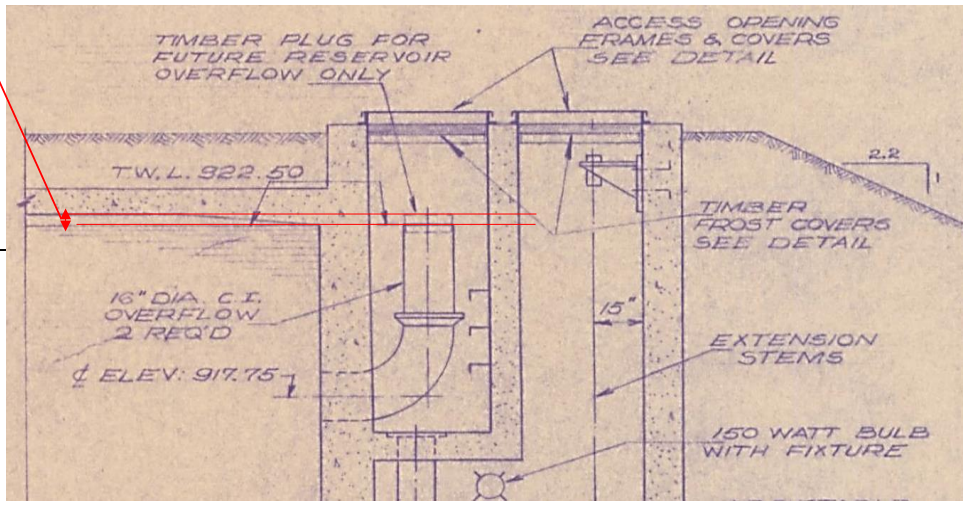
Revision	Date	Revision Description/Status	No. of Pages	Prepared by	Checked by	Approved by
1	06-Jul-18	Initial Draft	1	HW	JR	SX

Design Calculation Sheets

Subject: Rsvr Overflow Compacity Calcuation
Client: City of Barrie | Project No: Anne St 2N 3N BPS | Date: 06-Jul-18
Prepared by: H. Wang | Checked by: JR | Page: _____ of 1

1. Anne St. Overflow Hydraulic Discharge Capacity Varification - (Francise Formular)

Available Driving Head



Inv. of Roof EL =	281.29	m
T.W.L. =	281.16	m
Available Driving Head =	0.125	m

Item	Imperial		Metric	
Internal Dia. of the O/F Pipe	16	in	406.4	mm
The length of the weir (L)	4.2	in	1276.7	mm

Overflow Pipe, C.I. 16" Dia.

Francis Formula

$$Q = \frac{2}{3} C_d . L \sqrt{2g} (H)^{\frac{3}{2}}$$

Cd =	0.62		
g =	9.8	m2/s	
H =	0.125	m	(head available above weir)
L =	1.3	m	
Q =	0.103	m3/s	
or	8921	m3/d	
or	103.3	l/s	Overflow capacity from each cell
x 2	206.5	l/s	Combined overflow capacity from both cells

Design Calculation Sheets

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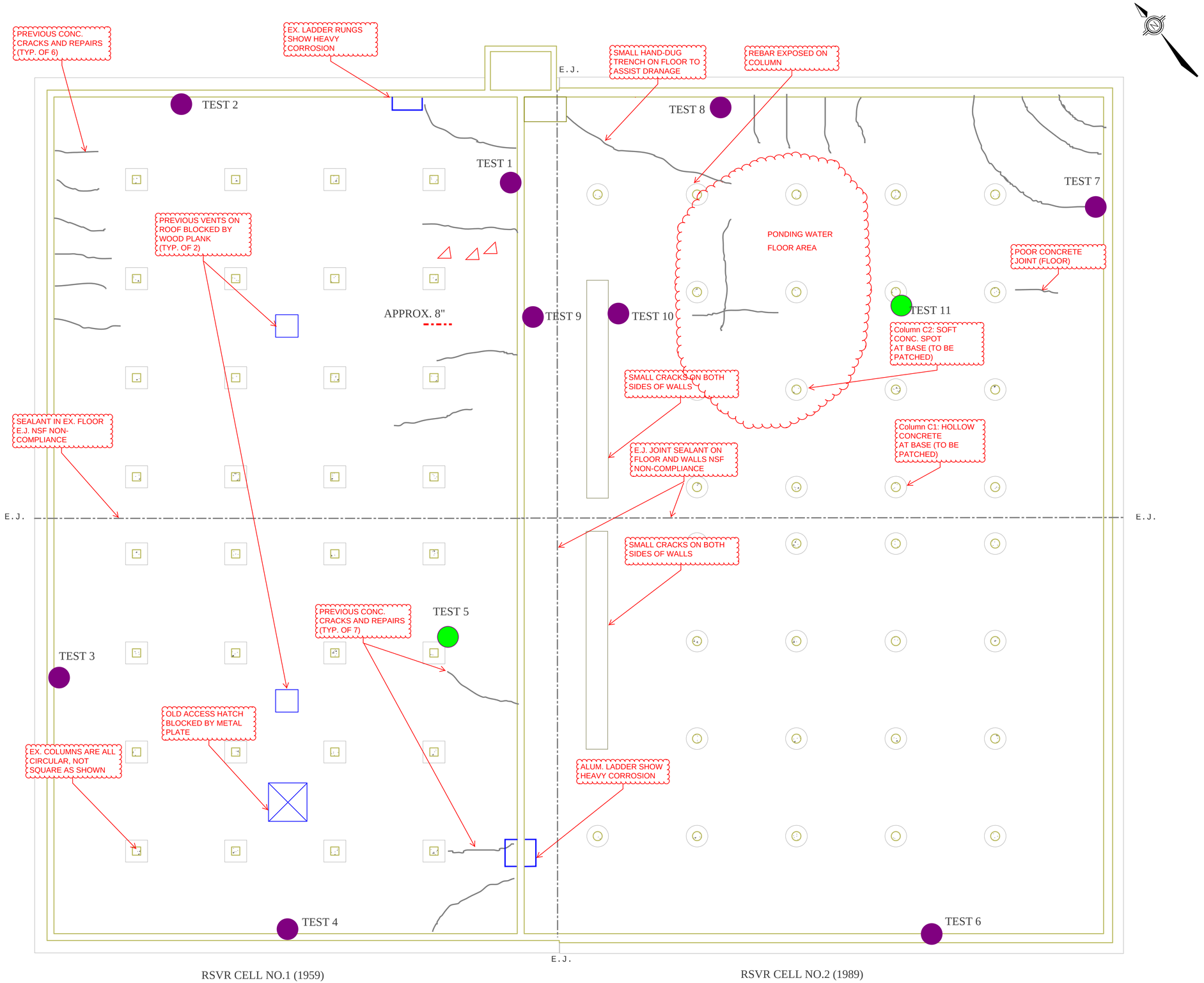
Appendix B.

Existing Reservoir Plan and Inspection Log



LEGEND

- SCHMIDT HAMMER TEST & ALKALINITY TEST
- ALKALINITY TEST ONLY
- SOFFIT REBAR EXPOSED
- FLOOR REBAR EXPOSED
- PREVIOUSLY REPAIRED CRACKS ON ROOF SLAB

NOTE

SCHMIDT HAMMER TEST RESULTS SHOWN SEPERATELY IN APPENDIX C

TM1 - Appendix B

ETO Engineering

DRAWING NAME	ANNE ST. RESERVOIR PLAN INSPECTION LOG
DATE	2018-07-23
SCALE	N.T.S

Appendix C.

Rebound Hammer Test Results

Anne St Reservoir Concrete Rebound Hammer Test Results

Reservoir Cell No.1

Test Location #	Rebound Number										Avg	MPa
1	38	33	35	25	35	30	32	28	33	30	31.9	22.9
2	34	30	29	34	28	25	38	33	28	38	31.7	22.5
3	20	20	25	33	28	25	25	28	28	20	25.2	14.9
4	20	28	22	25	23	22	25	28	28	25	24.6	14.1

Reservoir Cell No.2

Test Location #	Rebound Number										Avg	MPa
6	43	35	44	45	40	40	48	35	38	38	40.6	34.5
7	38	37	38	35	35	35	33	38	38	37	36.4	29.3
8	43	46	44	46	48	43	45	46	40	44	44.5	38.8
9	36	38	36	36	38	39	32	37	29	32	35.3	27.1
10	40	42	41	40	40	45	38	40	40	48	41.4	36.3

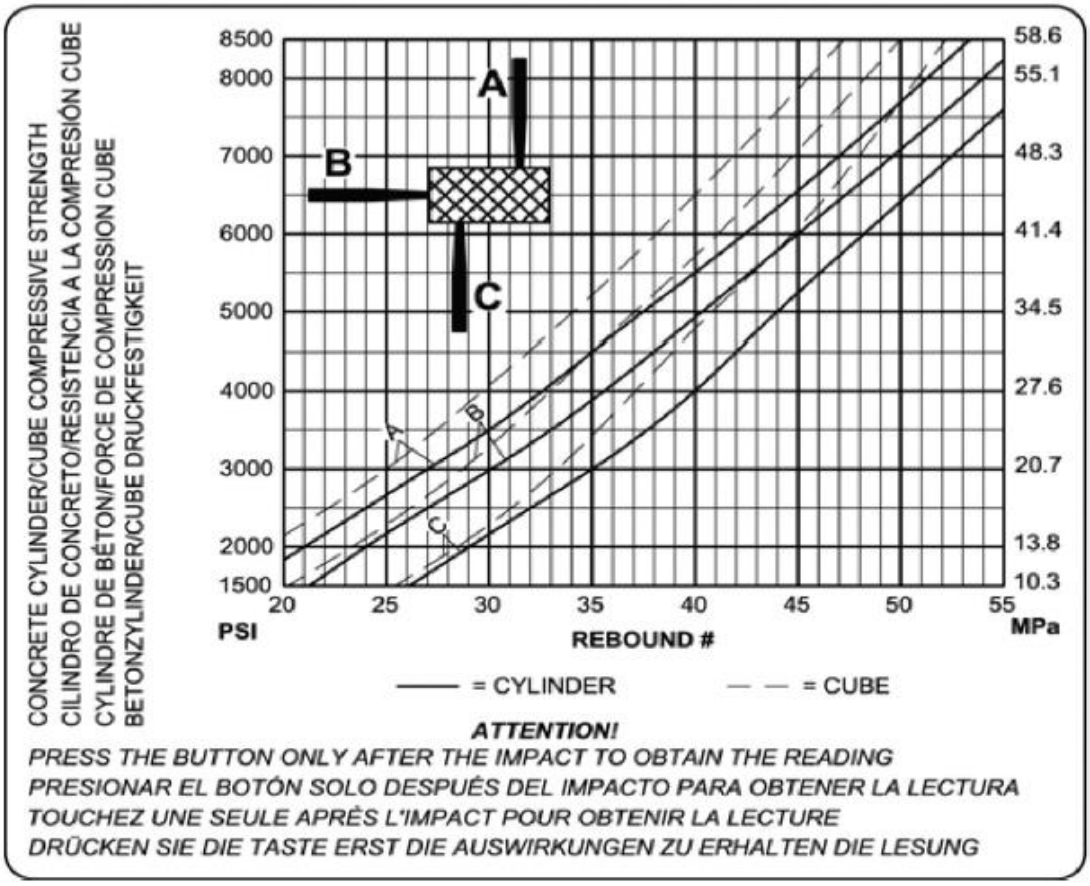


Figure 4: Concrete Rebound Hammer correlation curves