FINAL

WATER AND WASTEWATER SERVICING IN THE COMMUNITY OF NOBLETON

Schedule ‘C’ Environmental Study Report

B&V PROJECT NO. 196238

PREPARED FOR

Regional Municipality of York

12 APRIL 2022

BLACK & VEATCH

Document Control

B&V File No.	RFP No.	PW Folder No.	RFP/Contract Reference(s):
196238		43.5100	

Version Log

B&V File No.	Version No.	Prepared By	Reviewed By	Authorized By	Issue/Version Description
196238	0	Carla Romo	John Bourrie, Rajan Sawhney	Zhifei Hu	Draft
196238	1	Carla Romo	John Bourrie, Rajan Sawhney	Zhifei Hu	Final
196238	2	Carla Romo	John Bourrie, Rajan Sawhney	Zhifei Hu	Revision

Unverified Assumptions (if applicable)

No.	Assumption	Verified By	Date
	Not Applicable		

Distribution List

B&V File No.	Version No.	# Copy	PDF Rq	Issued to	Date (yy-mm-dd)	Reason for Issue
196238	0	1		Afshin Naseri, Olivia Lun		Draft for Review
196238	1	1		Afshin Naseri, Olivia Lun	21-11-04	Final
196238	2	1		Afshin Naseri, Olivia Lun	22-12-04	Revision

Black & Veatch Signatures

Prepared By Carla Romo

Romo, Carla

Reviewed By John C. Bourrie

Bourrie, John

Rajan Sawhney

Sawhney, Rajan

Table of Contents

LIST OF TABLES

LIST OF FIGURES

Acronym List

ADF	Average Daily Flow
ADWF	Average Dry Weather Flow
ANSI	Areas of Natural Scientific Interest
BHR	Built Heritage Resources
CHL	Cultural Heritage Landscape
CWA	Clean Water Act
DWL	Drinking Water Licence
DWWP	Drinking Water Works Permit
EA	Environmental Assessment
ESA	Electrical Safety Authority
ESR	Environmental Study Report
GHG	Greenhouse Gas
HVA	Highly Vulnerable Aquifers
I&I	Inflow and Infiltration
IPZ	Intake Protection Zone
km	Kilometer
L/c/d	Litres per Capita per Day
L/s	Litres per Second
m^3	Cubic Metres
m^3/d	Cubic Metres per Day
MABR	Membrane Aerated Bioreactor
MCEA	Municipal Class Environmental Assessment
MLSS	Mixed Liquor Suspended Solids
mm	Millimetre
MMFW	Maximum Month Flow
MNRF	Ministry of Natural Resources and Forestry
O&M	Operations and Maintenance
ORAC	Oak Ridges Aquifer Complex
ORM	Oak Ridges Moraine
PDF	Peak Day Flow
PHF	Peak Hour Flow
PIF	Peak Instantaneous Flows
PS	Pump Station
PSW	Potentially Significant Wetlands
PTTW	Permit to Take Water

RAS	Return Activated Sludge
RDII	Rainfall Derived Infiltration and Inflow
SCADA	Supervisory Control and Data Acquisition
SGRA	Significant Groundwater Recharge Areas
SPP	Source Protection Plan
TM	Technical Memorandum
WHPA	Wellhead Protection Area
WRRF	Water Resource Recovery Facility
WVSS	West-Vaughn Sewage System
WWR	Water Well Records
YDSS	York-Durham Sewage System

Executive Summary

Introduction

The Regional Municipality of York (York Region) retained Black & Veatch to conduct the Nobleton Water and Wastewater Municipal Engineers Association (MEA) Schedule “C” Class Environmental Assessment. The study was carried out as a Schedule “C” in accordance with Municipal Engineers Association (MCEA), Municipal Class Environmental Assessment (2018).

Background

Currently, Nobleton is served by stand-alone water and wastewater systems to meet the demand of its current population. In the community of Nobleton, a growth up to 10,800 people is expected by 2041. According to the York Region Water and Wastewater Master Plan, Nobleton’s growth is limited by the existing water and wastewater systems that do not have enough capacity to service the projected population to the 2041 horizon.

The existing water servicing system consists of the distribution system, three wells (Wells #2, #3, and #5) and two elevated storage tanks (Nobleton South Elevated Tank and Nobleton North Elevated Tank). The maximum permitted capacity of the three wells and two storage tanks are 51.6 litres per second (L/s) and 3,843 cubic metres (m^3), respectively. The projected water demand and storage requirements are 89.5 L/s and 3,917 m^3, respectively. Thus, additional water supply and a minor storage increase will be required to meet the forecasted 2041 growth.

The existing wastewater servicing system consists of a sewer collection system, two pump stations and their associated force mains (Janet Avenue Pump Station [PS] and Bluff Trail PS), and the Nobleton Water Resource Recovery Facility (WRRF) that convey and treat a flow of 2,924 cubic metres per day (m^3/d). The projected wastewater flow rate is expected to increase to 3,996 m^3/d, requiring an upgrade and expansion of Janet Avenue PS and Nobleton WRRF.

To identify the preferred servicing solutions to accommodate growth, an Environmental Assessment was completed.

Study Area

The community of Nobleton is located in the township of King. It is generally bounded by 8th and 10th Concession Road on East-West, and 15th Sideroad and the King-Vaughan municipal boundary line on North-South. The service area boundary is the Community of Nobleton boundary, including current and planned service areas. It is expected that future growth will occur within this boundary, and that the area within the boundary has, or will have, future municipal water and wastewater servicing. The study area is all the serviced area plus an assessment of potentially impacted lands caused by new infrastructure requirements. The study and service areas can be found on Figure ES-1.

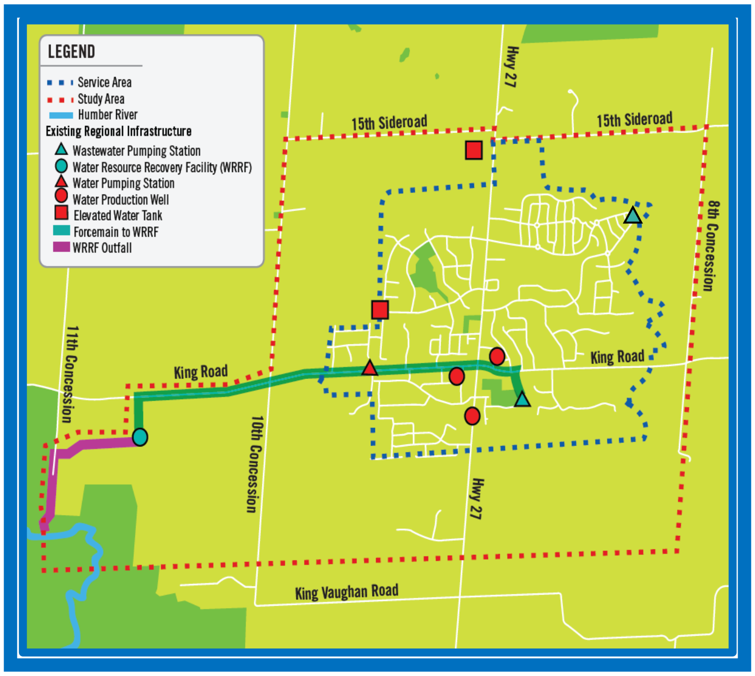


Figure ES-1 Study and Service Areas

Problem and Opportunity Statement

The current water and wastewater system in Nobleton does not have sufficient capacity to meet requirements to support the growth to the 2041 horizon. Thus, several upgrades, improvements, and expansions will be required in different facilities to meet the requirements of the projected population.

The problem/opportunity statement for this MCEA is as follows:

- To identify long-term water and wastewater servicing solutions to support forecasted growth in Nobleton to 2041 while optimizing the use of existing regional infrastructure.

Alternative Solutions

All alternative solutions for the water and wastewater servicing were identified and evaluated. A two-stage process was used to first screen a long list of alternatives, and then evaluate a short list against technical, financial, jurisdictional/regulatory, and environmental (natural environment, socioeconomic, and cultural) criteria.

Water System Alternative Solutions

Because of the different needs of the water system to meet the forecasted growth, the water system alternative solutions were evaluated separately: solutions for supply deficit and solutions for storage deficit.

Water Supply Alternative Solutions

The following nine alternative solutions were considered to address the water supply needs:

1. Do nothing.
2. Limit growth to existing system capacity.
3. Water conservation to reduce projected maximum day demand.
4. Increase capacity of existing well(s).
5. Increase capacity of existing Well #2 in combination with a new production well at Site H (recommended):

   Increase the production and treatment capacity of Well #2 to 32 L/s in addition to a new well with a capacity of 32 L/s at Site H (future Well #6). Site H is located at the same site as the existing Nobleton Well #5. This alternative was the recommended solution because it maximizes existing infrastructure, has the lowest cost, and requires the least amount of permitting while meeting forecasted demand.
6. Increase capacity of existing Well #2 in combination with a new production well at Site F.
7. Increase capacity only with new production wells.
8. Blended system with addition of lake-based connection to existing wells.
9. New water supply source from Humber River.

Water Storage Alternative Solutions

The following six alternative solutions were considered to address the water storage needs:

1. Do nothing.
2. Limit growth to existing system capacity.
3. Water conservation to reduce projected maximum day demand.
4. Modify existing design guidelines to reduce equalization component of storage requirements.
5. Add new storage facility.
6. Supplement increased supply to offset storage deficit (recommended).

   This concept considers increasing the combined permit to take water (PTTW) and supply capacity in Nobleton to exceed the forecasted maximum day demand (>89.5 L/s). By exceeding the maximum day demand (even slightly), it allows for the wells to operate at a higher rate during the hours when demand exceeds the average maximum day demand. Since a well-based supply was recommended as the solution for water supply, the expanded Well #2 and the new well from Site H and its treatment facilities will each need to have a total capacity of 34 L/s (an additional 2 L/s). This will bring up the combined well firm capacity to 91.5 L/s to cover the storage deficit.

Wastewater System Alternative Solutions

To increase the capacity of the wastewater system in Nobleton, the following eight alternative solutions were developed:

1. Do nothing.
2. Limit growth to existing system capacity.
3. Water conservation and inflow and infiltration (I&I) reduction to reduce projected maximum day demand.
4. Expand and upgrade the existing Janet Avenue PS, force main, and Nobleton WRRF and outfall (recommended).

   Increase the capacity of Janet Avenue PS, force main from Janet Avenue PS to Nobleton WRRF, and outfall and expand and upgrade Nobleton WRRF to handle and treat the projected wastewater flows.
5. Construct a new pumping station, force main, WRRF, and outfall.
6. Convey additional flows to neighbouring WRRFs.
7. Convey all flows to lake-based treatment systems.
8. Maintain existing treatment facilities and convey additional flows to lake-based treatment facilities.

Alternative Design Concepts

Design concepts were developed for each of the recommended solutions. A two-stage process was used to first screen a long list of design concepts to generate a short list, and then evaluate the shortlisted design concepts against technical, financial, jurisdictional/regulatory, and environmental (natural environment, socioeconomic, and cultural) criteria.

Water System Alternative Design Concepts

To expand existing Well #2 and add a new well at Site H, the following three design concepts were developed:

1. Expand the existing capacity for Well Site #2 (recommended).

   Increase the capacity of Well Site #2 to 34 L/s by using existing facility and infrastructure, with the exception of increasing the capacity of the well pump.
2. Expand the existing treatment train capacity for Well Site #5 to treat water from the new well at Site H.
3. Add a second dedicated treatment train at Well Site H to treat water from the new well at Site H (recommended).

   Add a new independent dedicated treatment train, similar to that for Well Site #5, to treat water from Well Site H.

<u>A combination of Design Concepts 1 and 3 was recommended to be progressed further</u>.

Wastewater System Alternative Design Concepts

For the wastewater system, different design concepts were developed for pumping and conveyance and the WRRF.

Pumping and Conveyance Alternative Design Concepts

The infrastructure involved in pumping and conveyance includes the gravity sewer collection system, Janet Avenue PS, the force main from the PS to the WRRF, and the outfall. Nobleton has considerably high peak instantaneous flows and expanding all the infrastructure along the system to handle these flows, which only occur during wet weather events, would result in an oversized and underused system. Therefore, flow attenuation, which involves reducing high peak flows in the system through a storage facility, was incorporated into the design concepts.

To increase the capacity of the pumping and conveyance infrastructure, the following four design concepts were developed:

1. No flow attenuation.
2. Flow attenuation at the WRRF with an equalization tank.
3. Flow attenuation at the Janet Avenue PS with a below grade storage tank (recommended).

   Provide flow attenuation storage upstream of the Janet Avenue PS with a 1,300 m^3 below grade storage tank that will reduce peak instantaneous flows to 145 L/s. Additionally, Janet Avenue PS will need to be expanded to a capacity of 145 L/s.
4. Flow attenuation at the Janet Avenue PS with a gravity pipe.

Nobleton WRRF Alternative Design Concepts

With flow attenuation upstream of the WRRF, the peak instantaneous flow into the WRRF will be reduced, minimizing the impact on preliminary treatment, secondary treatment, tertiary treatment, and disinfection. Secondary biological treatment is the fundamental basis for municipal wastewater treatment; it has the largest impact on performance, operation, and cost of the WRRF; therefore, design concepts focused on the expansion, intensification, and/or upgrade of the secondary biological treatment process. In parallel, upgrades to the screening, grit removal, nutrient removal, tertiary treatment, effluent disinfection, and sludge handling will also be required.

The following six design concepts were developed for the expansion of the WRRF:

1. No flow attenuation.
2. Expand existing secondary biological treatment by enlarging existing aeration tanks.
3. Reduce loads to secondary biological treatment by adding primary treatment.
4. Intensify secondary biological treatment with membrane aerated bioreactor (MABR) (recommended).

   The existing aeration system would be intensified by converting it to a hybrid suspended growth/attached growth process to increase treatment capacity. The existing tanks will be modified to include the MABR but no new aeration tanks will be required.

5. Add a new independent treatment train.

6. Add a new aerated equalization tank to reduce flow rates into the treatment trains.

Conceptual Design

The preferred design for Nobleton water and wastewater systems was chosen after consideration of constructability, ability to meet future needs, cost, and impacts to the natural, cultural, and socioeconomic environment. The recommended design concepts were developed and refined through extensive consultation with agencies, stakeholders, and the public.

Water System Conceptual Design

Increase Capacity of Well #2

The capacity of Well #2 will be increased from 22.7 L/s to 34 L/s by replacing the existing well pumps. Chlorine gas will continue to be used as the disinfectant. The existing treatment facility has enough capacity to handle the additional flows and no upgrades to the chemical storage, educators, and chemical metering pumps will be required. Pump motor starters will be replaced with larger variable frequency drives and installed in the same location on the existing motor control center (MCC). In addition, a new electrical distribution system and communication system will be installed. The upgrades for Well #2 are relatively minor so no changes to the existing site layout are anticipated.

New Well and Treatment Train at Site H

A new well, known as Well #6, with a capacity of 34 L/s and its associated treatment train, will be added to Well Site H. Well #5 is also located at Well Site H and there will be several upgrades and modifications to the existing facilities and site layout to add the new well.

The treatment process will consist of chlorine gas disinfection and iron and manganese sequestration. The existing building housing the equipment for Well #5 will be modified and expanded to include the treatment equipment, chemical storage tanks, switchgear, and operating room for Well #6. A new emergency power generator will be located outdoors to provide power for both Wells #5 and #6. A new electrical distribution system will be installed along with lighting and lighting control. Additionally, the existing pumphouse at Site H will be modified and expanded to accommodate pumping of potable water from the proposed new Well.

Region of York is considering other upgrades to PW2 and PW5 well sites as part of a Groundwater Treatment Strategy (GWTS), including provision of standby power at PW2 and upgrading to iron and manganese oxidation/filtration system at both sites. These improvements are provided for reference, but are not related to this evaluation.

Wastewater System Conceptual Design

Janet Avenue PS: Flow Attenuation with Storage Tank and Expand PS

A below grade flow attenuation tank with a capacity of 1,300 m^3 will be installed upstream of the PS to reduce peak instantaneous flows to 145 L/s. A new flow diversion chamber will be provided on the incoming gravity sewer immediately upstream of the wet well. During a wet weather event, if the incoming flow to Janet Avenue PS is greater than its firm capacity of 145 L/s, the flow diversion chamber will passively overflow wastewater into a gravity pipe conveying it into the flow attenuation tank. As the wet weather event subsides, the flow attenuation tank will be allowed to drain back into the flow diversion chamber by operator intervention. The tank will be a below ground cast-in-place structure with approximate dimensions of 15.5 metres long by 12 metres wide by 11 metres deep, and an operational depth of 7 metres. The existing Janet Avenue PS site will accommodate the new flow attenuation tank.

Janet Avenue PS will also be expanded to a firm capacity of 145 L/s. The existing pumps, valves, and suction and discharge piping will be replaced with larger equipment. A larger flowmeter will also be needed to measure the increased pumped flows. The larger pumps will require larger starters and the existing MCC will not have enough capacity to accommodate the new power requirements. A larger MCC and generator will be installed to replace the existing MCC and generator. The new generator will be installed exterior to the building within the Janet Ave PS site.

WRRF: Intensify Secondary Biological Treatment with MABR Along with Expansion and Upgrades of Other Treatment Trains

Overall, the processes for the upgraded WRRF will be the same except gravity thickening of waste activated sludge (WAS) will be discontinued. The processes include screening, grit removal, secondary biological treatment, phosphorous removal, tertiary treatment, disinfection, and sludge storage. Table ES-1 summarizes the technology used and upgrades recommended for each treatment process.

Table ES-1 WRRF Treatment Processes Upgrades and Expansions

WRRF Treatment Process	Technology/Process	Upgrades/Expansions
Screening	Fine Screening: Perforated Plate	Existing coarse screen system will be removed and replaced with fine screening.
Grit Removal	Induced Vortex Grit Tanks	The two existing grit removal units will be kept and the third grit removal unit and classifier will be added.
Secondary Treatment	MABR	Existing extended aeration activated sludge process will be converted to an MABR hybrid suspended growth/attached process with the addition of MABR media to the existing aeration basins. The MABR modules will be in an anoxic zone at the head of each basin. The rest of the basin will be aerated. Mixers will be added to the anoxic zones. Return activated sludge (RAS) and WAS pumps will be replaced with larger pumps. A dissolved oxygen monitoring and control system will be provided for the oxic zones for energy efficiency of the wastewater aeration system and process control benefit.
Phosphorous Removal	Chemical Phosphorous Removal (Alum)	The existing chemical phosphorous removal process will be retained. Additional alum storage will be added.
Tertiary Treatment	Single-Stage Sand Filtration	The existing sand filtration system will be expanded with the addition of three cells to provide a total of seven filtration cells.

WRRF Treatment Process	Technology/Process	Upgrades/Expansions
Effluent Disinfection	UV Disinfection	The existing UV disinfection system is a low-pressure, low intensity system. The existing system will be replaced by a new low-pressure high output system.
Sludge Thickening	Sludge Storage	The existing sludge thickener and aerated sludge storage tank will be replaced with aboveground aerated sludge storage tanks. Two tanks will be provided for redundancy, each tank providing the design volume of storage.

All expansions and upgrades will be constructed within the existing site of the WRRF. The existing electrical distribution system demand load and emergency load will be verified before project detailed design. In addition to the upgrades required at each treatment process, several buildings will be expanded.

Public, Stakeholder, and Indigenous Consultation

Public consultation is an important aspect of the Nobleton Class EA. There were five points of notification (notices) and three opportunities for public contact, public consultation centres (PCC), throughout this process as follows:

Activity	Date
Notice of Commencement	November 15, 2018
Notice of PCC #1	February 15, 2018
PCC #1	February 28, 2019
Notice of PCC #2	November 12, 2020
PCC #2	November 25, 2020
Notice of PCC #3	July 6, 2021
PCC #3	July 20, 2021
Notice of Completion	November 4, 2021

Key engagement audiences included agencies, stakeholders, Indigenous communities, and the general public. Feedback and questions collected during the public consultation centres focused on the following topics:

- Current water quality issues.
- Water sourcing options and alternatives (i.e., lake-based supply).
- Costs associated with the EA and future development.
- User fees for water and wastewater servicing.

- Concern for the local environment and development pressures in Nobleton.
- Population and servicing projections.
- Planning policy and alignment with other planning initiatives at the local, regional, and provincial levels.
- Opportunities for additional engagement.

The original plan as noted in Appendix C envisaged that a Technical Advisory Group as well as a Stakeholder Advisory Group will be established, these groups were not established. This was due to the understanding that these members would engage through public consultation.

Environmental Effects and Mitigation

Throughout the Class EA process, several studies were conducted to document current environmental, socioeconomic, and cultural conditions in the study area along with potential effects of the proposed work and the appropriate mitigation measures.

The natural environment evaluation included an analysis of vegetation, wildlife, surface water features, and aquatic biota. The cultural evaluation included an analysis of archeological resources, built heritage resources, and cultural heritage landscapes. The socioeconomic evaluation included an analysis of property impacts, air quality, and noise effects.

Since all of the proposed upgrades will occur on sites that currently house existing and operating water and wastewater infrastructure, no major impacts were identified. Appropriate measures will be taken to mitigate impacts during construction. An environmental monitoring plan will be prepared during the detailed design stage of the project.

Commitments

As part of this Environmental Study Report (ESR), several items will be reviewed and confirmed during the Detailed Design phase. Some of these commitments will address specific concerns raised by property owners and review agencies during the EA process. Some of the items to be addressed during detailed design include:

- Odour and noise mitigation during construction
- Drainage and stormwater management
- Coordination with existing utilities
- Permits and approvals

Next Steps

Upon completion of the mandatory review period of the ESR and provide no Part II Orders related to Aboriginal or treaty rights are received, the project will proceed to preliminary design, upon completion of which, the project will proceed to detailed design, tendering, and construction.

1.0 Introduction

Nobleton is a community in King Township, located in York Region. Nobleton has completed a Municipal Class Environmental Assessment (MCEA) Study to identify water and wastewater servicing solutions to accommodate population growth to the 2041 horizon.

Black & Veatch was retained by York Region to undertake this study on their behalf. This Environmental Assessment (EA) Study was classified as a Schedule “C” project. This Environmental Study Report (ESR) was prepared to document the key aspects of Phases 1 through 3 of the Class EA process conducted to select the preferred water and wastewater servicing solutions.

1.1 Background

Currently, Nobleton is serviced by stand-alone water and wastewater systems to meet the demand of its current population. According to the King Township Official Plan, in Nobleton’s urban boundary, there will be a considerable increase in population and jobs by 2041.

The Official Plan outlines that growth in the community of Nobleton is limited by the capacity of the existing sanitary sewer service. Similarly, the York Region Water and Wastewater Master Plan (2016) indicated that both the current water and wastewater system do not have sufficient capacity to meet the requirements to support the growth to the 2041 horizon. The Master Plan suggested undertaking the current project, an EA, to identify the preferred servicing solutions to accommodate growth.

1.2 Ontario Environmental Assessment Act

The Ontario Environmental Assessment Act (R.S.O 1990, c.E. 18; EA Act) seeks to protect, conserve, and properly manage the natural, social, cultural, built, and economic environment in Ontario. The EA Act applies to provincial ministries, agencies, and municipalities such as towns, cities, and counties and other public bodies (unless explicitly exempted). Under the EA Act, municipal water, wastewater, roads, stormwater, and transit projects must undergo an EA planning and approval process known as the Municipal Class Environmental Assessment (MCEA).

1.3 Municipal Class Environmental Assessment Process

The MCEA process is prepared by the Municipal Engineers Association (MEA) and is a mechanism by which municipal infrastructure projects are planned and implemented in an environmentally responsible manner. Additionally, the MCEA process includes mandatory requirements for public consultation.

Depending on the potential environmental impact of the project, they are classified in terms of schedules as follows:

- **Schedule A and A+:** Small-scale projects usually associated with operational and maintenance activities that have minimal adverse environmental effects. Schedule A projects are pre-approved and can proceed to implementation. Schedule A+ projects are also pre-approved. However, the public is to be advised prior to project implementation.
- **Schedule B:** Projects that include improvements and minor expansions to existing facilities. These projects have potential for some environmental adverse effects and must undergo Phase 1 and 2 of the Class EA process.

- **Schedule C:** Projects that include construction of new facilities or expansions to existing facilities. These projects have the potential for significant environmental effects and must undergo all phases of the Class EA process.

Because of the major expansion and addition of new facilities required to meet Nobleton's growth, this project was carried out under the requirements of a Schedule "C" Class EA. This Class EA was undertaken in accordance with the guidelines of the Municipal Engineers Association document. For a Schedule "C" project, the following Class EA planning phases apply:

- **Phase 1 –** Identify problem (deficiency) or opportunity.
- **Phase 2 –** Identify alternative solutions to address the problem or opportunity considering the existing environment. Establish the preferred solution, taking into account public and review agency input.
- **Phase 3 –** Identify alternative design concepts for the preferred solution while considering the existing environment. Determine the preferred design concept by considering public and review agency input.
- **Phase 4 –** Document, in an ESR, the design and consultation process for public review. Place the ESR on public record for a minimum of 30 calendar days for review.
- **Phase 5 –** Complete contract drawings and documents and proceed to construction and operation. Monitor construction for adherence to environmental provisions and commitments. Where special conditions dictate, also monitor the operation of the completed facility.

Figure 1-1 shows the planning and design phases followed in this Municipal Class EA. Black & Veatch's current scope will progress the project to the preliminary design stage upon completion of Phase 4.

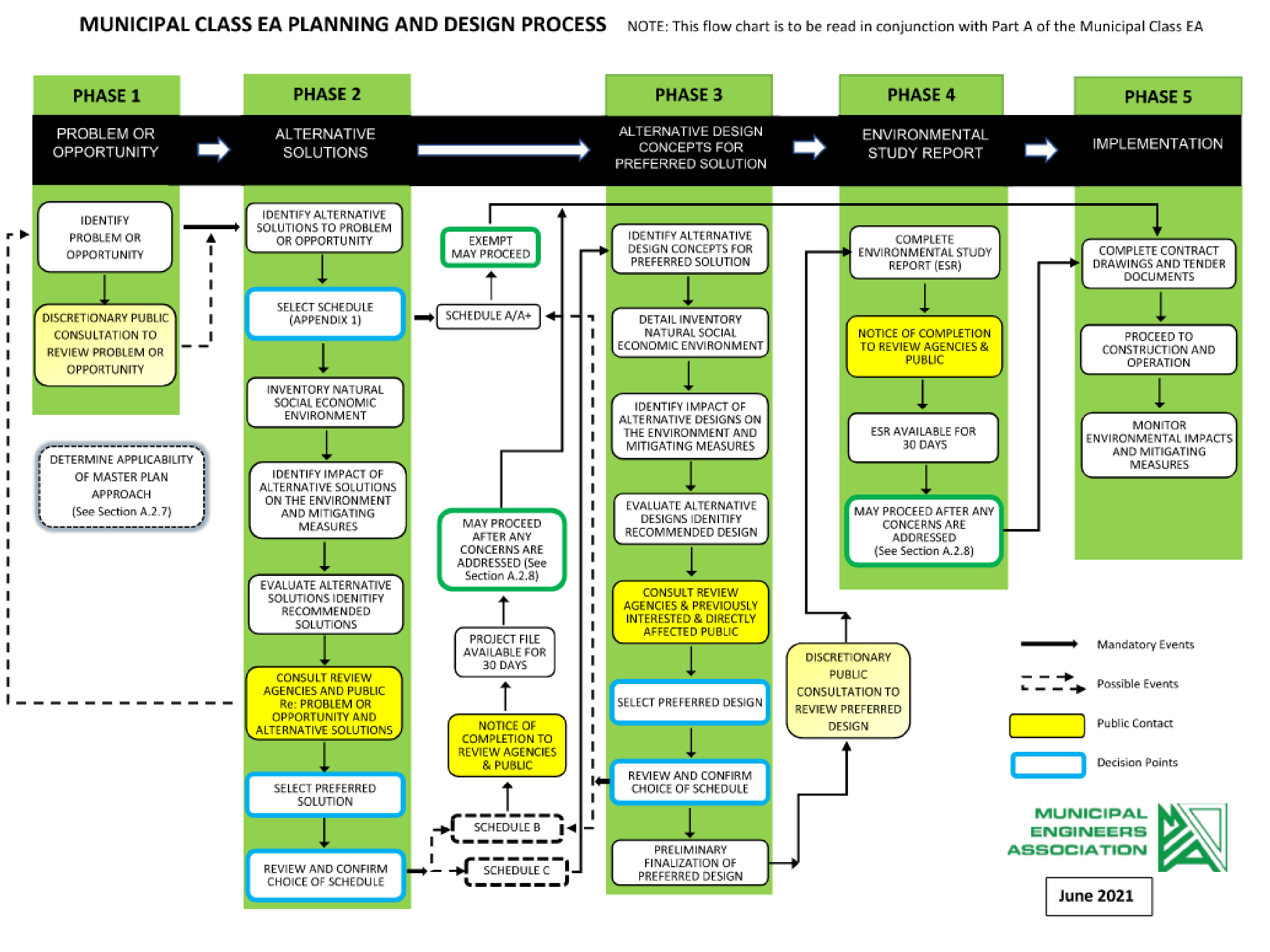


Figure 1-1 Municipal Class EA Process

1.4 Nobleton Class EA Schedule

In June, 2017, The Regional Municipality of York, initiated the Schedule "C" Nobleton Water and Wastewater Servicing Municipal Class EA Study. Currently the project is at Phase 4 of the study where the ESR is undergoing public review. The phases and completion dates of the different phases is summarized on Figure 1-2.

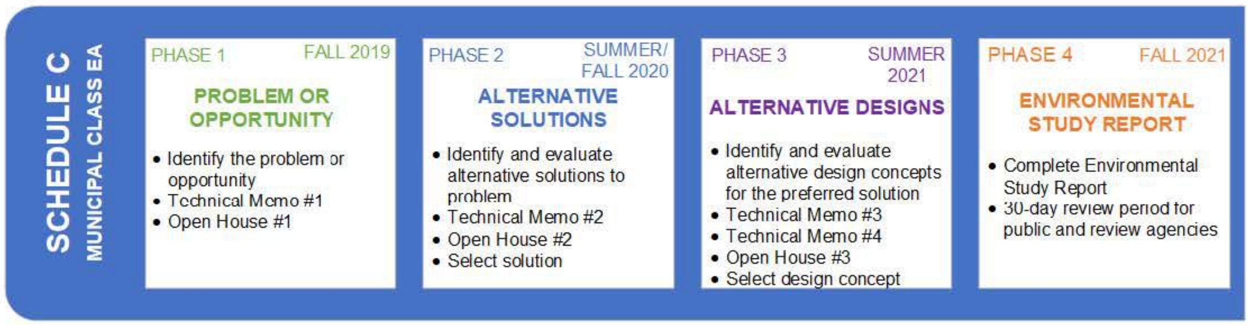


Figure 1-2 Nobleton Class EA Schedule

2.0 Background and Problem Statement

As part of Phase 1 of the Class EA, background information of the project was compiled and a formal description of the problem was developed. Technical Memo (TM) Phase 1, Identify the Problem or Opportunity, can be found in Appendix A. The following section documents background information for Nobleton, relevant policies, existing conditions of the water and wastewater system, and future requirements.

2.1 Study Area

The community of Nobleton is located in the Township of King. It is generally bounded by 8th and 10th Concession Road on East-West, and 15th Sideroad and the King-Vaughan municipal boundary line on North-South. The service area boundary is the Community of Nobleton boundary, including current and planned service areas. It is expected that future growth will occur within this boundary, and that the area within the boundary has, or will have, future municipal water and wastewater servicing. The study area is all the serviced area plus an assessment of potentially impacted lands caused by new infrastructure requirements. The study and service areas can be found on Figure 2-1.

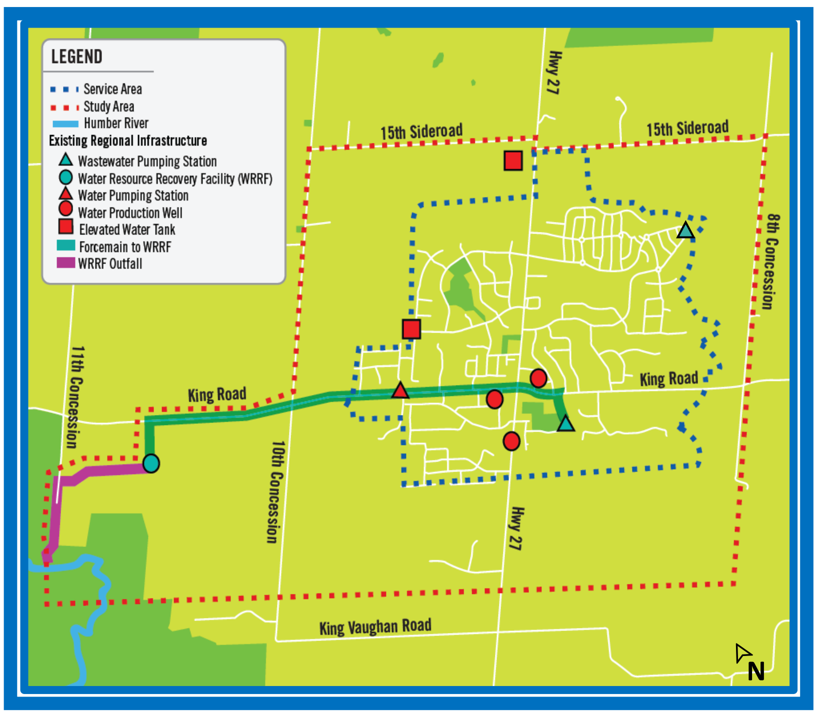


Figure 2-1 Study and Service Area

2.2 Growth in the Nobleton Community

The Township of King is predominantly a rural yet growing municipality. Growth in the Township is expected to occur within the three villages – King City, Nobleton, and Schomberg – because they have the greatest concentration of land uses, infrastructure, and community services.

The Township of King Official Plan plans to accommodate population growth through intensification of the already built up area in the three major villages. The goal is to increase the mix of land uses by balancing housing, employment opportunities, community services, and parks and open spaces.

Currently Nobleton's development is limited by the capacity of the existing sanitary system; considering this limitation, the population is forecasted to increase to a maximum of 6,750 people. However, considering the allowable densities outlined in the Nobleton Community Plan along with the currently approved lands for development, the Township of King Official Plan recognizes that population could increase up to 9,600 to 10,900 people because of intensification in residential development areas. For the purpose of this study, a population of 10,800 people has been used as a basis future for water and wastewater servicing requirements.

2.3 Relevant Legislation, Plans, and Policies

There are several completed and ongoing plans and policies that were reviewed and taken into consideration when developing the water and wastewater servicing solutions. The most relevant legislation and how they relate to the study are summarized in Table 2-1.

Table 2-1 Relevant Legislation, Plans, and Policies

Legislation Plan/Policy	Description	Relevance to EA
The Regional Municipality of York Official Plan (2019 Consolidation)	Describes York Region plans to accommodate future growth and development in the Region. The Plan provides policies to guide the municipality in economic, environmental, and community planning decisions.	The Plan emphasizes the need to develop water and wastewater services to support economic growth; it establishes policies for water and wastewater systems while protecting the Region's natural and cultural heritage.
Township of King Official Plan (2019)	Establishes land use, transportation, and development policies for King Township. The Plan includes a Nobleton Community Plan with directions and policy framework for managing growth and infrastructure decisions in Nobleton.	The Plan sets limitations and establishes a framework for Nobleton's community growth.
The Regional Municipality of York Water and Wastewater Master Plan (2016)	Outlines York Region's Plan for providing safe, cost-efficient and reliable water and wastewater services to the Region's residents, businesses, and communities by 2041.	It is the guiding document on water and wastewater system investments to 2041; it emphasizes the desire to keep and expand stand-alone water and wastewater systems.
Provincial Policy Statement (2020)	Sets the policies to regulate the development and use of land while enhancing the quality of life of Ontario residents. The policies require that the infrastructure for public service facilities shall be integrated with growth management so that they meet the forecasted needs of the Region.	Emphasizes the need to develop water and wastewater services to meet the expected growth, while sustaining our water resources and protecting the natural and cultural environment.

Legislation Plan/Policy	Description	Relevance to EA
Greenbelt Plan (2017)	Establishes a land use planning framework and identifies areas where urbanization should not occur in the Greater Golden Shoe Area.	The Plan sets constraints for the extension of municipal sewage and water services in addition to policies any infrastructure in the Greenbelt area should follow.
Growth Plan for the Greater Golden Horseshoe (2020)	Provides a framework for where and how the Region will grow while supporting economic prosperity, the environment, and helping communities achieve a high quality of life.	The Plan sets policies for water servicing, most importantly, limiting the extension of water or wastewater services from a Great Lakes Source if the settlement area is serviced by groundwater.
Oak Ridges Moraine Conservation Plan (2017)	Provides land use and resource management to provincial ministers, ministries, agencies, municipalities, and other stakeholders for the land and water use within the Moraine.	The Plan forbids new infrastructure within the Moraine and sets stringent requirements for exempt infrastructure in the area.
Humber River Watershed Plan (2008)	Provides guidance to local, regional, and provincial governments and the Toronto and Region Conservation Authority (TRCA) as they update their policies and programs for environmental protection, conservation, and restoration within the contexts of land and water use, and the planning of future development.	The current Nobleton Water Resource Recovery Facility discharges to the Humber River. Therefore, any changes in discharge quantity or quality needs to be analyzed and discussed in collaboration with the TRCA.
Clean Water Act (CWA) (2006)	Establishes Source Protection Areas and a Source Protection Plan (SPP) for each area that includes a set of policies to protect human health, ensure that adequate safe clean water is available, and protect current and future water sources from significant threats. The Act delineates vulnerable areas around surface water intakes and wellheads knowns as Intake Protection Zones (IPZs) and Wellhead Protection Areas (WHPAs), respectively.	The Community of Nobleton includes some WHPAs within the study area that were considered throughout the Municipal Class EA to determine the best water and wastewater servicing solutions.
Great Lakes – St. Lawrence River Basin Sustainable Water Resources Agreement (Intra-Basin Transfer of Water) (2007)	Bans transfer of water from one of the Great Lakes watershed to another except under strictly regulated conditions. The agreement limits the Region to transfer no more than 105 million litres a day of water and must meet ongoing conditions for this transfer.	Emphasizes the need to maintain a balance between the Lake Ontario and Lake Huron watersheds.

Legislation Plan/Policy	Description	Relevance to EA
Ontario Water Resources Act (OWRA)	Provides for the conservation, protection and management of Ontario's waters, both groundwater and surface, and for their efficient and sustainable use, in order to promote Ontario's long-term environmental, social and economic well-being. This Act regulates sewage disposal and sewage works as well as regulates water taking, well construction and related "water works".	Applies to water taking and sewage disposal. OWRA will require that all proposed water and wastewater works, including well construction/ operation, watermains, sewage pumping stations, sewers and treatment facilities, proposed within this EA are in compliance with this regulation. Applicable OWRA permits will also be required during the detailed design and construction phases.

2.4 Existing Water Servicing and Future Needs

Site visits, discussions with operators, and a review of existing documents was completed as part of the EA to evaluate the existing condition of Nobleton's water and wastewater systems. Additionally, several studies were completed in advance of starting the Class EA to further assess the system's current capacity and determine future needs.

To determine and evaluate the existing water servicing system, the following background studies were completed:

- Water System Capacity and Optimization.
- Water Hydraulic Analysis.
- Water Needs Assessment and Justification.
- Water Hydrogeological Study.

All studies can be found in Appendix B.

2.4.1 Existing Water Servicing

Nobleton's water system consists of three groundwater wells and two elevated storage tanks that provide service to the Nobleton Pressure District. The wells operate based on level at either of the elevated tanks. The well pumps start and stop to maintain a certain water level at both the elevated tanks. Additionally, there is a booster pumping station (PS) that services a higher elevation area in the northwest portion of the distribution system that operates independently from the rest of the water system controls.

2.4.1.1 Water Supply

Table 2-2 summarizes Nobleton wells. The current water supply capacity is limited by the Permit to Take Water (PTTW). With all three wells in service, the Nobleton system has a total pumping capacity of 80.5 litres per second (L/s). However, the firm capacity is calculated assuming the largest well is out of service, which equates to a total firm water supply capacity of 51.6 L/s. The wells are installed within the Scarborough Aquifer and are developed within the aquifer at depths below 83 metres below ground surface.

Table 2-2 Nobleton Existing Well Summary

Facility	Nobleton Well #2	Nobleton Well #3	Nobleton Well #5
Location	22 Faris Avenue	14 Royal Avenue	12860 Highway 27
Year in Service	1961	1968	2012
Capacity (L/s)	22.7	28.9	28.9
Standby Generator	No	Yes	Yes
Disinfectant	Chlorine Gas	Sodium Hypochlorite	Chlorine Gas
Condition Assessment	Generally good; upgrades and repairs will be required in the next 20 years	Generally good; upgrades and repairs will be required in the next 20 years	Excellent condition

Based on population and employment estimates, hourly supervisory control and data acquisition (SCADA) production records from 2012 to 2018, and weather patterns from 2015 to 2018 the baseline water demand was determined. With that information, it was determined that Nobleton has an average day demand of 21 L/s and a maximum day demand of 44 L/s. The current PTTW limit is 51.6 L/s, which is greater than Nobleton's baseline demand.

2.4.1.2 Water Storage

Table 2-3 summarizes Nobleton existing storage tank capacities. The combined water storage available in Nobleton is currently 3,845 cubic metres (m^3).

Table 2-3 Nobleton Existing Water Storage Summary

Facility	Nobleton South Elevated Tank	Nobleton North Elevated Tank
Location	117 Russell Snider Drive	13740 Highway 27
Year in Service	1986	2012
Capacity (m^3)	2,045	1,800

Several hydraulic simulations were completed to determine the baseline capacity of the system and any hydraulic limitations. The study evaluated the existing storage requirements and determined that the total storage required is 2,688 m^3; this capacity includes the equalization, fire, and emergency storage required by the Region. Therefore, current storage tanks have enough capacity to meet Nobleton's current demand.

2.4.1.3 Water Distribution

The Nobleton water distribution network consists of both York Region's infrastructure and the Township of King's infrastructure. The Region only owns a total of less than 5 kilometres (km) of watermains, which are either inlet/outlets for the elevated storage facilities or are within the three well facilities. The remainder of the distribution network is owned and operated by the Township of King, as shown on Figure 2-2. The Nobleton Booster PS services a higher elevation area in the northwest portion of the distribution system and is owned and operated by York Region.

A hydraulic analysis on the distribution network determined that there are no system bottlenecks or limitations that would prevent the Region's well supply and storage volume from being distributed. The current distribution system has enough capacity to service the demands generated by the equivalent capacity of three wells, 80.5 L/s, without any limitations. The Nobleton Booster PS was also determined to have enough capacity to service baseline demands without any issues or bottlenecks.

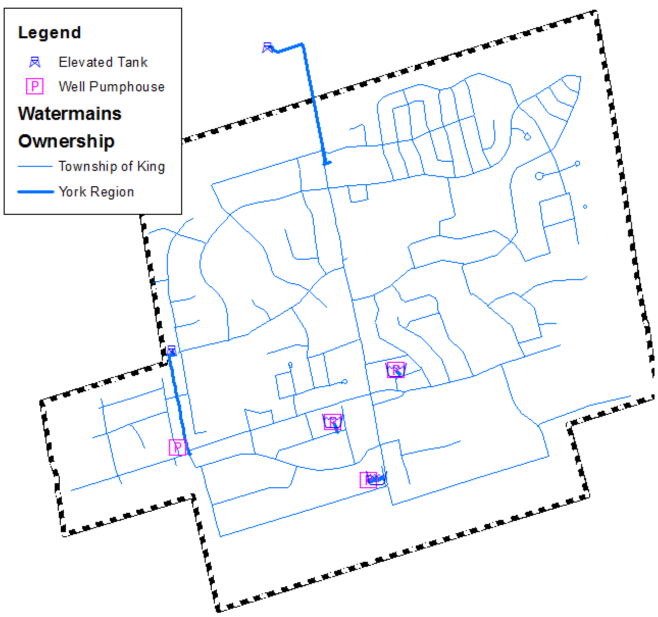


Figure 2-2 Existing Distribution System

2.4.2 Future Water System Needs

A review of historical data along with discussions with York Region were completed to estimate the projected population, per capita demand, and future demand. Table 2-4 summarizes the design criteria used for the water servicing system.

Table 2-4 Water Demand Design Criteria

Design Criteria	2016	Future
Residential Population	5,520	10,800
Employment Population	772	1,800
Residential per Capita Demand (litres per cap per day [L/c/day])	220	220
Employment per Capita Demand (L/c/day)	64	182*
Average Day Demand (L/s)	21	42.6
Maximum Day Demands (L/s)	44	89.5

*Since the current Nobleton employment per capita demand is significantly lower than the remainder of York Region, it is recommended that for future employment projections the higher per capita demand rate of 182 L/cap/d be used. The type of future employment in Nobleton is currently unknown, so this will allow for slightly larger consuming employment users than those that currently exist. The selected 182 L/cap/d is based on the York Region Master Plan 2016 Employment per capita rate.

The demands shown in Table 2-4 are established as the design basis for alternative solutions without taking into account any water conservation; however, considering that water conservation alternatives could be implemented, there is a potential for the estimated demands to be reduced.

2.4.2.1 Future Water Supply Needs

The current firm well supply in Nobleton is 51.6 L/s, which is well below the projected MDD of 89.5 L/s. To meet the forecasted demand, additional water supply capacity will be required.

2.4.2.2 Future Water Storage Needs

The existing storage capacity of the Nobleton system is sufficient to meet the fire, emergency, and equalization storage requirements of up to 3,845 m^3. Since the total storage corresponding to projected MDD + Fire demands is higher at 3,917 m^3, a marginal amount of additional storage would ultimately be required; however, it is unlikely that a new storage facility would be added to make up for the small deficit.

2.4.2.3 Future Distribution Needs

Hydraulic analysis on the distribution system determined that the current system will be able to handle projected demands without any bottlenecks or limitations and thus no expansions will be needed. The existing distribution system is also capable of accommodating the minor additional demands created as a result of the marginal storage deficit, i.e., 3,917 m^3 versus 3,845 m^3 between the existing system and the future needs.

2.5 Existing Wastewater Servicing and Future Needs: Collection, Pumping, Treatment, and Disposal

York Region is responsible for the wastewater collection and treatment from its local area municipalities. In Nobleton, the Region owns the Janet Ave SPS and treatment plant, along with the forcemain that collects the two.

2.5.1 Existing Wastewater Servicing

Nobleton's wastewater system consists of a sewage collection system, two pump stations with associated force mains, and a Water Resources Recovery Facility (WRRF) and effluent outfall. To determine and evaluate the existing wastewater servicing system, the following background studies were completed:

- Wastewater System Capacity and Optimization.
- Existing Wastewater Hydraulic Analysis.
- Wastewater Needs Assessment and Justification.
- Assimilative Capacity Study.
- Fluvial Geomorphology.

All studies can be found in Appendix B.

2.5.1.1 Wastewater Flows and Generation Rates

As part of the study, flow meter, weather, servicing population, and historical water demand data from 2014 to 2017 were reviewed to determine the baseline average dry weather flow (ADWF) and annual average day flow (ADF). The current ADF is based on a generation rate of 370 L/c/d with an average residential generation rate of 220 L/c/d and approximately 150 L/c/d, 40 percent of average daily flow, being extraneous flow from inflow and infiltration. Table 2-5 summarizes the current influent loadings at the WRRF based on plant records.

Table 2-5 Influent Loadings at the Nobleton WRRF

Loading Parameter	Loading Rate (g/c/d)	Average Day Loading (kg/d)
BOD	45	175
TSS	43	167
TKN	10	39
TP	1.3	5

2.5.1.2 Existing Wastewater Collection System

The Nobleton wastewater collection system consists of over 50 km of gravity sewer. All of the gravity sewers in the collection system are owned by the Township of King, except for a short section of pipe, less than 50 metres, upstream of the Janet Avenue PS, which is owned by York Region.

There are two PSs within the collection system: Bluff Trail PS (owned by the Township of King) and Janet Avenue PS, owned by York Region. The Janet Avenue PS pumps all the flows from the collection system to the Nobleton WRRF via a 300 millimetre (mm) diameter force main.

Through a review of SCADA data and various hydraulic analyses, the existing capacity of the conveyance system was evaluated. The hydraulic analyses showed that the existing system has sufficient capacity to convey flows to Janet Avenue Pump Station; during peak flows, some surcharging is predicted to occur because of insufficient capacity of the pipes around the PS, but no flooding is predicted. The analyses demonstrated that Janet Avenue PS has a capacity of 1,454 cubic metres per day (m^3/d). It was determined that the current collection system has enough capacity to handle current needs as well as future peak instantaneous flows (PIFs).

2.5.1.3 Existing Wastewater Treatment

The Nobleton WRRF is an extended aeration plant with tertiary filtration. Its rated capacity is 2,925 m^3/d with a peak design flow of 9,177 m^3/d. The plant was originally designed to service 6,500 people and approval was granted to increase it to 6,590 people. The treatment facility consists of the following unit processes prior to discharge to the Humber River via an outfall and a constructed wetland:

- Inlet Works: Screening and grit removal system.
- Secondary Treatment: Extended aeration activated sludge process with nitrification.
- Post-Secondary Treatment: Deep bed granular filters, continuous backwash system equipped with filter reject tanks.
- Chemical Feed System: Alum and sodium hydroxide.
- Sludge handling system: Gravity thickening and a thickened sludge storage tank.

Because of the technology limitations of the existing processes in the WRRF, some unit processes have a capacity lower than 2,935 m^3/d and thus will not be able to handle future flows.

2.5.2 Future Wastewater Servicing

Through a review of historical data and discussions with York Region, the projected population, per capita demand and future demand, was estimated. Table 2-6 summarizes the design criteria used for the wastewater servicing system.

Table 2-6 Wastewater Flow Projection

Design Flow Criteria	Baseline (2017)	Future
Residential Population	3,891	10,800
Wastewater Generation Rate	370 L/c/d	370 L/c/d
ADF Capacity	2,925 m^3/day	3,996 m^3/day
Peaking Factors		
Maximum Month Flow (MMFW)	1.4	1.4
Peak Day Flow (PDF)	2.2	2.2
Peak Hour Flow (PHF)	4.7	4.7
PIF	6.3	6.3

A value of 370 L/c/d is recommended for both the existing population and future growth. This value includes the backwash flows from the proposed iron and manganese treatment facilities for the Nobleton water system. Based on this value, the future average wastewater flow for a future population of 10,800 people is calculated to be 3,996 m^3/d.

2.5.2.1 Future Wastewater Collection Needs

Based on the hydraulic model analysis of the sewer system, it is concluded that the existing sanitary sewer system has sufficient capacity to drain the future projected flows to Janet Avenue PS; however, Janet Avenue PS will require an additional capacity of 2,566 m^3/day to meet the forecasted population. Additionally, the existing force main from Janet Avenue PS has insufficient capacity to accommodate the future peak flows and will need to be expanded. It is noted that the selected alternative and the design concept considered a flow attenuation tank at the Janet Avenue PS site to limit the capacity of the Janet Avenue PS such that the twinning of the force main is eliminated.

2.5.2.2 Future Wastewater Treatment Needs

The Nobleton WRRF is currently limited by the capacity of its screens and grit removal tanks. The plant currently cannot treat the future PIFs of 25,175 m^3/day and thus additional capacity will be required by upgrading certain treatment units along the plant.

2.6 Problem Statement

The current water and wastewater system in Nobleton does not have sufficient capacity to meet requirements to support the growth to the 2041 horizon. Thus, several upgrades, improvements, and expansions will be required in different facilities to meet the requirements of the projected population.

The problem/opportunity statement for this MCEA is as follows:

To identify long-term water and wastewater servicing solutions to support forecasted growth in Nobleton to 2041 while optimizing the use of existing regional infrastructure.

3.0 Existing Conditions

The following sections documents current conditions in the study area, including existing natural environment, cultural features, and socioeconomic environment.

3.1 Natural Environment

The study area is located within a rural setting consisting of a mixture of residential properties and agricultural lands. Along with field visits and review of background materials and previous studies, the following studies were completed to evaluate current environmental conditions in the study area:

- Hydrogeological Study.
- Environmental Impact Study.
- Groundwater Exploration Study.
- Fluvial Geomorphology.

The studies can be found in Appendix B.

3.1.1 Climate and Rainfall

Using the data from the meteorological station at Toronto Pearson International Airport, the mean annual temperature from 1981 to 2010 was 8.1° C; the mean monthly temperature ranged from -5.5° C in January to 21.4° C in August. During this time period, there was a total annual precipitation of 786 mm with a range of monthly normal between 47.7 mm in February and 78.1 mm in August.

For comparison, climate and rainfall from long-term climate normal was compared to 2016. In all months of 2016 there were warmer climates than normal, with a mean temperature of 10.0° C and monthly mean temperatures ranging from -3.6° C in January to 24.3° C in August. The 2016 total precipitation was approximately 630.6 mm with monthly totals ranging from 26.4 mm in June to 80.0 mm in March. The comparison of climate and precipitation data is shown in Table 3-1.

Table 3-1 1981 to 2010 and 2016 Climate and Precipitation

	1981 to 2010	2016
Maximum Monthly Normal Mean Temperature	21.4 ° C	24.3 ° C
Minimum Monthly Normal Mean Temperature	-5.5 ° C	-3.6 ° C
Average Annual Normal Mean Temperature	8.1 ° C	10.0 ° C
Maximum Normal Monthly Mean Precipitation	78.1 mm	80.0 mm
Minimum Normal Monthly Mean Precipitation	47.7 mm	26.4 mm
Average Annual Normal Mean Precipitation	785.8 mm	630.6 mm

3.1.2 Physiography and Topography

The study area is mostly located within the South Slope physiographic region and the Oak Ridges Moraine at the northeast. The South Slope is the southern slope of the Oak Ridges Moraine; it is a gently rolling plain, characterized by numerous drumlins-oriented upslope. Nobleton is located on a gentle north-south trending ridge with elevations ranging from 265 to 275 masl. Figure 3-1 shows the physiological areas of the study area.

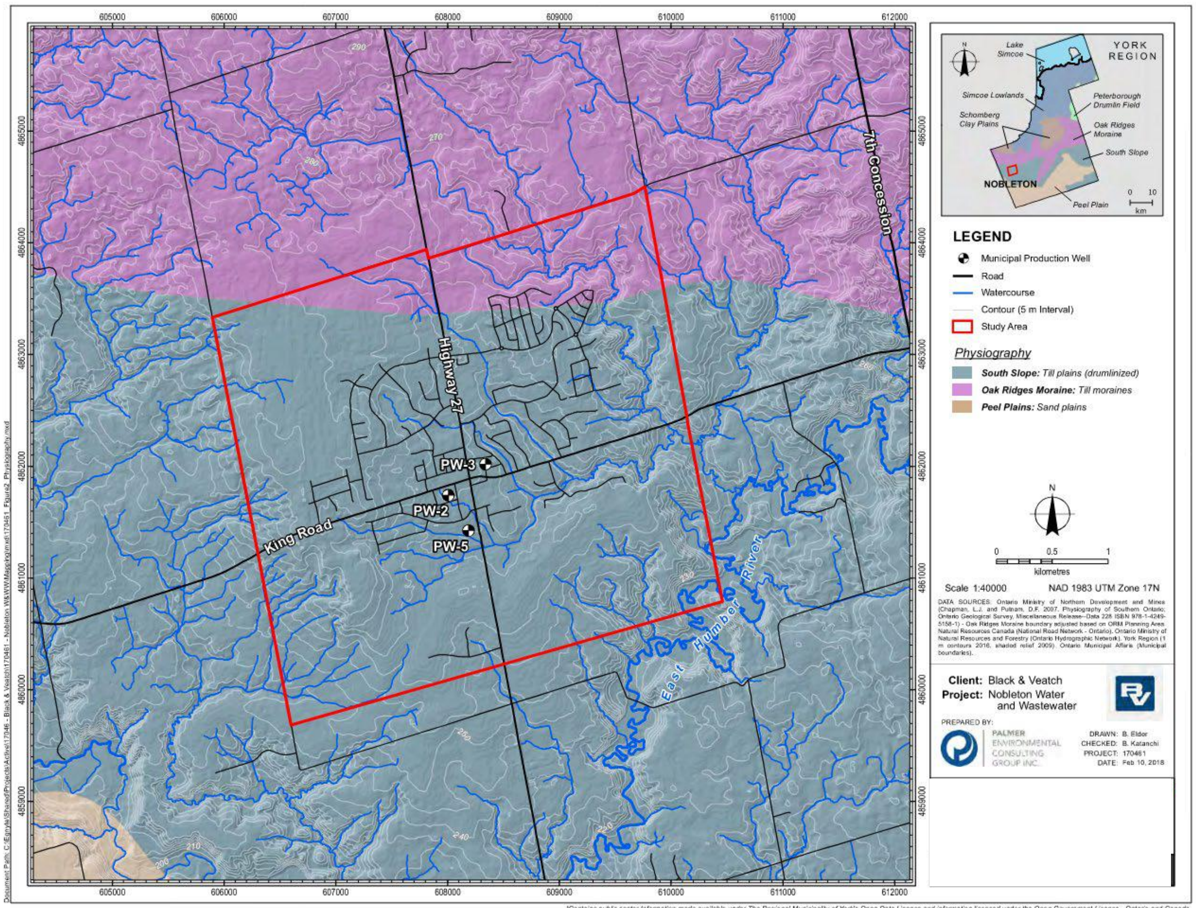


Figure 3-1 Physiography

3.1.3 Surficial Geology and Bedrock

Overburden thickness in the study area is approximately 250 metres. At surface, the quaternary geology of the study area consists mostly of Halton Till. The Humber valley lands, near the river, consist of recent alluvial deposits. The underlying bedrock in the study area is mapped and the Georgian Bay formation is composed of bluish grey shale with occasional bands of harder, greyish sandstone, siltstone, and limestone. The bedrock is interpreted to be higher to the west and southwest of the study area and sloped south toward Lake Ontario. The surficial geology and bedrock in the study area can be seen on Figure 3-2 and Figure 3-3, respectively.

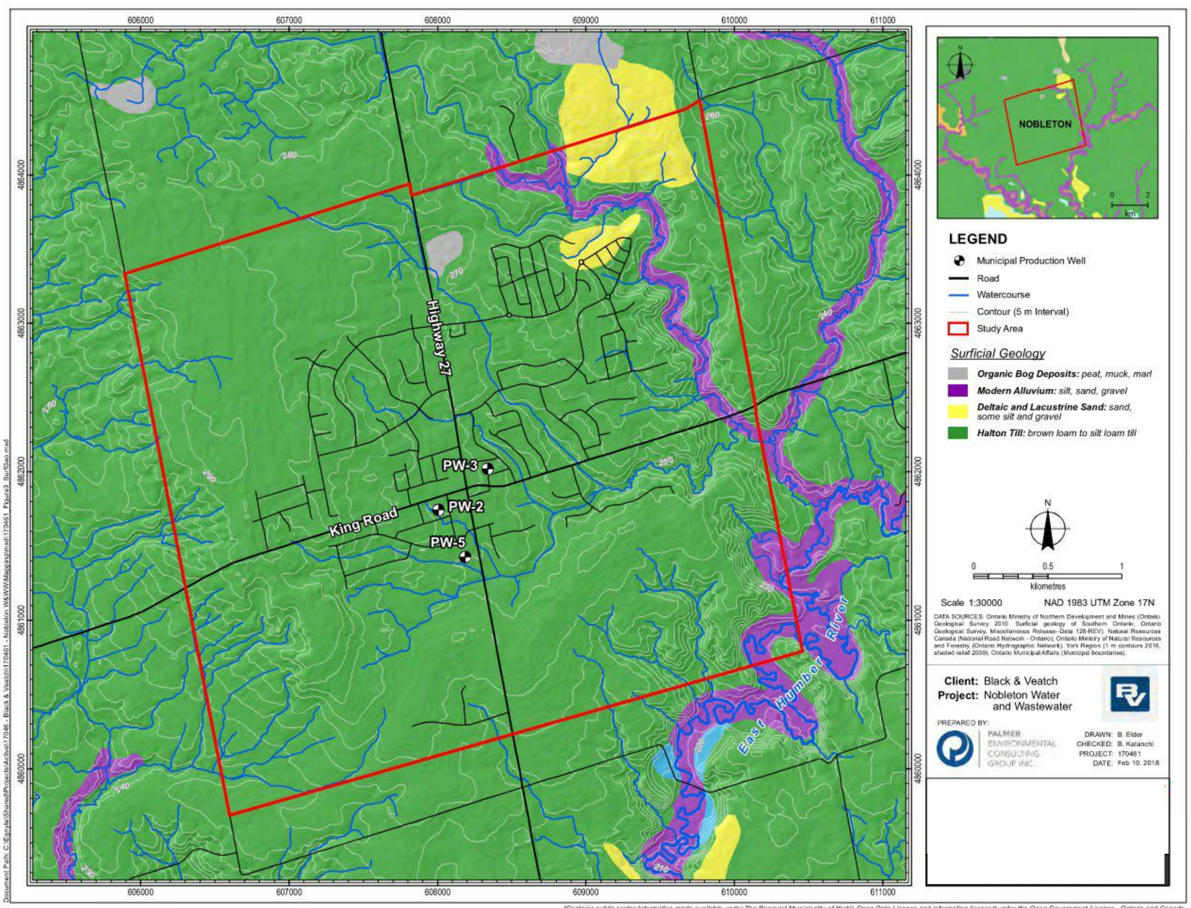


Figure 3-2 Surficial Geology

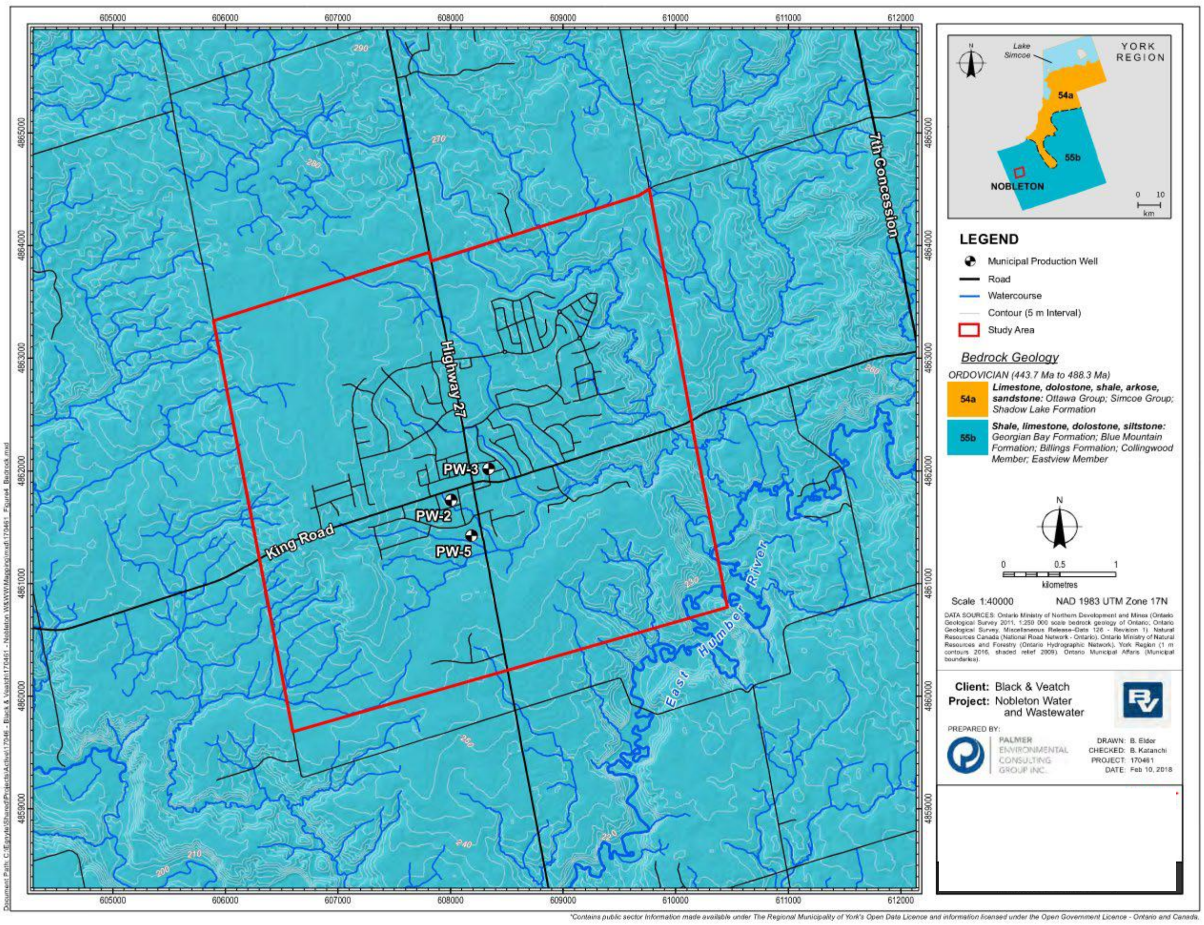


Figure 3-3 Bedrock Geology

3.1.4 Areas of Natural Scientific Interest

Areas of Natural and Scientific Interest (ANSI) are areas of land and/or water containing landscapes or features that have been identified as having life science or earth science (or both) values related to natural heritage protection, scientific study, or education.

No provincially significant ANSIs are identified within the study area; however, a candidate life science ANSI is identified in the north-western portion of the study area. Candidate life science ANSI are ANSIs that have been identified and recommended for protection by the Ministry of Natural Resources and Forestry (MNRF) but have not been formally confirmed through the confirmation procedure. The candidate ANSI is shown on Figure 3-4.

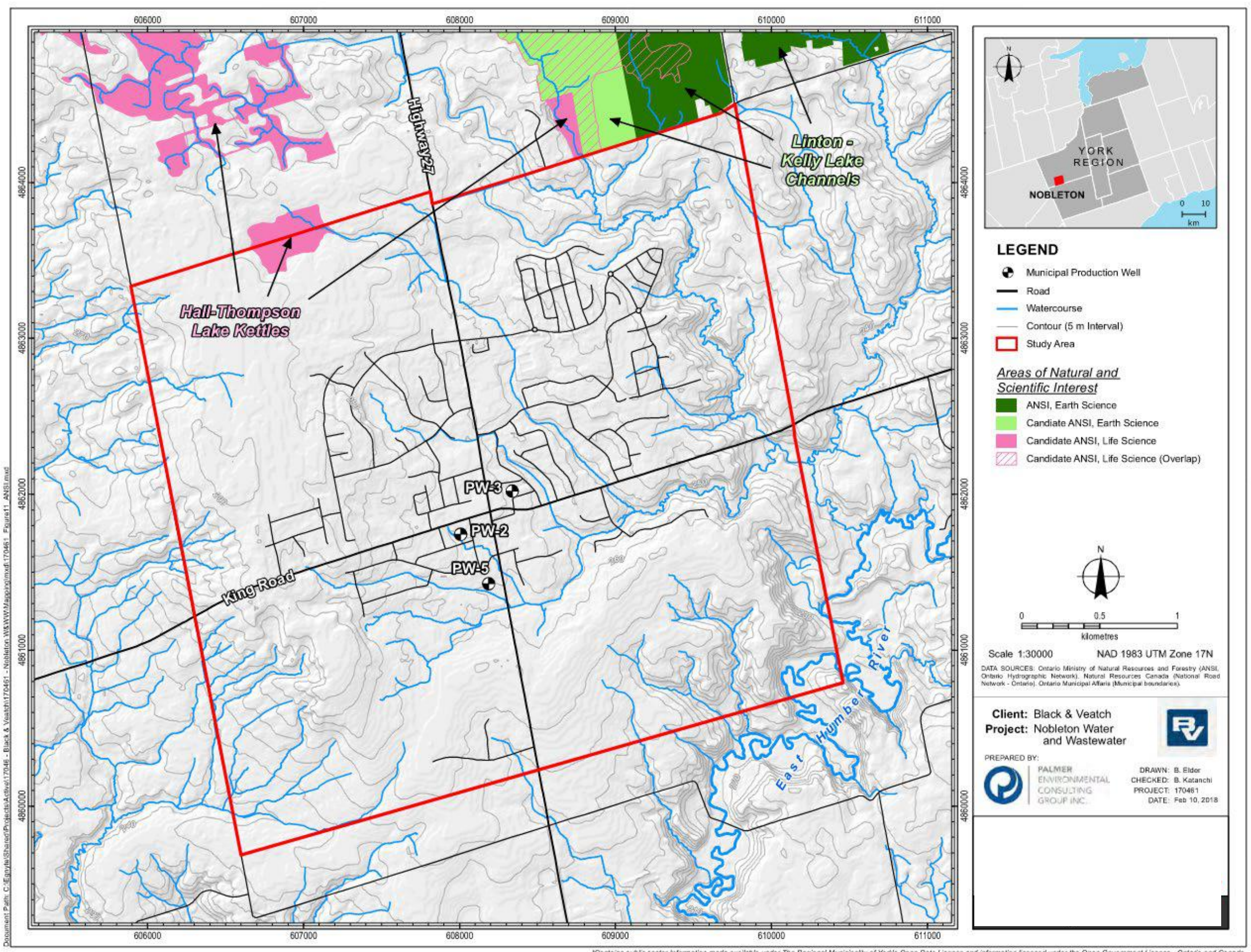


Figure 3-4 Areas of Natural and Scientific Interest

3.1.5 Hydrogeology

This section covers underground features in the study area.

3.1.5.1 Hydrostratigraphy

Hydrostratigraphic units can be subdivided in two groups based on their capacity to permit groundwater movement: an aquifer and an aquitard. An aquifer is defined as a layer of soil that is permeable enough to permit usable water supply to be extracted; conversely, and aquitard is a layer of soil that inhibits groundwater movement because of its low permeability.

Figure 3-5 shows a hydrostratigraphic cross section of the study area. Surface deposits, Halton Till, Newmarket Till, and Sunnybrook Drift are characterized by low permeability deposits; these sediments act as a surficial aquitard limiting groundwater recharge and downward movement of water from the surface to the underlying aquifers.

There are two major aquifers in the Nobleton Community, the Thorncliffe Aquifer and the Scarborough Aquifer, which are major sources of potable water for the area. The Scarborough Formation Aquifer is the main potable water source and the three municipal water supply wells for the village of Nobleton are installed in this formation. The Oak Ridges Aquifer Complex (ORAC) is a significant regional aquifer in Southern Ontario. The ORAC is not located at surface within the study area. The ORAC or equivalent unit depicted in Figure 3-5 is interpreted as near-surface ORAC sediments. Near-surface ORAC sediments that extend into the study area form a shallow aquifer made up of Upper and Lower ORAC units. Generally, only locally shallow dug wells obtain water from this aquifer as a result of its limited extent.

Additionally, there are two tunnel channel deposits in the region that provide spatially discrete aquifers and/or promote connectivity between regional aquifers. Refer to Appendix B for further details.

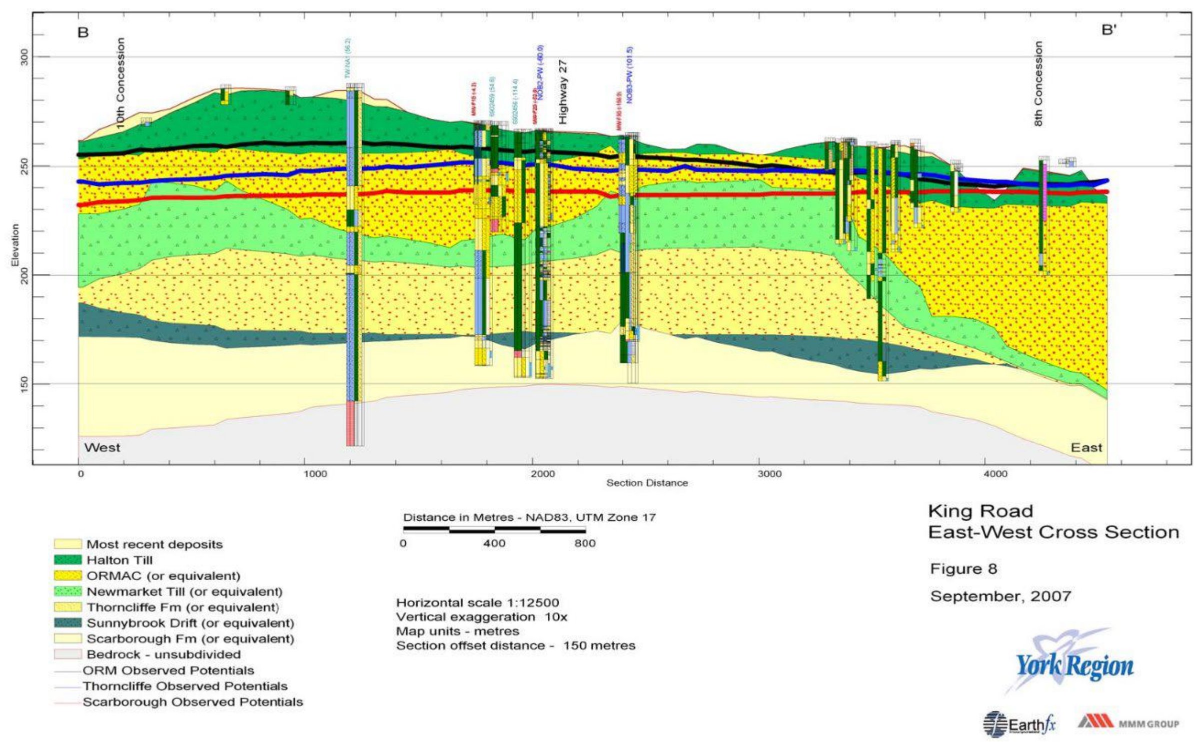


Figure 3-5 Hydrostratigraphic Cross Section

3.1.5.2 Water Well Records

Based on the Ministry of the Environment and Climate Change Water Well Records (WWR) database, 150 WWRs were identified within 500 metre radius of the study area. Of the 150 wells, 80 are used for domestic water supply, 12 used for livestock or irrigation water supply, five for commercial or industrial water supply, and four for municipal water supply. The remaining 49 wells are either abandoned, test holes, observation wells, or their use is unknown. Figure 3-6 shows the water wells in the study area.

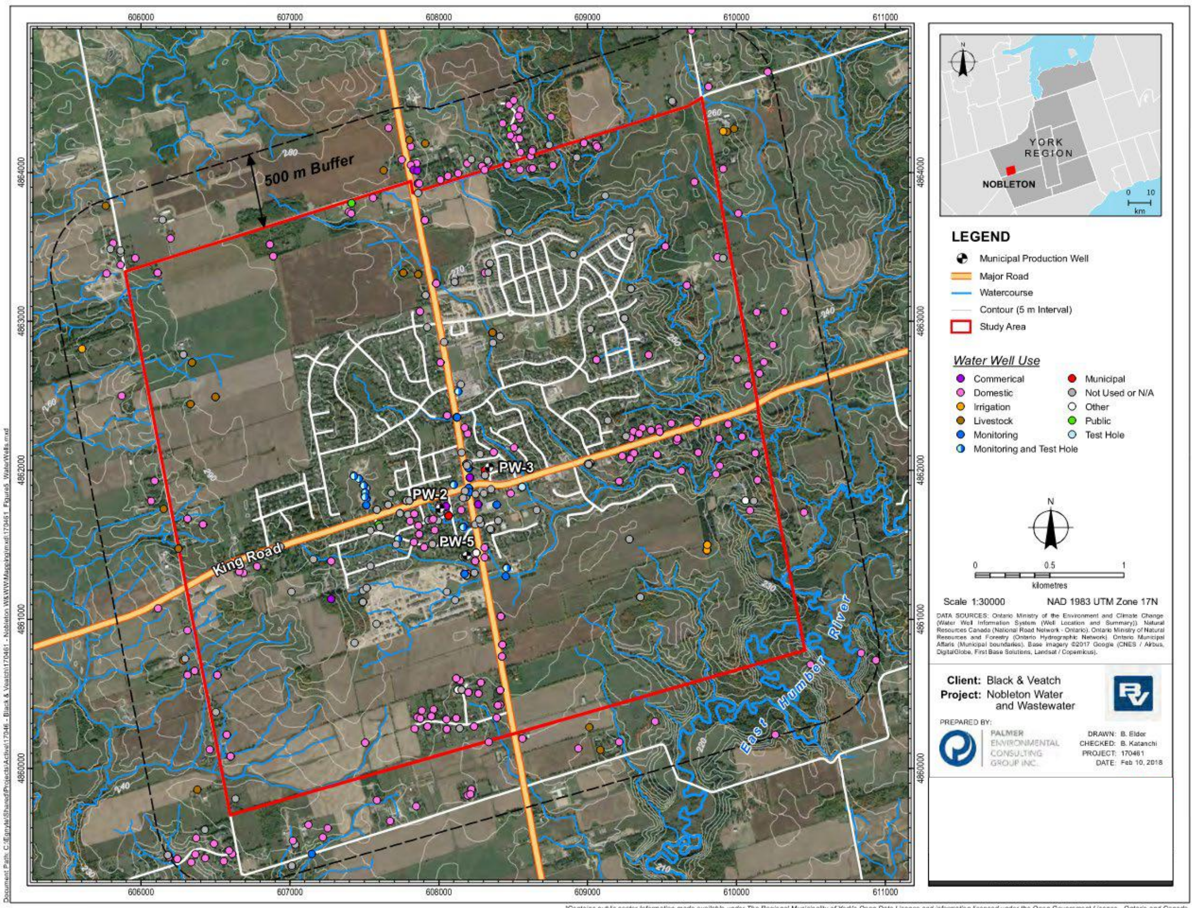


Figure 3-6 Water Wells in the Study Area

3.1.5.3 Groundwater Elevation and Flows

Groundwater flow within the Oak Ridges Aquifer Complex, Thorncliffe, and Scarborough aquifers is generally in a southerly direction. The generally downward hydraulic gradient encourages groundwater recharge across the region as infiltrating water successively recharges deeper aquifer units. Table 3-2 summarizes the elevations and flow directions of aquifers in the study area.

Table 3-2 Groundwater Elevations and Flows

Aquifer	Flow Direction	Static Water Levels Range	Static Water Level Near Town Centre
Oak Ridges Aquifer Complex	Southerly direction with influence of topography	260 masl (northwest) to 225 masl (Humber River)	255 masl
Thorncliffe Aquifer	Southerly direction with moderate influence of Humber River	250 masl (north) to 210 masl (south)	245 masl
Scarborough Aquifer	South with very little convergence to Humber River	250 masl (north) to 210 masl (south)	241 masl

3.1.6 Surface Water Resources

The main surface water feature in the study area is the Humber River. The river is located along the western portion of Nobleton and various small tributaries are present in the study area. The headwaters from the Humber River originate in the Niagara Escarpment and Oak Ridges Moraine. A large fraction of the Main Humber River sub watershed is protected by the Niagara Escarpment, Oak Ridges Moraine, and Greenbelt legislation.

The study area of the Humber River exhibits an irregular meander pattern. The river has a relatively trapezoidal cross-section with steep bank and a bankfull width between approximately 10 metres and 15 metres within the study area. The substrate of the Humber River in the study area is characterized as cobble, gravel, sand, and rocks. Substrate characteristics vary with stream morphology, with gravel and cobble as the dominant substrate within the riffles and sand as the dominant substrate in the pools. Periphyton was noted on rocks and cobble, and macrophyte growth was not present in any abundance throughout the area.

The banks are composed of silts and sands, with some gravels, and show evidence of active erosion and slumping. Riparian vegetation includes grasses, shrubs, and trees. Uplands consist of forested areas and agricultural areas transitioning to naturalized areas providing some shading of the watercourse.

Nobleton's WRRF discharges treated effluent to the Humber River via an outfall and constructed wetland. Originally, the wetland came to a confluence with the Humber River at a designed riprap overflow along the left bank.

3.1.7 Source Water Protection

The CWA (2006) consists of several regulations and policies to protect water sources before they enter the municipal drinking water system. As part of the CWA, the SPP includes a set of policies to protect human health, ensure that adequate safe clean water is available, and protect current and future water sources from significant threats. As part of the plan, vulnerable areas are delineated around surface water intakes and wellheads for every existing and planned municipal residential drinking system.

The SPP identifies different types of vulnerable areas; the ones relevant to this project include the following:

1. WHPAs: Areas on the land around a municipal well; the area size is determined by how quickly water travels underground to the well.
2. Significant Groundwater Recharge Areas (SGRAs): Areas characterized by porous soils that allow water to seep easily into the ground and flow to an aquifer.
3. High Vulnerable Aquifer (HVA): Area with an aquifer that is susceptible to contamination because of its location near the ground's surface or where type of materials in the ground are highly permeable.
4. WHPA-Q (Water Quantity): Areas where a significant or moderate stress on drinking water quantity has been identified; in these areas, activities that take water without returning it to the source might become a significant threat.

Within the study area WHPAs, HVAs, and SGRAs have been identified.

3.1.7.1 Wellhead Protection Areas

Each WHPA is delineated based on groundwater flow calculations and pumping rates and is based on a mathematical model. WHPAs assume a specified time of travel from the outer edge of the zone to the well intake. The size and shape of each WHPA depend on the pumping rate of the well and the properties of the aquifer providing water to the well. WHPAs are subdivided based on distance or transit time boundaries. WHPA-A, WHPA-B, WHPA-C, and WHPA-D boundaries are 100 metres, less than or equal to 2 years, less than or equal to 5 years, and less than or equal to 25 years, respectively.

As shown on Figure 3-7, a large portion of the study area is located within the WHPA-A, B, C, and D, as well as WHPA-Q (Recharge Management Area). The majority of the northern portion of the study area is within a WHPA-A, B, C, or D. WHPA-A is illustrated around each municipal pumping well. WHPA-B, C, and D are also shown to extend beyond the northern boundary of the study area. The portion of the study area that is located within the WHPA-Q is subject to the recharge management policy. Hydrogeological assessment and water balance may be required to ensure that infiltration volumes at the study area are maintained.

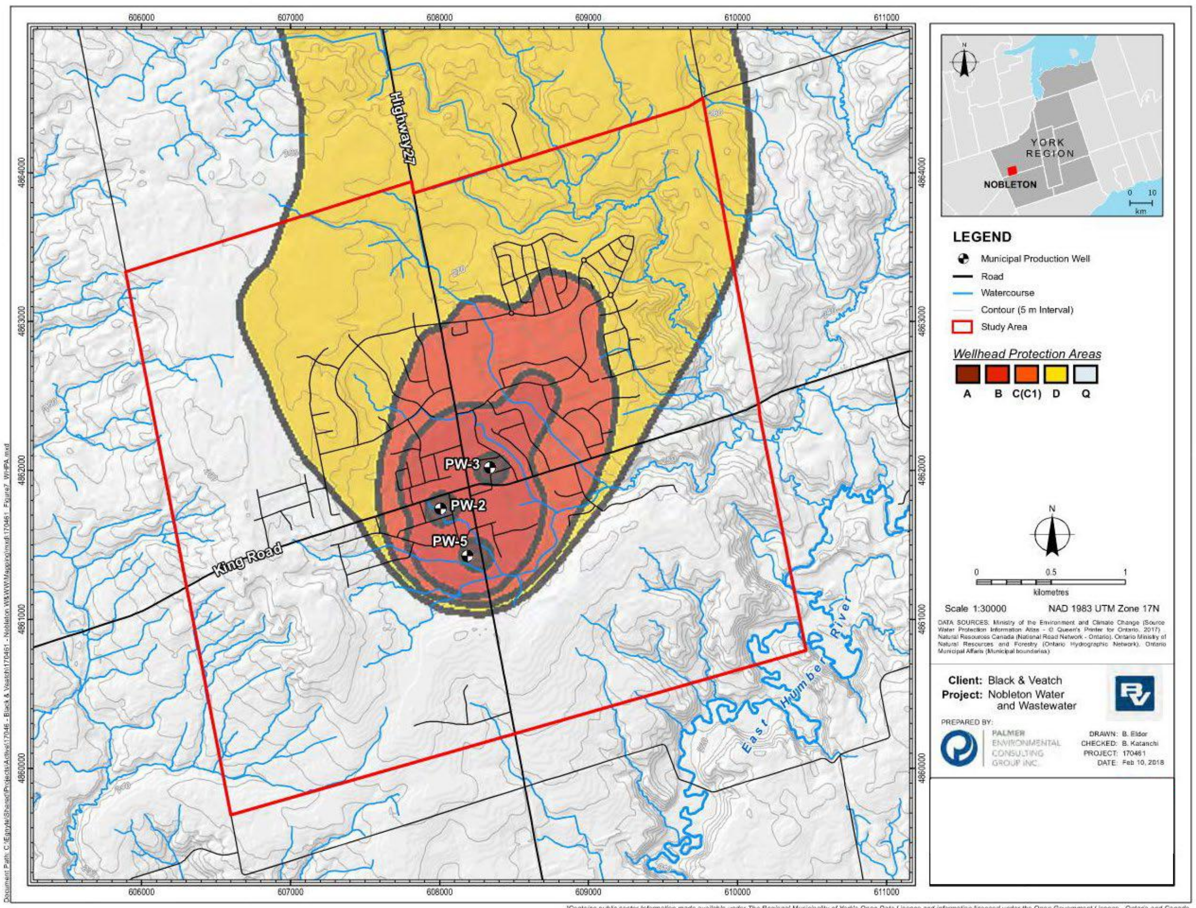


Figure 3-7 Wellhead Protection Areas

3.1.7.2 Highly Vulnerable Aquifers

As shown on Figure 3-8, two significant HVAs are located within the study area; the first in proximity to the city centre, slightly east of Highway 27 and King Road, and the second in an area on the eastern portion of the study area extending from the north to south boundary coinciding with surficial glaciolacustrine and alluvial deposits.

The majority of the surficial geology of the study area consists of either low permeability glaciolacustrine silty and clay, or low permeability sandy silt till aquitard materials. The regionally significant Thorncliffe and Scarborough Aquifers are situated in this area are confined by the overlying till and glaciolacustrine units. While the Scarborough Aquifer is important for municipal groundwater supply, the Halton and Newmarket tills act to inhibit vertical recharge to the aquifer. The primary recharge area for this aquifer is located north of the study area, where high permeability Oak Ridges Moraine (ORM) deposits are present at the surface.

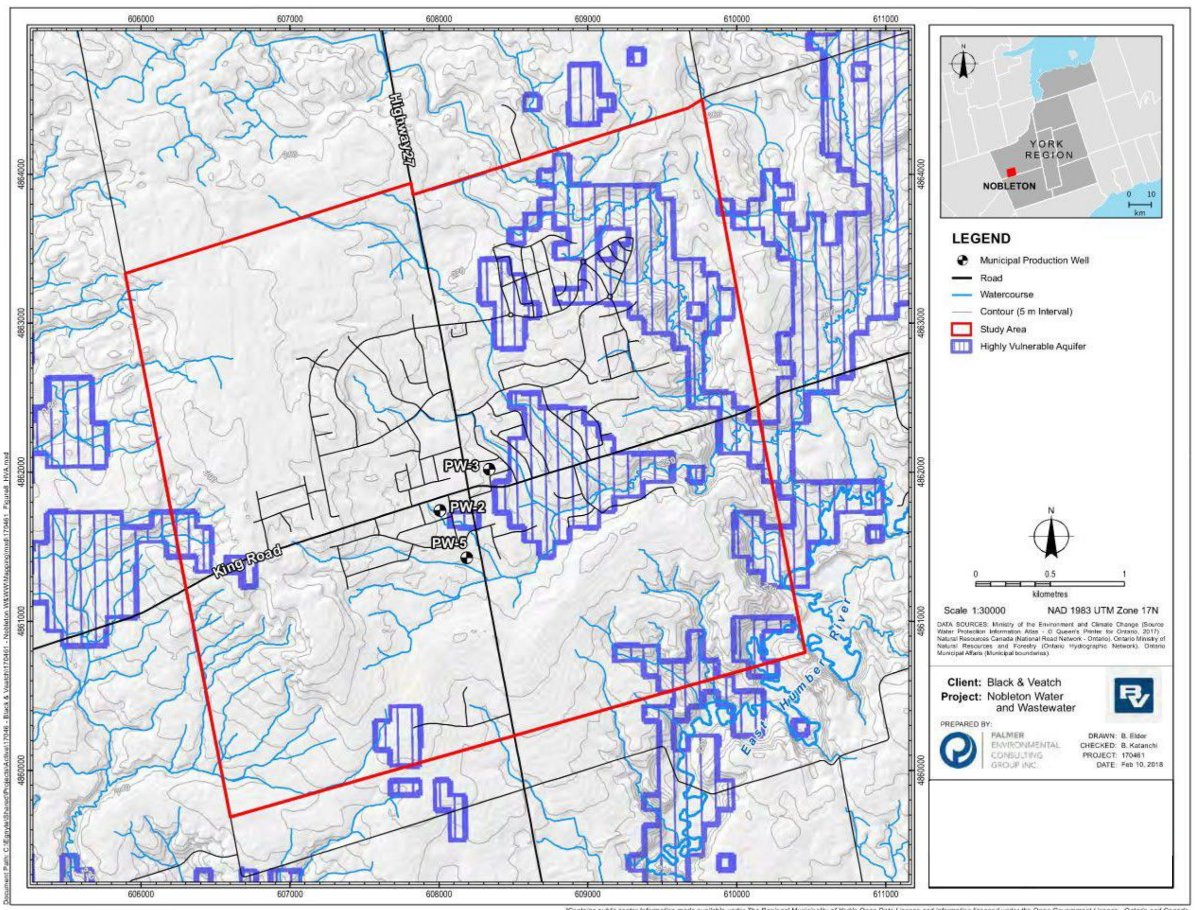


Figure 3-8 Highly Vulnerable Aquifers

3.1.7.3 Significant Groundwater Recharge Areas

Infiltration is the term used to describe the volume of water that enters the subsurface from a surface source, whereas recharge is the term used to describe downward flowing groundwater that reaches an underlying aquifer. Infiltration aside, precipitation that reaches the ground surface is either lost to evaporation or runs off the surface directly into streams, other water bodies (i.e., lakes, ponds), or storm sewers. The remainder infiltrates into the ground, a portion of which may be transported to an underlying aquifer to act as recharge.

Recharge areas are important because they replenish aquifers. As mentioned, the ORM (where exposed at the surface) exhibits the greatest rate of groundwater recharge within the vicinity of the study area. Nearly all of the precipitation infiltrates into the crest area of the ORM because of the high permeabilities of these surficial deposits, a large portion of this infiltrated precipitation acts as recharge to the ORAC. Minor groundwater recharge also occurs in areas of the South Slope that are underlain by ORAC sediments and where the Halton Till is thin. In the areas of thicker Halton Till and/or Newmarket Till, runoff exceeds recharge because of these low permeability deposits.

As shown on Figure 3-9, the majority of the study area outside of the town's centre is classified as being a significant groundwater recharge area (ranging from groundwater recharge zones 2 to 6). These areas generally have a relatively high surficial permeability. Within the study area, groundwater infiltration as a percentage of total precipitation ranges from 13 to 24 percent (TRCA, 2015). The majority of the study area is classified as having an SGRA vulnerability score of 2 or 0, with a small fraction of the east and northeast areas having a score of 6.

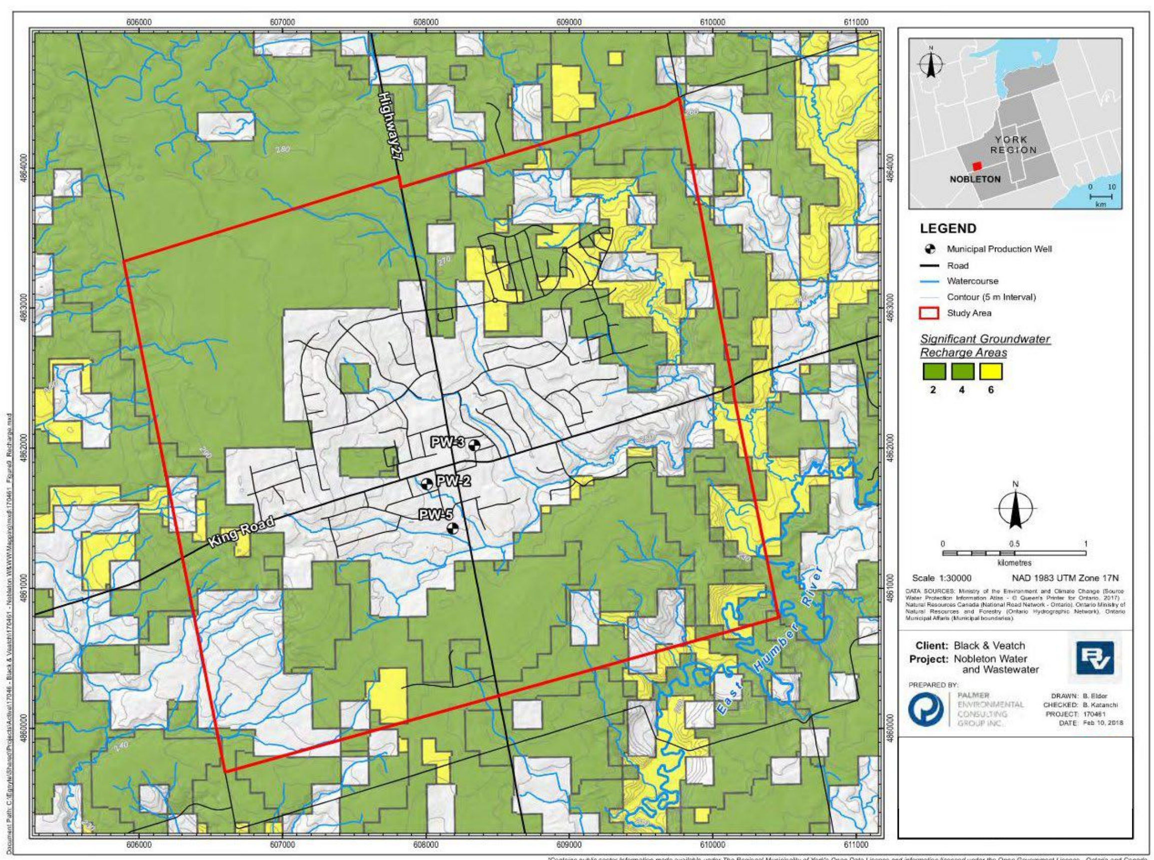


Figure 3-9 Significant Groundwater Recharge Areas

3.1.8 Significant Wetlands

Provincially Significant Wetlands (PSW) are areas identified by the province as being the most important to ecological and hydrological health. There are three PSWs identified within the study area: the Nobleton, Black Duck, and East Humber River. Figure 3-10 shows the location of these wetlands within the study area.

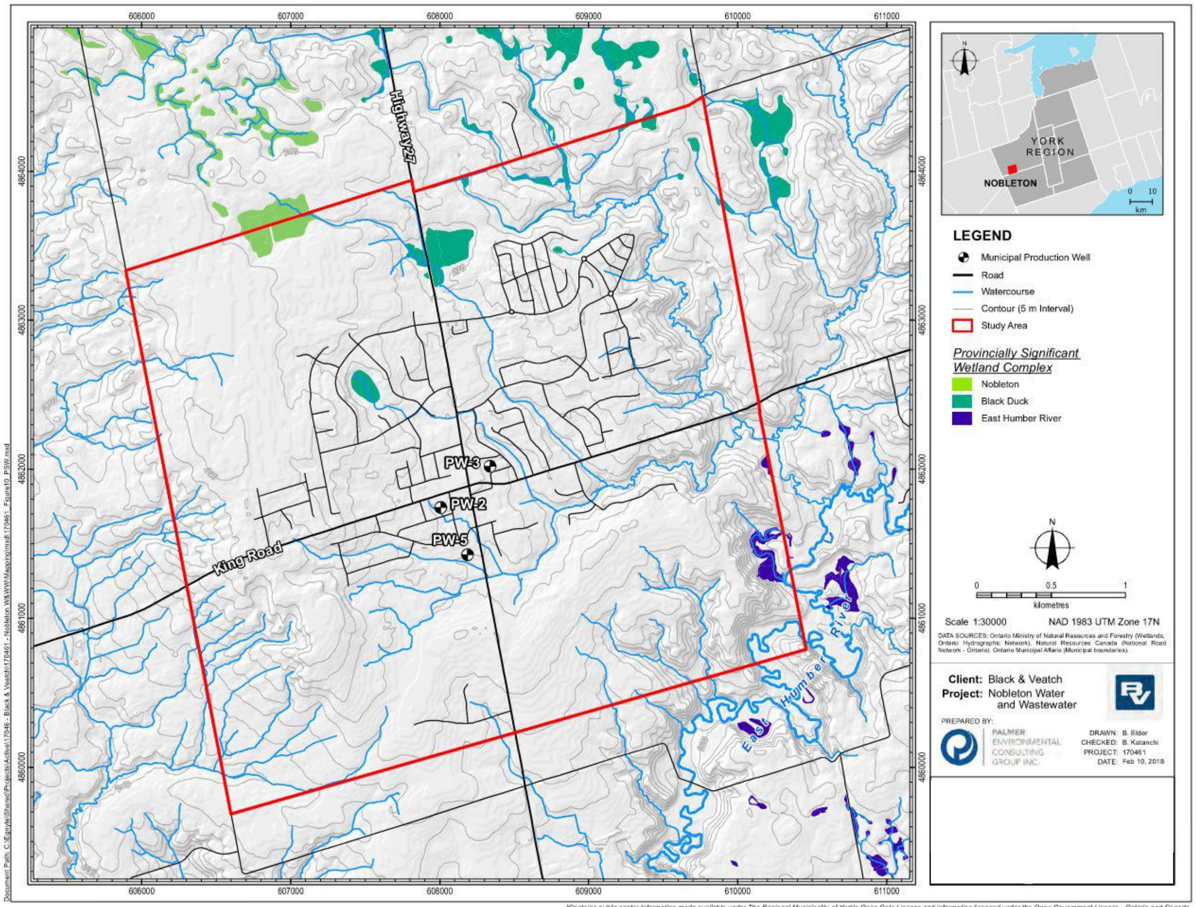


Figure 3-10 Provincially Significant Wetlands

3.1.9 Designated Natural Areas

Designated natural areas include areas for protection by the TRCA, the Region, and the Township of King. Most of the study area falls within the Greenbelt's Protected Countryside and some areas fall within the Regional Greenland System. Figure 3-11 shows the designated natural areas within the study area.

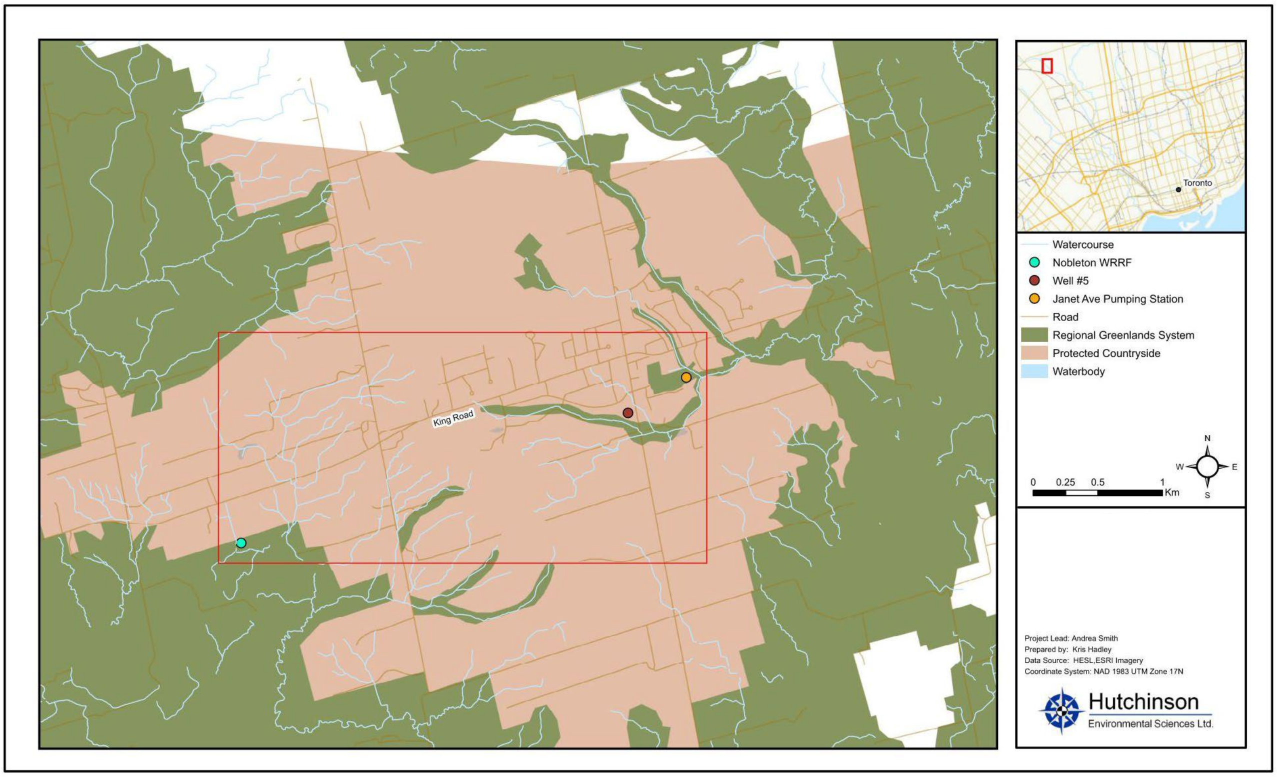


Figure 3-11 Designated Natural Areas

3.1.10 Vegetation

Vegetation communities within the study area consist of a mixture of forest, wetlands, streams, and meadows. A total of 129 plant species were documented in the study area. All species identified were considered non-native invasive plants and no endangered species were identified.

3.1.11 Wildlife

Seven different species of amphibians were identified at Well #5 site, Janet Avenue PS, and the WRRF. Only one at risk species, the Western Chorus frog, was identified at the WRRF.

A total of 33 bird species were documented within the study area, including three species at risk, one species of regional conservation concern, and four area sensitive species. The three bird species at risk, Barn Swallow (*Hirundo rustica*), Bobolink (*Dolichonyz oryzivorous*) (also specie of regional conservation concern), and Eastern Meadowlark (*Sturnella magna*), were all documented in the vicinity of the WRRF and are listed as threatened both in Ontario and federally. Area sensitive species require large areas of continuous habitat for breeding and foraging. At Janet Avenue PS, the Hairy Woodpecker (*Picoides villosus*) was identified and at the WRRF the Bobolink, Eastern Meadowlark, and Savannah Sparrow (*Passerculus sandwichensis*) were identified.

At the WRRF most bird species were typical of open grassland and agricultural habitat. On the other hand, bird species observed at the urban locations represented a mix of species associated with forest edge, open parkland, and riparian thickets. Most bird species were documented adjacent to the infrastructure facilities and not within the property sites.

Five species at risk were documented in the study area: snapping turtle, Western Chorus frog, barn swallow, Bobolink, and Eastern Meadowlark as well as the host plant for the Monarch Butterfly. All these species were found within the wetlands or agricultural fields surrounding the WRRF. Three additional species at risk, Grasshopper Sparrow, Blanding's Turtle, and Midland Painted Turtle, were identified but they were not documented during field investigations.

3.1.12 Fish and Aquatic Habitat

The study area is located in the Humber River watershed and is divided between the East Humber Sub watershed and the Upper Main Humber Sub watershed. The eastern portion of the study area contains tributaries of King Creek and the western portion contains tributaries of Cold Creek.

In the Humber River there are 74 species that have been identified in the past 150 years, 64 of which are native. Fish sampling records were obtained from Land Information Ontario and were used to characterize the fish community within the study area. Fish records for Kings Creek indicate the presence of Creek Chub (*Semotilus atromaculatus*) and White Sucker (*Catostomus commersonii*). Species at risk mapping also indicate the presence of Redside Dace in the main branch of King Creek downstream of the study area. There were several fish records identified for the Cold Creek Tributaries; however, upon further review it was determined that the ephemeral habitat would not support these species.

Critical habitats are areas that support fish during sensitive life stages such as spawning and rearing. No critical habitat that would support spawning or rearing life stages was identified in the Humber River, King Creek, or Cold Creek Tributaries within the study area, largely because of the intermittent or ephemeral nature of the watercourses.

3.2 Cultural Environment

Along with field visits and review of background materials and previous studies, the following studies were completed to define the cultural environment in the study area:

- Stage 1 Archeological Assessment.
- Heritage Study.

The studies can be found in Appendix B.

3.2.1 Archaeological Resources

The Stage 1 Archaeological Assessment was completed to evaluate the properties' geography, fieldwork, and current land condition. Within the study area, there is a presence of numerous previously identified archeological sites, designated and non-designated archeological resources, primary and secondary water sources, and documented pre-ca. 1900 Euro-Canadian settlement.

A background review, detailed desktop review, and visual inspection of properties was carried out in the following seven locations where upgrades are expected to occur:

1. Water System Servicing Locations:
   a. Existing Well #2 (22 Faris Avenue).
   b. Potential Well Site F (12650 Highway 27).
   c. Existing Well #5 and Potential Well at Site H (12860 Highway 27).
2. Wastewater Servicing Locations:
   a. Force Main (follows an easement north of Janet Avenue PS into 5885 King Road, encompassing the right-of-way of King Road westward to Nobleton WRRF access road into the WRRF).
   b. Nobleton WRRF (7277 King Road).
   c. Janet Avenue PS (66 Janet Avenue).
   d. Nobleton WRRF Outfall (500 metres westward from Nobleton WRRF).

A large portion of these locations have been subjected to deep and extensive disturbances (e.g., existing roadways, buried utilities, previous construction activities) that have removed any archeological potential. Moreover, several areas have also been subject to previous archeological assessments and cleared of further archeological concern.

For existing Well #2, future Well Site F, force main route, and Janet Avenue PS small portions of these parcels have been identified as areas of archeological potential. These portions of the parcels neither exhibit extensively disturbed conditions nor contain physical features of no or low archeological potential and therefore are considered to retain archeological potential.

The Wesleyan Methodist Cemetery, a currently inactive mid- to late nineteenth century cemetery, is adjacent to the force main route along King Road. Because of the early establishment of the cemetery (ca. 1849) and the disappearance of many original markers and monuments, there is a potential to recover archeological resources within these areas. Some portions of the force main route are adjacent to the cemetery. The Stage 1 Archeological Assessment recommended that if development were to occur in land adjacent to the Wesleyan Methodist Cemetery identified as having moderate or high archeological potential, a Stage 2 and Stage 3 archeological assessment will be required.

3.2.2 Built Heritage Resources and Cultural Heritage Landscape Features

A Cultural Heritage Assessment consisting of background research, data collection, and field review was conducted to identify built heritage resources (BHRs) and cultural heritage landscapes (CHLs) in the study area.

Based on a review of available municipal, provincial, and federal data, there are a total of 30 BHRs and CHLs in the study area; 22 were previously identified and the remaining eight are considered potential BHRs and CHLs identified during background research and field review. Based on the type of resources, physical location, architectural style, and/or function, some of these individual resources were combined into larger CHL resulting in a total of four BHRs and nine CHLs within the study area. Table 3-3 presents a summary of the heritage resources in the study area.

Table 3-3 Summary of Built Heritage Resources and Cultural Heritage Landscapes Features

Resource	Type	Address	Recognition
BHR 1	Residence	12855 Highway 27	Potential BHR, identified during background research and field review
BHR 2	Residence	12863 Highway 27	Potential BHR, identified during background research and field review
BHR 3	Residence	9 Ellis Avenue	Known, listed Cultural Heritage Property Inventory
BHR 4	Residence	29 Faris Avenue	Potential BHR, identified during background research and field review
CHL 1	Farmscape	12805 Highway 27	Known, listed Cultural Heritage Property Inventory
CHL 2	Settlement Centre	Nobleton Settlement Centre	Potential CHL, identified during background research and field review
CHL 3	Cemetery	6400 King Road	Known, designated Pat IV (bylaw #2009-109)
CHL 4	Farmscape	6770 King Road	Known, listed Cultural Heritage Property Inventory
CHL 5	Former Farmscape	6845 King Road	Potential CHL, identified during background research and field review
CHL 6	Farmscape	7300 King Road	Known, listed Cultural Heritage Property Inventory
CHL 7	Farmscape	7305 King Road	Known, listed Cultural Heritage Property Inventory
CHL 8	Farmscape	12705 Concession Road 11	Potential CHL, identified during background research and field review
CHL 9	Waterway	Humber River	Known, Canadian Heritage River System

3.3 Socioeconomic Environment

Field visits, review of background material, and different studies were completed to define the socio-economic environment. The studies can be found in Appendix B.

3.3.1 Land Use

The study area is primarily situated within a rural setting of the Township of King and the suburban setting of Nobleton. The study area encompasses typical features associated with a suburban community: residential subdivisions, schools, churches, cemeteries, business plazas, small businesses, grocery stores, restaurants, parks, public library, fire station, etc. The centre of the community is intersected by King Road and Highway 27, which lead outward to largely undeveloped rural areas, consisting of open agricultural fields, woodlots, and several farm complexes. All locations where current and potential water and wastewater infrastructure are primarily located in previously developed lands; few locations remain undeveloped consisting of grassed margins, agricultural fields, areas of overgrown vegetation, and manicured yards.

4.0 Alternative Solutions

As part of Phase 2 of the MCEA, all reasonable and feasible alternative solutions shall be identified and evaluated. Based on the needs identified during Phase 1, different alternative solutions were developed during Phase 2 to address the water and wastewater servicing needs. TM 2, Identify Alternative Solutions, can be found in Appendix A.

4.1 Screening and Evaluation Methodology

A two-stage process was used for the selection of the preferred alternative solution. The first stage is screening the long list of alternatives against a screening criteria and the second stage is evaluating the short list of alternatives. This process provides a clear and simple way to identify which alternatives are technically feasible whilst meeting current regulations.

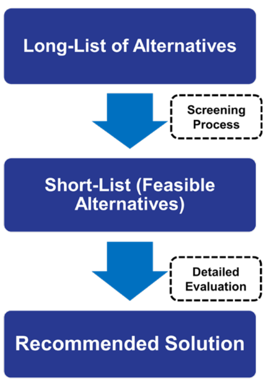


Figure 4-1 Screening and Evaluation Methodology

4.1.1 Stage 1: Screening Long List of Alternatives

In this stage the feasibility of each alternative was determined by comparing it against a set of Pass (✓) or Fail (✗) screening criteria shown in Table 4-1.

Table 4-1 Screening Criteria for Nobleton's Water and Wastewater Servicing Solutions

"Pass/Fail" Screening Criteria
TECHNICAL • The alternative will be able to support the forecasted growth and provide capacity for the community of Nobleton.
JURISDICTIONAL/REGULATORY • The alternative will be able to comply with all existing and proposed regulations and land use policies, including the following: ○ Provincial Policy Statement. ○ Green Belt Plan. ○ Oak Ridges Moraine Conservation Plan. ○ Watershed Management Plan. ○ Great Lakes – St. Lawrence River Basin Sustainable Water Resources Agreement. ○ Municipal and Community Plans for York Region. ○ York Region Master Plan, Standards, and Design Guidelines. ○ Clean Water Act.

4.1.2 Stage 2: Evaluation of Short List of Alternatives

The resulting short-listed solutions from the screening process were then subject to a detailed evaluation. Evaluation criteria were developed and categorized to assess short-term (construction and commissioning) and long-term (permanent) impacts of the proposed alternative water and wastewater servicing solutions. A description of the evaluation criteria used is shown in Table 4-2.

Alternatives were rated based on how well it performed in addressing the specified criterion. Overall performance of each alternative was determined based on the combination of individual criterion performance rating. The evaluations used the "Traffic Light Assessment" method, where each alternative was scored as green, yellow, or red for each criterion.

Table 4-2 Description of Evaluation Criteria for Short List of Alternatives

Criteria		Description/Considerations	Performance Rating
TECHNICAL			
A.	Constructability	• What are the major construction challenges and risks (e.g., crossing environmentally sensitive areas, noise, odour, dust, public safety, traffic) associated with the alternative? To what extent does it impact the community? • How much volume and complexity of construction will be associated with the alternative?	(green) Low Impact *(Low Construction Impact/Complexity)* (yellow) Moderate Impact *(Moderate Construction Impact/Complexity)* (red) High Impact *(Higher Construction Impact/Complexity)*
B.	Redundancy of Supply/Service	• Will the alternative be able to provide improvements in redundancy of supply or service?	(green) High Redundancy (yellow) Moderate Redundancy (red) Low Redundancy
C.	Resilience to Climate Change	• Is the alternative resilient against changing climate conditions, such as the following: ○ Changes to water supply quantity and quality (e.g., because of drought). ○ Increase of intensity and frequency of wet weather flow events.	(green) High Resilience (yellow) Moderate Resilience (red) Low Resilience
D.	Operations & Maintenance (O&M) Requirements	• What will be the level of additional and new O&M resources (e.g., human resources) required for the alternative? • What will be the level of complexity and maintainability of new and optimized assets?	(green) Low Complexity/O&M Requirements (yellow) Moderate Complexity/O&M Requirements (red) High Complexity/O&M Requirements
E.	Adaptability to Existing Infrastructure	• What will be the level of modification required to the existing infrastructure to adapt to the alternative? What is the relative ease of connection to the existing alternative?	(green) High Adaptability (yellow) Moderate Adaptability (red) Low Adaptability
F.	Maximizing Use of Existing Infrastructure	Will the alternative be able to maximize the capacity of the existing infrastructure to reduce new asset needs?	(green) High Degree (*Efficient Use of Existing Infrastructure)* (yellow) Moderate Degree (*Partial Use of Existing Infrastructure)* (red) Low Degree (*Inefficient Use of Existing Infrastructure)*

Criteria		Description/Considerations	Performance Rating
NATURAL ENVIRONMENT			
G.	Aquatic Vegetation and Wildlife	• Will the alternative have significant impacts during construction and/or from ongoing operations on the following: ○ Streams and rivers. ○ Local aquatic species and habitats. ○ Environmentally sensitive areas, aquatic species at risk, or locally significant aquatic species.	Low Impact Moderate Impact High Impact
H.	Terrestrial Vegetation and Wildlife	• Will the alternative have significant impacts during construction and/or from ongoing operations on the following: ○ Trees and vegetation. ○ Local terrestrial species and habitats. ○ Environmentally sensitive areas, species at risk and locally significant species.	Low Impact Moderate Impact High Impact
I.	Groundwater Resources	• Will the alternative have significant impacts during construction and/or from ongoing operations on aquifers and groundwater resources such as the following: groundwater quantity, groundwater recharge quality and flow regime, and groundwater discharge to streams and wetlands?	Low Impact Moderate Impact High Impact
J.	Surface Water Resources	• Will the alternative have significant impacts during construction and/or from ongoing operations on adjacent surface water resources (e.g., Humber River) and related biological communities?	Low Impact Moderate Impact High Impact
K.	Greenhouse Gas (GHG) Emissions	• What will be the level of impact of GHG emissions associated with the alternative? *(GHG emissions will be evaluation based on the alternative's energy intensity requirements.)*	Low Impact Moderate Impact High Impact
SOCIOECONOMIC ENVIRONMENT			
L.	Short-Term Community Impacts (Impacts to Community during Construction)	• Will the alternative have significant short-term impacts to the community during construction, including the following: ○ Noise, dust, and odour. ○ Local traffic.	Low Impact Moderate Impact High Impact
M.	Long-Term Community Impact	• Will the alternative have significant long-term impacts on the community, including the following: ○ Impact of Operating Facility. ○ Visual Impact. ○ Public acceptance/resistance (any potential resistance to the proposed servicing solution? [e.g. resistance to growth/resistance to well supply]).	Low Impact Moderate Impact High Impact
N.	Archaeological Sites	• Will the alternative have significant impacts during construction and/or from ongoing operations on registered/known archaeological features?	Low Impact Moderate Impact High Impact

Criteria		Description/Considerations	Performance Rating
O.	Cultural/Heritage Features	• Will the alternative have significant impacts during construction and/or from ongoing operations on known cultural landscapes and built heritage features?	Low Impact Moderate Impact High Impact
FINANCIAL			
P.	Capital Cost	• What will be the relative capital cost for the alternative?	Low Cost Alternative Moderate Cost Alternative High Cost Alternative
Q.	Lifecycle Cost	• What will be the relative lifecycle cost for the alternative?	Low Cost Alternative Moderate Cost Alternative High Cost Alternative
R.	Land Acquisition Cost	• What will be the relative land acquisition cost for the alternative?	Low Cost Alternative Moderate Cost Alternative High Cost Alternative
JURISDICTIONAL/REGULATORY			
S.	Land Requirements	• What will be the relative area of non-regional land or easement required to construct the alternative?	Low Requirement Moderate Requirement High Requirement
T.	Ability to Accommodate Potential Future Regulatory Changes	• Will the alternative have the ability to adapt to potential future changes in drinking water quality and final effluent requirements?	High Adaptability Moderate Adaptability Low Adaptability
U.	Permits and Approval	• What will be the level of permits and approvals required to construct the alternative?	Low Requirement Moderate Requirement High Requirement

4.2 Water System Alternative Solutions: Supply and Storage

Because of the different needs of the water system to meet the forecasted growth, the water system alternative solutions were split up as follows:

- Alternative solutions to address supply deficit.
- Alternative solutions to address storage deficit.

4.2.1 Water Supply Alternative Solutions

In 2019, the Region of York's Water Resources Group conducted a desktop groundwater supply options study to assess the ability of the existing groundwater resources to help meet future water demands. The study identified Nobleton Well #2 as the only well with sufficient drawdown to increase its capacity.

Knowing that out of the three existing wells only Well #2 can be increased in capacity, the following eight alternative servicing solutions were developed:

1. **Do Nothing**: Permit the growth, but do not increase the capacity of the existing water supply system.
2. **Limit Growth:** Limit the growth up to the existing capacity of the current water supply system.
3. **Water Conservation:** Implement practices for efficient water use to reduce water usage per person.
4. **Increase Capacity of Existing Well(s):** Increase water production and treatment capacity from existing well sites through facility upgrades and increases to PTTWs.
5. **Increase Capacity of Existing Well #2 in Combination with a New Production Well:** Increase the production and treatment capacity of Well #2 to 32 L/s in addition to a new well with a capacity of 32 L/s. Based on the location of the new well, the following sub-alternative solutions were considered:
    a. **Increase Capacity of Existing Well #2 and Add New Well at Site H:** Site H is located at the same site as the Existing Nobleton Well #5.
    b. **Increase Capacity of Existing Well #2 and Add New Well at Site F:** Site F is located along lands adjacent to Highway 27 approximately 950 metres south of King Road.
6. **Increase Capacity Only with New Production Wells:** Establish two new well sites along with their associated treatment facilities to meet the projected demand.
7. **Blended System with Addition of Lake Based Connection to Existing Wells**: Construct a new transmission main (and booster pump station) to connect to existing nearby lake-based water system (Kleinburg or King City).
8. **New Water Supply Source from Humber River:** Construct a new water treatment plant, pump station, and watermain to use the main branch of the Humber River as a new water supply source.

4.2.1.1 Screening of Long List of Alternatives for Water Supply Solution

The long list of alternative solutions was screened against the criteria established in Table 4-1. The screening results are presented in Table 4-3.

Out of the eight alternatives, three passed the screening criteria and are considered for further evaluation. Alternative 1, "Do Nothing," was also carried forward as a baseline for comparison. In total, the following four alternatives were carried forward:

1. Do Nothing.
2. Increase Capacity of Existing Well(s) in Combination with New Production Well(s).
    a. Increase Existing Well #2 and Add New Well at Site H.
    b. Increase Existing Well #2 and Add New Well at Site F.
3. Increase Capacity Only with New Production Well(s).
4. Blended System with Addition of Lake Based Connection to Existing Wells *(conditional pass only if well alternatives are not deemed feasible due to restrictions of lake-based servicing in the area*).

Table 4-3 Screening of the Long List of Alternative Water Supply Solutions

Alternative Solutions	Technical	Jurisdictional	Notes
1. Do Nothing	×	✓	• **This alternative is unable** to provide additional capacity for the forecasted growth. However, it is not screened out to provide a baseline for comparison of the alternatives.
2. Limit Growth	×	✓	• **Eliminated** because of its inability to meet the forecasted growth.
3. Water Conservation	×	✓	• **Eliminated** as a stand-alone alternative because water conservation alone is unable to account for all the growth in water supply needs. • Water conservation should be accounted for in the overall servicing strategy because it can help partially reduce the projected demands.
4. Increase Capacity of Existing Well(s)	×	✓	• **Eliminated** as a stand-alone alternative as it cannot support the forecasted growth. Out of three existing wells, only Well #2 is has the potential to increase capacity.
5A. and 5B. Increase Capacity of Existing Well(s) in Combination with New Production Wells	✓	✓	• **Proceed to Detailed Evaluation**. Able to support forecasted growth in the community of Nobleton while meeting the jurisdictional and regulatory requirements.
6. Increase Capacity Only with New Production Wells	✓	✓	• **Proceed to Detailed Evaluation**. Able to support forecasted growth in the community of Nobleton while meeting the jurisdictional and regulatory requirements.
7. Blended System with Addition of Lake Based Connection to Existing Wells	✓	✓(*)	• **Conditionally* **Proceed to Detailed Evaluation**. The Greenbelt Plan restricts the extension of lake-based water servicing, unless well supply is proven to be insufficient to service the forecasted community growth, because of either quality reasons (water quality unable to meet required standards) or quantity (insufficient well capacity available from aquifer). • This alternative would become feasible if increasing well capacity in Nobleton is deemed not feasible.
8. New Water Supply Source from the Main Branch of the Humber River	×	✓	• **Eliminated** because of the Humber River's limited capacity as a new source of water supply.

4.2.1.2 Evaluation of Short List of Alternatives for Water Supply Solution

A detailed evaluation of the short-listed alternatives was carried out in accordance with the evaluation methodology described in Table 4-2. The results of this evaluation are presented in Table 4-4.

Although Alternative 2a and 2b ranked similarly, the evaluation of the short-list of alternative solutions favored **Alternative 2b: Increase Existing Well #2 and Add New Well at Site H** primarily because of the lower short-term construction impacts. The following considerations favored Alternative 2b:

- **Technical:** Alternative 2a and 2b both ranked similarly because of their aim to maximize capacity of existing Well #2, and low O&M complexity. However, Alternative 2b ranked higher in terms of constructability because of lower traffic impacts during construction.
- **Environmental:** Alternative 4 is the only alternative that was determined to have significant impacts on aquatic and terrestrial vegetation and wildlife as well as greenhouse emissions. All other alternatives ranked similarly in terms of environmental impacts.
- **Socioeconomic:** Alternative 2b ranked better because it has less short-term construction impacts and will not require additional archeological assessments that Alternative 2a does.
- **Financial:** Both Alternatives 2a and 2b were found to be of low cost with Alternative 2b having slightly lower capital because no land acquisition is required.
- **Jurisdictional:** Alternative 2b has the least jurisdictional/regulatory requirements because it is the only alternative that requires no new land acquisition.

Table 4-4 Evaluation of Short-Listed Water Supply Alternative Design Concepts

Evaluation Criteria	1. Do Nothing	2a. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site F	2b. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site H	3. Increase Capacity Only with New Production Wells	4. Blended System with Addition of Lake Based Connection to Existing Wells
TECHNICAL					
CONSTRUCTABILITY	**LOW IMPACT** • No construction to be conducted	**MODERATE IMPACT** • Minor impact expected in the residential neighborhood adjacent to Well #2 and no major constructability challenges are expected for the construction of the new well Site F. • There would be some traffic impacts associated with connecting to the existing distribution network along Highway 27 and a stream crossing. • Longer construction schedule than B2.	**LOW IMPACT** • Minor impact expected in the residential neighborhood adjacent to Well #2 during upgrades. • Maintaining operation of Well #5 during construction at the existing site would require constructability review and staging. • Connection to the existing distribution network could be made at Site H, resulting in fewer challenges than connection to B1.	**MODERATE IMPACT** • Site F would have minimal construction challenges but connection to the existing distribution network would impact traffic along Highway 27 and require stream crossing. • Construction of a new well at Site H would require constructability review and staging to maintain operation of Well #5. • Relatively high volume of construction required for two new production wells.	**HIGH IMPACT** • Approximately five stream crossings are expected for the transmission main, and dewatering may be required. • Low utility conflicts are expected. Most construction work is to be within right-of-way; however, the transmission main will cross through Green Belt zones. Moderate impacts on local traffic. • High construction required because of transmission main and PS.

Evaluation Criteria	1. Do Nothing	2a. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site F	2b. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site H	3. Increase Capacity Only with New Production Wells	4. Blended System with Addition of Lake Based Connection to Existing Wells
REDUNDANCY OF SUPPLY/SERVICE	**LOW REDUNDANCY** • Without any system upgrades, the forecasted growth cannot be met; therefore, there is also insufficient redundancy.	**MODERATE REDUNDANCY** • The largest well can be taken out of service while still being able to supply the maximum demand. • Concern all wells are within the same source. • Relative to Alternative 2b, somewhat greater available well supply (pumping rate). Allows for better redundancy if other wells are taken out of service.	**MODERATE REDUNDANCY** • The largest well can be taken out of service while still being able to supply the maximum demand. • Concern all wells are within the same source.	**MODERATE REDUNDANCY** • The largest well can be taken out of service while still being able to supply the maximum demand. • Concern all wells are within the same source. • Minor risk if local surface level spill occurs at Site H, could affect new well and existing Well #5 because both wells would share a facility.	**HIGH REDUNDANCY** • Improvement in redundancy because of the addition of lake-based supply via transmission main along with the existing well supply. • Increased reliability from any supply issues caused by having two different supply sources: lake based (surface water) and groundwater.
RESILIENCE TO CLIMATE CHANGE	**LOW RESILIENCE** • Without any system upgrades, the forecasted growth cannot be met; therefore, there is also no resilience to increasing demands caused by climate change.	**MODERATE RESILIENCE** • Deep groundwater well supply is generally resistant to changing climate. • Quality of groundwater is more resilient to climate change than lake-based supplies because of the potential algae blooms in lakes. • Less flexibility to high demands.	**MODERATE RESILIENCE** • Deep groundwater well supply is generally resistant to changing climate. • Quality of groundwater is more resilient to climate change than lake-based supplies because of the potential algae blooms in lakes. • Less flexibility to high demands.	**MODERATE RESILIENCE** • Deep groundwater well supply is generally resistant to changing climate. • Quality of groundwater is more resilient to climate change than lake-based supplies because of the potential algae blooms in lakes. • Less flexibility to high demands.	**MODERATE RESILIENCE** • Lake-based system would have more flexibility to increase supply within shorter notice in comparison to groundwater supply. • This alternative has flexibility because it could use either source if/when future challenges arise.

Evaluation Criteria	1. Do Nothing	2a. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site F	2b. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site H	3. Increase Capacity Only with New Production Wells	4. Blended System with Addition of Lake Based Connection to Existing Wells
O&M REQUIREMENTS	**LOW COMPLEXITY** (green) • No upgrades, so there are no additional facilities to operate and maintain.	**LOW COMPLEXITY** (green) • Low additional resource requirements to maintain and operate one new production well. • No major changes in O&M requirements at existing wells. Well #2 would have additional treatment O&M requirements to replenish chlorine and sodium silicate. • More space at this site for significant maintenance work than Alternative 2b.	**LOW COMPLEXITY** (green) • Low additional resource requirements to maintain and operate one new production well at same site as existing Well #5. • No major changes in O&M requirements are expected at existing wells. Well #2 would have additional treatment O&M requirements to replenish chlorine and sodium silicate. • Convenient for daily tasks to have two wells at same site; however, less space at this site for significant maintenance work.	**MODERATE COMPLEXITY** (yellow) • Moderate additional resource requirements to maintain and operate two new wells. • No major changes in O&M requirements are expected at existing wells. • No major impact to system complexity. • Convenient for daily tasks to have two wells at Site H. Space constraints for significant maintenance work because of operating two wells from one facility.	**HIGH COMPLEXITY** (red) • Potential O&M increases because the high-water age of supply from the lake-based system would likely require increased flushing (lower-tier). • Low additional resource requirements to maintain and operate new PS. • Existing wells are still to be maintained as backup/emergency supply (some blending of sources will occur when the wells operate with the lake-based supply, which may potentially cause water quality issues).

Evaluation Criteria	1. Do Nothing	2a. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site F	2b. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site H	3. Increase Capacity Only with New Production Wells	4. Blended System with Addition of Lake Based Connection to Existing Wells
ADAPTABILITY TO EXISTING INFRASTRUCTURE	**HIGH ADAPTABILITY** • No planned upgrades, so there is no new infrastructure that needs to connect to the existing system.	**MODERATE ADAPTABILITY** • Minor changes required at existing Well #2 and its associated treatment facility to increase capacity. • Connecting piping from new production well to existing distribution piping would requires stream crossing and traffic impacts to Highway 27. • New connection to sanitary sewer required, or storage facility for disposal of sanitary and treatment process waste.	**HIGH ADAPTABILITY** • Minor changes required at existing Well #2 and its associated treatment facility to increase capacity. • Connecting piping from the new production well to the existing facility expected to be straightforward. • Initial assessment of Well #5 site indicates that it can allow for the expansion of the existing treatment facility to accommodate both the new and existing wells; however, some existing infrastructure may need to be relocated.	**MODERATE ADAPTABILITY** No new changes required to existing infrastructure. • At Site H connecting piping from new production well to existing facility expected to be straightforward. • At Site F connecting piping from new production well to existing distribution piping would require stream crossing and traffic impacts to Highway 27.	**LOW ADAPTABILITY** • Modification to the existing infrastructure is expected. There is a need to convert chlorine disinfection at to chloramine disinfection to be consistent with the lake-based water supply (or vice versa). • Potential challenges in Kleinburg system if upgrades are needed at Kleinburg BPS. • Lake-based supply systems have reduced alkalinity, which could impact wastewater treatment process requirements.

Evaluation Criteria	1. Do Nothing	2a. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site F	2b. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site H	3. Increase Capacity Only with New Production Wells	4. Blended System with Addition of Lake Based Connection to Existing Wells
MAXIMIZING USE OF EXISTING INFRASTRUCTURE	**LOW DEGREE** • Without any system upgrades, there is no ability to maximize the capacity of existing infrastructure.	**HIGH DEGREE** • Continues to use all existing wells and maximizes capacity of existing Well #2.	**HIGH DEGREE** • Continues to use all existing wells and maximizes capacity of existing Well #2. • Uses existing Well #5 treatment facility but some more new equipment is needed.	**MODERATE DEGREE** • Continues to use all existing wells and maximizes capacity of existing Well #2.	**LOW DEGREE** • New connection would become the primary source of water supply. Existing wells would only be used for emergency or backup supply.
OVERALL TECHNICAL RATING	**HIGH IMPACT** • Without any system upgrades, the forecasted growth cannot be met.	**MODERATE IMPACT** • Moderate impacts because of constructability and ability to adapt to existing infrastructure. Low complexity of O&M. Maximizes use of existing infrastructure. • All groundwater alternatives provide moderate redundancy and resiliency.	**LOW IMPACT** • Low impacts associated with constructability, low complexity of O&M, and ability to adapt to existing infrastructure. Maximizes use of existing infrastructure. • All groundwater alternatives provide moderate redundancy and resiliency.	**MODERATE IMPACT** • Moderate impacts because of constructability, O&M complexity, and ability to adapt to existing infrastructure. Moderately maximizes existing infrastructure. • All groundwater alternatives provide moderate redundancy and resiliency.	**HIGH IMPACT** • High impacts because of constructability, high complexity of O&M, low adaptability to existing infrastructure, and low degree of maximizing use of existing infrastructure.

Evaluation Criteria	1. Do Nothing	2a. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site F	2b. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site H	3. Increase Capacity Only with New Production Wells	4. Blended System with Addition of Lake Based Connection to Existing Wells
ENVIRONMENTAL					
AQUATIC VEGETATION AND WILDLIFE	**LOW IMPACT** • Without any system upgrades, there is no impact to aquatic vegetation/ wildlife.	**LOW IMPACT** • No significant risk to aquatic vegetation and wildlife. Minimal impact expected from expansion of existing well. • Potential short-term impact during construction of new well caused by erosion and sediment washout. Non-damaging construction techniques and erosion controls to be used.	**LOW IMPACT** • Slightly higher risk to aquatic vegetation and wildlife is expected than Alternative 2a because Site H is adjacent to a watercourse. This watercourse is linked to residence and therefore has stringent discharge requirements. • Minimal impact expected from expansion of existing well. • Potential short-term impact during construction.	**LOW IMPACT** • Slightly higher risk to aquatic vegetation and wildlife is expected than Alternative 2a because Site H is adjacent to a watercourse. This watercourse is linked to residence and therefore has stringent discharge requirements. • Potential short-term impact during construction of two new wells caused by erosion and sediment washout.	**MODERATE IMPACT** • Moderate to significant impact with approximately five stream crossings are expected. • Small risk of impact resulting from future watermain break resulting in the discharge of chlorinated water to streams. • Potential short-term impact during construction of new PS caused by erosion and sediment washout.

Evaluation Criteria	1. Do Nothing	2a. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site F	2b. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site H	3. Increase Capacity Only with New Production Wells	4. Blended System with Addition of Lake Based Connection to Existing Wells
TERRESTRIAL VEGETATION AND WILDLIFE	**LOW IMPACT** (green) • Without any system upgrades, there is no impact to terrestrial vegetation/ wildlife.	**MODERATE IMPACT** (yellow) • Minimal impact is expected from upgrades at existing well. • New well site currently being considered does avoid environmentally sensitive areas. • Limited impact expected, but some impact from construction likely to remain.	**MODERATE IMPACT** (yellow) • Minimal impact is expected from upgrades at existing well. • New well site currently being considered does avoid environmentally sensitive areas. • Limited impact expected, but some impact from construction likely to remain.	**MODERATE IMPACT** (yellow) • New well sites currently being considered do both avoid environmentally sensitive areas, wetlands, water bodies, etc. • Limited impact expected, but some impact from construction likely to remain.	**HIGH IMPACT** (red) • Potential impact because of construction in right-of-way through the Green Belt zone are expected. • Depending on the location of new BPS, there is potential risk associated with construction of the new pump station on a greenfield site. Phase 3 site selection would generally consider this impact.
GROUNDWATER RESOURCES	**LOW IMPACT** (green) • Without any system upgrades, there is no impact to terrestrial vegetation/ wildlife.	**MODERATE IMPACT** (yellow) • High transmissivity of aquifer indicates groundwater supply potential. No significant risk to groundwater resources is expected. • Based on aquifer testing, new well at Site F is expected to achieve the target pumping rate of 35+ L/s.	**MODERATE IMPACT** (yellow) • High transmissivity of aquifer indicates groundwater supply potential. No significant risk to groundwater resources is expected. • Based on aquifer testing, new well at Site H is expected to achieve the target pumping rate of 32+ L/s.	**MODERATE IMPACT** (yellow) • High transmissivity of aquifer indicates groundwater supply potential. No significant risk to groundwater resources is expected. • Based on aquifer testing, wells at Site F and H are both expected to achieve the target pumping rate of 32+ L/s.	**LOW IMPACT** (green) • No significant risk to groundwater resources is expected.

Evaluation Criteria	1. Do Nothing	2a. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site F	2b. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site H	3. Increase Capacity Only with New Production Wells	4. Blended System with Addition of Lake Based Connection to Existing Wells
		• Less groundwater interference effects to the existing municipal well network than 2b. • 2a is expected to have minor interference effects (<1 metre drawdown) with three private wells screened in the Scarborough Aquifer located on Hilda Road/ Diana Drive. This interference is not expected to adversely affect groundwater quality or quantity in the existing private wells.	• A new pumping well at 2b will have moderate interference effects with the existing municipal well network, particularly Well #5. However, detailed hydraulic testing demonstrated that these effects would not adversely affect yields from 2b or the existing municipal well network. • No private wells are expected to be affected under 2b.	• A new well at Site F is expected to have minor interference effects (<1 metre drawdown) with three private wells screened in the Scarborough Aquifer located on Hilda Road/ Diana Drive. This interference is not expected to adversely affect groundwater quality or quantity in the existing private wells. • A new pumping well at Site H will have moderate interference effects with the existing municipal well network, particularly Well #5. However, detailed hydraulic testing demonstrated that these effects would not adversely affect yields from the new well or the existing municipal well network.	
SURFACE WATER RESOURCES	**LOW IMPACT** • Without any system upgrades, there is no impact to terrestrial vegetation/ wildlife.	**LOW IMPACT** • No significant risk to surface water resource.	**LOW IMPACT** • No significant risk to surface water resources.	**LOW IMPACT** • No significant risk to surface water resources.	**LOW IMPACT** • No significant risk to surface water resources.

Evaluation Criteria	1. Do Nothing	2a. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site F	2b. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site H	3. Increase Capacity Only with New Production Wells	4. Blended System with Addition of Lake Based Connection to Existing Wells
GHG EMISSIONS	**LOW IMPACT** • Without any system upgrades, there is no added impact GHG emissions.	**MODERATE IMPACT** • Energy required from wells are generally low. Existing Nobleton wells have an approximate energy intensity of 900 kWh/ML.	**MODERATE IMPACT** • Energy required from wells are generally low. Existing Nobleton wells have an approximate energy intensity of 900 kWh/ML.	**MODERATE IMPACT** • Energy required from wells are generally low. Existing Nobleton wells have an approximate energy intensity of 900 kWh/ML.	**HIGH IMPACT** • Energy required to pump from Lake Ontario to Nobleton is significantly higher than groundwater wells. Lake Ontario energy intensity is greater than 1,500 kWh/ML.
OVERALL ENVIRONMENTAL RATING	**LOW IMPACT** • Without any system upgrades, there are no environmental impacts.	**MODERATE IMPACT** • No significant risks to aquatic vegetation and wildlife and surface water resources. • Minimal impacts to terrestrial vegetation and wildlife expected. • Moderate impact to groundwater resources and GHG emissions.	**MODERATE IMPACT** • No significant risks to aquatic vegetation and wildlife and surface water resources. • Minimal impacts to terrestrial vegetation and wildlife expected. • Moderate impact to groundwater resources and GHG emissions.	**MODERATE IMPACT** • No significant risks to aquatic vegetation and wildlife and surface water resources. • Minimal impacts to terrestrial vegetation and wildlife expected. • Moderate impact to groundwater resources and GHG emissions.	**HIGH IMPACT** • Moderate to significant impacts expected to aquatic and terrestrial vegetation and wildlife. • High impacts to GHG emissions.

Evaluation Criteria	1. Do Nothing	2a. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site F	2b. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site H	3. Increase Capacity Only with New Production Wells	4. Blended System with Addition of Lake Based Connection to Existing Wells
SOCIOECONOMIC					
SHORT-TERM COMMUNITY IMPACTS	**LOW IMPACT** • Without any system upgrades, there are no environmental impacts.	**MODERATE IMPACT** • Well #2 is within the residential neighborhood, noise, dust, and construction traffic will cause some short-term impacts to the neighborhood. • Connecting to the existing distribution network at Highway 27 would impact traffic along highway. Mitigation measures will be employed during design and construction to minimize impact. • Well Site F is adjacent to Highway 27 and within 300 metre radius of residential properties, so some short-term impact will exist.	**LOW IMPACT** • Well #2 is within the residential neighborhood, noise, dust, and construction traffic will cause some short-term impacts to the neighborhood. Mitigation measures will be employed during design and construction to minimize impact. Construction confined to existing sites. • Well Site H is adjacent to some residential properties, increasing effects of short-term impacts such as noise and dust on local community.	**MODERATE IMPACT** • Short-term impact/nuisance to the community are expected during construction of the new well at Site H. • Well Site H is adjacent to some residential properties, increasing effects of short-term impacts such as noise and dust on local community. • Connecting to the existing distribution network at Site F would impact traffic along Highway 27. Well Site F is adjacent to Highway 27 and within 300 metre radius of residential properties, so some short-term impact will exist.	**HIGH IMPACT** • Construction of new transmission main would impact local traffic, routes will be assessed to minimize impact. • Likely that a 5 km stretch of Highway 27 would cause greater short-term impact than well alternatives. • Short-term impact/nuisance to the community are expected during construction of pump station, including the following: noise, dust, and impact to the local traffic. Mitigation measures will be employed during design and construction to minimize impact.

Evaluation Criteria	1. Do Nothing	2a. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site F	2b. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site H	3. Increase Capacity Only with New Production Wells	4. Blended System with Addition of Lake Based Connection to Existing Wells
LONG-TERM COMMUNITY IMPACTS	**MODERATE IMPACT** • Without any system upgrades, it is not possible to meet the forecasted growth. This would impact the community since the growth helps the local economy grow.	**MODERATE IMPACT** • One new facility to accommodate treatment would be constructed. New well site can be designed to mitigate long-term impact to community. • Minimal visual and operating impacts are expected. • Potential ongoing aesthetic complaints from residents regarding groundwater quality because of high iron and manganese. • Potential impacts to community from new WHPA (e.g., restrictions on herbicide and pesticide use on nearby agricultural land).	**MODERATE IMPACT** • Expanded existing facility to accommodate treatment would be constructed. Upgraded well site can be designed to mitigate long-term impact to community. • Minimal visual and operating impacts are expected. • Potential ongoing aesthetic complaints from residents regarding groundwater quality because of high iron and manganese.	**MODERATE IMPACT** • One new facility to accommodate treatment would be constructed and a second existing facility would be expanded. New and upgraded well sites can be designed to mitigate long-term impact to community. • Minimal visual and operating impacts are expected. • Potential ongoing aesthetic complaints from residents regarding groundwater quality because of high iron and manganese. • Potential impacts to community from new WHPA (e.g., restrictions on herbicide and pesticide use on nearby agricultural land). Mitigation measures could be applied to reduce impacts on community.	**HIGH IMPACT** • No major long-term impact is expected after construction of transmission main. For the booster pump station, a small size pump station will provide more flexibility to search for a suitable site (e.g., with minimal likelihood of impact to community). • Minimal visual impact is expected. • The switch to lake supply could reduce water quality complaints. However, public resistance may be expected because of potential resistance to lake-based supply in case it encourages further growth/sprawl. • Does not follow the Growth Plan for the Greater Golden Horseshoe, so public resistance is expected.

Evaluation Criteria	1. Do Nothing	2a. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site F	2b. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site H	3. Increase Capacity Only with New Production Wells	4. Blended System with Addition of Lake Based Connection to Existing Wells
ARCHEOLOGICAL SITES	**LOW IMPACT** • Without any system upgrades, there is no additional construction that would lead to archaeological impact.	**LOW IMPACT** • New location would be on a greenfield site (farmland). • Stage 1 archeological assessment has not identified any major risk of archeological potential at Site F. • Stage 2 archeological assessment would be required.	**LOW IMPACT** • New location would be at the existing Nobleton Well #5 property. • Stage 1 archeological assessment has not identified any risk of archeological potential at Site H, since the entire parcel was previously assessed in 2007.	**LOW IMPACT** • Proposed locations require confirmation that no archaeological impacts exist. • Stage 2 archeological assessment would be required.	**MODERATE IMPACT** • New transmission main to be within right-of-way; therefore, minimal risk of impact expected. • Sites for the new PS could potentially be on a greenfield site, • Larger area for Stage 1 archeological assessment would be required.
CULTURAL/HERITAGE FEATURES	**LOW IMPACT** • Without any system upgrades, there is no additional construction that would lead to a cultural/heritage impact.	**LOW IMPACT** • The well locations considered are not located near any of the heritage properties in Nobleton.	**LOW IMPACT** • The well locations considered are not located near any of the heritage properties in Nobleton.	**LOW IMPACT** • The well locations considered are not located near any of the heritage properties in Nobleton.	**LOW IMPACT** • New transmission main to be within right-of-way, thus minimal risk of impact expected. • There are no heritage properties along the considered route from Kleinburg to Nobleton.

Evaluation Criteria	1. Do Nothing	2a. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site F	2b. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site H	3. Increase Capacity Only with New Production Wells	4. Blended System with Addition of Lake Based Connection to Existing Wells
OVERALL SOCIOECONOMIC RATING	**LOW IMPACT** • Without any system upgrades, there is no additional construction that would lead to socioeconomic impacts.	**MODERATE IMPACT** • Moderate short- and long-term impacts to community. • Low impacts to archeological and cultural/heritage sites/features.	**LOW IMPACT** • Low to moderate short- and long-term impacts to community. • Low impacts to archeological and cultural/heritage sites/features.	**MODERATE IMPACT** • Moderate short- and long-term impacts to community. • Low impacts to archeological and cultural/heritage sites/features.	**HIGH IMPACT** • High short- and long-term impacts to community. • Low to moderate impacts to archeological and cultural/heritage sites/features.
FINANCIAL					
LAND ACQUISITION COST	**LOW COST** • Without any system upgrades, there is no land acquisition needed.	**MODERATE COST** • One new site for the new production well at Site F will need to be purchased. • Upgrades for existing Well #2 expected to be within existing footprint.	**LOW COST** • All upgrades and expansion expected to be within the existing parcels owned at Well Site #2 and Well Site #5, so no land acquisition is required.	**MODERATE COST** • One new site for the new production well at Site F will need to be purchased.	**MODERATE COST** • New transmission main to be within the right-of-way, no additional cost for land acquisition expected. • New land would be required for a PS from Kleinburg to Nobleton; however, a relatively smaller area/land would be required in comparison to the production wells and treatment.

Evaluation Criteria	1. Do Nothing	2a. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site F	2b. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site H	3. Increase Capacity Only with New Production Wells	4. Blended System with Addition of Lake Based Connection to Existing Wells
CAPITAL COST	**LOW COST** • Without any system upgrades, there is no upfront capital cost.	**MODERATE COST** • Comparatively moderate amount of construction needed. • At Site F, new well and treatment facility will be required along with costs of connecting watermain from Site F to the existing Nobleton system along Highway 27.	**LOW COST** • Least amount of construction needed. • Site H will require a new well and contact chamber (dedicated to the new well). • Site H is located at the existing Well Site #5 and would use the upgraded existing treatment facility, avoiding the cost of a new facility.	**MODERATE COST** • Comparatively moderate amount of construction required with two new well facilities. • Connecting two new wells to the existing distribution network would be of high cost.	**HIGH COST** • Comparatively high amount of construction required with approximately 5 km of piping and a new pump station. • Would also require modifications to treatment at existing wells (chlorine to chloramine disinfection).
LIFECYCLE COST	**LOW COST** • With no system upgrades there is no associated lifecycle cost. O&M costs limited to existing costs.	**LOW COST** • One additional production well and treatment facility to maintain and operate. • Higher initial capital and land acquisition costs, but the overall lifecycle is only slightly higher when compared to 2b.	**LOW COST** • One additional production well and upgraded treatment facility to maintain and operate. • Slightly lower O&M with Site H facilities included on existing site. • Over lifecycle, slightly lower lifecycle costs when compared to 2a.	**MODERATE COST** • Two new production wells and treatment facilities to maintain and operate.	**HIGH COST** • High water age from lake-based system is likely to require closer management of flushing. • Need to maintain existing wells, despite infrequent use. • Additional O&M cost from Peel/Toronto.

Evaluation Criteria	1. Do Nothing	2a. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site F	2b. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site H	3. Increase Capacity Only with New Production Wells	4. Blended System with Addition of Lake Based Connection to Existing Wells
OVERALL FINANCIAL RATING	**LOW COST** • Without any system upgrades, no associated costs.	**MODERATE COST** • Moderate land acquisition and capital costs associated with alternative. • Similar overall lifecycle cost when compared to B2.	**LOW COST** • No land acquisition cost and lowest capital cost associated with alternative. • Lowest overall lifecycle cost.	**MODERATE COST** • Moderate land acquisition and capital costs. • Higher lifecycle costs associated with operating two new wells, as compared to 2a and 2b.	**HIGH COST** • Moderate land acquisition costs. • High capital costs and high lifecycle costs associated with alternative.
JURISDICTIONAL/REGULATORY					
LAND REQUIREMENTS	**LOW REQUIREMENT** • Without any system upgrades, there is no land acquisition needed.	**MODERATE REQUIREMENT** • A new production well will require new land acquisition at Site F.	**LOW REQUIREMENT** • No land acquisition is required.	**MODERATE REQUIREMENT** • A new production well will require new land acquisition at Site F.	**MODERATE REQUIREMENT** • PS would require new land acquisition.
ABILITY TO ACCOMMODATE POTENTIAL FUTURE REGULATORY CHANGES	**LOW ADAPTABILITY** • Without any system upgrades, does not have the ability to adapt to potential future change.	**HIGH ADAPTABILITY** • Meets current water quality regulations. Potential changes to water treatment requirements not expected to have significant impact. • Has the ability to adapt to future changes in drinking water quality requirements.	**HIGH ADAPTABILITY** • Meets current water quality regulations. Potential changes to water treatment requirements not expected to have significant impact. • Has the ability to adapt to future changes in drinking water quality requirements.	**HIGH ADAPTABILITY** • Meets current water quality regulations. Potential changes to water treatment requirements not expected to have significant impact. • Has the ability to adapt to future changes in drinking water quality requirements.	**HIGH ADAPTABILITY** • Lake-based treatment process tends to be highly adaptable to changing regulatory requirements.

Evaluation Criteria	1. Do Nothing	2a. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site F	2b. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site H	3. Increase Capacity Only with New Production Wells	4. Blended System with Addition of Lake Based Connection to Existing Wells
PERMITS AND APPROVALS	**LOW REQUIREMENT** (green) • Without any system upgrades, there are no additional permits/approvals required.	**MODERATE REQUIREMENT** (yellow) • Will require a new PTTW from the MECP for increased water takings. PTTW also required during construction (dewatering). • Site plan and local permits as required for the design and construction of the new production well and its associated treatment facility. • Permit required for stream crossing with species at risk contributing habitat.	**MODERATE REQUIREMENT** (yellow) • Will require a new PTTW from the MECP for increased water takings. PTTW also required during construction (dewatering). • Site plan and local permits as required for the design and construction of new infrastructure on the existing site. • Because of Site H's proximity to the adjacent watercourse with species at risk contributing habitat, , there are additional permits (and restrictions) regarding discharge that would need to be adhered to.	**MODERATE REQUIREMENT** (yellow) • Will require a new PTTW from the MECP for increased water takings. PTTW also required during construction (dewatering). • Site plan and local permits as required for the design and construction of new infrastructure on the existing site. • Because of Site H's proximity to the adjacent watercourse with residence, there are additional permits (and restrictions) regarding discharge that would need to be adhered to. • Permit required for stream crossing.	**HIGH REQUIREMENT** (red) • New transmission main would cross the Greenbelt Plan's "Protected Country Side" and would be challenging to acquire approvals because of Greenbelt protection. • Permits are required for the design and construction of the new watermain. • Permit requirements for dewatering (stream crossings). • Would require a modification of the Water Purchasing Agreements to bring lake-based water to Nobleton.

Evaluation Criteria	1. Do Nothing	2a. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site F	2b. Increase Capacity of Existing Well #2 in Combination with New Production Well at Site H	3. Increase Capacity Only with New Production Wells	4. Blended System with Addition of Lake Based Connection to Existing Wells
OVERALL JURISDICTIONAL/ REGULATORY RATING	**MODERATE IMPACT** (yellow) • Without any system upgrades, there is no need for land acquisition or additional permits/approvals. • Has no ability to adapt to potential future changes in drinking water quality requirements.	**MODERATE IMPACT** (yellow) • Requires new land acquisition and some additional permits/approvals. • Is able to adapt to potential future changes in drinking water quality requirements.	**LOW IMPACT** (green) • Requires no new land acquisition. • Requires some additional permits/approvals. • Is able to adapt to potential future changes in drinking water quality requirements.	**MODERATE IMPACT** (yellow) • Requires new land acquisition and some additional permits/approvals. • Is able to adapt to potential future changes in drinking water quality requirements.	**HIGH IMPACT** (red) • Requires some new land acquisition and potentially challenging permits/approvals. • Is able to adapt to potential future changes in drinking water quality requirements

4.2.2 Water Storage Alternative Solutions

To increase the water storage capacity in Nobleton from 3,845 m^3 to 3,917 m^3, the following six alternative solutions were developed:

1. **Do Nothing.** Permit the growth, but do not increase the storage capacity of the existing water supply system.
2. **Limit Growth.** Limit the growth up to the existing capacity of the current water supply system.
3. **Water Conservation.** This concept considers methods to reduce the projected maximum day water demand from 89.5 L/s to below 87.40 L/s so that additional storage is not necessary. This could involve implementing practices for efficient water use to reduce water usage per person and/or to reduce the maximum day peaking factor by reducing summer demands in particular.
4. **Modification of Existing Design Guidelines.** This concept considers modifying the current York Region Design Guideline for storage sizing. Currently, the equalization component of storage volume is calculated as 25 percent of maximum day demand, which is a general rule that is considered suitable for most systems based on a typical diurnal pattern. A detailed review of the actual diurnal pattern in Nobleton could suggest that this percentage be reduced, thereby eliminating the need for additional storage.
5. **New Storage Facility.** This concept considers the addition of a new storage facility (with volume of at least 2.055 ML) to meet the storage deficit of the Nobleton water system at the projected future demand. The existing Nobleton storage facilities were built in 1985 and 2012, respectively, so, both storage facilities are considered to have a life expectancy beyond 2040. This alternative considers a new storage facility that would act as an upsized replacement of the older Nobleton South Elevated Tank (2.041 ML). Once a new tank is built and commissioned, the existing Nobleton South elevated tank would be able to be removed from service.
6. **Supplement Increased Supply to Offset Storage Deficit.** This concept considers increasing the combined PTTW and supply capacity in Nobleton to exceed the forecasted maximum day demand (>89.5 L/s). By exceeding the maximum day demand (even slightly), it allows for the wells to operate at a higher rate during the hours when demand exceeds the average maximum day demand. This reduces the amount of equalization storage required because some of the equalization is pumped (rather than being stored). Since a well-based supply was recommended as the alternative design concept for the water supply solution, the expanded Well #2 and the new well from Site H and its treatment facilities will each need to have a total capacity of 34 L/s (an additional 2 L/s). This will bring up the combined well firm capacity to 91.5 L/s to cover the storage deficit.

4.2.2.1 Screening of Long List of Alternatives for Water Storage Solutions

The long list of alternative solutions was screened against the criteria established in Table 4-1. The screening results are presented in Table 4-5.

Out of the six alternatives, only the following two passed the screening criteria and are considered for further evaluation. Alternative 1, "Do Nothing," was also carried forward as a baseline for comparison. The following three alternatives were carried forward:

1. Do Nothing.
2. New Storage Facility.
3. Supplement Increased Supply to Offset Storage Deficit.

Table 4-5 Long-list of Alternative Storage Solutions Screening

Alternative Solutions	Technical	Jurisdictional	Notes
1. Do Nothing	×	✓	• **This alternative is unable** to provide additional storage capacity for the forecasted growth, so it does not meet the technical or jurisdictional/regulatory requirements. However, it is not screened out to provide a baseline for comparison of the alternatives.
2. Limit Growth	×	✓	• **Eliminated** because of its inability to meet the forecasted growth.
3. Water Conservation	×	✓	• **Eliminated** because of limitations and uncertainty on the effectiveness of further water conservation measures in the Nobleton community. • The Region of York does not expect further reductions to per capita water consumption in Nobleton. Recent development in Nobleton would already have included a degree of water conservation (low flow water fixtures, etc.), but there has been no clear sign of per capita consumption being reduced yet. • Despite this alternative not being carried forward, Region of York is still continuing to emphasize the benefits of water conservation to the public. Water conservation will be carried forward as a separate ongoing program in York Region.
4. Modification of Existing Design Guidelines	✓	×	• **Eliminated** because a modification to the existing design guideline does not meet the jurisdictional/regulatory criteria. It is currently deemed that there is insufficient evidence to definitively prove that the equalization storage needs in Nobleton are less than the standard (25 percent of maximum day demand).
5. New Storage Facility	✓	✓	• **Proceed to Detailed Evaluation**. A new storage facility would be able to support forecasted growth in the community of Nobleton while meeting the jurisdictional and regulatory requirements.
6. Supplement Increased Supply to Offset Storage Deficit	✓	✓	• **Proceed to Detailed Evaluation**. Increasing the combined PTTW and supply capacity in Nobleton to exceed the maximum day demand (>89.5 L/s) would allow for the forecasted growth because the equalization storage need could be reduced; thereby eliminating the need for additional storage.

4.2.2.2 Evaluation of Short List of Alternative Water Storage Solutions

A detailed evaluation of the short-listed alternatives was carried out in accordance with the evaluation methodology described in Table 4-2. The results of this evaluation are presented in Table 4-6.

The evaluation of the short list of alternative solutions favored **Alternative 3: Supplement Increased Supply to Offset Storage Deficit** because of the following considerations:

- **Technical**: This alternative maximizes the use of existing infrastructure, while avoiding unnecessary new assets; it also results in less volume and complexity compared to the other alternatives.
- **Environmental:** Alternative 3 is expected to have minimal to no negative environmental effects.
- **Socioeconomic:** This alternative would increase the capacity of facilities that are already being upgraded or built as part of the water supply solution, thus no additional impacts other than those from the water supply solution are expected.
- **Financial:** Alternative 3 will have the lowest capital and lifecycle cost.
- **Jurisdictional:** This alternative has the least jurisdictional/regulatory requirements because no land acquisition or additional permitting is required.

Table 4-6 Evaluation of Short-Listed Water Storage Alternative Design Concepts

Evaluation Criteria	1. Do Nothing	2. Add New Storage Facility	3. Supplement Increased Supply to Offset Storage Deficit
TECHNICAL			
CONSTRUCTABILITY	**LOW IMPACT** • No construction to be conducted.	**MODERATE IMPACT** • Moderate impact expected in the residential neighborhood adjacent to the existing Nobleton South elevated tank during construction. • No major constructability challenges are expected for the construction of the new storage facility.	**LOW IMPACT** • Alternative considers increase in well capacity as part of the design solutions for water supply; no major constructability challenges or additional impact are expected because of increase of capacity.
REDUNDANCY OF SUPPLY/SERVICE	**LOW REDUNDANCY** • Without any system upgrades, the forecasted growth cannot be met; therefore, there is also insufficient redundancy.	**HIGH REDUNDANCY** • Two storage facilities will still exist that provide flexibility to have one storage facility out of service without significant impact to service.	**HIGH REDUNDANCY** • Two storage facilities will still exist that provide flexibility to have one storage facility out of service without significant impact to service. • Marginally greater risk than Alternative A because pumped equalization could be unavailable during system-wide blackouts; however, this risk would be mitigated by standby power at well facilities.
RESILIENCE TO CLIMATE CHANGE	**LOW RESILIENCE** • Without any system upgrades, the forecasted growth cannot be met; therefore, there is also no resilience to increasing demands because of climate change.	**MODERATE RESILIENCE** • New storage facility is generally resistant to changing climate. • Similarly impacted by changing water demands/drought/increasing temperatures as Alternative B.	**MODERATE RESILIENCE** • Marginally increased supply is generally resistant to changing climate. • Similarly impacted by changing water demands/drought/increasing temperatures as Alternative A.

Evaluation Criteria	1. Do Nothing	2. Add New Storage Facility	3. Supplement Increased Supply to Offset Storage Deficit
O&M REQUIREMENTS	**LOW COMPLEXITY** (green) • No upgrades, so there are no additional facilities to operate and maintain.	**LOW COMPLEXITY** (green) • Low additional resource requirements to maintain and operate the new storage facility because it is considered a replacement of an existing storage facility. • No impact to system complexity.	**LOW COMPLEXITY** (green) • Low additional resource requirements because this alternative only considers a small increase in supply capacity to facilities that are already being considered as part of the Well Supply Evaluation. • No impact to system complexity.
ADAPTABILITY TO EXISTING INFRASTRUCTURE	**HIGH ADAPTABILITY** (green) • No planned upgrades, so there is no new infrastructure that needs to connect to the existing system.	**HIGH ADAPTABILITY** (green) • Minor modifications would be required near the existing Nobleton South elevated tank to ensure a smooth transition to the new elevated tank during the respective commissioning and decommissioning phases for the tanks.	**HIGH ADAPTABILITY** (green) • Negligible difference is expected to occur at the supply facilities from the required additional 2 L/s supply capacity. Similar modifications required to existing infrastructure. • No significant challenges.
MAXIMIZING USE OF EXISTING INFRASTRUCTURE	**LOW DEGREE** (red) • Without any system upgrades, there is no ability to maximize the capacity of existing infrastructure.	**LOW DEGREE** (red) • Replacing an existing storage facility with a larger facility, even though the existing storage is not at the end of its useful life does not fully maximize the existing infrastructure.	**HIGH DEGREE** (green) • Supplementing the supply capacity of existing and/or planned facilities to avoid the need for a new storage facility, maximizes the existing infrastructure, and helps to avoid unnecessary new assets.

Evaluation Criteria	1. Do Nothing	2. Add New Storage Facility	3. Supplement Increased Supply to Offset Storage Deficit
OVERALL TECHNICAL RATING	**HIGH IMPACT** • Without any system upgrades, the forecasted growth cannot be met.	**MODERATE IMPACT** • Moderate impacts because of constructability. Moderate resilience to climate change. Low impacts associated with high redundancy, low complexity of O&M, and ability to adapt to existing infrastructure. • Does not fully maximize use of existing infrastructure.	**LOW IMPACT** • Moderate resilience to climate change. Low impacts associated with constructability, high redundancy, low complexity of O&M, and ability to adapt to existing infrastructure. Maximizes use of existing infrastructure.
ENVIRONMENTAL			
AQUATIC VEGETATION AND WILDLIFE	**LOW IMPACT** • Without any system upgrades, there is no impact to aquatic vegetation/wildlife.	**LOW IMPACT** • No significant risk to aquatic vegetation and wildlife are expected. • Minimal impact expected from replacement of elevated tank near Nobleton South elevated tank site. Potential short-term impact during construction. Non-damaging construction techniques and erosion controls will be employed to minimize construction impact.	**LOW IMPACT** • No significant risk to aquatic vegetation and wildlife are expected. • Minimal impact is expected from work associated with the increase in well supply capacity.
TERRESTRIAL VEGETATION AND WILDLIFE	**LOW IMPACT** • Without any system upgrades, there is no impact to terrestrial vegetation/wildlife.	**LOW IMPACT** • Minimal impact is expected from replacement of elevated tank near Nobleton South elevated tank site.	**LOW IMPACT** • Minimal impact is expected from work associated with the increase in well supply capacity.
GROUNDWATER RESOURCES	**LOW IMPACT** • Without any system upgrades, there is no impact to terrestrial vegetation/wildlife.	**LOW IMPACT** • Storage alternative has negligible impact on aquifer and groundwater resources	**LOW IMPACT** • Groundwater study demonstrated wells have enough capacity to increase drawdown.

Evaluation Criteria	1. Do Nothing	2. Add New Storage Facility	3. Supplement Increased Supply to Offset Storage Deficit
SURFACE WATER RESOURCES	**LOW IMPACT** (green) • Without any system upgrades, there is no impact to terrestrial vegetation/wildlife.	**LOW IMPACT** (green) • No significant risk to surface water resource.	**LOW IMPACT** (green) • No significant risk to surface water resources.
GHG EMISSIONS	**LOW IMPACT** (green) • Without any system upgrades, there is no added impact GHG emissions.	**LOW IMPACT** (green) • Available storage ensures that the peak hourly energy requirements are reduced; however, the same total amount of water would be supplied each day, so there is negligible difference between the two alternatives.	**LOW IMPACT** (green) • Available storage ensures that the peak hourly energy requirements are reduced; however, the same total amount of water would be supplied each day, so there is negligible difference between the two alternatives.
OVERALL ENVIRONMENTAL RATING	**LOW IMPACT** (green) • Without any system upgrades, there are no environmental impacts.	**LOW IMPACT** (green) No significant risks to aquatic vegetation and wildlife and surface water resources. • Minimal impacts to terrestrial vegetation and wildlife expected. • Negligible impact to groundwater resources and GHG emissions.	**LOW IMPACT** (green) No significant risks to aquatic vegetation and wildlife and surface water resources. • Minimal impacts to terrestrial vegetation and wildlife expected. • No significant impact expected to groundwater resources, and negligible impact to GHG emissions.
SOCIOECONOMIC			
SHORT-TERM COMMUNITY IMPACTS	**LOW IMPACT** (green) • Current system can serve the current population; without any upgrades there are no short-term community impacts.	**MODERATE IMPACT** (yellow) • Nobleton South elevated tank is within a residential neighborhood, so a tank replacement would lead to moderate noise, dust, and construction traffic on a short-term basis, although this can be mitigated to some extent.	**LOW IMPACT** (green) • Short-term impact/nuisance to the community are expected during construction/expansion of well facilities, including noise, dust, and impact to the local traffic. • No additional impacts than those from the water supply solution are expected.

Evaluation Criteria	1. Do Nothing	2. Add New Storage Facility	3. Supplement Increased Supply to Offset Storage Deficit
LONG-TERM COMMUNITY IMPACTS	**MODERATE IMPACT** • Without any system upgrades, it is not possible to meet the forecasted growth. This would impact the community because the growth helps the local economy grow.	**LOW IMPACT** • Long-term, replacing the storage facility is no different than the current arrangement in terms of facility operations and visual impact. Low impact is therefore expected long-term.	**LOW IMPACT** • Minimal visual and operating impacts are expected because the new well will be located in the same site as Well #5. • No additional impacts than those from the water supply solution are expected.
ARCHEOLOGICAL SITES	**LOW IMPACT** • Without any system upgrades, there is no additional construction that would lead to archaeological impact.	**LOW IMPACT** • New location of storage facility likely to be in proximity to existing Nobleton South elevated tank. • Stage 1 archeological assessment has not identified any significant risk of archaeological potential at either site. A Stage 2 assessment is required to further validate certain parts of the Well #2 site.	**LOW IMPACT** • Archeological assessment has not identified any significant risk of archaeological potential at any of the potentially expanded well facilities. • No additional impacts than those from the water supply solution are expected.
CULTURAL/HERITAGE FEATURES	**LOW IMPACT** • Without any system upgrades, there is no additional construction that would lead to a cultural/heritage impact.	**LOW IMPACT** • Known heritage properties in Nobleton are not located close to the potential site locations. • Currently, nothing suggests that the replacement of the tank at the existing Nobleton South elevated tank site would impact cultural/heritage features.	**LOW IMPACT** • Known heritage properties in Nobleton are not located close to the considered well site locations. • No additional impacts than those from the water supply solution are expected.

Evaluation Criteria	1. Do Nothing	2. Add New Storage Facility	3. Supplement Increased Supply to Offset Storage Deficit
OVERALL SOCIOECONOMIC RATING	**LOW IMPACT** • Without any system upgrades, there is no additional construction that would lead to a cultural/heritage impact.	**MODERATE IMPACT** • New storage tank will be in a new site, causing long-term visual impact in the neighborhood. • Short-term construction impacts are expected in the neighborhood sorrounding the tank.	**LOW IMPACT** • No long-term impacts are expected because no new facilities will be constructed. • Some minor construction impacts can be anticipated during construction.
FINANCIAL			
LAND ACQUISITION COST	**LOW REQUIREMENT** • Without any system upgrades, there is no land acquisition needed.	**MODERATE REQUIREMENT** • New location of storage facility likely to be in proximity to existing Nobleton South elevated tank, but not likely to fit on the existing site without purchasing some adjacent land to the west.	**LOW REQUIREMENT** • No additional land requirements because the new well will be located in the existing site.
CAPITAL COST	**LOW COST** • Without any system upgrades, there is no upfront capital cost.	**HIGH COST** • High amount of upfront capital costs for this alternative because it involves a new storage tank and does not maximize the investments already made in the existing tank.	**MODERATE COST** • Comparatively lower amount of capital cost because the costs would only be costs associated with the slightly higher flow requirement at these facilities.
LIFECYCLE COST	**LOW COST** • With no system upgrades there is no associated lifecycle cost. O&M costs are limited to existing costs.	**HIGH COST** • Operating costs no different than the baseline scenario because there are no extra pumping costs or O&M costs. • Main factor in rating is the capital cost.	**MODERATE COST** • No significant costs because the system would still supply the same total flow each year. It would simply supply slightly more during peak hours, which is likely to increase energy costs slightly.

Evaluation Criteria	1. Do Nothing	2. Add New Storage Facility	3. Supplement Increased Supply to Offset Storage Deficit
OVERALL FINANCIAL RATING	**LOW COST** (green) • Without any system upgrades, no associated costs.	**HIGH COST** (red) • Moderate land acquisition costs. • High capital costs and high lifecycle costs associated with alternative.	**MODERATE COST** (yellow) • Moderate capital costs and lifecycle costs associated with alternative.
JURISDICTIONAL/REGULATORY			
LAND REQUIREMENTS	**LOW REQUIREMENT** (green) • Without any system upgrades, there is no land acquisition needed.	**MODERATE REQUIREMENT** (yellow) • New location of storage facility likely to be in proximity to existing Nobleton South elevated tank, but not likely to fit on the existing site without purchasing some adjacent land to the west.	**LOW REQUIREMENT** (green) • No additional land requirements because the new well will be located in the existing site.
ABILITY TO ACCOMMODATE POTENTIAL FUTURE REGULATORY CHANGES	**LOW ADAPTABILITY** (red) • Without any system upgrades, does not have the ability to adapt to potential future change.	**HIGH ADAPTABILITY** (green) • No impact anticipated in drinking water quality requirements that would be affected by new storage facility.	**HIGH ADAPTABILITY** (green) • Meets current water quality regulations. Potential changes to water treatment requirements not expected to have significant impact. • Has the ability to adapt to future changes in drinking water quality requirements.
PERMITS AND APPROVALS	**LOW REQUIREMENT** (green) • Without any system upgrades, there are no additional permits/approvals required.	**MODERATE REQUIREMENT** (yellow) • Will require a Drinking Water Works Permit (DWWP) Amendment to have a new storage facility to replace the existing one. • Site plan and local permits as required for the design and construction of the new facility.	**LOW REQUIREMENT** (green) • No additional permits required other than those for the water supply solution.

Evaluation Criteria	1. Do Nothing	2. Add New Storage Facility	3. Supplement Increased Supply to Offset Storage Deficit
OVERALL JURISDICTIONAL/REGULATORY RATING	**MODERATE IMPACT** • Without any system upgrades, there is no need for land acquisition or additional permits/approvals. • Has no ability to adapt to potential future changes in drinking water quality requirements.	**MODERATE IMPACT** • Requires new land acquisition and some additional permits/approvals. • Is able to adapt to potential future changes in drinking water quality requirements.	**LOW IMPACT** • Requires no new land acquisition or additional permits/approvals. • Is able to adapt to potential future changes in drinking water quality requirements.

4.3 Wastewater System Alternative Solutions

In Phase 1, the wastewater collection system was determined to have sufficient capacity to handle projected flows; however, upgrades to the Janet Avenue PS, potentially along with its associated force main and the WRRF, were determined to be necessary. The needs of both of these facilities were considered to develop a set of wastewater alternative solutions.

4.3.1 Wastewater Alternative Solutions

To increase the capacity of the wastewater system in Nobleton, the following eight alternative solutions were developed:

1. **Do Nothing:** Permit the growth, but do not increase the capacity of the existing wastewater system.
2. **Limit Growth:** Limit the growth up to the existing capacity of the current wastewater system.
3. **Water Conservation and Inflow and Infiltration (I&I) Reduction:** Implement practices for efficient water use and reduction of I&I into the sewage collection system to reduce future flows.
4. **Expand and Upgrade the Existing Janet Avenue PS, Force Main, and Nobleton WRRF and Outfall:** Increase the capacity of Janet Avenue PS, force main from Janet Avenue PS to Nobleton WRRF, and outfall and expand and upgrade Nobleton WRRF.
5. **Construct a New PS, Force Main, WRRF, and Outfall:** Maintain existing treatment and conveyance ADF capacity of 2,925 m^3/d and peak design flow of 9,177 m^3/d. Construct a new collection system for the new development areas along with a new pump station, new force main, new treatment facility, and new outfall to meet future flow requirements.
6. **Convey Additional Flows to Neighbouring WRRFs:** Maintain existing treatment and conveyance ADF capacity of 2,925 m^3/d and peak design flow of 9,177 m^3/d. Construct new pipelines or pump station to convey future excess flows to neighboring WRRFs. Currently, the Kleinburg WRRF does not have capacity available to allocate to the Community of Nobleton. However, it is understood that, in the future, the Community of Kleinburg would be ultimately serviced by the West Vaughan Sewage System (WVSS) and the Kleinburg WRRF would be decommissioned. This is a long-term plan that would be implemented after the Kleinburg WRRF reaches its capacity.
7. **Convey All Flows to Lake-Based Treatment Systems:** Decommission or repurpose the existing Nobleton WRRF and convey all current and future flows to either the York-Durham Sewage System (YDSS) or WVSS.
8. **Maintain Existing Treatment Facilities and Convey Additional Flows to Lake-Based Treatment Facilities:** Maintain existing treatment and conveyance ADF capacity of 2,925 m^3/d and peak design flow of 9,177 m^3/d. Construct new pipelines and/or pump station to convey future excess flows to either the YDSS or to the WVSS.

4.3.1.1 Screening of Long List of Alternatives for Wastewater Solution

The long list of alternative solutions was screened against the criteria established in Table 4-1. The screening results are presented in Table 4-7.

Out of the eight alternatives, two passed the screening criteria and are considered for further evaluation. Alternative 1, “Do Nothing,” was also carried forward as a baseline for comparison. The following three alternatives were carried forward:

1. Do Nothing.
2. Expand and Upgrade the Existing Janet Avenue PS, Force Main, and Nobleton WRRF and Outfall.
3. Construct a New PS, Force Main, WRRF, and Outfall.

Table 4-7 Screening of the Long List of Alternative Wastewater Solutions

Alternative Solutions	Technical	Jurisdictional	Notes
1. Do Nothing	✗	✓	• **This alternative is unable** to provide additional capacity for the forecasted growth. However, it is not screened out to provide a baseline for comparison of the alternatives.
2. Limit Growth	✗	✓	• **Eliminated** because of its inability to meet the forecasted growth.
3. Water Conservation and I&I Reduction	✗	✓	• **Eliminated** as an alternative because I&I reduction alone is unable to account for all the increase in wastewater flows, resulting in inability to meet forecasted growth. • It is recommended that this alternative be accounted for in the overall servicing strategy to help reduce peak wastewater flows.
4. Expand and Upgrade the Existing Janet Avenue PS, Force Main, and Nobleton WRRF and Outfall	✓	✓	• **Proceed to Detailed Evaluation**. Able to support forecasted growth in the community of Nobleton while meeting the jurisdictional and regulatory requirements.
5. Construct a New PS, Force, Main and New WRRF and Outfall	✓	✓	• **Proceed to Detailed Evaluation**. Able to support forecasted growth in the community of Nobleton while meeting the jurisdictional and regulatory requirements.
6. Convey Additional Flows to Neighbouring WRRFs	✓	✗	• **Eliminated**. It may be technically feasible to convey flows south to the Kleinburg WRRF; however, the Kleinburg WRRF currently does not have capacity allocated to accept any flows from Nobleton. This may change in the long-term future depending on the outcome of the WVSS project but as of now it is uncertain. • This alternative is not in accordance with requirements set forth in the Greenbelt Plan (2017) and is also inconsistent with the York Region Water and Wastewater Master Plan (2016).

Alternative Solutions	Technical	Jurisdictional	Notes
7. Convey All Flows to Lake-Based Treatment Facilities	✓	×	• **Eliminated**. Although it is technically feasible to construct conveyance facilities, this alternative contradicts the requirements of the Greenbelt Plan (2017) and is inconsistent with the York Region Water and Wastewater Master Plan (2016).
8. Maintain Existing Treatment Facilities and Convey Additional Flows to Lake-Based Treatment Facilities	✓	×	• **Eliminated**. Although it is technically feasible to construct conveyance facilities, this alternative contradicts the requirements of the Greenbelt Plan (2017) and is inconsistent with the York Region Water and Wastewater Master Plan (2016).

4.3.1.2 Evaluation of Short List of Alternatives for Wastewater Solution

A detailed evaluation of the short-listed alternatives was carried out in accordance with the evaluation methodology described in Table 4-2. The results of this evaluation are presented in Table 4-8.

The detailed evaluation of the short-listed alternative wastewater servicing solutions favored **Alternative 2: Expand and Upgrade the Existing Janet Avenue PS, Force Main, and Nobleton WRRF and Outfall** because of the following considerations:

1. **Technical**: Alternative 2 ranked highest because of its ability to maximize existing infrastructure and limit additional O&M requirements. This alternative also required the least number of new facilities.
2. **Environmental:** This alternative ranked the highest because all expansions and upgrades will occur in already existing sites mitigating impacts to aquatic/terrestrial vegetation and wildlife as well as greenhouse emissions. In comparison to Alternative 3, that requires the operations of two facilities, Alternative 2 has lower energy intensity requirements.
3. **Socioeconomic:** Alternative 2 has no considerable short-term effects because all construction will occur in already existing and operating facilities.
4. **Financial:** By maximizing the capacity of existing infrastructure, Alternative 2 was found to have lesser capital, lifecycle, and land acquisition costs than Alternative 3.
5. **Jurisdictional:** Alternative 1 ranked the highest as it requires limited land acquisition and the fewer permits/approvals.

Table 4-8 Evaluation of Short-Listed Wastewater Alternative Solutions

Evaluation Criteria	1. Do Nothing	2. Expand and Upgrade the Existing Janet Avenue PS, Force Main, WRRF, and Outfall	3. Construct a New PS, Force Main, WRRF, and Outfall
TECHNICAL			
CONSTRUCTABILITY	**LOW IMPACT** (green) • No construction to be conducted.	**MODERATE IMPACT** (yellow) • The existing Janet Avenue PS and the Nobleton WRRF have limited space for the required expansion. • Expansions could impact the local community (disturbance through traffic, dust, and noise). • High volume of construction expected at the existing facility for expansion to meet future flow requirements. • Constructability at the existing facilities for expansion would be challenging.	**MODERATE IMPACT** (yellow) • Construction of the new pump station, force main, and WRRF could impact the local community (increased disturbance through traffic, dust, and noise). • Significant volume of construction is expected during the construction of the new pump station, force main, and WRRF.
REDUNDANCY OF SUPPLY/SERVICE	**LOW REDUNDANCY** (red) • Without any system upgrades, the forecasted growth cannot be met. Therefore, there is also insufficient redundancy.	**MODERATE REDUNDANCY** (yellow) • Existing system would be able to provide reliable wastewater collection and treatment system for future growth. • Moderate redundancy for treatment capacity could be accommodated via expansion.	**HIGH REDUNDANCY** (green) • A new treatment system along with upgrades to the existing facility would be able to provide reliable wastewater collection and treatment system for future growth. • Potential for system redundancy may be achieved through interconnection between separate facilities.

Evaluation Criteria	1. Do Nothing	2. Expand and Upgrade the Existing Janet Avenue PS, Force Main, WRRF, and Outfall	3. Construct a New PS, Force Main, WRRF, and Outfall
RESILIENCE TO CLIMATE CHANGE	**LOW RESILIENCE** • Without any system upgrades, the forecasted growth cannot be met; therefore, there is also no resilience to increasing demands because of climate change.	**MODERATE RESILIENCE** • The existing system showed high I&I. The Region is taking measures and new development could be constructed with tighter requirements. • Reduction in I&I would result in reduced peak flows into the existing facilities.	**MODERATE RESILIENCE** • The existing system showed high I&I. The Region is taking measures and new development could be constructed with tighter requirements. • Reduction in I&I would result in reduced peak flows into the existing facilities.
O&M REQUIREMENTS	**LOW COMPLEXITY** • No upgrades, so there are no additional facilities to operate and maintain.	**LOW COMPLEXITY** • No major changes would be expected in O&M requirements for the existing facility and the new collection system. • New assets (from system upgrade and expansion) would be part of the existing facility, which could be maintained holistically. No major complexity for maintenance of the new assets would be expected.	**HIGH COMPLEXITY** • No major changes required in O&M requirements for the existing facilities; however, there would be new O&M requirements and resources required to maintain the new treatment facilities. • Maintaining two separate treatment facilities would have added complexity in O&M requirements.

Evaluation Criteria	1. Do Nothing	2. Expand and Upgrade the Existing Janet Avenue PS, Force Main, WRRF, and Outfall	3. Construct a New PS, Force Main, WRRF, and Outfall
ADAPTABILITY TO EXISTING INFRASTRUCTURE	**HIGH ADAPTABILITY** • No planned upgrades, so there is no new infrastructure that needs to connect to the existing system.	**MODERATE ADAPTABILITY** • Modification would be required for the existing PS expansion and Nobleton WRRF expansion to meet future flow requirements. • Optimization and some modification would be required for the existing pump station and Nobleton WRRF.	**HIGH ADAPTABILITY** • No changes required to the existing wastewater system infrastructure; new facilities will be built to service all future growth. • No major challenges are expected for connection from existing trunk sewer to the new facilities.
MAXIMIZING USE OF EXISTING INFRASTRUCTURE	**LOW DEGREE** • Without any system upgrades, there is no ability to maximize the capacity of existing infrastructure.	**HIGH DEGREE** • Aims to continuously use and optimize all existing facilities such as the existing trunk sewer, pump station, and WRRF to service future needs.	**LOW DEGREE** • Brand new facility would be constructed for future growth and current needs; does not aim to maximize capacity of existing wastewater infrastructure.
OVERALL TECHNICAL RATING	**HIGH IMPACT** • Without any system upgrades, the forecasted growth cannot be met.	**MODERATE IMPACT** • Low impacts associated with low complexity of O&M. • Maximizes use of existing infrastructure. • Moderate impacts because of constructability and ability to adapt to existing infrastructure. Alternative provides moderate redundancy and resiliency.	**HIGH IMPACT** • Low impacts associated with ability to adapt to existing infrastructure. • Moderate impacts because of constructability. Alternative provides moderate resiliency. • High impact associated with O&M complexity. Does not maximize use of existing infrastructure.

Evaluation Criteria	1. Do Nothing	2. Expand and Upgrade the Existing Janet Avenue PS, Force Main, WRRF, and Outfall	3. Construct a New PS, Force Main, WRRF, and Outfall
ENVIRONMENTAL			
AQUATIC VEGETATION AND WILDLIFE	**LOW IMPACT** • Without any system upgrades, there is no impact to aquatic vegetation/ wildlife.	**MODERATE IMPACT** • No significant risk expected to aquatic vegetation and wildlife during system expansion and upgrades of the Janet Avenue PS and the Nobleton WRRF, as expansion is expected to be in proximity or within the existing footprint. • Short-term impacts during construction for replacement or twinning of existing force main or new connection to existing outfall are expected, but non-damaging construction techniques would be employed to minimize impact. • Proven technology will be used to ensure that effluent quality meet requirements prior to discharge to Humber River to minimize impact.	**HIGH IMPACT** • A new WRRF could have potential impact to the aquatic environment as new outfall would need to be installed. • Proven technology will be used to ensure that effluent quality meet requirements prior to discharge to Humber River to minimize impact. • New treatment facility will require a second source of discharge, requiring a new capacity study at the point of discharge.

Evaluation Criteria	1. Do Nothing	2. Expand and Upgrade the Existing Janet Avenue PS, Force Main, WRRF, and Outfall	3. Construct a New PS, Force Main, WRRF, and Outfall
TERRESTRIAL VEGETATION AND WILDLIFE	**LOW IMPACT** • Without any system upgrades, there is no impact to terrestrial vegetation/wildlife.	**LOW IMPACT** • Low risk expected to terrestrial vegetation and wildlife because expansion/upgrade will occur within current footprint of facilities. • Short-term impacts during construction are expected, but non-damaging construction techniques would be employed to minimize impact.	**MODERATE IMPACT** • Depending on the location of new treatment facility, potential risk to vegetation and wildlife with construction of the new PS and new WRRF on a greenfield site. • Connection from existing trunk sewer to the new PS will be within right-of-way to reduce impact.
GROUNDWATER RESOURCES	**LOW IMPACT** • Without any system upgrades, there is no impact to groundwater resources.	**LOW IMPACT** • Low impact expected to groundwater resources.	**LOW IMPACT** • Low impact expected to groundwater resources.
SURFACE WATER RESOURCES	**LOW IMPACT** • Without any system upgrades, there is no impact to surface water resources.	**LOW IMPACT** • WRRF effluent has no impacts on Humber River water quality.	**LOW IMPACT** • WRRF effluent has no impacts on Humber River water quality.

Evaluation Criteria	1. Do Nothing	2. Expand and Upgrade the Existing Janet Avenue PS, Force Main, WRRF, and Outfall	3. Construct a New PS, Force Main, WRRF, and Outfall
GHG EMISSIONS	**LOW IMPACT** • Without any system upgrades, there is no added impact GHG emissions.	**MODERATE IMPACT** • Some changes expected with energy intensity requirement with the current system; energy saving technologies will be accounted for system upgrades and expansion.	**HIGH IMPACT** • Energy intensity requirement is significantly higher when operating two new facilities, including a new WRRF and PS, for a single community.
OVERALL ENVIRONMENTAL RATING	**LOW IMPACT** • Without any system upgrades, there are no environmental impacts.	**LOW IMPACT** • No significant risks to terrestrial or aquatic vegetation and wildlife. Low to moderate short-term impacts expected during construction but non-damaging construction techniques would be employed to minimize impact. • Low impact expected to groundwater and surface water resources. Findings of assimilative capacity study would be used to mitigate impact to surface water resources. • Moderate impacts on GHG emissions.	**MODERATE IMPACT** • Potential risks to terrestrial or aquatic vegetation and wildlife. High to moderate short-term impacts expected during construction. • Low impact expected to groundwater and surface water resources. Findings of assimilative capacity study would be used to mitigate impact to surface water resources. • High impacts on GHG emissions - significantly higher energy intensity when operating two facilities.

Evaluation Criteria	1. Do Nothing	2. Expand and Upgrade the Existing Janet Avenue PS, Force Main, WRRF, and Outfall	3. Construct a New PS, Force Main, WRRF, and Outfall
SOCIOECONOMIC			
SHORT-TERM COMMUNITY IMPACTS	**LOW IMPACT** (green) • Without any system upgrades, there are no environmental impacts.	**MODERATE IMPACT** (yellow) • Existing Janet Avenue PS has been blended within a residential neighborhood, noise, dust, and increased construction traffic during system upgrades could cause some short-term impacts to the neighborhood although they can be mitigated to some extent. • Twinning or replacement of existing force main and connection to existing outfall would impact local traffic.	**HIGH IMPACT** (red) • Higher impact/nuisance during construction of the new WRRF, including: noise, dust, and impact to the local traffic. New facility site will be assessed during the design phase and mitigated as needed to reduce impact to community. • Construction of trunk sewer connection, new force main, and outfall would impact local traffic.
LONG-TERM COMMUNITY IMPACTS	**MODERATE IMPACT** (yellow) • Without any system upgrades, it is not possible to meet the forecasted growth. This would impact the community because the growth helps the local economy grow.	**LOW IMPACT** (green) • Increase in sludge truck haulage from the WRRF will impact traffic. • All new assets for the system upgrade are expected to be within the current footprint or within proximity to the existing facility. • Potential increases in odour generation.	**HIGH IMPACT** (red) • Increase in sludge truck haulage from the WRRF will impact local traffic. • Potential visual impacts and negative public perception ("Not In My Backyard" – NIMBYism) associated with building a second treatment facility. • Potential increases in odour generation.

Evaluation Criteria	1. Do Nothing	2. Expand and Upgrade the Existing Janet Avenue PS, Force Main, WRRF, and Outfall	3. Construct a New PS, Force Main, WRRF, and Outfall
ARCHAEOLOGICAL SITES	**LOW IMPACT** • Without any system upgrades, there is no additional construction that would lead to archaeological impact.	**LOW IMPACT** • All construction activities are expected to take place on previously disturbed properties. Archeological potential is not expected to be significant. • No archaeological risks identified so far.	**MODERATE IMPACT** • Location of new facilities would be on a greenfield site (previously undisturbed farmland). Stage 1 archeological assessment would be conducted to confirm whether there is archeological potential.
CULTURAL/HERITAGE FEATURES	**LOW IMPACT** • Without any system upgrades, there is no additional construction that would lead to a cultural/heritage impact.	**LOW IMPACT** • Cultural heritage features were assessed in Phase 3 of this EA. The Stage 1 archeological assessment did not identify any significant risks to BHRs or CHLs.	**MODERATE IMPACT** • Cultural heritage features were assessed in Phase 3 of this EA. This alternative was deemed to have moderate impact as construction of the new facilities, forcemain and outfall will occur on new lands.
OVERALL SOCIOECONOMIC RATING	**LOW IMPACT** • Without any system upgrades, no socioeconomic impacts apart from inability to meet forecasted growth.	**LOW IMPACT** • Moderate short- and long-term impacts to community. • Low impacts to archeological and cultural/heritage sites/features.	**MODERATE IMPACT** • High short- and long-term impacts to community. • Low impacts to archeological and cultural/heritage sites/features.

Evaluation Criteria	1. Do Nothing	2. Expand and Upgrade the Existing Janet Avenue PS, Force Main, WRRF, and Outfall	3. Construct a New PS, Force Main, WRRF, and Outfall
FINANCIAL			
LAND ACQUISITION COST	**LOW COST** • Without any system upgrades, there is no land acquisition needed.	**LOW COST** • No land requirement for expansion and upgrade of existing WRRF on existing site. • Minor land requirement may be required during expansion of Janet Avenue PS. • Twinning or replacement of force main expected to be within right-of-way and upgrading of outfall expected to be within existing easement, so no land requirement expected for force main or outfall.	**HIGH COST** • Land acquisition would be required for the new WRRF to service new growth area. However, smaller land in comparison is required as new WRRF will only be used to service future growth.
CAPITAL COST	**LOW COST** • Without any system upgrades, there is no upfront capital cost.	**MODERATE COST** • Moderate amount of construction required within the existing facilities but considered to be a lower cost alternative in comparison.	**HIGH COST** • Construction and commissioning of a new WRRF and PS for the newly developed area is expected to cost significantly more.

Evaluation Criteria	1. Do Nothing	2. Expand and Upgrade the Existing Janet Avenue PS, Force Main, WRRF, and Outfall	3. Construct a New PS, Force Main, WRRF, and Outfall
LIFECYCLE COST	**LOW COST** (green) • With no system upgrades there is no associated lifecycle cost. O&M costs limited to existing costs.	**MODERATE COST** (yellow) • Lower O&M cost would be expected. • Lower lifecycle cost would be is also expected.	**MODERATE COST** (red) • Higher O&M cost would be required for two treatment facilities. • Higher lifecycle cost would be required for two treatment facilities.
OVERALL FINANCIAL RATING	**LOW COST** (green) • Without any system upgrades, no associated costs.	**MODERATE COST** (yellow) • Moderate land acquisition costs, capital costs, and lifecycle costs associated with alternative.	**HIGH COST** (red) • High land acquisition, capital, and lifecycle costs associated with alternative.
JURISDICTIONAL/REGULATORY			
LAND REQUIREMENTS	**LOW REQUIREMENT** (green) • Without any system upgrades, there is no land acquisition needed.	**LOW REQUIREMENT** (green) • No land requirement for expansion and upgrade of existing WRRF on existing site. • Minor land requirement may be required during expansion of Janet Avenue PS. • Twinning or replacement of force main expected to be within right-of-way and upgrading of outfall expected to be within existing easement, so no land requirement expected.	**HIGH REQUIREMENT** (red) • New PS and WRRF will require land acquisition. • New trunk sewer for the new development area to be within right-of-way, no new land acquisition expected but trunk sewer alignment may need easement.

Evaluation Criteria	1. Do Nothing	2. Expand and Upgrade the Existing Janet Avenue PS, Force Main, WRRF, and Outfall	3. Construct a New PS, Force Main, WRRF, and Outfall
ABILITY TO ACCOMMODATE POTENTIAL FUTURE REGULATORY CHANGES	**LOW ADAPTABILITY** • Without any system upgrades, does not have the ability to adapt to potential future change.	**HIGH ADAPTABILITY** • Technologies used for upgrade and expansion could be selected to account for more stringent future requirement. • Higher flexibility in choosing new technologies for the expansion to account for potential future changes in final effluent requirements.	**HIGH ADAPTABILITY** • Higher flexibility in choosing new technologies for the new WRRF to account for potential future changes in final effluent requirements.
PERMITS AND APPROVALS	**LOW REQUIREMENT** • Without any system upgrades, there are no additional permits/approvals required.	**MODERATE REQUIREMENT** • Will require an amended ECA permit. • Site plan and local permits as required for the system upgrade and expansion of the existing system.	**HIGH REQUIREMENT** • Will require a new ECA permit. • Second source of discharge for the new treatment plant will also require approval and permit. • Site plan and local permits as required for the design and construction of the of the new WRRF. • Degree of permits and approval required to construct a new treatment facility is expected to be significantly higher.

Evaluation Criteria	1. Do Nothing	2. Expand and Upgrade the Existing Janet Avenue PS, Force Main, WRRF, and Outfall	3. Construct a New PS, Force Main, WRRF, and Outfall
OVERALL JURISDICTIONAL/ REGULATORY RATING	**MODERATE IMPACT** • Without any system upgrades, there is no need for land acquisition or additional permits/approvals. • Has no ability to adapt to potential future changes in final effluent requirements.	**LOW IMPACT** • Not expected to require significant new land acquisition; however, does require some additional permits/approvals. • Is able to adapt to potential future changes in final effluent requirements.	**MODERATE IMPACT** Requires significant new land acquisition and additional permits/approvals. • Is able to adapt to potential future changes in final effluent requirements.

5.0 Alternative Design Concepts

Table 5-1 summarizes the recommended water and wastewater servicing solutions that were recommended after screening and evaluation during Phase 2.

Table 5-1 Recommended Solutions for Water and Wastewater Servicing

Service System	Recommended Solution
Water System Supply	Increase Capacity of Existing Well #2 and Add New Well at Site H
Water System Storage	Supplement Increased Supply to Offset Storage Deficit
Wastewater System	Expand and Upgrade the Existing Janet Avenue PS, Force Main, and Nobleton WRRF and Outfall

During Phase 3, the recommended solutions were further developed to screen and evaluate the preferred design concepts for the water and wastewater servicing solutions. TM 3, Alternative Design Concepts, can be found in Appendix A.

5.1 Screening and Evaluation Methodology

Similar to Phase 2, a two-stage process was used for the selection of the preferred design concept. The first stage is screening the long list of design concepts against a screening criteria and the second stage is evaluating the short list of design concepts.

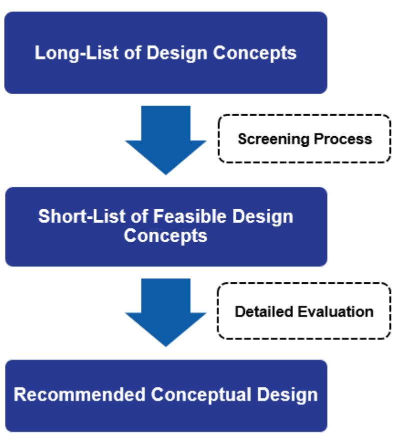


Figure 5-1 Screening and Evaluation Methodology

5.1.1 Stage 1: Screening Long List of Alternatives

In this stage the feasibility of each design concept was determined by comparing it against a set of Pass (✓) or Fail (×) screening criteria shown in Table 5-2.

Table 5-2 Screening Criteria for Nobleton's Water and Wastewater Alternative Design Concepts

"PASS/FAIL" SCREENING CRITERIA
COMPATIBILITY WITH EXISTING SERVICING INFRASTRUCTURE The alternative must be able to be integrated with the existing Janet Avenue PS, wastewater collection system, force main, Nobleton WRRF, and Wells #2 and #5. This would include compatibility in terms of hydraulics, available space, and operations.
PROVEN TECHNOLOGY The design concept or technology must be in operation in a full-scale plant in North America (specifically in areas with colder climates). The technology must have been in operation for a minimum of 5 years.
PERFORMANCE ROBUSTNESS AND RELIABILITY The design concept or technology must be able to achieve robustness and reliability of performance to meet the project objectives, water quality, effluent requirements, and performance requirements.
STAKEHOLDER ACCEPTANCE Potential impacts from the alternative must be able to be mitigated to an acceptable level to satisfy local and regulatory stakeholders.
ACCEPTABLE CONSTRUCTION IMPACTS The construction impacts to the natural environment and the adjacent landowners/users must be able to be mitigated to an acceptable level.
COST Costs must be acceptable, as evaluated based on high-level assumptions of capital and operating costs of each design concept.

5.1.2 Stage 2: Evaluation of Short List of Alternatives

The resulting short-listed solutions from the screening process is then subject to a detailed evaluation. Evaluation criteria have been developed and categorized to assess short-term (construction and commissioning) and long-term (permanent) impacts of the proposed alternative water and wastewater servicing solutions. A description of the evaluation criteria used is shown in Table 5-3.

Alternatives will be rated based on how well it performs in addressing the specified criterion. Overall performance of each alternative will be determined based on the combination of individual criterion performance rating. The evaluations used the "Traffic Light Assessment" method, where each alternative is scored as green, yellow, or red for each criterion.

Table 5-3 Description of Evaluation Criteria for Short-List Design Concepts

Criteria		Description/Considerations	Performance Rating
TECHNICAL			
A.	Constructability	• What are the major construction challenges and risks (e.g., crossing environmentally sensitive areas, noise, odour, dust, public safety, traffic) associated with the alternative? To what extent does it impact the community? • How much volume and complexity of construction will be associated with the alternative?	Low Impact *(Low Construction Impact/Complexity)* Moderate Impact *(Moderate Construction Impact/Complexity)* High Impact *(Higher Construction Impact/Complexity)*
B.	Redundancy of Supply/Service	• Will the alternative be able to provide improvements in redundancy of supply or service? • If there is an unexpected event (e.g., power outage, spill, equipment failure) does that impact supply or service?	High Redundancy Moderate Redundancy Low Redundancy
C.	Resilience to Climate Change	• Is the alternative resilient against changing climate conditions, such as the following: ○ Changes to water supply quantity and quality (e.g., because of drought). ○ Increase of intensity and frequency of wet weather flow events.	High Resilience Moderate Resilience Low Resilience
D.	O&M Requirements	• What will be the level of additional and new O&M resources (e.g., human resources) required for the alternative? • What will be the level of complexity and maintainability of new and optimized assets?	Low Complexity/O&M Requirements Moderate Complexity/O&M Requirements High Complexity/O&M Requirements
E.	Adaptability to Existing Infrastructure	• What will be the level of modification required to the existing infrastructure to adapt to the alternative? What is the relative ease of connection to the existing infrastructure? • What is the level of interference or effects on other utilities (e.g., are relocations required)? • What is the compatibility of the design concept with the existing infrastructure? This would include compatibility in terms of hydraulics, available space/footprint, and operations.	High Adaptability Moderate Adaptability Low Adaptability
F.	Maximizing Use of Existing Infrastructure	• Will the alternative be able to maximize the capacity of the existing infrastructure to reduce new asset needs?	High Degree (*Efficient use of Existing Infrastructure)* Moderate Degree (*Partial use of Existing Infrastructure)* Low Degree (*Inefficient use of Existing Infrastructure)*

Criteria		Description/Considerations	Performance Rating
NATURAL ENVIRONMENT			
G.	Aquatic Vegetation and Wildlife	• Will the alternative have significant impacts during construction and/or from ongoing operations on the following: ○ Streams and rivers. ○ Local aquatic species and habitats. ○ Environmentally sensitive areas, aquatic species at risk, or locally significant aquatic species.	Low Impact Moderate Impact High Impact
H.	Terrestrial Vegetation and Wildlife	• Will the alternative have significant impacts during construction and/or from ongoing operations on the following: ○ Trees and vegetation. ○ Local terrestrial species and habitats. ○ Environmentally sensitive areas, species at risk, and locally significant species.	Low Impact Moderate Impact High Impact
I.	Groundwater Resources	• Will the alternative have significant impacts during construction and/or from ongoing operations on aquifers and groundwater resources such as the following: groundwater quantity, groundwater recharge quality and flow regime, and groundwater discharge to streams and wetlands?	Low Impact Moderate Impact High Impact
J.	Surface Water Resources	• Will the alternative have significant impacts during construction and/or from ongoing operations on adjacent surface water resources (e.g., Humber River) and related biological communities?	Low Impact Moderate Impact High Impact
K.	GHG Emissions	• What will be the level of impact of GHG emissions associated with the alternative? *(GHG emissions will be evaluation based on the alternative's energy intensity requirements.)*	Low Impact Moderate Impact High Impact
SOCIOECONOMIC ENVIRONMENT			
L.	Short-Term Community Impacts (Impacts to Community during Construction)	• Will the alternative have significant short-term impacts to the community during construction, including the following: ○ Noise, dust, and odour. ○ Local traffic.	Low Impact Moderate Impact High Impact
M.	Long-Term Community Impact	• Will the alternative have significant long-term impacts on the community, including the following: ○ Impact of operating facility including air quality, odour, and noise impacts. ○ Visual impact. ○ Public acceptance/resistance (Any potential resistance to the proposed servicing solution [e.g., Resistance to Growth/Resistance to Well Supply]?)	Low Impact Moderate Impact High Impact

Criteria		Description/Considerations	Performance Rating
N.	Archaeological Sites	• Will the alternative have significant impacts during construction and/or from ongoing operations on registered/known archaeological features?	🟢 Low Impact 🟡 Moderate Impact 🔴 High Impact
O.	Cultural/Heritage Features	• Will the alternative have significant impacts during construction and/or from ongoing operations on known cultural landscapes and built heritage features?	🟢 Low Impact 🟡 Moderate Impact 🔴 High Impact
FINANCIAL			
P.	Land Acquisition Cost	• What will be the relative land acquisition cost for the alternative?	🟢 Low Cost Alternative 🟡 Moderate Cost Alternative 🔴 High Cost Alternative
Q.	Capital Cost	• What will be the relative capital cost for the alternative?	🟢 Low Cost Alternative 🟡 Moderate Cost Alternative 🔴 High Cost Alternative
R.	Lifecycle Cost	• What will be the relative lifecycle cost for the alternative?	🟢 Low Cost Alternative 🟡 Moderate Cost Alternative 🔴 High Cost Alternative
JURISDICTIONAL/REGULATORY			
S.	Land Requirements	• What will be the relative area of non-regional land or easement required to construct the alternative?	🟢 Low Requirement 🟡 Moderate Requirement 🔴 High Requirement
T.	Ability to Accommodate Potential Future Regulatory Changes	• Will the alternative have the ability to adapt to potential future changes in drinking water quality and final effluent requirements?	🟢 High Adaptability 🟡 Moderate Adaptability 🔴 Low Adaptability
U.	Permits and Approval	• What will be the level of permits and approvals required to construct the alternative?	🟢 Low Requirement 🟡 Moderate Requirement 🔴 High Requirement

5.2 Water System Alternative Design Concepts

Although in Phase 2 two solutions, one for storage and one for supply, were recommended for the water system, in Phase 3 these were combined and analyzed as one since an increase in water supply would offset the storage needs. Therefore, different design concepts were developed to determine the most optimal design to increase the capacity of existing Well #2 and add a new well at Site H.

5.2.1 Water System Solution

As summarized in Section 3 of this ESR, the recommended water supply solution suggested increasing the supply of Well #2 to 32 L/s and building a new well at Site H with a capacity of 32 L/s. To offset the storage deficit, the supply and treatment capacity for each of these wells will need to be further increased to 34 L/s. This increase in capacity eliminates the need for storage because the water will be pumped rather than being stored. Combined, the overall well production capacities would meet the projected MDD of 89.5 L/s, as presented in Table 5-4, plus the surplus supply capacity that would be required to offset the minor storage deficit.

Table 5-4 Water System Solution Conceptual Breakdown of Current and Future Well Capacity

Category	Current Capacity Limit	Conceptual Future Capacity
Well #2 Capacity	22.7 L/s	34 L/s
Well #3 Capacity	28.9 L/s	28.9 L/s
Well #5 Capacity	28.9 L/s	28.9 L/s
New Production Well	-	34 L/s
Total Well Supply Firm Capacity (largest well out of service)	51.6 L/s	91.8 L/s
Total Capacity	80.5 L/s	121.8 L/s

5.2.2 Water Alternative Design Concepts

For the water system solution, a total of three design concepts were developed. To increase the capacity of existing Well #2, one design concept was developed and for the addition of new well at Site H, two design concepts were developed.

1. **Expand the existing capacity for Well Site #2**: Increase the capacity of Well Site #2 to 34 L/s by using the existing facility and infrastructure, with the exception of increasing the capacity of the well pump. The existing chemical storage, educators, and chemical metering pumps have enough capacity to handle the additional flows so no upgrades will be required.
2. **Expand the existing treatment train capacity for Well Site #5**: Expand the treatment capacity at Well Site #5 to include water from Well Site H. Major adjustments will be needed, including increasing the capacity of chlorination system, constructing and testing a new supply well, and implementing a system to deliver water from Well Site H to Well Site #5.
3. **Add a second treatment train at Well Site H:** Add a new independent dedicated treatment train, similar to that for Well Site #5, to treat water from Well Site H.

5.2.3 Screening of Long List of Alternative Design Concepts for Water System

The long list of alternative design concepts was screened against the criteria established in Table 5-2. The screening results are presented in Table 5-5.

All three alternatives passed the screening criteria and are considered for further evaluation. The following three alternatives were carried forward:

1. Expand the existing capacity for Well Site #2.
2. Expand the existing treatment capacity for Well Site #5.
3. Add a second treatment train at Well Site H.

Table 5-5 Screening of the Long List of Water System Alternative Design Concepts

Alternative Solutions	Compatibility	Proven Technology	Performance Robustness	Stakeholder Acceptance	Construction Impacts	Cost	Notes
1. Expand Existing Capacity of Well Site #2	✓	✓	✓	✓	✓	✓	• **Proceed to Detailed Evaluation**. Meets all the criteria with minor upgrades; replacement of existing pump required.
2. Expand Existing Treatment Train Capacity of Well Site #5	✓	✓	✓	✓	✓	✓	• **Proceed to Detailed Evaluation**. An expanded treatment train at Well Site #5 will be able to meet the forecasted growth but major upgrades will be required in the existing facility.
3. Add Independent Dedicated Treatment Train from Well Site H	✓	✓	✓	✓	✓	✓	• **Proceed to Detailed Evaluation**. A new treatment facility at Well Site H will be able to provide water to the forecasted growth while meeting all the criteria.

5.2.4 Evaluation of Short List of Alternatives for Water Supply Solution

A detailed evaluation of the short listed design concepts was carried out in accordance with the evaluation methodology described in Table 5-3.

Since **Alternative 1, Expand Existing Capacity of Well Site #2,** is the only design concept for Well #2, it was evaluated on its own and chosen as the design concept for Well #2. The results of the evaluation can be seen in Table 5-6. The following considerations came out of the evaluation:

- **Technical:** This alternative makes use of the existing infrastructure and requires only minor equipment replacement at the existing facility; no technical challenges were identified.
- **Environmental:** Alternative 1 requires no changes to the already existing Well Site #2 and treatment facility so no environmental impacts will be expected except during construction.
- **Socioeconomic:** No socioeconomic impacts were identified besides those already existing from Well Site #2.
- **Financial:** Alternative A has a low relative capital cost but no other major costs were identified.
- **Jurisdictional:** Some permitting will be needed to increase the well capacity.

Alternatives 2 and 3 pertain to the new well at Site H and were evaluated together for comparison. The results of the evaluation can be seen in Table 5-7. The evaluation favored design concept **Alternative 3, Add Independent Dedicated Treatment Train from Well Site H,** because of the following considerations:

- **Technical:** Alternative 2 would require Well Site #5 to be taken out of service for an extended period while modifications are made; this could impact the ability to meet demand under certain conditions. Therefore, Alternative 3 ranked higher because of its ability to maximize existing infrastructure while being able to keep existing water servicing in place.
- **Environmental:** This alternative posed no environmental threats besides the expected impacts during construction.
- **Socioeconomic:** Alternative 3 has no considerable short-term or long-term effects since all construction will occur in the already existing site.
- **Financial:** This alternative will have moderate costs because it involves the construction of a new facility.
- **Jurisdictional:** Alternative 3 will require several permits to construct and bring into operation a new treatment train.

Table 5-6 Evaluation of Short-Listed Water Alternative Design Concepts for Well #2

Evaluation Criteria	1. Expand the Treatment Capacity of Well #2
TECHNICAL	
CONSTRUCTABILITY	**LOW IMPACT** • There will be no constructability challenges, complexity, and risks with this alternative because no new infrastructure would be installed. There will be no new impacts to the community.
REDUNDANCY OF SUPPLY/SERVICE	**MODERATE REDUNDANCY** • A higher capacity will cause a shorter supply of chemicals on hand. Thus, a higher redundancy of chemical delivery service would be required before the chemical reserves are depleted. However, the increase in chemical consumption is marginal.
RESILIENCE TO CLIMATE CHANGE	**HIGH RESILIENCE** • With no proposed changes to the existing system, there will be no impacts to environment/climate.
O&M REQUIREMENTS	**LOW COMPLEXITY** • There will be a low level of additional O&M resources required beyond the resources already required because of no new assets or infrastructure for this alternative.
ADAPTABILITY TO EXISTING INFRASTRUCTURE	**HIGH ADAPTABILITY** • There will be no modification required to the existing infrastructure.
MAXIMIZING USE OF EXISTING INFRASTRUCTURE	**HIGH DEGREE** • This alternative uses the existing infrastructure; no new asset needs.
OVERALL TECHNICAL RATING	**LOW IMPACT** • Low constructability impact, O&M complexity, and adaptability to existing infrastructure. • High redundancy and high degree of maximizing existing infrastructure. • Low resilience to climate change.
NATURAL ENVIRONMENT	
AQUATIC VEGETATION AND WILDLIFE	**LOW IMPACT** • There will be low impact on the aquatic vegetation and wildlife beyond the existing impact of the current system.

Evaluation Criteria	1. Expand the Treatment Capacity of Well #2
TERRESTRIAL VEGETATION AND WILDLIFE	**LOW IMPACT** • There will be low impact on the terrestrial vegetation and wildlife beyond the existing impact of the current system.
GROUNDWATER RESOURCES	**LOW IMPACT** • The only impact this alterative would have is a greater amount of water withdrawn from the well.
SURFACE WATER RESOURCES	**LOW IMPACT** • There will be no impact to surface water resources since the source stems from a well.
GHG EMISSIONS	**LOW IMPACT** • There will be low increase of GHG emissions associated with the alternative. Increases could stem from greater frequency of chemical transportation and greater energy demand for the pumps.
OVERALL ENVIRONMENTAL RATING	**LOW IMPACT** • This alternative will have an overall low environmental impact. No environmental impacts beyond those of the existing system are expected.
SOCIOECONOMIC ENVIRONMENT	
SHORT-TERM COMMUNITY IMPACTS	**LOW IMPACT** • There will be low level impacts short-term in the community. There would be a marginal increase in the frequency of delivery of chemicals. There would be no noise, dust, or odor impacts.
LONG-TERM COMMUNITY IMPACTS	**MODERATE IMPACT** • This alternative would have minimal long-term impacts to the community since existing infrastructure is largely suitable for the capacity increase.
ARCHEOLOGICAL SITES	**LOW IMPACT** • There would be no archaeological site impacts beyond what already exists with there being no new site work for this alternative.
CULTURAL/HERITAGE FEATURES	**LOW IMPACT** • There would be no cultural/heritage feature impacts beyond what already exists with the current system.
OVERALL SOCIOECONOMIC RATING	**LOW IMPACT** • No new impacts beyond those of the already existing facility are expected.

Evaluation Criteria	1. Expand the Treatment Capacity of Well #2
FINANCIAL	
LAND ACQUISITION	**LOW COST** • No land acquisition expected.
CAPITAL COST	**LOW COST** • There would be a low relative capital cost with no new construction required. Cost impacts include replacement of the existing well pump and switchgear, as required. Other cost impacts would stem from a greater frequency of chemical delivery.
20 YEAR LIFECYCLE COST	**LOW COST** • This alternative has a relatively low 20-year lifecycle cost.
OVERALL FINANCIAL RATING	**LOW COST** • Alternative will have no significant costs.
JURISDICTIONAL/REGULATORY	
LAND REQUIREMENTS	**LOW REQUIREMENT** • No land requirement expected.
ABILITY TO ACCOMMODATE POTENTIAL FUTURE REGULATORY CHANGES	**HIGH ADAPTABILITY** • The existing site is adaptable for the addition of conventional and advanced treatment technologies to accommodate potential future regulatory changes.
PERMITS AND APPROVALS	**LOW REQUIREMENT** • The only permit required would be modification of the PTTW for 32 L/s. The Region has acquired permits/LOA from TRCA & MNRF/MECP for the discharge of water associated with the development and commissioning and testing of wells.
OVERALL JURISDICTIONAL/REGULATORY RATING	**LOW IMPACT** • No new land acquisition or major permitting expected.

Table 5-7 Evaluation of Short-Listed Water System Alternative Design Concepts for New Well

Evaluation Criteria	2. Expand Existing Treatment Capacity for Well Site #5	3. Add a Second Treatment Train from Well Site H
TECHNICAL		
CONSTRUCTABILITY	**HIGH IMPACT** • There will be major constructability challenges relating to increasing the size of main line piping, valves, and instrumentation, replacing the sodium silicate metering pumps, and increasing the volume of the chlorine contactor. Challenges would include removing Well Site #5 from service for a significant length of time to perform modifications, which may impact the ability to meet demand.	**MODERATE IMPACT** • A second treatment train would include all types constructability challenges when building a new facility—noise, traffic, dust, etc. It may impact the community during the ongoing construction of the facility, but this will be dissipated when construction ends. The complexity of the construction will be low and will allow Well Site #5 to remain in service for the majority of construction.
REDUNDANCY OF SUPPLY/SERVICE	**MODERATE REDUNDANCY** • A higher capacity will cause a shorter supply of chemicals on hand, resulting in less redundancy of chemicals.	**HIGH REDUNDANCY** • A second treatment train would increase overall redundancy at the site. The second treatment train would not be impacted from disruptions at Well Site #5. Chemical storage would be sized for required redundancy at Well Site H.
RESILIENCE TO CLIMATE CHANGE	**HIGH RESILIENCE** • Expansion of the existing site would have minimal impacts to climate change.	**HIGH RESILIENCE** • The second treatment train would be able to have resistance similar to that of the existing treatment facility.
O&M REQUIREMENTS	**LOW COMPLEXITY** • There will be a low level of additional O&M resources required beyond the resources already required because of no additional unique assets or infrastructure for this alternative.	**MODERATE COMPLEXITY** • Adding a second treatment train will increase the amount of equipment to be maintained, leading to higher O&M requirements.

Evaluation Criteria	2. Expand Existing Treatment Capacity for Well Site #5	3. Add a Second Treatment Train from Well Site H
ADAPTABILITY TO EXISTING INFRASTRUCTURE	**LOW ADAPTABILITY** • This alternative requires replacement of existing main line piping and silicate metering pumps, as well as the addition of volume of the chlorine contact pipe.	**MODERATE ADAPTABILITY** • Adding a second treatment train requires minimal modification to the existing Well Site #5. The new treatment train would tie in downstream of Well Site #5.
MAXIMIZING USE OF EXISTING INFRASTRUCTURE	**HIGH DEGREE** • This design concept will optimize the use of the existing facilities.	**HIGH DEGREE** • The new treatment train will not use existing infrastructure, other than finished water piping.
OVERALL TECHNICAL RATING	**MODERATE IMPACT** • Considerable impacts from construction and low adaptability to existing infrastructure. • Moderate degree of adapting to existing infrastructure.	**MODERATE IMPACT** • Moderate constructability impact, O&M complexity, and adaptability to existing infrastructure. • High redundancy and high degree of maximizing existing infrastructure. • Low resilience to climate change.
ENVIRONMENTAL		
AQUATIC VEGETATION AND WILDLIFE	**MODERATE IMPACT** • There will be moderate impact on the aquatic vegetation and wildlife during construction because of the need to expose the existing chlorine contact pipe.	**MODERATE IMPACT** • With ongoing construction, personnel, and traffic, the local habitats, animals, and environmentally sensitivity areas may be impacted significantly. Although this depends on the level of local aquatic species and habitat already present at the site.

Evaluation Criteria	2. Expand Existing Treatment Capacity for Well Site #5	3. Add a Second Treatment Train from Well Site H
TERRESTRIAL VEGETATION AND WILDLIFE	**MODERATE IMPACT** • There will be moderate impact on the terrestrial vegetation and wildlife during construction because of the need to expose the existing chlorine contact pipe.	**MODERATE IMPACT** • By building a second building, local vegetation will need to be removed, possibility disrupting any existing habitats and species.
GROUNDWATER RESOURCES	**LOW IMPACT** • Low impact expected to groundwater resources.	**LOW IMPACT** • Low impact expected to groundwater resources.
SURFACE WATER RESOURCES	**LOW IMPACT** • Minimal impact to surface water resources.	**LOW IMPACT** • Minimal impact to surface water resources.
GHG EMISSIONS	**LOW IMPACT** • There will be low increase of GHG emissions associated with the alternative. Increases could stem from greater frequency of chemical transportation and greater energy demand for the pumps.	**MODERATE IMPACT** • There could be a moderate increase in GHG emissions from all the energy required to operate an additional facility and transportation for supply/servicing.
OVERALL ENVIRONMENTAL RATING	**LOW IMPACT** • This alternative will have an overall low environmental impact; construction impacts on terrestrial and aquatic vegetation will be mitigated with the appropriate measures.	**LOW IMPACT** • This alternative will have an overall low environmental impact; construction impacts on terrestrial and aquatic vegetation will be mitigated with the appropriate measures.

Evaluation Criteria	2. Expand Existing Treatment Capacity for Well Site #5	3. Add a Second Treatment Train from Well Site H
SOCIOECONOMIC		
SHORT-TERM COMMUNITY IMPACTS	**MODERATE IMPACT** • There would be moderate impact because of the construction of expanding the chlorine contactor, which includes noise, dust, odor, and local traffic. Additionally, increasing the size of the main line piping will require the existing well site to be removed from service, which may impact ability to meet demand.	**MODERATE IMPACT** • With construction of a new facility, noise, dust, potential odor, and local traffic will be experienced.
LONG-TERM COMMUNITY IMPACTS	**LOW IMPACT** • Expansion of the existing treatment train will have no long-term impacts on the community.	**MODERATE IMPACT** • Addition of a new treatment train will result in additional buildings and equipment, which may be perceived by the community as detrimental.
ARCHEOLOGICAL SITES	**LOW IMPACT** • All construction activities take place on previously disturbed properties. Archeological potential not expected to be significant.	**LOW IMPACT** • All construction activities take place on previously disturbed properties. Archeological potential not expected to be significant.
CULTURAL/HERITAGE FEATURES	**LOW IMPACT** • The Stage 1 archeological assessment did not identify any significant risks to BHRs or CHLs.	**LOW IMPACT** • The Stage 1 archeological assessment did not identify any significant risks to BHRs or CHLs.
OVERALL SOCIOECONOMIC RATING	**MODERATE IMPACT** • Moderate impact because of the new main that will be required.	**LOW IMPACT** • Low community impacts because all construction will happen in the already operating facilities.

Evaluation Criteria	2. Expand Existing Treatment Capacity for Well Site #5	3. Add a Second Treatment Train from Well Site H
FINANCIAL		
LAND ACQUISITION	**LOW COST** (green) • No land acquisition expected.	**LOW COST** (green) • No land acquisition expected.
CAPITAL COST	**LOW COST** (green) • The capital cost of increasing the main line piping, replacing the sodium silicate feed pumps, and expanding the volume of the chlorine contact pipe is relatively low compared to adding a new treatment train. However, this alternative requires taking the facility out of service for the duration of construction.	**MODERATE COST** (yellow) • The capital cost of adding a new treatment train is moderately higher than expanding the existing treatment train.
20 YEAR LIFECYCLE COST	**LOW COST** (green) • The lifecycle cost of increasing the main line piping, replacing the sodium silicate feed pumps, and expanding the volume of the chlorine contact pipe is relatively low compared to adding a new treatment train.	**MODERATE COST** (yellow) • The cost of adding a new treatment train is moderately higher than expanding the existing treatment train
OVERALL FINANCIAL RATING	**LOW COST** (green) • Expansion of the existing treatment capacity for Well Site #5 will increase the capital and 20-year lifecycle cost but will be of lower cost than Alternative 3.	**MODERATE COST** (yellow) • Adding a second treatment train will increase the capital and 20-year lifecycle cost.

Evaluation Criteria	2. Expand Existing Treatment Capacity for Well Site #5	3. Add a Second Treatment Train from Well Site H
JURISDICTIONAL/REGULATORY		
LAND REQUIREMENTS	**LOW REQUIREMENT** • No land requirement expected.	**LOW REQUIREMENT** • No land requirement expected.
ABILITY TO ACCOMMODATE POTENTIAL FUTURE REGULATORY CHANGES	**HIGH ADAPTABILITY** • The existing site is adaptable for addition of conventional and advanced treatment technologies to accommodate potential future regulatory changes.	**MODERATE ADAPTABILITY** • The new treatment train would be adaptable for the addition of conventional and advanced treatment technologies to accommodate potential future regulatory changes. However, less space would be available for such technologies.
PERMITS AND APPROVALS	**MODERATE REQUIREMENT** • Some permitting is anticipated to be required for modifying/expanding the existing train.	**MODERATE REQUIREMENT** • Some permitting is anticipated to be required for modifying/expanding the existing train.
OVERALL JURISDICTIONAL/REGULATORY RATING	**LOW IMPACT** • Alternative has the ability to accommodate future regulatory changes; some new permitting is anticipated.	**MODERATE IMPACT** • Because of site constraints there is limited availability to accommodate future regulatory changes; some new permitting is anticipated.

5.2.5 Recommended Water Design Concept

After screening and evaluation, the following two design concepts for Nobleton's water servicing were recommended:

1. Well Site #2: Expand well to capacity of 34 L/s; the current facility has enough treatment capacity to treat additional flows and only chemical consumption will increase. Figure 5-2 shows the current location of Well #2.
2. New Well at Site H: A new well with a capacity of 34 L/s will be built at Site H along with a new treatment train facility. This well will be in the same site as Well #5 so the pump house will have to be extended. Figure 5-3 shows the Site H with the proposed new well and treatment facility.

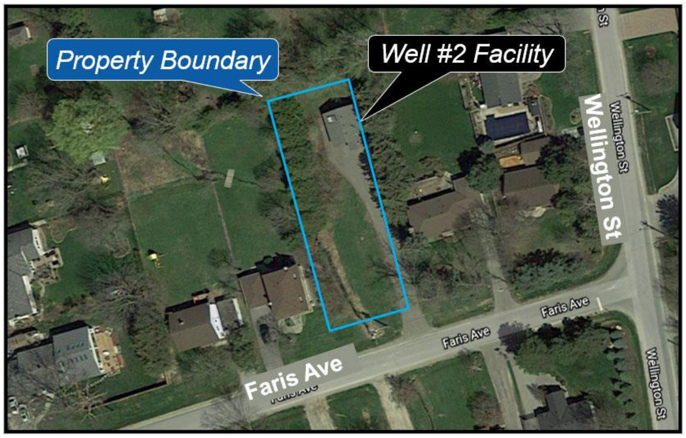


Figure 5-2 Well #2 Recommended Design Concept

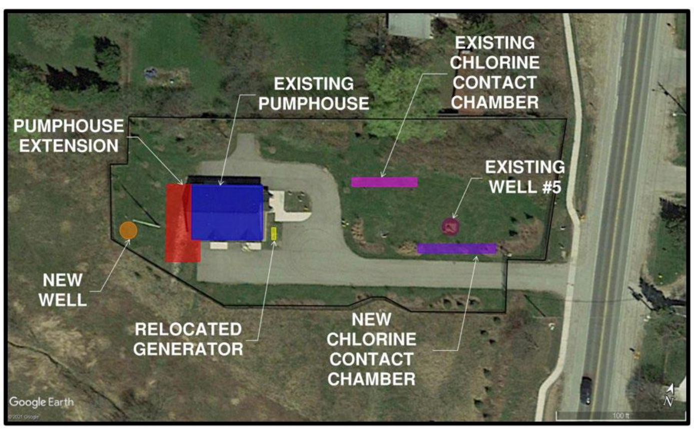


Figure 5-3 New Well from Site H Recommended Design Concept

5.3 Wastewater Alternative Design Concepts

In Phase 2 the recommended design alternative was to expand and upgrade the existing Janet Avenue PS, Force Main, and Nobleton WRRF and Outfall. As part of Phase 3, various design concepts were developed to ensure that the wastewater system can handle projected flows while maximizing the current infrastructure.

5.3.1 Wastewater System Solution

When developing the design concepts, the recommended solution was split up in two different solutions focusing on two different parts of the wastewater system.

The first solution focused on design concepts for wastewater conveyance and pumping. The infrastructure involved in this solution includes the gravity sewer collection system, Janet Avenue PS, the force main from the PS to the WRRF, and the outfall. Nobleton has considerably high PIFs and expanding all the infrastructure along the system to handle these flows, that only occur during wet weather events, would result in an oversized and underused system. Therefore, flow attenuation, which involves reducing high peak flows in the system through a storage facility, was incorporated into the design concepts; attenuation can be achieved through the use of structures such as pipes or tanks that would store wastewater during wet weather events to mitigate above average flows in the system. Hence, all the design concepts for the wastewater conveyance and pumping solution incorporated flow attenuation at some part of the system.

The second solution focused on design concepts for the Nobleton WRRF. As part of the wastewater servicing solution, several upgrades and expansions at various treatment trains are required in the WRRF to meet future flows and treated effluent quality. The design concepts focused primarily on the different technologies available to upgrade the secondary biological treatment process.

5.3.2 Wastewater Pumping and Conveyance Alternative Design Concepts

A total of four design concepts were developed for the wastewater pumping and conveyance solution. Alternative 3 focuses on attenuation at Janet Avenue PS and two alternative design concepts were developed focusing on different storage infrastructure.

1. **No Flow Attenuation:** No flow attenuation at either upstream of the Janet Avenue PS or the WRRF. With no flow attenuation the entire wastewater infrastructure, Janet Avenue PS, force main, and outfall would have to be expanded to handle peak flows.

2. **Flow Attenuation at the WRRF:** Provide an equalization tank of 1,300 m^3 at the WRRF that will be equipped with a PS to lift wastewater to the headworks and will reduce peak instantaneous flows to 145 L/s. Additionally the following upgrades will be required: expansion of Janet Avenue PS to 292 L/s, twinning of existing 300 mm sanitary force main, and twinning of constricted part of effluent to 145 L/s.

3. **Flow Attenuation at the Janet Avenue PS:** flow attenuation upstream of the Janet Avenue PS with one of the following structures:

    a. **Below Grade Storage Tank:** Provide flow attenuation storage upstream of the Janet Avenue PS with a 1,300 m^3 below grade storage tank that will reduce PIFs to 145 L/s. Additionally, Janet Avenue PS will need to be expanded to a capacity of 145 L/s.

b. **Flow Attenuation at the Janet Avenue PS with a Gravity Pipe:** Provide flow attenuation storage upstream of the Janet Avenue PS with an oversize pipe that will store wastewater and then divert it back to the PS to reduce PIFs to 145 L/s. Additionally, Janet Avenue PS will need to be expanded to a capacity of 145 L/s.

5.3.2.1 Screening of Long List of Alternative Design Concepts for Wastewater Pumping and Conveyance

The long list of alternative design concepts was screened against the criteria established in Table 5-2. The screening results are presented in Table 5-8.

The following two design concepts passed the screening criteria and were considered for further evaluation:

1. Flow Attenuation at Janet Avenue PS with a Below Grade Storage Tank.

2. Flow Attenuation at Janet Avenue PS with a Gravity Pipe.

Table 5-8 Screening of the Long List of Wastewater Pumping and Conveyance Alternative Design Concepts

Alternative Solutions	Compatibility	Proven Technology	Performance Robustness	Stakeholder Acceptance	Construction Impacts	Cost	Notes
1. No Flow Attenuation	✓	✓	×	✓	✓	×	• **Eliminated** because this alternative would result in expansion of all the infrastructure in the wastewater system, which would be of high cost and would result in oversized facilities.
2. Flow Attenuation at Nobleton WRRF	✓	✓	×	✓	✓	×	• **Eliminated** because this alternative would result in expansion of all the infrastructure in the wastewater system, which would be of high cost and would result in oversized facilities.
3a. Flow Attenuation at Janet Avenue PS with a Below Grade Storage Tank	✓	✓	✓	✓	✓	✓	• **Proceed to detailed evaluation**. Alternative eliminates the twinning of the 300 mm force main and minimizes the expansion of Janet Avenue PS; it is the least expensive alternative that also maximizes existing infrastructure.
3b. Flow Attenuation at Janet Avenue PS with a Gravity Pipe	✓	✓	✓	✓	✓	✓	• **Proceed to detailed evaluation**. Alternative eliminates the twinning of the 300 mm force main and minimizes the expansion of Janet Avenue PS; it is the least expensive alternative that also maximizes existing infrastructure.

5.3.2.2 Evaluation of Short List of Alternatives for Wastewater Solution

A detailed evaluation of the short-listed design concepts was carried out in accordance with the evaluation methodology described in Table 5-3. The results of the evaluation can be seen in Table 5-9.

The evaluation favored design concept **Alternative 1, Flow Attenuation at Janet Avenue PS with a Below Grade Storage Tank,** because of the following considerations:

- **Technical:** This alternative ranked highest because it will not interrupt access into the PS site during construction, has high redundancy, and maximizes the existing infrastructure.
- **Environmental:** Besides additional power requirements, this alternative will have low environmental impacts.
- **Socioeconomic:** Alternative 2 would require closure of the access roadway and an alternate site entrance and thus Alternative 1 ranked the highest because it minimizes the community impacts during construction.
- **Financial:** This alternative was determined to have the most economical capital investment and lifecycle cost.
- **Jurisdictional:** Amendment to existing permits would be required but no additional permitting or land acquisition is expected for this alternative.

Table 5-9 Evaluation of Short-Listed Pumping and Conveyance Alternative Design Concepts

Evaluation Criteria	1. Flow Attenuation at Janet Avenue PS With a Below Grade Storage Tank	2. Flow Attenuation at Janet Avenue PS With Gravity Pipe
TECHNICAL		
CONSTRUCTABILITY	**LOW IMPACT** • Excavation required for a sizeable footprint (15.5 metres x 12 metres x 11 metres deep) at the Janet Avenue PS site. • The Janet Avenue PS is in a residential area. Therefore, the community will be impacted by construction. • The existing Janet Avenue PS needs to be operational at firm capacity during the construction.	**MODERATE IMPACT** • Excavation required to install a large and deep pipe (3 metres to 3.6 metres diameter and up to 11 metres deep) on the approach road to the Janet Avenue PS, and a chamber to connect the new pipe to the wet well. • The Janet Avenue PS is in a residential area. Therefore, the community will be impacted by construction. • The existing Janet Avenue PS needs to be operational at firm capacity during the construction. • Alternative access to the Janet Avenue PS will be needed during the construction of the big pipe on the approach road leading to the PS, causing further community impacts.
REDUNDANCY OF SUPPLY/SERVICE	**HIGH REDUNDANCY** • The PS firm capacity will increase by addition of larger and/or additional pumps, and/or increase in wet well capacity. • The flow attenuation tank will provide redundancy to divert flows to the tank if required during dry weather as well.	**HIGH REDUNDANCY** • The PS firm capacity will increase by addition of larger and/or additional pumps and/or increase in wet well capacity. • The big pipe will provide buffer to store flows if the pump station is operating at reduced capacity for preventative maintenance or breakdown.

Evaluation Criteria	1. Flow Attenuation at Janet Avenue PS With a Below Grade Storage Tank	2. Flow Attenuation at Janet Avenue PS With Gravity Pipe
RESILIENCE TO CLIMATE CHANGE	**LOW RESILIENCE** • The facilities are sized based on Rainfall Derived Infiltration and Inflow (RDII) for a current 1 in 25-year wet weather event. Wet weather resilience has not been built into the volume calculation of the flow attenuation tank.	**LOW RESILIENCE** • The facilities are sized based on RDII for a current 1 in 25-year wet weather event. Wet weather resilience has not been built into the volume calculation of the flow attenuation tank.
O&M REQUIREMENTS	**MODERATE COMPLEXITY** • The expansion of the Janet Avenue PS will result in moderate increase of the O&M resources. • The new flow attenuation tank will need new equipment such as a coarse bubble aeration system, including blowers, in addition to tipping buckets and odour control and will result in moderate increase to the complexity of operation.	**MODERATE COMPLEXITY** • The expansion of the Janet Avenue PS will result in moderate increase of the O&M resources. • The new big pipe will not result in appreciable increase in the operation complexity. The key additional system envisaged for this infrastructure is a new odour control system.
ADAPTABILITY TO EXISTING INFRASTRUCTURE	**MODERATE ADAPTABILITY** • Modest modifications will be needed to connect the new flow attenuation tank to the existing wet well. Moderate structural work will be needed.	**MODERATE ADAPTABILITY** • A new chamber will be needed to connect the new big pipe to the wet well. Moderate civil and structural work will be needed.
MAXIMIZING USE OF EXISTING INFRASTRUCTURE	**HIGH DEGREE** • This design concept will optimize the use of the existing facilities, including the existing force main and outfall and eliminate their twinning. • This design concept will also limit the expansion of the Janet Avenue PS.	**HIGH DEGREE** • This design concept will optimize the use of the existing facilities, including the existing force main and outfall and eliminate their twinning. • This design concept will also limit the expansion of the Janet Avenue PS.

Evaluation Criteria	1. Flow Attenuation at Janet Avenue PS With a Below Grade Storage Tank	2. Flow Attenuation at Janet Avenue PS With Gravity Pipe
OVERALL TECHNICAL RATING	**MODERATE IMPACT** • Moderate constructability impact, O&M complexity, and adaptability to existing infrastructure. • High redundancy and high degree of maximizing existing infrastructure. • Low resilience to climate change.	**MODERATE IMPACT** • Moderate constructability impact, O&M complexity, and adaptability to existing infrastructure. • High redundancy and high degree of maximizing existing infrastructure. • Low resilience to climate change.
ENVIRONMENTAL		
AQUATIC VEGETATION AND WILDLIFE	**LOW IMPACT** • Increase in capacity and flow attenuation will have a positive impact, reducing the potential for emergency overflows into the water bodies. • The construction of the flow attenuation tank has the potential to allow sediment to flow into the nearest water body, which will be mitigated by taking control measures during construction.	**LOW IMPACT** • Increase in capacity and flow attenuation will have a positive impact, reducing the potential for emergency overflows into the water bodies. • The construction of the big pipe has the potential to allow sediment to flow into the nearest water body, depending on the method of construction, i.e., open trench versus trenchless methods. This will be mitigated by taking control measures during construction.
TERRESTRIAL VEGETATION AND WILDLIFE	**LOW IMPACT** • Low risk expected to terrestrial vegetation and wildlife. Expansion of the PS and construction of the new tank is within the current footprint of the existing facility's property line. • Short-term impacts during construction are possible, but non-damaging construction techniques would be employed to minimize impact.	**LOW IMPACT** • Low risk expected to terrestrial vegetation and wildlife. Expansion of the PS and construction of the big pipe expansion is within the current footprint of the existing facility's property line and existing easement. • Short-term impacts during construction are possible, but non-damaging construction techniques would be employed to minimize impact.

Evaluation Criteria	1. Flow Attenuation at Janet Avenue PS With a Below Grade Storage Tank	2. Flow Attenuation at Janet Avenue PS With Gravity Pipe
GROUNDWATER RESOURCES	**LOW IMPACT** • Low impact expected to groundwater resources.	**LOW IMPACT** • Low impact expected to groundwater resources.
SURFACE WATER RESOURCES	**LOW IMPACT** • Because of excavation during construction, there is potential for silt and sediment finding its way into the nearby water course. Appropriate silt and sediment control measures will be taken during construction to minimize impact. • Minimum impact is expected during operation because of redundancy built into the system, which will minimize the potential for emergency overflows.	**LOW IMPACT** • Because of excavation during construction, there is potential for silt and sediment finding its way into the nearby water course. Appropriate silt and sediment control measures will be taken during construction to minimize impact. • Minimum impact is expected during operation because of redundancy built into the system, which will minimize the potential for emergency overflows.
GHG EMISSIONS	**MODERATE IMPACT** • The PS expansion will result in greater energy demands because of increased power requirements. In addition, the flow attenuation tank will be equipped with a blower system that will place additional power demands.	**LOW IMPACT** • The PS expansion will result in greater energy demands because of increased power requirements. The big pipe will not be equipped with a blower system. Therefore, this alternative will have slightly lower greenhouse emissions impact.
OVERALL ENVIRONMENTAL RATING	**LOW IMPACT** • This alternative will have an overall low environmental impact except for the greenhouse emissions impact, which will be slightly greater because of the need for a blower system to supply air to the coarse bubble aeration system for the flow attenuation tank.	**LOW IMPACT** • This alternative will have an overall low environmental impact.

Evaluation Criteria	1. Flow Attenuation at Janet Avenue PS With a Below Grade Storage Tank	2. Flow Attenuation at Janet Avenue PS With Gravity Pipe
SOCIOECONOMIC		
SHORT-TERM COMMUNITY IMPACTS	**MODERATE IMPACT** • As the Janet Avenue PS is in a residential area, the construction of the tank and PS expansion will have typical construction impacts of traffic, noise, and dust. These will be mitigated as much as possible by taking appropriate measures during construction.	**MODERATE IMPACT** • Alternative access to the Janet Avenue PS will be needed during the construction of the big pipe on the approach road leading to the PS, causing further community impacts. • Construction impacts expected in residential area during construction.
LONG-TERM COMMUNITY IMPACTS	**MODERATE IMPACT** • The PS expansion is expected to increase the power requirements, as a result of which, a larger substation and a new, second standby power generator will be needed. • The new flow attenuation tank will be below ground and is not expected to cause adverse visual impact. However, the coarse bubble aeration system blowers will need additional footprint, building, or enclosures and will create noise when in operation. • All new assets for system upgrade are within the current footprint of the existing facility. • The new flow attenuation tank will have the potential to cause adverse odours. This will be mitigated by providing odour control if required.	**LOW IMPACT** • The PS expansion is expected to increase the power requirements, as a result of which, a larger substation and a new, second standby power generator will be needed. • The new pipe will not cause adverse visual impact. • All new assets for system upgrade are within the current footprint of the existing facility or the easement. • The new pipe will have the potential to cause adverse odours. This will be mitigated by providing odour control if required.
ARCHEOLOGICAL SITES	**LOW IMPACT** • All construction activities take place on previously disturbed properties. Archeological potential not expected to be significant.	**LOW IMPACT** • All construction activities take place on previously disturbed properties. Archeological potential not expected to be significant.

Evaluation Criteria	1. Flow Attenuation at Janet Avenue PS With a Below Grade Storage Tank	2. Flow Attenuation at Janet Avenue PS With Gravity Pipe
CULTURAL/HERITAGE FEATURES	**LOW IMPACT** • The Stage 1 archeological assessment did not identify any significant risks to BHRs or CHLs.	**MODERATE IMPACT** • The Stage 1 archeological assessment did not identify any significant risks to BHRs or CHLs.
OVERALL SOCIOECONOMIC RATING	**LOW IMPACT** • Low overall long-term community impact because of expansion of the existing Janet Avenue PS, and addition of the coarse bubble blower system.	**LOW IMPACT** • Low community impacts besides the need for an alternate route to the PS during construction.
FINANCIAL		
LAND ACQUISITION	**LOW COST** • No land acquisition expected.	**LOW COST** • No land acquisition expected.
CAPITAL COST	**LOW COST** • Since both alternatives require expansion of the PS for the purpose of this comparison, the comparative cost difference between the flow attenuation tank and the big pipe is negligible.	**LOW COST** • Since both alternatives require expansion of the PS for the purpose of this comparison, the comparative cost difference between the flow attenuation tank and the big pipe is negligible.
20-YEAR LIFECYCLE COST	**MODERATE COST** • The expanded Janet Avenue PS and flow attenuation tank is expected to increase the 20-year lifecycle cost primarily because of the increased hydro requirement. Alternative will need additional blower system, which is associated with additional power requirements. However, because of the use of the flow attenuation tank, only during WWF events, the lifecycle cost difference between Alternatives 1 and 2 is expected to be negligible.	**MODERATE COST** • The expanded Janet Avenue PS and flow attenuation pie is expected to increase the 20-year lifecycle cost primarily because of the increased hydro requirement. Because of the use of the flow attenuation tank, only during WWF events, the lifecycle cost difference between Alternatives 1 and 2 is expected to be negligible.

Evaluation Criteria	1. Flow Attenuation at Janet Avenue PS With a Below Grade Storage Tank	2. Flow Attenuation at Janet Avenue PS With Gravity Pipe
OVERALL FINANCIAL RATING	**MODERATE COST** • Expansion of the Janet Avenue PS and the new flow attenuation facility will increase the capital and 20-year lifecycle cost.	**MODERATE COST** • Expansion of the Janet Avenue PS and the new flow attenuation facility will increase the capital and 20-year lifecycle cost.
JURISDICTIONAL/REGULATORY		
LAND REQUIREMENTS	**LOW REQUIREMENT** • No land requirement expected.	**LOW REQUIREMENT** • No land requirement expected.
ABILITY TO ACCOMMODATE POTENTIAL FUTURE REGULATORY CHANGES	**NOT APPLICABLE** • The Janet Avenue PS and the storage is not expected to have any impact on the wastewater effluent quality requirements in the present or the future.	**NOT APPLICABLE** • The Janet Avenue PS and the storage is not expected to have any impact on the wastewater effluent quality requirements in the present or the future.
PERMITS AND APPROVALS	**LOW REQUIREMENT** • This alternative would need an amendment to the existing MECP ECA. • This alternative would need the following requirements: Township of King Site Plan Approval, Township of King Building Permit, Electrical Safety Authority (ESA) Plans Approval, and Toronto and Regional Conservation Authority Approval.	**LOW REQUIREMENT** • This alternative would need an amendment to the existing MECP ECA. • This alternative would need the following requirements: Township of King Site Plan Approval, Township of King Building Permit, and Electrical Safety Authority (ESA) Plans Approval
OVERALL JURISDICTIONAL/ REGULATORY RATING	**LOW IMPACT** • No new land acquisition or major permitting expected.	**LOW IMPACT** • No new land acquisition or major permitting expected.

5.3.3 Wastewater WRRF Alternative Design Concepts

Secondary biological treatment is the fundamental basis for municipal wastewater treatment; it has the largest impact on performance, operation, and cost of the WRRF. Therefore, design concepts focused on the expansion, intensification, and/or upgrade of the secondary biological treatment process. In parallel, upgrades to the screening, grit removal, nutrient removal, tertiary treatment, effluent disinfection, and sludge handling will also be required.

With flow attenuation upstream of the WRRF, the PIF into the WRRF will be reduced to 12,500 m^3/day. This minimizes the impact on preliminary treatment, secondary treatment, tertiary treatment, and disinfection, which will reduce the upgrades needed in the WRRF. A long list of the following six design concepts were developed for the WRRF:

1. **No Flow Attenuation:** With no upstream flow attenuation, most treatment processes will need to be upgraded and expanded to handle PIFs, including twinning of the outfall and force main.
2. **Expand Existing Secondary Biological Treatment - Enlarge Existing Aeration Tanks:** Increase the volume of each aeration tank by widening the tanks; aeration blower capacity and return activated sludge (RAS) pumping capacity would also need to be increased.
3. **Reduce Loads to Secondary Biological Treatment – Add Primary Treatment:** Add primary filtration to reduce the loading on secondary treatment process. This would eliminate the need to expand the existing aeration tanks but would require modifications to the current primary treatment process.
4. **Intensify Secondary Biological Treatment – Membrane Aerated Bioreactor (MABR):** The existing aeration system would be intensified by converting it to a hybrid suspended growth/attached growth process to increase treatment capacity. A Technology Options Study was completed to evaluate wastewater technologies; the study recommended MABRs as the preferred intensification process. The existing tanks will be modified to include the MABR but no new aeration tanks will be required. A baffle wall will be included in the modified aeration tanks to include anoxic zones.
5. **Add Secondary Biological Treatment Train:** Construction of a new, independently operated treatment train, including a new headworks building, new aeration tank, new process building for pumping and blowers, and a new secondary clarifier.
6. **Expand Existing Biological Treatment with Equalization Expansion:** Add a new aerated equalization tank, downstream of the preliminary treatment to reduce flow rates into the treatment trains. A new pump station would be required to convey flows from the equalization tank to secondary treatment. The existing aeration tank would still need to be upgraded but no other treatment trains will need to be upgraded.

5.3.3.1 Screening of Long List of Alternative Design Concepts for WRRF

The long list of alternative design concepts was screened against the criteria established in Table 5-2. The screening results are presented in Table 5-10.

The following two design concepts passed the screening criteria and were considered for further evaluation:

1. Expand Existing Secondary Biological Treatment - Enlarge Existing Aeration Tanks.
2. Intensify Secondary Biological Treatment – MABR.

Table 5-10 Screening of the Long List of WRRF Alternative Design Concepts

Alternative Solutions	Compatibility	Proven Technology	Performance Robustness	Stakeholder Acceptance	Construction Impacts	Cost	Notes
1. No Flow Attenuation	✓	✓	×	✓	×	×	• **Eliminated** because this alternative would result in expansion of all the infrastructure in the wastewater system, which would be of high cost and would result in oversized facilities.
2. Expand Existing Secondary Biological Treatment – Enlarge Aeration Tanks	✓	✓	✓	✓	✓	✓	• **Proceed to detailed evaluation**. Alternative passed all screening and will provide redundancy for increased flow rates.
3. Reduce Loads to Secondary Biological Treatment – Add Primary Treatment	×	✓	✓	×	✓	✓	• **Eliminated** because of incompatibility with operation and hydraulics of the existing facility.
4. Intensify Secondary Biological Treatment –MABR	✓	✓	✓	✓	✓	✓	• **Proceed to detailed evaluation**. MABR technology is compatible with the existing treatment process without undue costs or construction impacts; many intensification processes have a long track record.
5. Add Secondary Biological Treatment Train	×	✓	✓	✓	✓	×	• **Eliminated** because of construction impacts and costs.
6. Expand Existing Biological Treatment with Equalization Expansion	×	✓	×	✓	✓	✓	• **Eliminated** because of the need of a new process and new PS. Additionally, peak capacity of the plant would not be increased so there would be no redundancy for future growth.

In addition to the modifications to the secondary treatment processes specified in each design concept, additional upgrades and/or expansions will be required in the other treatment processes. A Technology Options to Meet Receiving Water Quality Study was conducted to select the most suitable technology for each treatment process at the Nobleton WRRF; the reasoning behind the selection of each technology can be found in Appendix B. Table 5-11 summarizes the chosen technology for each of the WRRF treatment processes.

Table 5-11 Technology Alternatives for Each WRRF Treatment Process

WRRF Treatment Process	Alternative 1: Enlarge Aeration Tanks	Alternative 2: Intensify Secondary Treatment
Coarse Screening	Coarse Screening: Climber Screen	Fine Screening: Perforated Plate
Grit Removal	Induced Vortex Grit Tanks	
Primary Treatment	Primary Filtration	
Secondary Treatment	Extended Aeration	Extended Aeration + MABR
Tertiary Treatment	Single-Stage Sand Filtration	
Effluent Disinfection	UV Disinfection	
Sludge Thickening	None	None

5.3.3.2 Evaluation of Short List of Alternatives for Water Supply Solution

A detailed evaluation of the short-listed design concepts was carried out in accordance with the evaluation methodology described in Table 5-3. The results of the evaluation can be seen in Table 5-12.

The evaluation favored design concept **Alternative 2, Intensify Secondary Biological Treatment – MABR,** because of the following considerations:

- **Technical:** This alternative ranked highest because it maximizes existing infrastructure and has less construction impacts.
- **Environmental:** Alternative 2 ranked the highest because of its low impact on GHG emissions that MABR process requires compared to extending the aeration tanks. Additionally, it has low impacts on existing terrestrial vegetation, groundwater resources, and surface water resources.
- **Socioeconomic:** No socioeconomic impacts are anticipated because construction will take place on previously disturbed property and no long-term impacts have been identified.
- **Financial:** Alternative 2 ranked the highest for the financial criteria because the additional equipment needed would cost less than the tanks expansion.
- **Jurisdictional:** Because of the lack of full-scale operations, Alternative 2 will require additional permitting but no major regulatory requirements have been anticipated.

Table 5-12 Evaluation of Short-Listed WRRF Alternative Design Concepts

Evaluation Criteria	1. Enlarge Aeration Tanks	2. Intensify Secondary Biological System (MABR)
TECHNICAL		
CONSTRUCTABILITY	**MODERATE IMPACT** • Modest excavation at aeration tanks for expansion. • Currently, the WRRF uses only one of two aeration tanks – assume they would be able to work at one tank at a time without disturbing the operation. • Expansion of filtration and UV disinfection area of process building.	**LOW IMPACT** • No excavation and few structural modifications required. • Currently, the WRRF uses only one of two aeration tanks – assume work could be done at one tank at a time without disturbing the operation. • Aeration tanks requires concrete work and additions of mixers. • Expansion of filtration and UV disinfection area of process building. • More complicated renovation of the inlet works area of the process building to incorporate fine screens.
REDUNDANCY OF SUPPLY/SERVICE	**HIGH REDUNDANCY** • Firm capacity would be provided as required in MECP standards. • For secondary treatment, assumed conservative operational parameters (e.g., mixed liquor suspended solids [MLSS] concentration), such that each basin has spare capacity through operational modification.	**HIGH REDUNDANCY** • Firm capacity would be provided as required in MECP standards. • For secondary treatment, assumed conservative operational parameters (e.g., MLSS) concentration, such that each basin has spare capacity through operational modification.

Evaluation Criteria	1. Enlarge Aeration Tanks	2. Intensify Secondary Biological System (MABR)
RESILIENCE TO CLIMATE CHANGE	**MODERATE RESILIENCE** • This alternative does not include expanding the outfall. Higher rates of RDII than projected could require expanding upstream flow attenuation to limit peak flow through the WRRF.	**MODERATE RESILIENCE** • This alternative does not include expanding the outfall. Higher rates of RDII than projected could require expanding upstream flow attenuation to limit peak flow through the WRRF.
O&M REQUIREMENTS	**LOW COMPLEXITY** • This alternative is an expansion of the existing treatment system that would require minimum additional and new O&M resources.	**MODERATE COMPLEXITY** • This alternative is a hybrid attached growth/suspended growth system that would require new O&M resources to operate. • This alternative has more equipment and more complexity to operate and maintain the attached growth system.
ADAPTABILITY TO EXISTING INFRASTRUCTURE	**HIGH ADAPTABILITY** • This alternative requires reconfiguration of the aeration tanks and system. There will be an expansion of concrete and adjustment of the piping.	**MODERATE ADAPTABILITY** • Some structural modifications may need to be made to add the frames that hold the MABR cassettes. The existing aeration system downstream from the MABR cassettes will not need to be modified. • Some concrete work will need to take place to add a baffle wall for the anoxic zone. • The existing coarse screens will need to be replaced with fine screens, which may require reconfiguration of the screen channel.
MAXIMIZING USE OF EXISTING INFRASTRUCTURE	**MODERATE DEGREE** • This alternative will only require expansion of the equipment and aeration tank.	**HIGH DEGREE** • This alternative will use the existing footprint of the aeration tanks and the aeration system.

Evaluation Criteria	1. Enlarge Aeration Tanks	2. Intensify Secondary Biological System (MABR)
OVERALL TECHNICAL RATING	**MODERATE IMPACT** • Moderate climate change resilience, constructability impact, resilience, and maximizing use of existing infrastructure. • High redundancy, low complexity, and high adaptability.	**MODERATE IMPACT** • Moderate climate change resilience, complexity, and adaptability. • Low constructability impact, high redundancy, high degree of use of existing infrastructure.
ENVIRONMENTAL		
AQUATIC VEGETATION AND WILDLIFE	**LOW IMPACT** • Proven technology to ensure that effluent quality meet requirements prior to discharge to Humber River to minimize impact.	**LOW IMPACT** • Proven technology to ensure that effluent quality meet requirements prior to discharge to Humber River to minimize impact.
TERRESTRIAL VEGETATION AND WILDLIFE	**LOW IMPACT** • Low risk expected to terrestrial vegetation and wildlife. System upgrade and expansion are within the current footprint of the existing facilities property line. • Short-term impacts during construction are possible, but non-damaging construction techniques would be employed to minimize impact.	**LOW IMPACT** • Low risk expected to terrestrial vegetation and wildlife. System upgrade and expansion is within the current footprint of the existing facilities property line. • Short-term impacts during construction are possible, but non-damaging construction techniques would be employed to minimize impact.
GROUNDWATER RESOURCES	**LOW IMPACT** • Low impact expected to groundwater resources.	**LOW IMPACT** • Low impact expected to groundwater resources.

Evaluation Criteria	1. Enlarge Aeration Tanks	2. Intensify Secondary Biological System (MABR)
SURFACE WATER RESOURCES	**LOW IMPACT** • Findings of assimilative capacity study would be used to determine final effluent quality to mitigate impact on the Humber River.	**LOW IMPACT** • Findings of assimilative capacity study would be used to determine final effluent quality to mitigate impact on the Humber River.
GHG EMISSIONS	**MODERATE IMPACT** • Expansion of the aeration tanks will require more aeration capacity. Energy efficient blowers can be accounted for in system upgrades and expansion to reduce energy loads.	**LOW IMPACT** • MABR technology has more oxygen transfer efficiency than traditional secondary treatment processes. Less aeration energy will be required with this technology in comparison to Alternative 1.
OVERALL ENVIRONMENTAL RATING	**LOW IMPACT** • Moderate GHG emissions impact. • Low impact for aquatic vegetation and wildlife, terrestrial vegetation and wildlife, and groundwater resources.	**LOW IMPACT** • Low impact for aquatic vegetation and wildlife, terrestrial vegetation and wildlife, groundwater resources, and GHG emissions.
SOCIOECONOMIC		
SHORT-TERM COMMUNITY IMPACTS	**LOW IMPACT** • Limited community impact limited to the vicinity of the WRRF site. • Construction traffic should not impact local traffic because the facility is more than 1.6 kilometres from the Nobleton urban boundary. • Wastewater treatment services will not be interrupted.	**MODERATE IMPACT** • Limited community impact limited to the vicinity of the WRRF site. • Construction traffic should not impact local traffic because the facility is more than 1.6 kilometres from the Nobleton urban boundary. • Wastewater treatment services will not be interrupted.

Evaluation Criteria	1. Enlarge Aeration Tanks	2. Intensify Secondary Biological System (MABR)
LONG-TERM COMMUNITY IMPACTS	**LOW IMPACT** • The new expanded facility will benefit the community by allowing economic growth. • Increase in sludge truck haulage from the WRRF should not impact local traffic. The facility is more than 1.6 kilometres from the current Nobleton urban boundary. • All new assets for system upgrade are within the current footprint of the existing facility.	**LOW IMPACT** • The new expanded facility will benefit the community by allowing economic growth. • Increase in sludge truck haulage from the WRRF should not impact local traffic. The facility is more than 1.6 kilometres from the current Nobleton urban boundary. • All new assets for system upgrade are within the current footprint of the existing facility.
ARCHAEOLOGICAL SITES	**LOW IMPACT** • All construction activities take place on previously disturbed properties. Archeological potential not expected to be significant.	**LOW IMPACT** • All construction activities take place on previously disturbed properties. Archeological potential not expected to be significant.
CULTURAL/HERITAGE FEATURES	**LOW IMPACT** • The Stage 1 archeological assessment did not identify any significant risks to BHRs or CHLs.	**LOW IMPACT** • The Stage 1 archeological assessment did not identify any significant risks to BHRs or CHLs.
OVERALL SOCIOECONOMIC RATING	**LOW IMPACT** • Beneficial to economic growth. • Low impact to traffic archaeological sites and cultural/heritage features.	**LOW IMPACT** • Beneficial to economic growth. • Low impact to traffic archaeological sites and cultural/heritage features.
FINANCIAL		
LAND ACQUISITION	**LOW COST** • No land acquisition expected.	**LOW COST** • No land acquisition expected.

Evaluation Criteria	1. Enlarge Aeration Tanks	2. Intensify Secondary Biological System (MABR)
CAPITAL COST	**LOW COST#** • Excavation and concrete work for the aeration tanks will be greater for Alternative 1 than Alternative 2. • The cost for aeration system reconfiguration will be greater for Alternative 1 than Alternative 2. • Estimated capital cost (+50 percent/-30 percent) is $13.4 million.	**LOW COST#** • Equipment costs for new screens and membrane equipment will be greater for Alternative 2 than Alternative 1. • This alternative requires the same tertiary, disinfection, and solids thickening expansion as Alternative 1. • Any concrete/excavation work will be lower for Alternative 2. • Estimated capital cost (+50 percent/-30 percent) is $13.4 million.
20-YEAR LIFECYCLE COST	**MODERATE COST** • This alternative is expected to be similar to the current annual operating cost.	**LOW COST** • This alternative would expect to have lower operating costs due to reduced energy intensity for aeration.
OVERALL FINANCIAL RATING	**MODERATE COST** • Relatively moderate capital and 20-year lifecycle costs. • No land acquisition is required.	**LOW COST** • Relatively low capital and 20-year lifecycle costs. • No land acquisition is required.
JURISDICTIONAL/REGULATORY		
LAND REQUIREMENTS	**LOW REQUIREMENT** • No land requirement expected.	**LOW REQUIREMENT** • No land requirement expected.

Evaluation Criteria	1. Enlarge Aeration Tanks	2. Intensify Secondary Biological System (MABR)
ABILITY TO ACCOMMODATE POTENTIAL FUTURE REGULATORY CHANGES	**MODERATE ADAPTABILITY** • The capacity of the extended aeration process is fixed by the volume of the aeration tanks. Aeration tank volume would need to be increased to add more functions, e.g., nitrogen removal.	**HIGH ADAPTABILITY** • This alternative has the ability to accommodate future more stringent nutrient requirements through operational modifications. Treatment capacity can be increased, or volume offset for additional functions, e.g., nitrogen removal, by addition of media without requiring major construction.
PERMITS AND APPROVALS	**MODERATE REQUIREMENT** • This alternative would need an amendment to the existing MECP ECA. • This alternative would need the following requirements: Township of King Site Plan Approval, Township of King Building Permit, and Electrical Safety Authority (ESA) Plans Approval	**MODERATE REQUIREMENT** • This alternative would need an amendment to the existing MECP ECA. • This alternative would need the following requirements: Township of King Site Plan Approval, Township of King Building Permit, and Electrical Safety Authority (ESA) Plans Approval
OVERALL JURISDICTIONAL/REGULATORY RATING	**MODERATE IMPACT** • Low requirement for land and permits and approvals. • Moderate adaptability.	**MODERATE IMPACT** • Low requirement for land and high adaptability. • Moderate requirement for permits and approvals for the MABR process due to the lack of full-scale operations.

#TM 3 had considered design concept 1 cost to be slightly higher than design concept 2 cost. However, upon closer evaluation, the capital costs for the two design concepts are very similar. Therefore, capital cost for both the design concepts have been evaluated as same. This is a deviation from TM 3. Table 5-12 supersedes the evaluation presented in TM 3.

5.3.4 Recommended Wastewater Design Concept

After screening and evaluation, two design concepts for Nobleton's wastewater servicing were recommended. Based on these design concepts the wastewater servicing design strategy would be the following:

- Flow Attenuation – Construct a 1,300 m^3 storage tank upstream of Janet Avenue PS to reduce PIF to 12,500 m^3/day. Figure 5-4 shows a layout of the proposed flow attenuation tank.
- Janet Avenue PS – Expand the PS to a firm capacity of 12,500 m^3/day.
- Force Main – Existing force main has enough capacity and will continue to be used.
- WRRF – Figure 5-5 shows a layout of the upgrades required at Nobleton's WRRF. The WRRF treatment processes will be upgraded as follows:
  - Preliminary Treatment/Screening: New perforated plate screen.
  - Grit screening: New vortex grit removal.
  - Secondary Biological Treatment: Modify aeration tanks for process intensification with MABR.
  - Nutrient Removal: Continue using chemical phosphorous removal with alum
  - Tertiary Treatment: Upgrade single-stage sand filtration system.
  - Disinfection: Continue using UV disinfection.
  - Sludge Thickening: Upgrade to mechanical thickening and construct two new sludge storage tanks.
- Effluent Outfall – Existing outfall has enough capacity and will continue to be used.

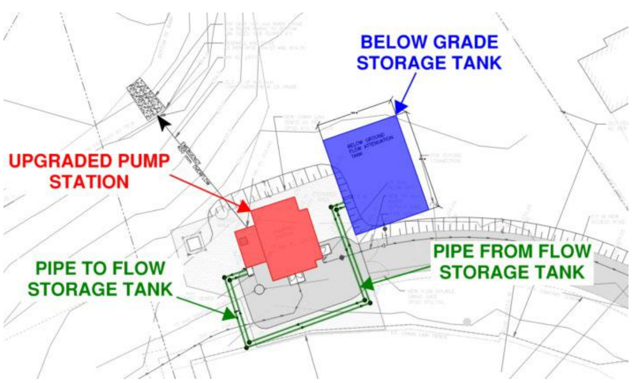


Figure 5-4 Flow Attenuation and Wastewater Pumping Design Concept

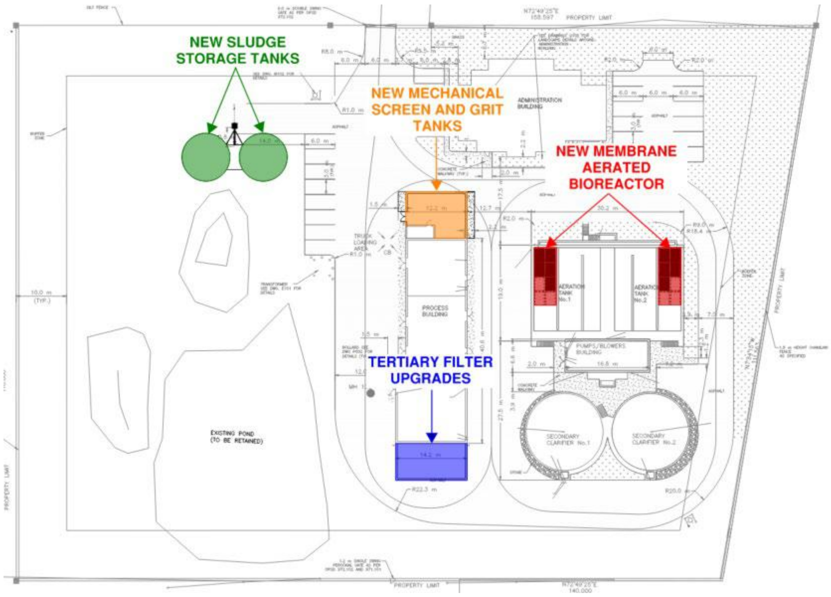


Figure 5-5 Nobleton WRRF Design Concept

6.0 Conceptual Design

For the second step of Phase 3, conceptual designs for the preferred water and wastewater design concepts were developed. The layouts and designs presented in this section are conceptual in nature; processes, equipment, cost estimates, and other design items will be revised/updated and further developed during the next stages of design. This is a common process that is typically practiced as designs are developed from conceptual level to preliminary level to detailed design and tendering. Phase 3 Technical Memo, Conceptual Design, can be found in Appendix A.

6.1 Development of Conceptual Design for Water Servicing

After screening and evaluation, the following design concepts were recommended for water servicing:

- **Increase capacity of Well #2**: Increase capacity of Well #2 from 22.7 L/s to 34 L/s by replacing the existing well pump at Well #2.
- **Add new production well at Site H (Well #6):** Add a new well with a capacity of 34 L/s at Site H; the new well will be labeled as Well #6. The new production well will be located on the same site as Well #5 and will have a dedicated treatment train.

6.1.1 Process Design

The treatment process for Well #6 will consist of disinfection and iron and manganese sequestration. A process flow diagram showing the major components of the treatment process is shown on Figure 6-1. Disinfection will be achieved using gas chlorine for 4-log virus inactivation. Chlorine gas will be delivered via 68 kg cylinders. Sufficient storage will be provided for 30 days of operation at the design dose. The chlorine feed system will be sized for a design dose of 8.5 mg/L of free chlorine. Contact time for primary disinfection will be accomplished in a below grade, chlorine contact chamber with superior baffling conditions for a baffle factor of 0.7 and will be sized for greater than 20 minutes of hydraulic retention time (HRT). Design criteria for the disinfection system are listed in Table 6-1.

Table 6-1 Well #6 Disinfection System

Parameter	Value
Chlorination System	
Disinfectant	Chlorine Gas
No. of Chlorinators	1 duty/1 standby Chlorinator will be fed from 2 duty/1 standby cylinders, each on separate weigh scale
Design Dose	8.5 mg/L as free chlorine
Gas Feed Rate	1.04 kg/h (total) 0.52 kg/h (per duty cylinder)
Storage Volume	816 kg (12 full cylinders)
Storage Capacity	24 cylinders (12 full/12 empty)

Parameter	Value
Chlorine Contact Chamber	
Sizing Criteria	4-log virus inactivation (8 mg-min/L at 5° C)
Minimum Free Chlorine Residual	0.5 mg/L
Volume	46.8 m^3
Baffle Factor	0.7
HRT at Design Flow	23 min

Iron and manganese sequestration will be achieved through addition of 37.5 percent sodium silicate solution. Sufficient storage will be provided for 30 days of operation at the average dose. The sodium silicate feed system will be sized for a design dose of 25 mg/L. A water heater will be included for maintenance of the sodium silicate feed system. Flanged connections will be included for integration of future iron and manganese oxidation/filtration systems. Design criteria for the sodium silicate feed and storage system are listed in Table 6-2.

Table 6-2 Well #6 Sodium Silicate Feed and Storage System

Parameter	Value
Sodium Silicate Feed System	
Concentration	37.5%
Design Dose	25 mg/L
Average Dose	18 mg/L
Number of Pumps	1 duty/1 standby
Design Feed Rate	5.9 L/h
Sodium Silicate Storage System	
Storage Volume, Well #5	3,043 L (804 gal)
Storage Volume, Well #6	3,043 L (804 gal)

Finished water from Well #6 will combine with finished water from Well #5 downstream of the chlorine contact chambers and chlorine residual monitoring points.

6.1.2 Site Layout

Figure 6-3 shows a site layout showing the approximate location of the new Well #6, expansion of the existing building, location of the emergency generator, and location of the new chlorine contact chamber. The upgrades required for Well #2 are relatively minor and include pump and motor replacement and associated electrical and control upgrades if needed. As such, no change to the existing site layout is anticipated.

6.1.3 Equipment Layout

The existing building housing treatment equipment for existing Well #5 will be modified and expanded to include treatment equipment for Well #6. A conceptual equipment layout showing modifications to the building and new and relocated equipment is shown on Figure 6-2.

A new emergency power generator will be located outdoors in a dedicated acoustical enclosure and will include integrated fuel tank. The existing generator room will be converted to a new electrical room that will contain electrical switchgear for both Well #5 and Well #6. The existing electrical room will be converted to an operating room for the new Well #6 treatment train. The existing washroom and office area will be relocated as part of the building addition.

The disinfection systems for Well #5 and Well #6 will share a new common chlorine room as part of an addition to the existing building. The existing disinfection equipment for Well #5 will be relocated.

The existing chlorine room will be expanded as part of the building addition and will be converted to a sodium silicate storage and feed room. The new sodium silicate storage and feed room will contain the sodium silicate feed and storage systems for Well #5 and Well #6. The existing sodium silicate feed equipment for Well #5 will be relocated. Sodium silicate storage for Well #5 will be converted to an aboveground tank storage system and the existing below grade storage tank will be demolished or abandoned.

6.1.4 Electrical, Instrumentation and Control, and SCADA Requirements

A new electrical distribution system and communication system will be installed for Well #2 and Well #6 with a radio tower communication system, remote processing unit (RPU), and a motor control centre (MCC) for all electrical equipment. Lighting and lighting control for the well will also be installed.

The generator will connect to Well #5 MCC to provide power for Wells #5 and #6. MCC will power to Well #6 equipment. The existing Well #5 incoming feeder from Hydro has 200A (maximum) rating and does not have sufficient ampacity to accommodate additional load from Well #6, Well #5 upgrade, and potential future load. Hydro power feed upgrade request should be submitted to the local hydro company at the start of the project. Existing Wells #2 and #5 RPU; SCADA upgrades and programming will be implemented during the construction. Radio communication between well and master SCADA will also be established as part of the project.

Existing Well #2 and Well #5 well pump motor starters will be replaced with larger variable frequency drives and installed in the same location on the existing MCC of Wells #2 and #5. Demolition and replacement will be done during the construction.

6.1.5 Structural and Architectural Requirements

The proposed upgrade works at the water servicing pump station includes the following.

Expanded Pump House for Well H

The existing pump house will be expanded to accommodate pumping of potable water from the proposed new Well #6. The extensions to the existing pump house shall be in similar lines with the existing pump house.

Additions to the pump house building shall be a pitched roof concrete masonry unit (CMU) load bearing structure with brick veneer facing and pitched roof, matching the existing structure. Continuous concrete wall footing foundation at appropriate frost depth shall be provided below the exterior walls to prevent any frost heave underneath building foundation. A concrete slab-on-grade foundation shall be provided within the outer wall footing. Metal deck roof supported on steel trusses at appropriate intervals shall be provided to transfer gravity and lateral loads to the CMU load bearing walls and to the foundation.

New Outdoor Standby Generator Pad

A 300 mm thick cast-in-place reinforced concrete slab on grade foundation pad with appropriate plan dimensions may be provided to support the new standby generator. Frost heave below this foundation shall be prevented.

6.1.6 Permits and Approvals

The following permits and approvals are anticipated for the expanded pump house for Well H:

- Amendment to the MECP DWWP, Municipal Drinking Water License (MDWL), PTTW, updated WHPAs, and updated Source Protection Plan.
- Township of King Site Plan Approval.
- Township of King Building Permit.
- Electrical Safety Authority (ESA) plan approval.
- TRCA Approval – Source Protection Notice. Also to be forwarded to the MECP.
- Technical Standards and Safety Authority Approval.

It is anticipated that the following permits and approvals will be needed for Well #2:

- Amendment to the MECP DWWP, MDWL, PTTW, updated WHPAs, and updated Source Protection Plan.

6.1.7 Opinions of Probable Cost

Black & Veatch has prepared opinions of probable cost suitable for this stage of the design (Table 6-3). These should be considered indicative cost estimates (Class D Cost Estimates). These have not been developed from bottom up. As the design moves through the subsequent stages, where various design elements are firmed up, the cost estimates will be refined as well. Black & Veatch will prepare and present a more detailed cost estimate in the next stage, which is preliminary design.

Table 6-3 Opinion of Probable Cost for Well #6

Discipline	Million Dollars (2021)
Site and Civil	$0.5 Million
Structural and Architectural	$0.8 Million
Process and Building Mechanical	$2.1 Million
Electrical, Instrumentation and Control, and SCADA	$0.8 Million
Total Capital Cost of Infrastructure	$4.2 Million
General Requirements (@ 15% of Capital Cost)	$0.7 Million
Contingencies (@20% of Capital Cost + General Requirements)	$1.0 Million
Engineering, Legal, and Administration (@ 20% of (Capital Cost + General Requirements + Contingencies))	$1.2 Million
Total Cost Including Engineering and Contingencies	$7.1 Million

Well #2 will be associated with relatively minor cost as compared with Well #6, located in the same site as Well #5, construction. A cost allocation of $0.2 million of the total cost allocation of $7.1 million is considered appropriate for a new Well Pump and associated electrical and control upgrades for Well #2. This cost will be further refined during the preliminary design stage.

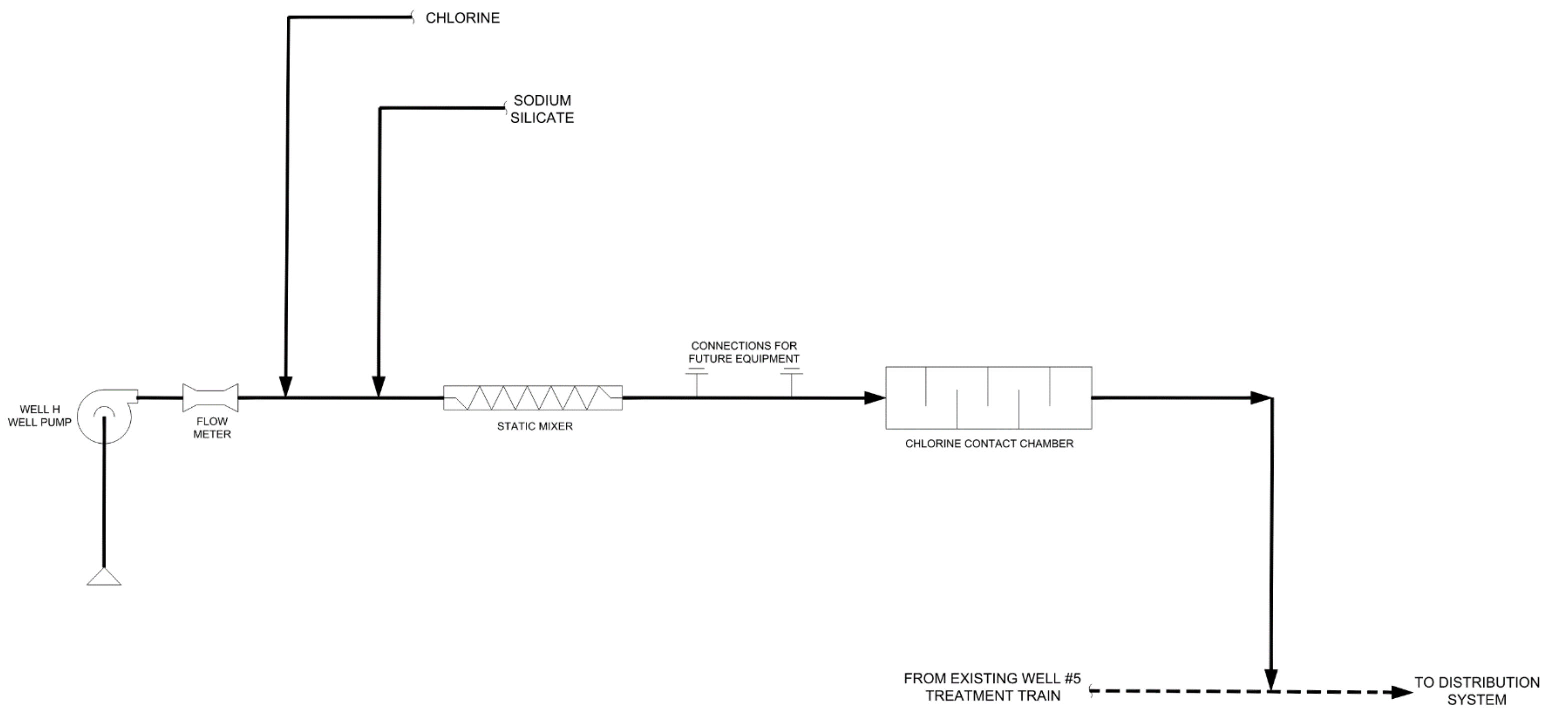


Figure 6-1 Process Flow Diagram for New Well #6 Treatment Train

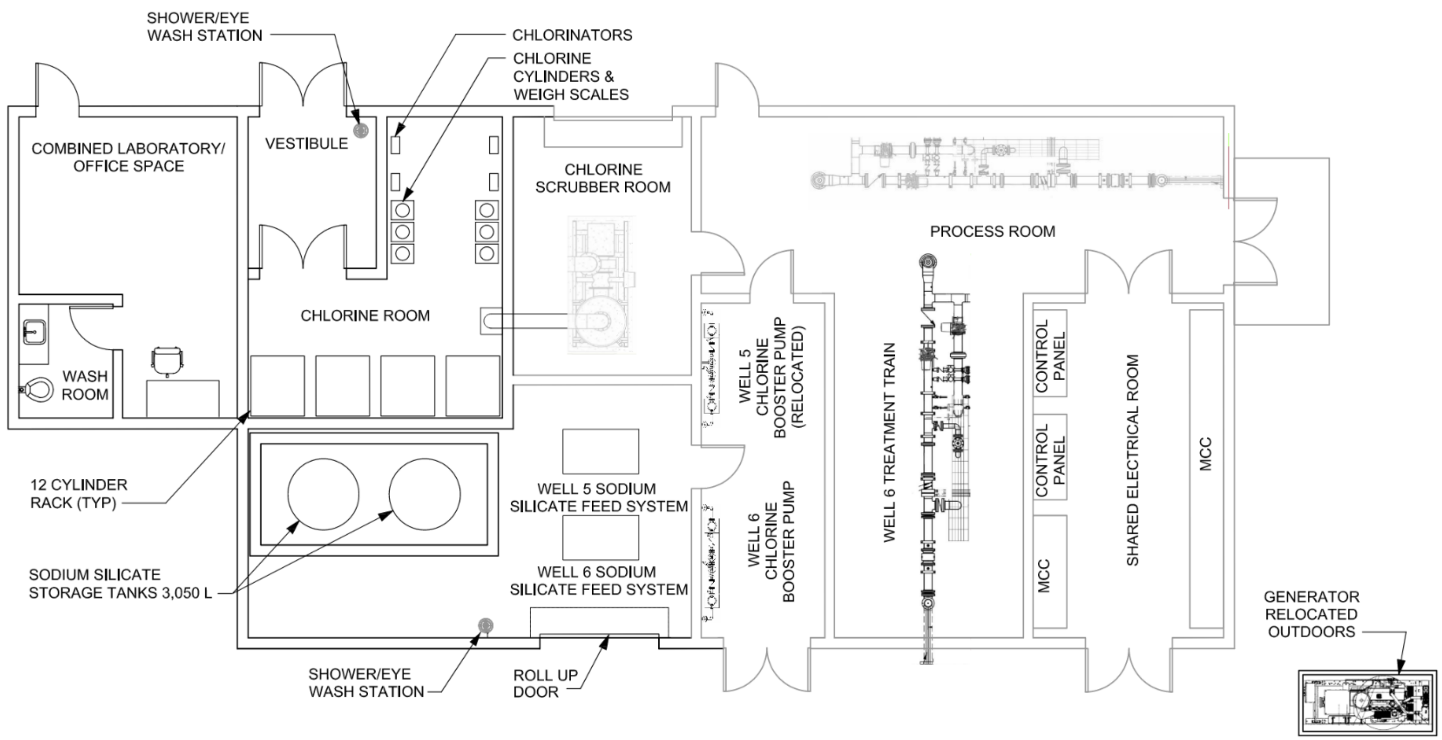


Figure 6-2 Well #5 and new Well #6 Equipment Layout

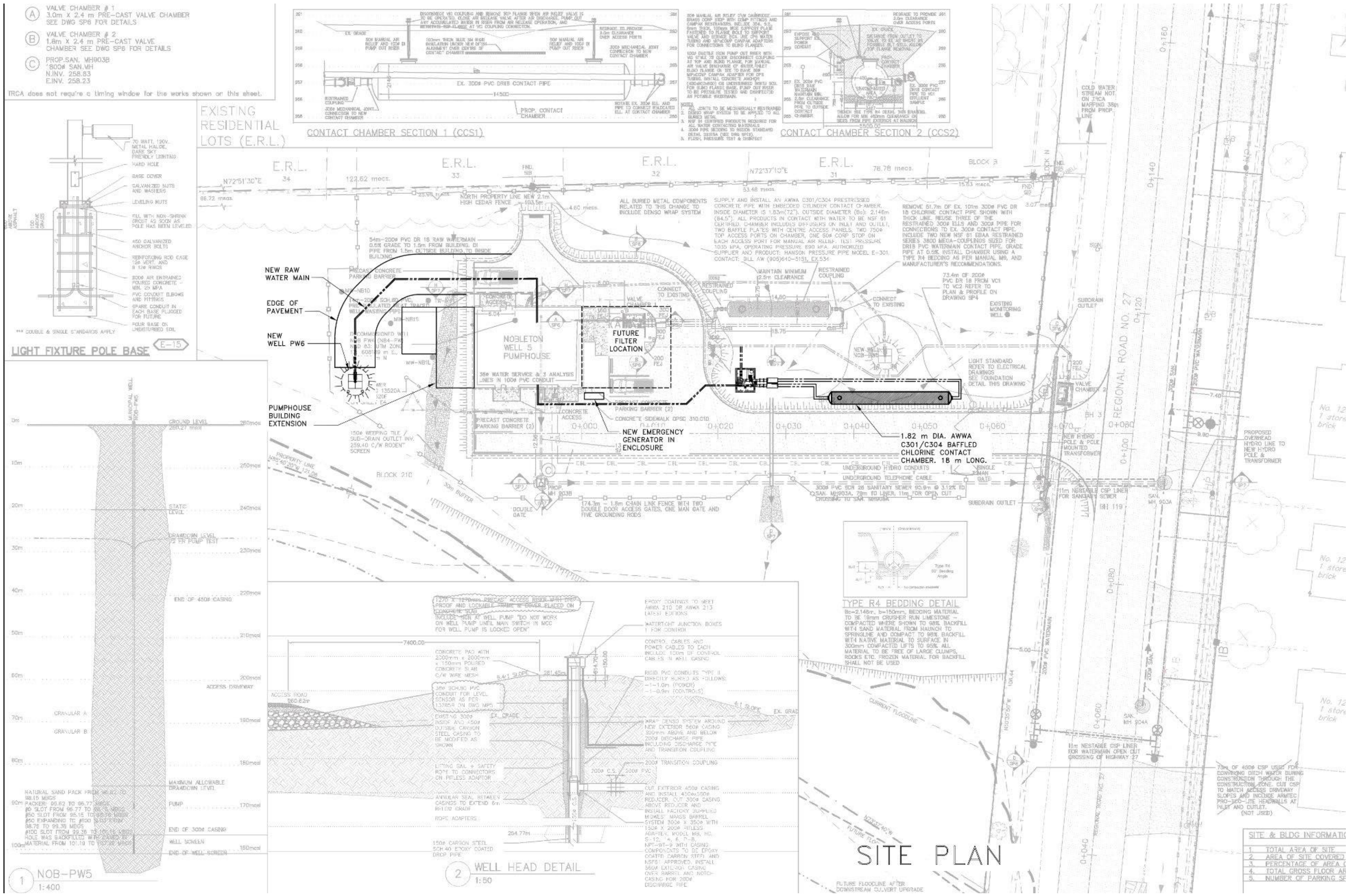


Figure 6-3 Well #5 and Well #6 Site Plan

6.2 Development of Conceptual Design for Wastewater Servicing

For the wastewater system, conceptual designs were developed for both the pumping and conveyance and WRRF recommended design concepts.

6.2.1 Wastewater Pumping and Conveyance

After screening and evaluation, the following two design concepts were recommended for the wastewater conveyance and pumping:

1. **Flow Attenuation**: Provide flow attenuation storage upstream of the Janet Avenue PS site for an operational volume of 1,300 m^3 with an underground tank.
2. **Janet Avenue PS:** Expand the Janet Avenue PS to a reduced capacity of 12,500 m^3/d (145 L/s).

The design criteria and basis summarized in Table 6-4 was adopted for the conceptual design.

Table 6-4 Design Criteria for Janet Avenue Pump Station and Flow Attenuation Tank

Design Element	Design Criterion/Basis
Number of Pumps	Three (2 duty + 1 standby)
Firm capacity of the Janet Avenue PS	145 L/s
Total dynamic head at the design point of 145 L/s	75 m (approximately)
Motor power required at the design point for each pump	140 kW (preliminary pump and motor selection by a vendor)
Operational volume of the flow attenuation tank (based on accommodating a 1 in 25 year storm in conjunction with 145 L/s capacity at Janet Avenue PS)	1,300 m^3
Operational depth of the flow attenuation tank	7 m
Approximate dimensions of the flow attenuation tank	15.5 m by 12 m by 11 m deep

6.2.1.1 Process Design

Janet Avenue Pump Station

The existing layout of the PS will remain the same. The pump suction and discharge headers and the station header sizing will increase to accommodate the increased flows from the larger pumps. A larger flowmeter will also be needed to measure the increased pumped flows.

The larger pumps units will result in pumps cycling more often than existing pumps so no new wetwell will be needed. The pumps will be equipped with variable frequency drives to reduce cycling to reasonable limits. The existing emergency overflow pipe was evaluated for its capacity to convey 1 in 25 year wet weather flows in the event of a catastrophic failure at the PS; the evaluation demonstrated that it has adequate capacity to convey the 1 in 25 year flow if the PS was not able to pump the received flow and the flow attenuation tank was full. Figure 6-4 shows a preliminary flow schematic for the PS and the flow attenuation tank.

Flow Attenuation Tank

The flow attenuation tank will be a belowground cast-in-place structure. A new flow diversion chamber will be provided on the incoming gravity sewer immediately upstream of the wetwell. In the event of a wet weather event, when the Janet Avenue PS is unable to pump received wastewater, the flow diversion chamber will passively overflow wastewater into a gravity pipe conveying it into the flow attenuation tank. As the wet weather event subsides, the flow attenuation tank will be allowed to drain back into the flow diversion chamber by operator intervention.

A tank cleaning system in the form of tipping buckets will be provided in the flow attenuation tank. The cleaning cycle will be initiated by operators through the Region's SCADA system. The wash water will drain into the wetwell.

Flow Diversion Chamber and Piping

A new flow diversion chamber will be constructed on the incoming gravity sewer at the wetwell immediately upstream of it. This chamber will be equipped with an adjustable overflow weir, which will passively divert flow beyond the capacity of the Janet Avenue PS into the flow attenuation tank through a new gravity sewer.

The flow diversion chamber will also receive flow drained from the flow attenuation tank and convey it to the wetwell. The flow diversion chamber top slab will be equipped with goosenecks to provide passive ventilation along with rising and falling liquid levels.

6.2.1.2 Site Layout

The Janet Avenue PS site will accommodate a new belowground flow attenuation tank. The location of the tank will be kept close to the PS to minimize pipe lengths and reduce friction losses. The location and dimensions of the tank are subject to be further refined during the preliminary design to obtain the most efficient layout and optimize cost.

Requirements relating to altering the site paving, fencing, yard piping etc., will be addressed during the preliminary design stage. Figure 6-5 includes a preliminary site layout for the Janet Avenue PS and flow attenuation tank.

6.2.1.3 Equipment Layout

The equipment layout in the drywell will follow the existing layout. The existing pumps will be replaced with larger capacity dry pit submersible pumps. The existing suction and discharge piping will be replaced with larger sized piping suitable for the larger pumps. The existing valves will also be replaced for larger sized valves.

6.2.1.4 Electrical, Instrumentation and Control, and SCADA Requirements

There are three existing pumps which need to be upsized and require larger starters. The existing MCC (ampacity of 400 ampere) will not have enough power to accommodate the new power requirement. A larger MCC and generator will be installed to replace the existing MCC and generator. The new generator will be installed exterior to the building.

A higher power demand request needs to be submitted to local hydro company at the beginning of the project. During construction, a temporary or permanent generator will be installed before the existing generator is removed. The new MCC could be installed in the area vacated by removing the existing generator. The space will need to be repurposed for installation of the new MCC. A larger incoming transformer could be installed close to the existing transformer. A new transformer pad with ground grid shall be in place before transformer installation. A power study, including ground touch and step potential, should be provided before transformer pad installation. Ground resistance verification should be done after the ground grid has been installed. A new duct bank will be installed to extend to the new MCC incoming section. The new power line from the hydro company will connect to the new MCC. An additional main breaker will connect to the existing MCC during the incoming hydro power transfer.

Existing starters and control will transfer to the new MCC. After cabling transfer, the existing MCC associated with the concrete pad will be removed. The floor opening will be filled to prevent hazards.

All additional instrumentation and control will tie into the existing RPU panel. The number of additional signals and changes on the RPU and SCADA will be finalized during the detailed design stage.

6.2.1.5 Structural and Architectural Requirements

Structural design of these upgrades/modifications shall be in accordance with Ontario Building Code 2012 with 2020 amendments. In addition, all liquid retaining concrete structures shall be designed in accordance with ACI 350 in order to ensure water tightness.

The proposed upgrades at the Janet Avenue PS include the following.

Equipment Pad for Pumps and Pipe Supports

Three of the existing pumps need to be upsized and, hence, require bigger equipment bases to seat the new pumps. The existing pump pads shall be demolished and new pump base concrete pads shall be cast on the operating floor of the pump gallery. Alternatively, the existing pads may be reused with appropriate modifications to accommodate the new pumps. The suction and discharge pipes also require replacement and may require a few pipe supports according to the pump manufacturer's criteria.

Flow Attenuation Tank and Flow Diversion Chamber

A new flow attenuation tank, approximately 15.5 metres by 12 metres by 11 metres deep, has to be constructed at a suitable location within the PS site. This tank shall be a fully or partly buried type cast-in-place concrete tank. In addition, a buried concrete flow diversion chamber, approximately 0.9 metre by 1.4 metre in plan dimension, shall be constructed adjacent to the west side of the existing wetwell.

Generator Pad and Transformer Pad

The existing generator capacity has to be increased because of the additional power requirement. This generator shall be replaced with a new higher capacity generator and shall be relocated to an exterior location on a separate concrete pad. Cast-in-place reinforced concrete slab-on-grade foundation shall be provided for the new generator. Frost heave below this foundation shall be prevented. The existing generator area will be repurposed for new MCC room. Existing transformer pads may have to be resized if the existing transformers are upsized.

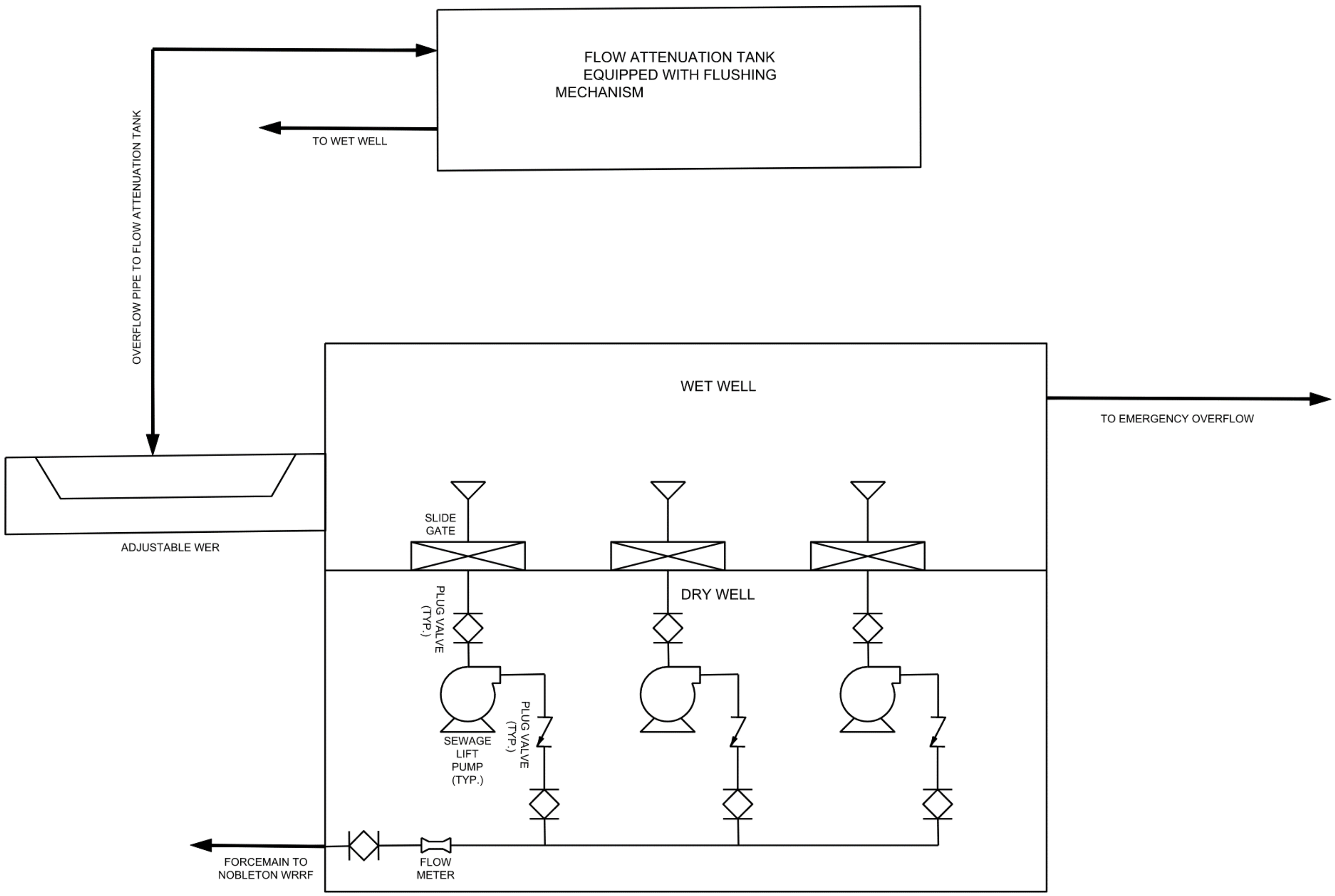


Figure 6-4 Process Flow Diagram for Janet Avenue Pump Station

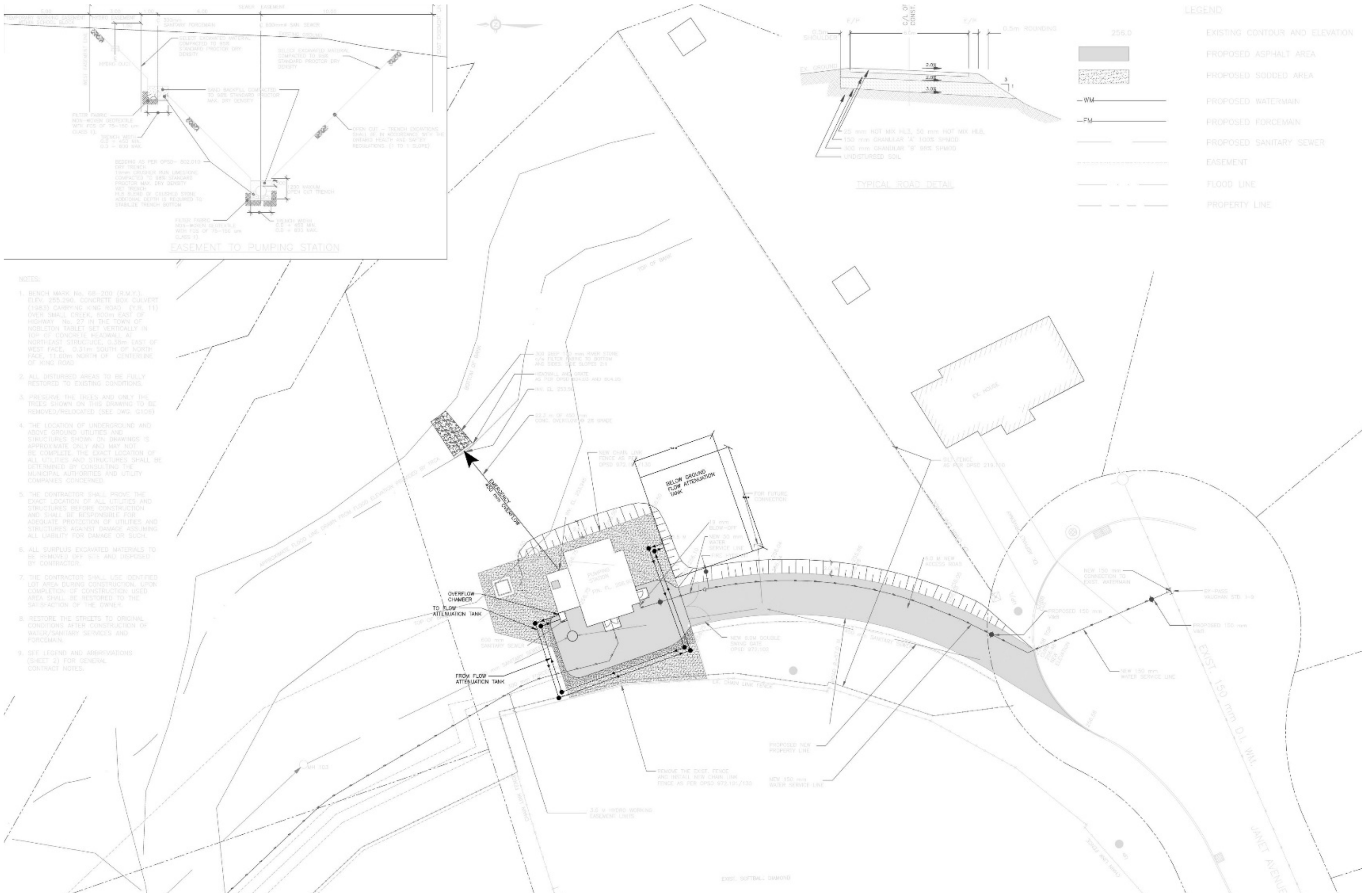


Figure 6-5 Janet Avenue Pump Station and Attenuation Tank Site Layout

6.2.2 Water Resource Recovery Facility

With flow attenuation at the Janet Avenue PS, the peaking factors at the WRRF will be reduced. After screening and evaluation, intensification of the secondary biological treatment with MABR was recommended as the design concept. Additionally, upgrades and modifications to various treatment processes in the WRRF will also be required.

6.2.2.1 Process Design

The WRRF processes for the upgraded facility will be the same as the existing facility except that gravity thickening of waste activated sludge (WAS) will be discontinued. The processes include screening, grit removal, secondary biological treatment, tertiary filtration, disinfection, and sludge storage. Figure 6-6 shows a preliminary flow schematic of the WRRF.

Screening

The existing coarse screen system will be removed and replaced with a fine screen system to satisfy the requirements for the downstream secondary biological treatment system. Table 6-5 summarizes the screens design criteria. Perforated plate fine screens will be provided to be compatible with technology at the Region's other WRRFs; the actual size of the openings should be evaluated during preliminary design. A minimum of two screens is required to provide firm capacity with one unit out of service. One new screen will be located in the channel where the existing coarse screen is located. Additional screens will be located in a new channel(s) constructed in an extension of the process building to the north. The width of the screens will be determined in the preliminary design stage.

Table 6-5 WRRF Wastewater Fine Screen Process Design Criteria

Parameter	Value
Number of New Screens	Two (1 duty / 1 standby) or three (2 duty/1 standby)
Type of Screens	Perforated plate (2 mm to 6 mm openings) *
Capacity (Each)	12,528 m^3/day (two screens) or 6,264 m^3/day (three screens)
* To be determined during preliminary design phase based on a sieve analysis of the mixed liquor.	

Grit Removal

The ECA-rated capacity of the existing 2 metre diameter vortex grit units is 9,177 m^3/d. Both units would be required to be in service for future design conditions. Therefore, a third 2 metre unit is proposed to provide firm capacity with one unit out of service. The new grit removal unit and classifier will be constructed in an extension of the process building to the north. A third grit pump will be added opposite the existing grit pumps in the process building.

A summary of the grit removal process design criteria can be found in Table 6-6.

Table 6-6 WRRF Grit Removal Process Design Criteria

Parameter	Value
Type of Grit Removal	Induced vortex
Number of Grit Tanks	3
Number of New Grit Tanks	1
Size of Grit Tanks	2,000 mm diameter
Capacity (each)	9,177 m^3/d

Secondary Biological Treatment

The existing extended aeration activated sludge process will be converted to an MABR hybrid suspended growth/attached growth process with the addition of MABR media to the existing aeration basins. The MABR media will be located in new anoxic selector/denitrification zones constructed with the addition of a baffle wall in each existing aeration tank. The anoxic zone will be outfitted with mixers to keep MLSS suspended around the MABR media.

Aeration capacity will be increased to satisfy oxygen demand for the MABR media with the addition of dedicated blowers. The capacity of the existing aeration blowers is adequate for the suspended growth portion of the process. The required blower capacity will be confirmed in the preliminary design phase.

RAS and WAS pumps will be replaced with larger pumps to satisfy design requirements for sludge recirculation and sludge wasting.

A dissolved oxygen monitoring and control system will be provided for the oxic zones for energy efficiency of the wastewater aeration system and process control benefit.

The WRRF secondary biological treatment system process design criteria are listed in Table 6-7.

Table 6-7 WRRF Secondary Biological Treatment System Process Design Criteria

Parameter	Value
Wastewater Temperature	12° C (minimum month)
Oxygen Transfer Rate	2,015 kg/d*
Solids Retention Time	>15 days
MLSS Concentration	<3,500 mg TSS/L
RAS Pumping	23 L/s to 92.5 L/s
F:M of Anoxic Selector Zone	0.5 to 1.0
Existing Alum Storage	20,000 L

Parameter	Value
Total Alum Storage Required	37,920 L
Membrane Oxygen Transfer Rate (OTR)	8 – 15 $g/m^2/d$**
Nit-Ammonia Removal Rate per m^2	1.5 – 3.5 $g/m^2/d$**
Film Thickness	0.1 – 0.6 mm**
Total SS/Area	10 – 50 g/m^2**
TSS at Film Bottom	>30,000 mg/L**
OTR:NR Ratio	4.57 - 7 **
* Calculated according to MECP standards assuming 1.5 kg O_2 / kg cBOD5, a PDF of 1.8 for TKN load, and assuming 90% of influent TKN is nitrified. ** MABR values not based on MECP design standards as there is not a category for MABRs. Values based on guidance from Suez for typical parameters.	

Chemical Phosphorous Removal

The existing chemical phosphorus removal process will be retained. There are five alum metering pumps with a firm capacity of 164 L/h, which is adequate for future design conditions. Chemical dosing distribution should be evaluated in the preliminary design phase to match the desired dosing rates with the dosing locations. One alum storage tank provides a storage volume of 20,000 L. Alum storage will be increased to provide a minimum 10 days of storage.

A summary of the chemical phosphorus removal process design criteria is shown in Table 6-8.

Table 6-8 WRRF Wastewater Chemical Phosphorous Removal Process Design Criteria

Parameter	Value
Phosphorus Removal Required	40 kg/d
Alum Dosing Capacity	158 L/h (3,792 L/d)
Dosing locations (existing)	Aeration basin inlet channel, mixed liquor outlet chambers, clarifier outlet chambers, filter inlet channel
Existing Alum Storage	20,000 L
Total Alum Storage Required	37,920 L

Tertiary Sand Filtration

The existing deep bed sand filtration system will be expanded with the addition of three additional cells to provide a total of seven cells and a total of 65 m^2 of filtration area. The new cells will be constructed in an extension of the existing process building to the south. The new cells will include an intermittent backwashing system which will also be retrofitted to the existing filter cells. The intermittent backwashing system will reduce backwashing volume and reject water such that the existing reject water sump and pumps will be adequate for design conditions without expansion.

The existing reciprocating compressors will be replaced with larger compressors to satisfy the increased air requirements. Two new screw compressors, each with its own receiver tank, will be provided in the same location as the existing compressors.

A summary of the tertiary filtration process design criteria is shown in Table 6-9.

Table 6-9 WRRF Tertiary Filtration Process Design Criteria

Parameter	Value
Type of Filtration	Deep sand
Total Number of Filter Cells/Modules	7 / 14
Number of New Filter Cells	3 / 6
Total Filtration Area	65 m^2
Backwash Flow per Module	0.9 L/s (max) (intermittent)
Airlift Air Requirement	17.2 L/s

Effluent Disinfection

The existing ultraviolet disinfection system is a low-pressure, low intensity system installed in an 8,000 mm long x 245 mm wide channel in the process building. In order to increase capacity, the existing system will be replaced by a new low-pressure high output system. This will substantially reduce the number of lamps and length of channel required such that the replacement system will fit in the existing channel without an extension.

A summary of the effluent disinfection system design criteria is shown in Table 6-10.

Table 6-10 WRRF Wastewater Effluent Disinfection Process Design Criteria

Parameter	Value
Type of Disinfection	Ultraviolet irradiation (low-pressure, high intensity)
Design Dose	35 millijoule per square centimeter (mJ/cm^2) (minimum)
Capacity	12,528 m^3/d
Number of Banks of Lamps in Series	Two (minimum)
Level Control	Automatic level control gate
Cleaning System	Automatic

Sludge Storage

The objective of sludge storage is to provide short-term storage of waste sludge over weekends and holidays prior to hauling. Other important objectives include thickening to reduce the hauled volume and to provide a decant quality that does not interfere with achieving treatment goals in the main stream treatment process.

The existing sludge thickener and aerated sludge storage tank will be replaced with aboveground aerated sludge storage tanks. Two tanks will be provided for redundancy, each tank providing the design volume of storage. Separate aeration and mixing systems will be provided. The aeration system will keep sludge fresh and reduce odor potential. The mixing system is provided to allow recirculation of tank contents with aeration “off” to allow for reducing the nutrients recycled to the main stream through denitrification of the stored sludge. A sludge pump house will be provided between the two sludge storage tanks in order to seat the blowers for aerating the sludge and pumps for loading sludge to transport trucks.

A summary of the sludge storage process design criteria is shown in Table 6-11.

Table 6-11 WRRF Wastewater Sludge Storage Process Design Criteria

Parameter	Value
Sludge Disposal Method	Hauled to Aurora SPS
Type of Storage	Liquid (aerated)
Daily WAS Volume	70,000 L/d
Capacity	4 days (unthickened)
Number of tanks	Two
Diameter of Tanks, each	10 metre
Heights of Tanks, each	5 metre
Effective Volume of each Tank	280,000 L
Materials of Tanks	Glass lined bolted steel tanks with aluminum geodesic dome fixed covers
Thickening	Decant
Mixing System	Pumped recirculation
Aeration System	Diffused air
Air Requirement	504 m^3/h*
* Air requirement based on MECP standard 18.2.3 for aerobically digested sludge storage, 30 m^3 / (1000 m^3 x min).	

6.2.2.2 Site Layout

All expansions, upgrades and new facilities will be constructed within the existing site of the WRRF. Figure 6-7 shows a site plan of the existing and proposed facilities at the WRRF.

6.2.2.3 Electrical, Instrumentation and Control, and SCADA Requirements

The existing electrical distribution system demand load and emergency load should be verified before project detailed design. The current estimate from the as-built drawing indicates that the existing distribution system has sufficient power to accommodate the additional loads. New indoor and exterior lights will be installed in the expanded building facility.

New equipment starters will be installed on the spare section of the MCC. All additional remote control and instrumentation signal will tie in to existing RPU. All new signals will be tied to the existing RPU spare points. The existing RPU could be expanded if required. The existing RPU will be reprogrammed to accommodate additional equipment control and instrumentation sign. A SCADA program update will also be needed.

6.2.2.4 Structural and Architectural Requirements

Structural design of these upgrades/modifications shall be in accordance with Ontario Building Code 2012 with 2020 amendments. In addition, all liquid-retaining concrete structures shall be designed in accordance with ACI 350 in order to ensure water tightness.

In order to accommodate new and upgraded equipment, several modifications to existing buildings will be required.

Existing Process Building Modifications

New Fine Screens, Grit Tank, and Classifier at North End

The existing process building is a reinforced concrete structure up to the grade level and a CMU load bearing structural system above the grade, except at screen channels and grit tank where the reinforced concrete walls are raised up to the upper floor; the remainder is CMU walls with brick cladding up to the roof level. Hollow core slabs are provided at roof level to carry gravity loads and to transfer lateral loads to the supporting walls and foundations.

The north end of the existing process building has to be extended approximately 11 metres further north in order to accommodate the proposed addition of new fine screen channels, grit classifiers, and grit tanks. There is no requirement to add or extend the existing sludge storage tank below grade. A structural system similar to the existing one (such as foundations and CMU wall load bearing superstructure) is proposed for the extension work. The existing stairwell at the north end shall be retained as a common access to the existing building and to the new north side extension. Figure 6-9 shows the expansion of the process building and the proposed layout of the new equipment.

New Tertiary Filters and Alum Storage Tanks Addition at South End

The existing tertiary filtration capacity has to be increased by adding six more filter beads to south side of the existing process building filtration units. Also, the existing effluent water tank adjacent to the existing filter units shall be extended along with the new filtration tank. This will involve construction of buried cast-in-place concrete tanks in continuation with the existing tanks. Figure 6-10 shows the proposed expansion of the process building to accommodate the new filter beds.

Provisions for seating alum/sodium hydroxide storage tanks at operating level shall be provided on the roof slab of the new effluent storage tank. Sufficient bearing walls and/or beams shall be provided in the slab to transfer loads from these tanks to the foundation.

Blowers Room Upgrades

The existing blower room shall be modified to accommodate two new air compressor units and new blowers, one blower to be installed at the time of this upgrade works and the second as a future provision. Adequate equipment pads shall be provided to seat the new blower and air compressor units. The existing slab on grade foundation shall be verified for these additional loads.

Aeration Tanks 1 and 2 Upgrades

Five membrane cassettes shall be added to each of these existing aeration tanks. Some steel/stainless steel beams shall be added to support these additional new membrane cassettes in the aeration tanks. These beams may be supported from the existing baffle walls. Alternatively, options to support these membrane cassettes from the base slab of the existing aeration basin shall also be investigated. A feasible and economical supporting scheme shall be adopted in detailed design. In addition to supports for the membrane cassettes, a retrofit of the existing aeration tanks will also include a baffle wall for the anoxic selector zone. Figure 6-8 shows the aeration tanks retrofit to incorporate the MABR process.

New Sludge Storage Tanks and Sludge Pump House

Two new biosolids/sludge storage tanks, glass lined bolted steel, approximately 10 metre diameter by 5 metre height with aluminum geodesic dome fixed covers shall be constructed for the storage of sludge. A concrete base foundation shall be provided to seat these tanks by tank supplier.

A pump house is required between the two sludge storage tanks in order to seat the blowers for aerating sludge and pumps for loading sludge transport trucks. This pump house building may be a single storied CMU building with concrete base slab foundation and hollow core plank roof.

New Truck Loading Area Upgrade

A new truck loading area shall be provided adjacent to the proposed sludge pump house. Existing pavement shall be extended to facilitate this truck loading area. A concrete buried sump shall be centered on this pavement to collect the spillages and shall be connected to an existing sanitary line at this site. Adequate pipe supports shall be provided from the pump house structure to support the discharge header.

6.2.3 Permits and Approvals

The following permits and approvals are anticipated for the Janet Avenue PS and the Nobleton WRRF:

- MECP ECA amendment.
- Township of King Site Plan Approval.
- Township of King Building Permit.
- ESA plan approval.
- TRCA Approval.

6.2.4 Opinion of Probable Cost

Black & Veatch has prepared opinions of probable cost suitable for this stage of the design (Table 6-12 and Table 6-13). These should be considered indicative cost estimates (Class D Cost Estimates). These have not been developed from bottom up. As the design moves through the subsequent stages where various design elements are firmed up, the cost estimates will be refined as well. Black & Veatch will prepare and present a more detailed cost estimate in the next stage which is preliminary design.

Table 6-12 Opinion of Probable Cost for Janet Avenue Pump Station and Flow Attenuation Tank

Discipline	Million Dollars (2021)
Site and Civil	$0.5 Million
Structural and Architectural	$2.3 Million
Process and Building Mechanical	$0.9 Million
Electrical, Instrumentation and Control, and SCADA	$0.4 Million
Total Capital Cost of Infrastructure	$4.1 Million
General Requirements (@ 15% of Capital Cost)	$0.6 Million
Contingencies (@20% of Capital Cost + General Requirements)	$0.9 Million
Engineering, Legal, and Administration (@ 20% of (Capital Cost + General Requirements + Contingencies))	$1.1 Million
Total Cost Including Engineering and Contingencies	$6.7 Million

Table 6-13 Opinion of Probable Cost for WRRF

Discipline	Million Dollars (2021)
Site and Civil	$0.9 Million
Structural and Architectural	$1.0 Million
Process and Building Mechanical	$4.9 Million
Electrical, Instrumentation and Control, SCADA	$1.2 Million
Total Capital Cost of Infrastructure	$8.0 Million
General Requirements (@ 15% of Capital Cost)	$1.2 Million
Contingencies (@20% of Capital Cost + General Requirements)	$1.9 Million
Engineering, Legal, and Administration (@ 20% of (Capital Cost + General Requirements + Contingencies))	$2.3 Million
Total Cost Including Engineering and Contingencies	$13.4 Million

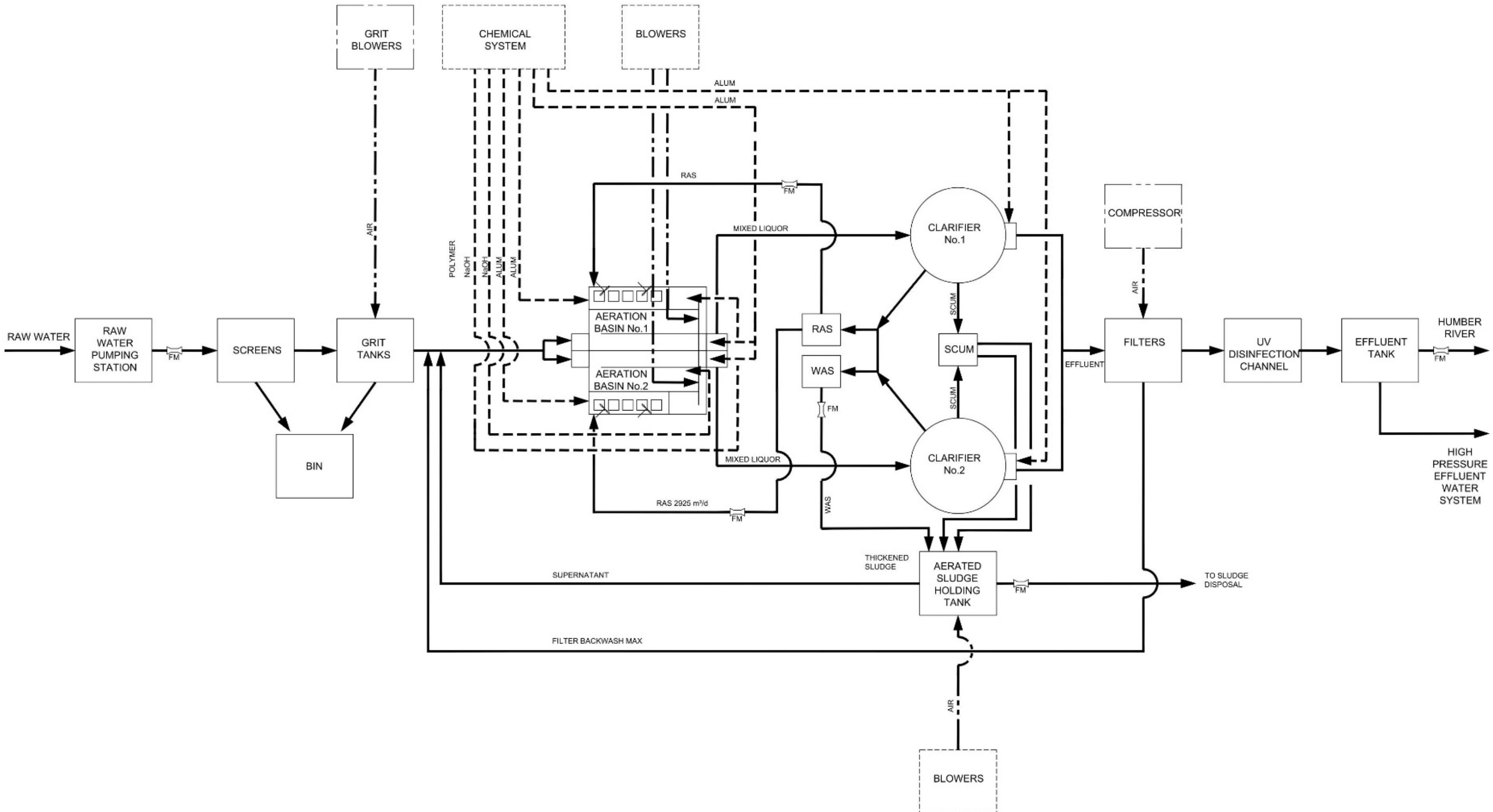


Figure 6-6 WRRF Process Flow Diagram

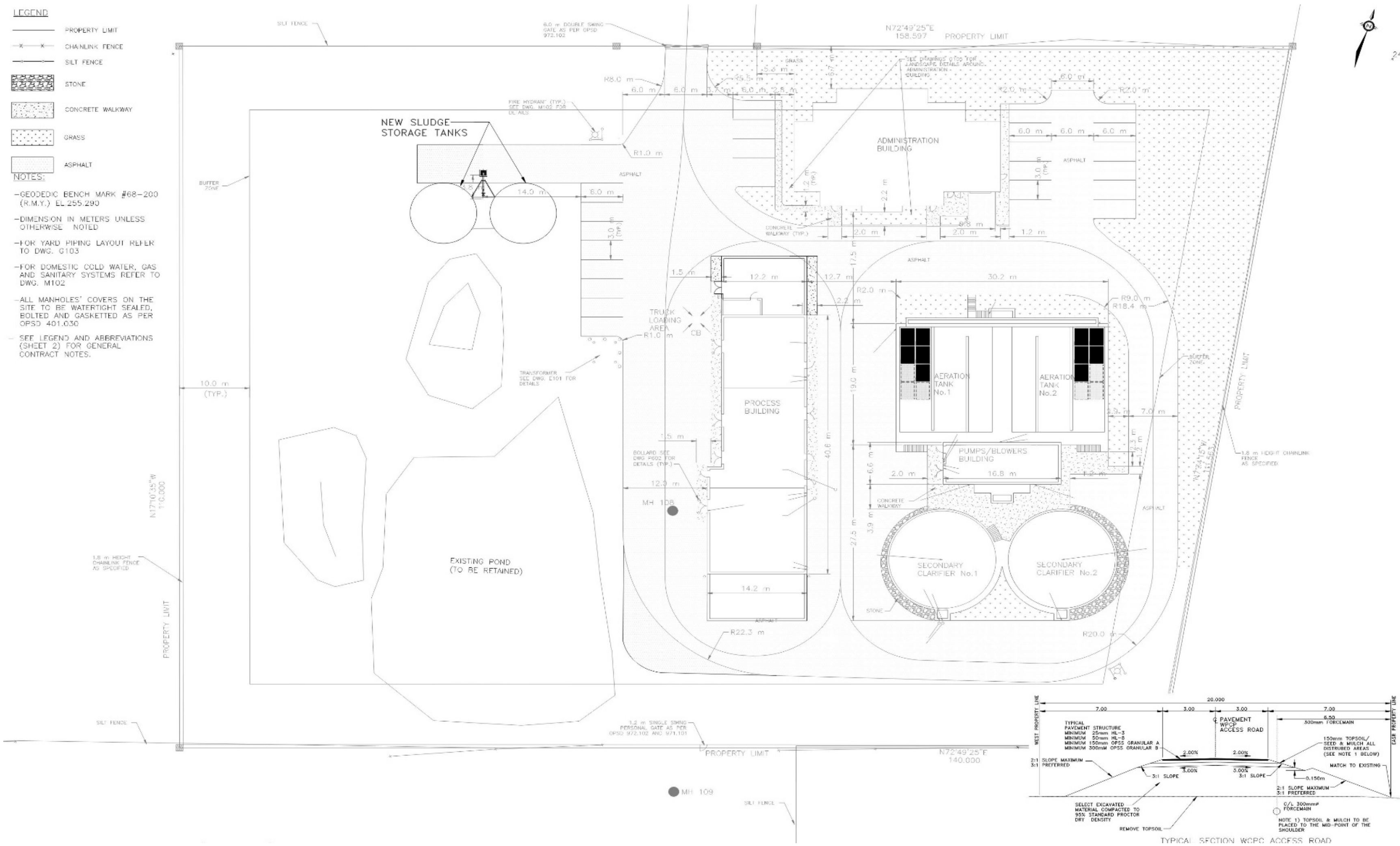
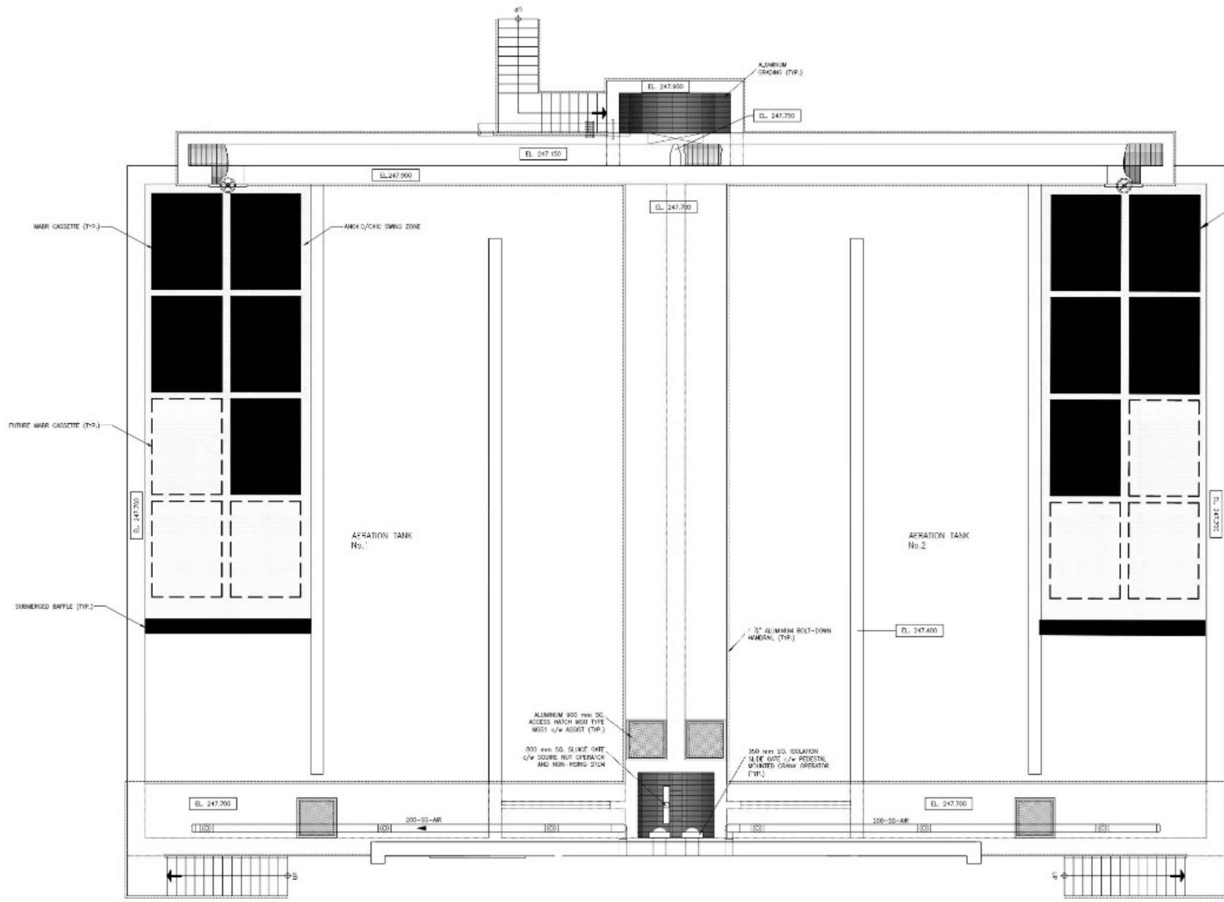
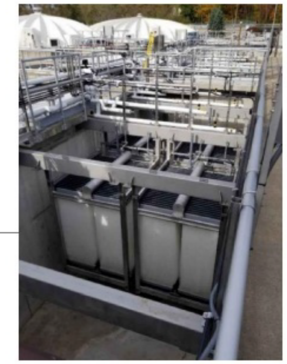


Figure 6-7 WRRF Site Plan





AERATION TANK RETROFIT

Figure 6-8 Aeration Tanks Retrofit

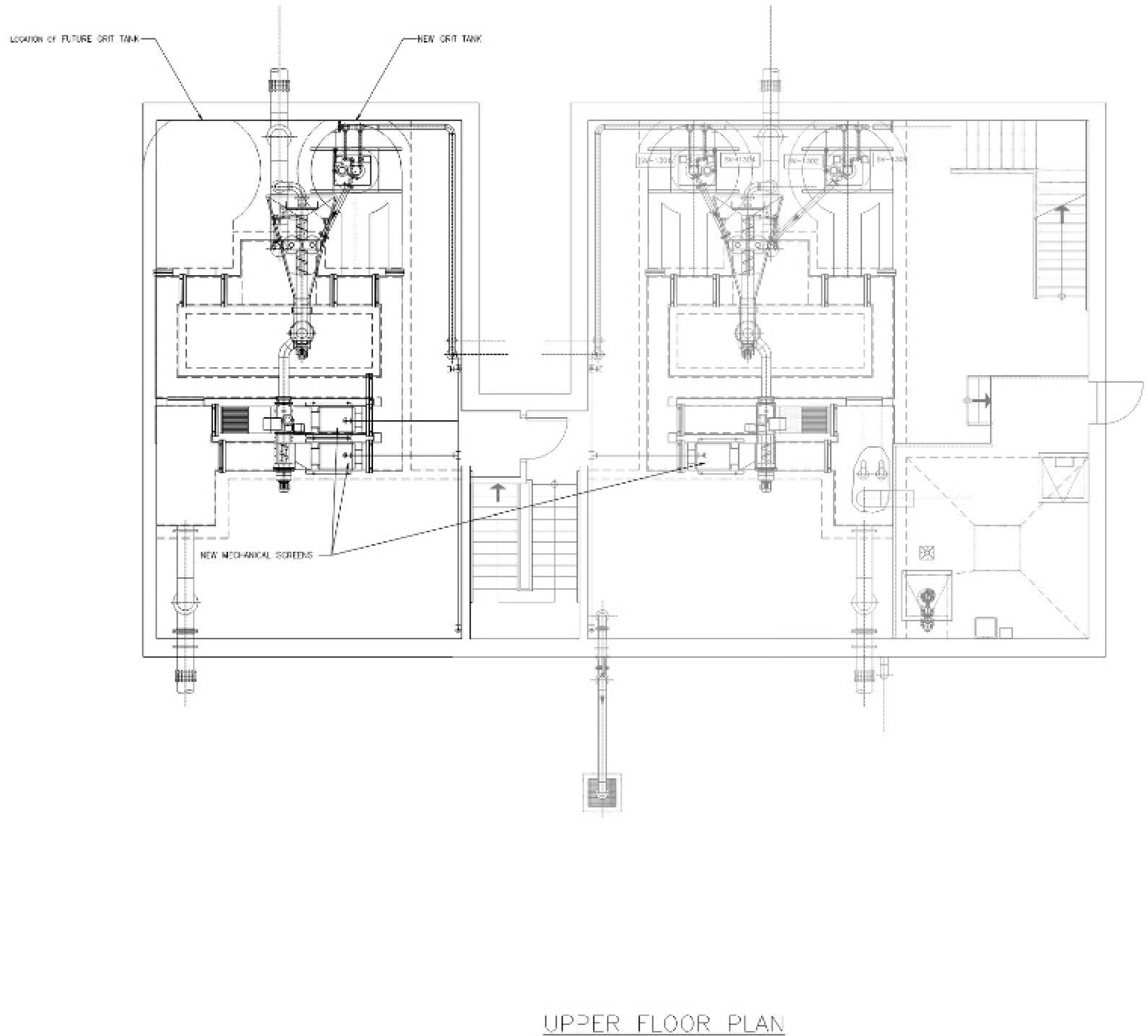
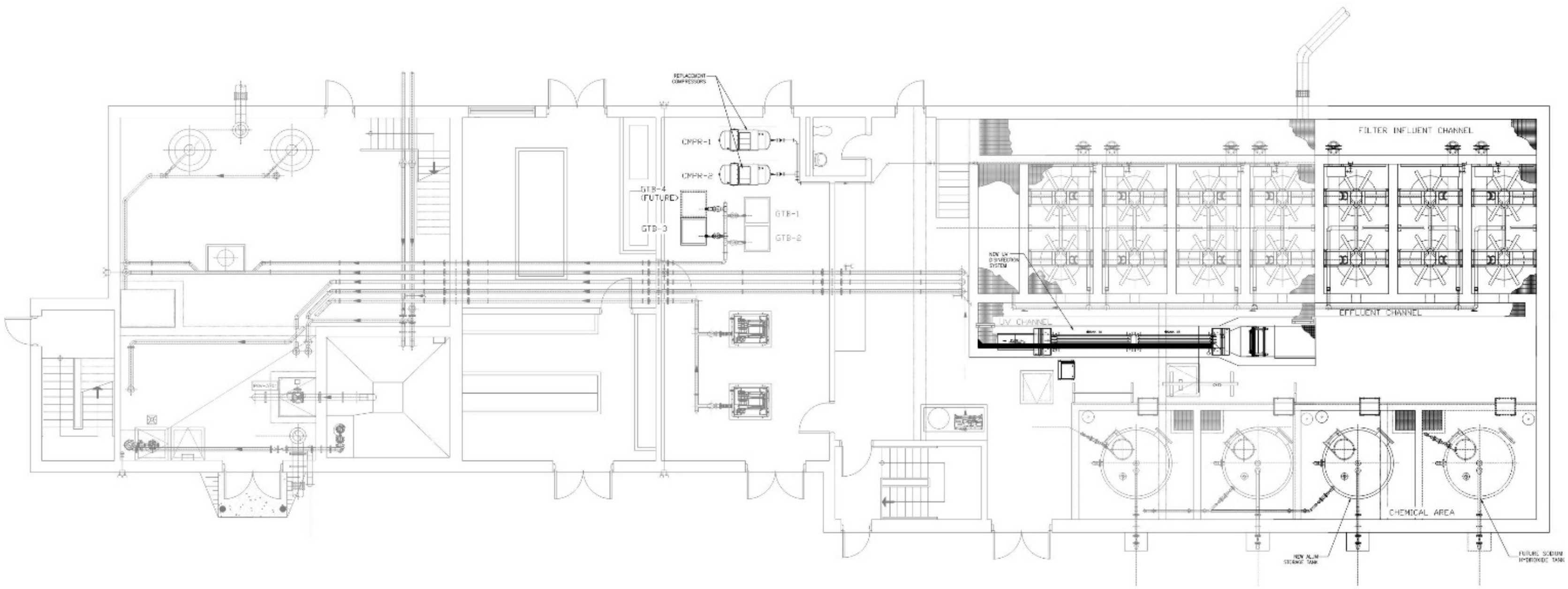


Figure 6-9 Process Building Upper Floor Plans



MAIN FLOOR PLAN

Figure 6-10 Process Building - Filters

7.0 Public, Stakeholder, and Indigenous Consultation

Public consultation is a vital component of major infrastructure projects. Key stakeholders and members of the public must have the ability to participate in processes and decisions that impact their daily lives. LURA Consulting served as Black & Veatch's Public Facilitator and Communications Team, facilitating engagement and communication with stakeholders and the community throughout the EA.

7.1 Overview

For a Schedule "C" project, the Ministry specifies the following mandatory points of contact with the public and review agencies:

- Notice of Commencement
- Notice of first Public Contact
- Implement first Public Contact
- Notice of second Public Contact
- Implement second Public Contact
- Notice of Completion

There were five points of notification (notices) and three opportunities for public contact (public consultation centres) throughout this process; the public, stakeholders, and indigenous communities received the five notices and were invited to the public consultation centres. The notices can be found in Appendix C. As such, the study has surpassed the minimum mandatory points of contact. Table 7-1 outlines the points of contact throughout the project:

Table 7-1 Class EA Points of Contact

Activity	Timing	Purpose	Methodology
Notice of Commencement	November 15, 2018	Notification of project commencement	Email, mail, newspaper ad, social media posts, and the York Region website
Notice of Public Consultation Centre (PCC) #1	February 15, 2019	Notification of upcoming public consultation opportunity	Email, mail, newspaper ad, social media posts, and the York Region website
PCC #1	February 28, 2019	Present and solicit input on the problem statement	In-person open house, feedback form
Notice of PCC #2	November 12, 2020	Notification of upcoming public consultation opportunity	Email, mail, newspaper ad, social media posts, and the York Region website
PCC #2	November 25, 2020	Present and solicit input on alternative solutions	Virtual open house, feedback form
Notice of PCC #3	July 6, 2021	Notification of upcoming public consultation opportunity	Email, mail, newspaper ad, social media posts, and the York Region website

Activity	Timing	Purpose	Methodology
PCC #3	July 20, 2021	Present and solicit input on alternative designs	Virtual open house, feedback form
Notice of Completion	November 4, 2021	Notification of results of EA process and initiating the 30 day review period for the public to comment	Email, mail, newspaper ad, social media posts, and the York Region website

A public consultation plan is required as part of the Municipal Class EA "Schedule C" process. The Public Engagement and Communications Plan can be found in Appendix C.

7.2 Agency and Stakeholder Consultation

A list of agencies and stakeholders was identified through a Stakeholder Sensitivity Analysis and Communications Approach (Appendix C). These groups reviewed and provided input on various aspects of the study process. The Stakeholder Advisory Group and Technical Advisory Group were never established because it was determined that they were not necessary as these groups would engage in the project through the public. Comments and concerns were incorporated and acknowledged throughout the study through letters, emails, phone calls, exchanges of information, and meetings. All correspondence was recorded and included in Appendix C.

The following is a summary of the agencies and stakeholders provided with updates throughout the process:

- Nobleton Village Association
- Nashville Area Ratepayers Association
- Concerned Citizens of King Township
- S.T.O.R.M (Save the Oak Ridges Moraine)
- Nobleton Landowners Group
- Ontario Federation of Agriculture
- East Gwillimbury
- Town of Aurora
- Town of Georgina
- Town of Newmarket
- Town of Richmond Hill
- City of Markham
- York Region Council
- King Township Council
- Township of King
    - Clerks Department
    - Engineering & Development Department
    - LACAC (Heritage Committee)
    - Planning Department
    - Public Works & Engineering Department
- City of Vaughn
    - City Manager
    - Clerks Department
    - Engineering & Public Works Department
    - Heritage Vaughn Committee
    - Planning Department
    - Water and Wastewater Department
- York Catholic District School Board

- York Region District School Board
- Utilities
  - Hydro One
  - Enbridge Gas Distribution
  - Vianet
  - Rogers
  - YorkNet
  - Prestige Telecom
  - Telus
  - Bell Media
- Metroland/GO Transit
- Canadian EA Agency
- Environment Canada
- Ministry of Indigenous Relations and Reconciliation
- Ministry of Agriculture, Food and Rural Affairs
- Ministry of Tourism, Culture and Sport
- Ministry of Municipal Affairs and Housing
- MNRF
- Ministry of Economic Development and Growth
- Ministry of Energy
- Ministry of Environment Conservation and Parks
- Fisheries and Oceans Canada
- Transport Canada – Ontario Region
- Toronto Region Conservation Authority
- CB Land Management Inc
- Coldwell Banker Ronan Realty Brokerage
- Evans Planning
- Foray Group
- Friends of the Greenbelt Foundation
- Greybrook Realty
- Humphries Planning
- Lennard Commercial Realty, Brokerage
- MHBC Planning
- Orca Equity
- Schaeffers Consulting Engineers
- Tercot Communities
- Treasure Hill
- Tribute Communities
- Urbanworks Engineering Corporation
- Montessori Country School - Nobleton Campus

7.3 Indigenous Consultation

Indigenous consultation occurred both through mailed and emailed study notices throughout the study. Contacts were identified with assistance from the MECP and updated throughout the study. In addition to sending these letters, in the third round of consultation, direct phone calls were made to key consultation contacts in an additional effort to extend the invitation to comment. This added outreach was conducted by Regional staff at the suggestion of the MECP. All correspondence was recorded and included in Appendix C. The following indigenous communities received the project notifications:

- Alderville First Nation
- Association of Iroquois and Allied Indians
- Beausoleil First Nation
- Chippewas of Georgina Island
- Chippewas of Mnjikaning First Nation (Rama)
- Chippewas of Nawash (Cape Croker)
- Curve Lake First Nation

- Haudenosaunee Confederacy Chiefs Council
- Hiawatha First Nation
- Huron-Wendat Nation
- Kawartha Nishnawbe First Nation of Burleigh Falls
- Mississaugas of Scugog Island First Nation
- Mississaugas of the New Credit First Nation
- Mohawks of the Bay of Quinte
- Moose Deer Point First Nation
- Munsee-Delaware Nation
- Nipissing First Nation
- Six Nations of the Grand River Territory
- Toronto & York Region Metis Council
- Wahta Mohawks (Mohawks of Gibson)

7.4 Public Consultation

Public consultation occurred throughout the study period. The following communications and engagement methods were used:

- **Project Webpage –** A project webpage was created by the Region (www.york.ca/nobletonea) to serve as a portal for all project information, frequently asked questions, updates, and consultation materials throughout the study. The webpage was referenced in all print and email communications.
- **Email Mailing List –** A mailing list was created and maintained throughout the study. It included the agencies, stakeholders and indigenous communities listed above, as well as, members of the public who requested to be added to the list via telephone, email, or feedback forms submitted during public consultations. Individuals on the mailing list received email notifications before each public consultation opportunity and at the study's commencement and completion.
- **Newspaper Notices** – Notices were placed in the local "King Connection" newspaper to announce the commencement of the EA (January 8, 2019), to publicize each public consultation event throughout the study process, and to announce the completion of the EA (November 4, 2021). The notices described the study, invited the public to attend the consultation events, and identified ways to obtain more information.
- **Direct Mail** – Approximately 2 weeks before each public consultation event, printed notices were delivered to identified indigenous communities (noted above) using Canada Post. In some cases, a cover letter and copies of the PCC slides/boards were also included in the mailing. Indigenous communities were also mailed copies of the Notice of Commencement and the Notice of Completion. All homes and businesses located within the study area also received direct mail notifications.
- **Public Consultation Centres** – Three PCCs were held during the study. The first PCC was held in person and consisted of an open house portion where participants had the opportunity to view display boards and speak with members of the project team and City staff, followed by a formal presentation and question and answer period. PCCs #2 and #3 were held virtually through Microsoft Teams Live and Zoom Webinar, respectively. Virtual events included a presentation from Region staff as well as question and answer period. Feedback forms (physical or digital, as appropriate) were made available following each PCC to encourage participants to submit written comments.

- **Feedback Form** – A feedback form was made available after each PCC (physical or digital, as appropriate). Members of the public had a minimum of 2 weeks following the PCC to complete the feedback form. The form asked for feedback on both the content and delivery of the PCC.

7.4.1 Public Consultation Centre #1 – Problem Statement

The first PCC was held on February 28, 2019, at Dr. William Laceby Community Centre in the community of Nobleton from 4 p.m. to 8 p.m. The PCC was in the form of a drop-in open house, and during this time, attendees had the opportunity to learn about the project and provide feedback. Approximately 90 participants attended the PCC. Of the 90 participants, 77 signed in. Municipal staff and representatives and interested members of the public attended the PCC. A total of nine members from the project team were in attendance at the PCC. No identified members of the media were present.

PCC #1 took place after Phase 1 was completed to share background information and the Class EA's problem statement. The PCC featured seven display panels, situated around the room, that provided context on the purpose of the EA Study; the steps involved in an EA; the proposed project timeline; and opportunities for residents and stakeholders to stay informed about the project. Participants were asked to provide feedback on the alternative solutions evaluation criteria through a survey, provide comments on the open house, and identify any improvements needed for the next open house.

Participants at the PCC were able to engage with members of the project team on key aspects of the EA Study through various means, including the following:

- An open house feedback form (also available online).
- An evaluation criteria survey form (also available online).
- Display boards (also available online).
- Members of the project team (each of whom specialized in a topic area) were available to answer questions.

Participants submitted feedback and questions, which were addressed and incorporated into the project Phases that followed. Many attendees expressed concerns over the existing water quality. They noted that the water they receive contains chlorine, iron, magnesium, and calcium. Attendees also noted that appropriate intensification and growth should be considered in the Nobleton community. Some attendees elaborated that the proposed project should consider the Greenbelt Plan and Oak Ridges Moraine Conservation Plan, as Nobleton is home to valuable agricultural land and natural heritage systems. Attendees expressed concern over the existing cost of water and wastewater services in Nobleton. Concerns were also raised over the potential future costs of water and wastewater services. Attendees asked where the water will be sourced from for this project. Many attendees also discussed concerns over storm water management in Nobleton. Participant questions were responded to in the PCC session. All feedback was logged for consideration by York Region and the project team.

A comprehensive summary of PCC #1, related materials, and feedback received are provided in Appendix C.

7.4.2 Public Consultation Centre #2 – Alternative Solutions

The second PCC was held on November 25, 2020, via Microsoft Teams Events; participants were provided with the option of joining through the internet or phone. PCC #2 took place after Phase 2 was completed to share with the public the water/wastewater servicing alternatives that were considered, the evaluation, and the recommended solution, and obtain input on the proposed solutions.

There were three sessions hosted throughout the day at 10 a.m., 2 p.m., and 7 p.m. Participants were invited to watch a recorded presentation on the evaluation of servicing alternatives and recommended servicing solutions (identical in each session). Following the presentation, members of the public were invited to join in a facilitated question and answer period.

The PCC was attended by approximately 60 participants across all three sessions. Of the 60 participants, most joined via Microsoft Teams Live, and nine joined via telephone. Municipal staff, consultants, and interested members of the public attended the PCC. No identified members of the media were present. Participants at the PCC were able to engage with members of the project team on key aspects of the EA Study through various means as follows:

- Completing an online feedback form.
- Viewing presentation boards and supporting materials posted online.
- Providing feedback directly to York Region's Project Manager (through calls or emails).

Questions asked by PCC attendees focused on planning policy, water servicing options, water quality, wastewater servicing, conservation, project costs, development, and further engagement opportunities for the project. Questions surrounding the planning policy focused on the Greenbelt Plan and its guidance on connecting to a lake-based supply for water servicing and the Oak Ridges Moraine Conservation Plan regarding water regeneration. Questions about water servicing focused on new well locations and potential limitations of the aquifer. Multiple participants raised water quality questions pertaining to iron levels of well-based water supply. One participant asked whether recent changes to land uses were included in the project's calculations. Another asked if York Region would be implementing an education campaign to help share conservation benefits with the public. A few questions were asked about the overall cost of the EA and the construction of the project. One participant asked why new development is frozen until a new water supply is provided. Finally, one participant asked when PCC #3 will be held in 2021. These questions were responded to in the PCC sessions. All feedback was logged for consideration by York Region and the project team.

A comprehensive summary of PCC #2, related materials, and feedback received are provided in Appendix C.

7.4.3 Public Consultation Centre #3 – Alternative Designs

The third PCC for the Water and Wastewater Servicing Municipal Class EA for the Nobleton Community was held online Tuesday, July 20, 2021. The purpose of this third and final PCC was to present the design concepts for the preferred water and wastewater solutions and to share the evaluation process and the recommended conceptual design. The PCC was hosted virtually by York Region via Zoom Webinar. The PCC was held as a virtual meeting with a pre-recorded presentation and live Q&A session from 6:30 p.m. – 8:00 p.m. All digital materials were made available online on York Region's website, www.york.ca/nobletonea.

Twenty participants attended the PCC. Of the 20 participants, most joined virtually via Zoom Webinar, and one joined via telephone. Municipal staff, consultants, and interested members of the public attended the PCC. No identified members of the media were present.

The PCC provided attendees with an opportunity to learn more about the project and engage with members of the project team through various means as follows:

- Completing an online feedback form.
- Viewing presentation boards and supporting materials posted online.
- Providing feedback directly to York Region’s Project Manager (through calls or emails).

Questions asked by PCC attendees focused on emissions and energy consumption, water servicing, wastewater servicing, development and policy, water infiltration, conservation, project costs, and further engagement opportunities for the project. One participant asked about the boundaries of the service area and whether a certain property would be included. Another participant asked about the population projections used for the study. Questions were asked about the servicing capacity for water and wastewater, and the number of homes that would be serviced. Participants asked how the development aligns with national and international GHG emissions reduction targets. One participant asked about infiltration and the potential for using permeable infrastructure. Another participant asked about opportunities for water conservation. Finally, participants asked about the cost of the project, the proportion covered by development charges and the expected impact on user fees. These questions were responded to in the PCC session. All feedback was logged for consideration by York Region and the project team.

A comprehensive summary of PCC #3, related materials, and feedback received are provided in Appendix C.

7.4.4 Key Concerns from the Public

The project team has identified the following key concerns from members of the public, as raised throughout the study. The table below highlights these concerns, as well as a response from the project team. Where applicable, it has been noted how the concerns have been addressed within the EA study.

Table 7-2 Key Concerns from the Public

Key Concerns from the Public	Response from Project Team
Concerns over water quality issues in Nobleton.	The water supply within York Region complies with the Ontario Drinking Water Quality Standards. York Region and the Township of King regularly sample drinking water, as required by the Safe Drinking Water Act, to ensure it meets the standards of quality. Nobleton's water supply is provided by a series of wells and the groundwater supply is higher in iron content than from surface (lake based) supplies. The iron content from the groundwater is the primary reason for the staining of your fixtures and is an unfortunate bi-product of well based water supply systems. This issue is common to municipalities that have well base systems. York Region is in the process of completing a Region-wide groundwater treatment study (to try and address iron, odour and taste issues). The outcome of this study will include treatment recommendations for the Nobleton water system. To learn more about drinking water quality and monitoring visit york.ca/drinkingwater.
Concerns over the cost of water and wastewater servicing, and who will be paying for the increase in servicing required.	At this time, it appears that most of the cost will be growth related. A final growth vs. non-growth share will be determined during the subsequent stages, when the design is further solidified.
Concerns about the amount of growth/density projected in Nobleton.	York Region's mandate to develop servicing alternatives was for a projected population of 10,800. Flows and demands will be monitored, vis-à-vis growth within the area, and studies for the next phase of expansion will be initiated before the facilities reach their operating capacity, such that the next stage of expansions could be planned ahead of time.
A desire to protect the natural environment, farmland, aquifer health and wildlife habitat.	As part of the current Class EA study, several sub-studies were completed to review and address the natural environment, aquifer health and wildlife habitat (flora and fauna). These include Environmental Site Assessment (ESA), Environmental Impact Assessment (EIA), Source Water Protection evaluation, Hydrogeological Study etc. These studies are included within the appendices for ready reference.

Key Concerns from the Public	Response from Project Team
A desire to understand the climate change implications of this project.	Resilience to climate change was a criterion included in the detailed evaluation of the alternatives and the design concepts. Various alternatives and design concepts were evaluated for their resilience to climate change among other criteria.
Concerns about conformity to existing policies at the local, regional and provincial planning levels, specifically as it relates to the following:	
• Township of King Master Plan	The current Nobleton Community Plan (Township of King) designates lands within the existing urban area boundary for future development. Future residential development within the existing urban area of the Nobleton Community Plan is dependent on the availability of additional servicing capacity. A servicing solution is needed to enable the Township to consider residential or mixed-use development applications that implement the existing Community Plan. On May 30, 2016, as part of King Township's Official Plan Review, King Council approved the recommended policy directions as part of the Understanding Greenfield Density and Intensification in King Township report. This provides the framework for a potential population increase in Nobleton. While Nobleton's future population is subject to King Township's Official Plan, it is expected to increase beyond the current capacity of the existing water and wastewater infrastructure. However, any population growth that occurs will take place within the current Nobleton Urban Area Boundary. No urban expansion beyond the current Urban Area Boundary of Nobleton is planned for in the current King Township Official Plan. The existing Nobleton Community Plan designates lands within the current urban area for residential and mixed-use purposes. Any development of these lands is required to be in accordance with the policies of the existing Nobleton Community Plan or the Township's future Official Plan. The Township approved its Official Plan, in September of 2020.

Key Concerns from the Public	Response from Project Team
• Region's Municipal Comprehensive Review	This Class EA study looks at the possibility of servicing future growth in the community of Nobleton within the urban area boundary. The Municipal Comprehensive Review is underway, and is being conducted by the Planning and Economic Development Branch of York Region. To learn more about the Municipal Comprehensive review, Vision 2051, and to view the Municipal Comprehensive review project plan, you can email futureyork@york.ca
• A Place to Grow which restricts a new Lake Based Supply	Increasing the capacity of the existing well, in combination with a new production well, resulted in the lowest overall impact after evaluating the natural environment, social, cultural, jurisdictional, regulatory, technical and economic criteria. Since increasing groundwater supply can meet the anticipated growth, connecting to the lake-based water supply is not permitted. According to the province's long-term plan, A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2019), extending supply from a Great Lake's source is generally only permitted if the local groundwater supply is unable to meet the quantity and/or quality requirements.
A desire to further explore the use of lake-based water service.	The lake-based water service was identified for screening under Technical Memorandum N.2 (TM2). This alternative does not meet the regulatory requirements under the Greenbelt Plan. It was discussed that unless the groundwater wells aren't capable of providing increased water demands, this alternative couldn't be considered further. Based on hydrogeological studies and a text well at Well Site 5, it was deemed that groundwater was a suitable option to meet the increased needs of Nobleton.

8.0 Potential Environmental Effects and Mitigation

Construction and operation of the proposed works will lead to potential impacts upon the natural, cultural, and socioeconomic environment. This section summarizes these potential impacts and present mitigation measures.

8.1 Natural Environment

Along with field visits and review of background materials and previous studies, the following studies were completed to determine the impacts and mitigation measures in the natural environment:

- Environmental Impact Study.
- Assimilative Capacity Study.
- Fluvial Geomorphology Study.
- Hydrogeological Study.

The studies can be found in Appendix B.

8.1.1 Vegetation and Wildlife

The proposed infrastructure and upgrades will be restricted to the existing property limits. These properties show evidence of disturbance and human activity with weedy non-native species. Most of the habitats have low vegetative ecological diversity and are of low to medium ecological value. The habitat within the infrastructure facilities, where all the proposed development would occur, was categorized as manicured lawn with planted trees and shrubs (at Janet Avenue PS and Well #5 and #6) and a mix of manicured lawn, storm water pond, and meadow (at the WRRF). While much of the study area has low to moderate ecological diversity, it was found to support a variety of wildlife species; five species at risk, Western Chorus Frog, Snapping Turtle, Bobolink, Eastern Meadowlark, and Barn Swallow were documented in the study area.

No major or long-term impacts on vegetation and wildlife are expected from the proposed upgrades. Since all properties have been previously impacted by urbanization and agricultural practices, no destruction to the existing habitat is expected. Construction activity could disturb adjacent wildlife due to excessive noise and light. The only location where impacts could be predicted is the WRRF because the marsh and meadows surrounding the WRRF and the storm water pond at the WRRF all provide habitat for species at risk.

However, to comply with federal, provincial and municipal policies, the following mitigation measures will be implemented to minimize any impacts during planning, construction, and post-construction:

- Site selection: All upgrades and expansions should be contained within the existing footprints and be kept as small as possible and away from sensitive natural heritage features and functions.
- Timing: Construction should be scheduled for times of the year that avoid or minimize wildlife disturbance. Breeding bird season in Nobleton is early April through late August; as a result, any development activities that could disturb breeding birds should be scheduled outside these periods. Amphibians and reptile population are active from March to October; construction

activities are recommended to occur outside these periods. If construction takes place during sensitive wildlife period, the approaches listed below should be followed:

  - Exclusion fencing should be installed prior to amphibian and reptile emergence from hibernation in spring. The enclosed areas should be surveyed immediately after installation, and then daily during active season.
  - Surveys based on Canadian Wildlife Service guidelines should be conducted to determine if birds are nesting in the planned construction area.

- Exclusion Fencing: Exclusion fencing should be used during the construction phase to separate the development zone from surrounding habitat.
- Lighting: Birds migrating at night can become disoriented by outdoor lighting; to avoid this problem, illuminating construction areas during bird migratory periods should be avoided.
- Wildlife Inspections: Before initiating work each day, construction site should be thoroughly inspected for wildlife. Where possible, wildlife should be allowed to leave site on their own and if not it should be safely removed by trained staff.
- Site Management: The site should be managed to prevent attracting wildlife (i.e., avoid food wastes, allow proper drainage to limit ponding, avoid entrance of wildlife to structures that could work as shelter).
- Erosion and Sediment Control Plan: A plan should be developed to control erosion and subsequent sedimentation that impact watercourses and wetlands.
- Retention of Vegetation and Habitat Features: Natural vegetation in the study areas should be protected as much as possible to maintain native plant diversity and the wildlife habitat it provides. Any vegetation that is removed should be replaced with plantings of native species once development is complete.

8.1.2 Surface Water Features

The only surface water feature of concern is the Main Branch of the Humber River to which Nobleton WRRF discharges the treated effluent. An Assimilative Capacity Study was conducted in the Humber River to characterize the river and recommend effluent limits for the expanded WRRF.

Monitoring in the river found that total suspended solids (TSS), total phosphorous (TP), total Kjeldahl nitrogen, total ammonia (TA) and un-iodized ammonia concentrations downstream of the WRRF discharge were not statistically different than those measured upstream. This demonstrates that the Nobleton WRRF discharge has no significant effect on downstream water quality. Some exceedances on TP were observed in the river; however, these were associated with high weather events and high TSS demonstrating that erosion and runoff were responsible for high concentrations of TP.

Ontario’s MECP has established policies and guidelines that direct the management of surface waters and the discharge requirements for wastewater treatment plants in the province. In the Water Management Policies, Guidelines, and Provincial Water Quality Objectives of the Ministry of Environment and Energy, the Ministry of the Environment provides direction on the management of surface water and groundwater quality and quantity for the Province of Ontario. The Provincial Water Quality Objectives (PWQO) are numerical and narrative criteria that serve as chemical and physical indicators representing a satisfactory level for surface water. The two policies that relate to the determination of WWTP discharges limits are as follows:

- Policy 1 – In areas which have water quality better than the PWQO water quality shall be maintained at or above the objectives.
- Policy 2 – Water quality which presently does not meet the PWQO shall not be degraded further and all practical measures shall be taken to upgrade the water quality to the objectives.

After sampling completed in 2017 and 2018, the Humber River is considered a Policy 1 receiver for dissolved oxygen, nitrate, ammonia, and total phosphorous.

Water quality modeling was undertaken to predict the effect of expanding the Nobleton WRRF on the water quality of the Humber River at the point of complete mixing and in the far-field. The modeling results showed that expansion will increase the concentration of TP, TAN, TSS, un-iodized ammonia, nitrate-nitrogen, and chloride, but concentrations will remain below their respective PWQOs and Canadian Water Quality Guideline standards in both the near and far-field. Dissolved oxygen concentrations will decrease slightly downstream of the river but will increase with distance further downstream and remain above PWQOs. Overall, the results showed that after upgrades and expansions, the policy status of Policy 1 will be maintained in the river.

Results from the Assimilative Capacity Study show that Nobleton WRRF and its future expansion will have no negative effect on downstream water quality. Thus, no mitigation measures will be required as long as the effluent limits, shown in Table 8-1, for the parameters of concern continue to be met.

Table 8-1 Effluent Limits for Nobleton WRRF

Effluent Parameter	Units	Monthly Average Concentration (mg/L)
5 day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	mg/L	10
Total Suspended Solids	mg/L	10
Total Phosphorous - Limit	mg/L	0.15
Total Phosphorous - Objective	mg/L	0.10
Total Ammonia Nitrogen	mg/L	1.0 (May 1 to Oct 31) 3.0 (Nov 1 to Apr 30)
E.coli	CFU/100 mL	200
pH	n/a	6.0 – 9.5

Additionally, an erosion and sedimentation evaluation was performed to determine any geomorphological impacts of the effluent discharge on the river. The peak daily effluent discharge represents an extremely small flow contribution to the Humber River downstream of the WRRF outlet during annually reoccurring moderate to high flow events. Furthermore, the Humber River has a relatively stable geomorphological form because of limited upstream urbanization and good connectivity to its floodplain. Thus, recorded peak daily effluent rates have had negligible impacts on natural erosional processes along the Humber River; it is expected that future flow rates will remain below the critical discharge, and thus will remain below the erosion threshold.

The study noted that the constructed effluent wetland has experienced some erosion leading to the development of a defined channel and new confluence to the Humber River. It is recommended that confluence of the wetland and the Humber River be restored to the constructed riprap overflow structure in order to reduce fine sediment input to the Humber River and reduce the risk of bank erosion/instability along the Humber River at the existing confluence.

8.1.3 Aquatic Biota

Periphyton and benthic invertebrate communities indicated that water quality in the study area ranged from good to excellent from upstream to downstream of the WRRF, with no observable changes related to the existing WRRF discharge. Decreases in periphyton biomass, minor contributions of blue-green algae in community composition, and consistent diversity values suggest the WRRF is not causing nutrient induced changes in the periphyton community. Therefore, the current WRRF and its future expansion will not negatively be impacting aquatic biota in the area.

8.1.4 Source Water Protection and Aquifer Vulnerability

8.1.4.1 Water System

The EA study area is situated within the Toronto and Region Source Protection Area (TRSPA) and is subject to the CTC Source Protection Plan. The objectives of the CTC Source Protection Plan, as established under the *Clean Water Act, 2006*, are as follows:

- To protect existing and future drinking water sources in the protection region; and,
- To ensure that, for every area identified in the assessment report as an area where an activity is or would be a significant drinking water threat:
  - The activity never becomes a significant drinking water threat; or,
  - If the activity is occurring when the SPP took effect, the activity ceases to be a significant drinking water threat.

The CTC Source Protection Plan identifies four vulnerable areas: Wellhead Protection Areas (WHPA), Intake Protection Zones (IPZ), Highly Vulnerable Aquifers (HVA), and Significant Groundwater Recharge Areas (SGRA). A Wellhead Protection Area (WHPA) is the area around the wellhead where land use activities have the potential to affect the quality or quantity of water that flows into the well. These areas are delineated into zones of vulnerability (A, B, C, and D) based on the time of travel of water into the well, and zones around a surface water body influencing a Groundwater Under Direct Influence (GUDI) well (E, F). Other zones (Q1, and Q2) are defined as the areas where new water takings or reduced recharge could impact the quantity of water to municipal supply wells.

A risk assessment works to establish levels of vulnerability of the municipal drinking water systems, categorize uses and activities which could present significant threats to those systems, and identify any existing drinking water quality and quantity issues. Vulnerability scores are assigned to each WHPA to determine whether the risk from a drinking water threat is significant, moderate, or low. The vulnerability score is calculated based on factors such as land cover, soil type, permeability, slopes, hydrological conditions, depth of the well, and historical water quality concerns. Each WHPA has an associated vulnerability scores based on the geology and hydrogeology of the Nobleton area. For the existing production wells, the associated vulnerability score within each of the WHPA's are:

- WHPA-A, vulnerability score of 10 (high vulnerability);
- WHPA-B, vulnerability score of 6 (moderate vulnerability);
- WHPA-C, vulnerability score of 2 (low vulnerability);
- WHPA-D, vulnerability score of 2 (low vulnerability).

The *Clean Water Act, 2006* identifies nineteen (20) potential chemical and pathogen threats set out in O.Reg. 287/07, and two (2) potential water quantity threats. The circumstances of each threat and related risk level are described in the 2017 Tables of Drinking Water Threats for Pathogens and Chemicals. The following activities are included in the list:

1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats, or disposes of sewage.
3. The application of agricultural source material to land.
4. The storage of agricultural source material.
5. The management of agricultural source material.
6. The application of non-agricultural source material to land.
7. The handling and storage of non-agricultural source material.
8. The application of commercial fertilizer to land.
9. The handling and storage of commercial fertilizer.
10. The application of pesticide to land.
11. The handling and storage of pesticide.
12. The application of road salt.
13. The handling and storage of road salt.
14. The storage of snow.
15. The handling and storage of fuel.
16. The handling and storage of a dense non-aqueous phase liquid.
17. The handling and storage of an organic solvent.
18. The management of runoff that contains chemicals used in the de-icing of aircraft.
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.
20. An activity that reduces the recharge of an aquifer.
21. The use of land as livestock grazing or pasturing land, and outdoor confinement area or a farm-animal yard.

22. The establishment and operation of a liquid hydrocarbon pipeline.

Work associated with upgrades to Well#2 and the addition of a new well and pump house at Well #6 will occur within an existing WHPA-A, with a vulnerability score of 10, and have the potential to introduce new significant drinking water threats. In addition, management of the lands around the wells also has the potential to introduce new significant drinking water threats. These threats include: application and handling/storage of road salt, snow storage, handling/storage of fuel (e.g., backup generator or during construction), and application and handling/storage of pesticides. Additionally, the increased pumping at Well #2 and the new Well #6 would be considered future significant drinking water threat activities because they are located within a WHPA-Q1. The WHPA-Q1 is delineated to address water taking threats, which is applicable to new wells and an activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body constitutes a future significant drinking water threat activity. This threat is addressed by Part b) of policy DEM-1 that applies to the future Permit To Take Water.

To mitigate these potential significant drinking water threats, the following mitigation measures will be established.

- Best Management Practices will be used during construction;
- Risk Management Measures will be put in place with respect to chemical use and storage including spill kits, secondary containment, a spill response plan and worker training;
- A Contractor who is certified by Smart About Salt will be retained for snow clearing and winter maintained, and use of best management practices identified in the TAC Synthesis of Best Management Practices for Salt and Snow will be followed (Transportation Association of Canada, 2013);
- No snow storage or stock piling will occur on site;
- During construction, no re-fueling will occur within the WHPA-A;
- Less than 2,500 L of fuel will be stored on-site for the back up generator, and will be stored above ground in a double walled tank;
- No pesticides will be stored or used on site; and
- Existing groundwater recharge rates will be maintained at the site to the extent practical.

The preferred solution would not increase the vulnerability scores for the existing wells but would add a new WHPA-A defined around a new Well #6 location. All existing production wells draw potable water supplies from the Scarborough Formation, a deep confined to which groundwater flow is restricted by overlying aquitards including the Sunnybrook Drift, the Newmarket Till and the Halton Till. Considering that the new production well would pump from this same aquifer, the vulnerability scores of WHPA-B, WHPA-C and WHPA-D would not change.

The addition of the new production well would introduce a new WHPA-A with a vulnerability score of 10 to the lands within a 100 m radius of the new well site. This overlaps significantly with the existing WHPA-A for Well #5, meaning only minor lands to the east of the existing well site would be covered by the new WHPA-A. No chemical or pathogen threats were identified in the new WHPA-A for Well #6. The vulnerability scores of WHPA-B, WHPA-C and WHPA-D would however remain unchanged. The new production well and the increase in pumping rate of existing Well #2 would increase the area covered by WHPA-B, WHPA-C and WHPA-D, however we do not expect that this change will be significant, and it is likely that WHPA-B and WHPA-C remain confined to areas of residential land use. Therefore, no change to the aquifer vulnerability scores for the Nobleton community or new chemical or pathogen threats were identified for the preferred solution.

8.1.4.2 Wastewater System

As part of the EA a Source Water Protection evaluation was completed; the evaluation can be found in Appendix B. In order to accommodate Nobleton's growth to the 2041 horizon construction will take place in the following parcels:

- Janet Avenue PS (66 Janet Ave)
  - WHPA-B with vulnerability score of 6
  - HVA with vulnerability score of 6
  - WHPA-Q1 and WHPA-Q2 with moderate stress
- Nobleton WRRF (7277 King Rd)
  - SGRA with vulnerability score of 4
  - WHPA-Q1 and WHPA-Q2 with moderate stress

As per Regulation 287/07, under the CWA there are 21 threats for which policies are written in areas where these threats could be significant. Out of these 21 threats, the one that applies to this project is "2. the establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage." The Tables of Drinking Water Threats (2017-2018) established by MECP where used to determine the chemical and pathogen threats in each area based on type of vulnerable area. Since the parcel of Nobleton WRRF is not classified as WHPA, IPA or HVA no chemical or pathogen threats were identified in the Tables of Drinking Water. For the Janet Avenue Pump Station, the threats that applied to a WHPA-B and HVA with a Score of 6, did not meet the flow rates, included chemicals not used in the Pump Station, included septic systems, or did not apply to the work that is being done in this project. Therefore, no chemical or pathogen threats were identified for this location.

8.1.5 Climate Change

The Ministry of the Environment, Conservation and Parks (MECP) guide, Consideration of Climate Change in Environment Assessment in Ontario, establishes Ministry's expectations and supports the province's Climate Change Plan by outlining climate change considerations for Class EA studies. The guide notes that "climate consideration" within a project implies that consideration must been given to methods to reduce greenhouse gas emissions and developing a design that is more resilient to future changes in climate and helps maintain the ecological integrity of the local environment in the face of a changing climate.

York Region's approach to considering climate change is guided by provincial policies (Growth Plan and Provincial Policy Statement), and embedded in several of the policies, including the Province's Growth Plan, Provincial Policy Statement, and York Region Official Plan.

Key potential climate change impacts related to this study include more intense weather events, greenhouse gas emissions, impacts to groundwater supply. Resilience to climate change was included as a criterion in the evaluation of various alternative solutions and design concepts. Some examples of climate considerations in this study are:

- Increase Capacity of Well#2 and add New Well #6: the Scarborough Aquifer has high recharge values and large drawdown available which make groundwater supply and its quality resilient to climate change.
- Consideration of relevant climate parameters unique to the community of Nobleton including consideration of impact of major storm events on the existing and proposed infrastructure leading to the recommendation of a sewage storage facility at the Janet Street pumping station to assist with managing peak wet weather flows. The onsite storage facility reduces the need for additional pumps and forcemains, which result in less construction and disturbance to the natural environment, manages peak flows to prevent overflows to the surrounding area, reduces electricity needs and results in keeping greenhouse gases low. Also increases security and reliability to the existing system and increases operational efficiency.
- The preferred water alternative maximize the use of existing infrastructure and existing sites thereby minimizing construction and operational impacts. A new well (Well No.6) and its associated treatment facility is being proposed at the existing Well Site 5. This solution eliminates the need for a new site for a new well facility, and also provides efficiency in terms of infrastructure eliminating the need for two buildings, two standby power generators, two chemical storage locations.
- The preferred wastewater pumping and storage alternative is aimed at maximizing the use of existing infrastructure, and minimizing new infrastructure. The solution is aimed at utilizing the existing 6.7 km long forcemain and the outfall to their capacity and avoiding twinning of these pipes eliminating environmental impact. This alternative also minimizes the expansion of the existing Janet Avenue Pumping Station by constructing a below ground flow attenuation tank, that is utilized to store flows during high storm events. The flows will be diverted back to the pumping station during low flow periods. These measures help in reducing the greenhouse gas emissions as well as reducing the environmental impacts related to twinning of the existing long forcemain as well as the outfall.
- The preferred wastewater treatment alternative also minimizes new infrastructure and endeavours to utilize the existing infrastructure (aeration tanks) instead of building additional tankage.
- WRRF: The design concept is based on a secondary treatment technology that has a high oxygen transfer efficiency and that minimizes the volume of tankage required, reducing energy consumption for aeration.

During the next phases of the project, which relate to design, consideration will be given to selecting efficient equipment, motors and fixtures which will help reduce electricity consumption and in turn, reduce greenhouse emissions.

8.2 Cultural Environment

Along with field visits and review of background materials and previous studies, the following studies were completed to determine the impacts and mitigation measures in the cultural environment:

- Archeological Assessment.
- Heritage Study.

The studies can be found in Appendix B.

8.2.1 Archeological Resources

All upgrades and construction will take place at the following locations: existing Well #2, existing Well #5, Nobleton WRRF, and Janet Avenue PS. The Stage 1 Archeological Assessment determined that there are several archeological sites within these locations. However, since these locations have been previously disturbed and other archeological assessments have been previously conducted, they are cleared of having any archeological potential.

Some smaller parts of these locations have no disturbed conditions nor contain physical features of no or low archeological potential and therefore are considered to retain archeological potential. In light of these results, the following recommendations were made:

- Lands that were subjected to previous archeological assessments and deemed free of further archeological concern are exempt from further assessment.
- All areas that were identified as having archeological potential removed are exempt from requiring a Stage 2 Archeological Assessment.
- All areas that were identified as having low or no archeological potential are exempt from requiring a Stage 2 Archeological Assessment.
- All areas identified as retaining archeological potential will be subjected to a Stage 2 AA and any further stages recommended in the course of the Stage 2 AA. These areas will be subjected to pedestrian or test pit survey at 5 metre intervals in accordance with the standards set in Subsections 2.1.1 and 2.1.2 of the 2011 S&G.
- All outstanding archeological work will be completed as early as practicable during detail design and well before the commencement of ground disturbing activities.
- If archeological resources are encountered during construction, all activities impacting archeological resources must cease immediately. MHSTCI will be notified, and a licensed archeologist will be engaged to carry out an archeological assessment in accordance with the Ontario Heritage Act and the Standards and Guidelines for Consultant Archeologists. If human remains are encountered, all activities must cease immediately and the local police as well as the Registrar, Burials of the Ministry of Government and Consumer Services (416-326-8800) must be contacted. If human remains are associated with archaeological resources, MHSTCI should also be notified to ensure that the site is not subject to unlicensed alterations which would be a contravention of the Ontario Heritage Act.

8.2.2 Built Heritage Resources and Cultural Heritage Landscape Features

The Cultural Heritage Assessment concluded that there are four BHRs and nine CHLs within the study area. No construction will take place on any BHR or CHL; therefore, no direct impacts will take place in these properties. At some parcels, indirect impacts due to vibration are possible because the structure is within 50 metres of the proposed work; however, these impacts are expected to be limited or temporary. For these properties, baseline vibration monitoring will be undertaken during detailed design. If the monitoring assessment concludes that any structures or landscapes features will be subject to vibrations, a vibration monitoring plan will be prepared and implemented as part of the detailed design phase to lessen vibration impacts related to construction.

8.3 Socioeconomic Environment

Along with field visits and review of background materials and previous studies, the following studies were completed to determine the impacts and mitigation measures in the socioeconomic environment:

- Air Quality Effect Assessment.
- Noise Impact Assessment.
- Archeological Assessment.

The studies can be found in Appendix B.

8.3.1 Property Impacts and Access

All upgrades and construction will take place in the following properties:

- Water System Servicing Locations
  - Existing Well #2 (22 Faris Avenue).
  - Existing Well #5 and new Well #6 (12860 Highway 27).
- Wastewater Servicing Locations
  - Nobleton WRRF (7277 King Road).
  - Janet Avenue PS (66 Janet Avenue).

In all these properties, current water and wastewater operations already take place and no new land acquisition will be required for the proposed water and wastewater servicing solutions. Full operations of the current facilities and access to the existing sites will be maintained at all times during construction.

8.3.2 Air Quality

An Air Quality Impact Assessment was completed to determine potential air quality effects and the appropriate mitigation measures.

8.3.2.1 Well #5 and Well #6

The only upgrade that will increase emissions in Well #5 and Well #6 site is the addition of a new standby generator. Ontario Regulation 524/98 outlines a set of air quality and noise parameters for standby generators that, when met, are expected to result in insignificant effects; hence MECP does not require any environmental approval for such sources. The new generator will meet O.Reg 524/98 conditions at minimum hence, these sources are not expected to have any notable air quality effects.

8.3.2.2 WRRF

The WRRF produces a variety of contaminants as a result of the chemical, biological, and physical processes that take place and the equipment used for the different treatment processes. The most common air contaminants are total reduced sulphur, hydrogen sulphide, ammonia, sulphur dioxide, and nitrogen oxide. Besides individual air contaminants, odour emissions and impacts were considered – which are the result of combinations of odour-causing chemicals. Within the WRRF, the most significant emission sources are the sludge loading area, emergency diesel generator, and three natural gas-fired air makeup units (AMUs).

The new standby generator at the WRRF will meet O.Reg 524/98 regulations at minimum so no negative air quality effects are expected. The sludge loading area was determined to be the largest source of odour and air contaminants; to determine the air quality effects in this area, an assessment and dispersion modeling was conducted. Because of the lack of historical emissions data, the modeling was based on conservative assumptions and results considered approximate. However, the modeling along with site visits showed that there may already be odour exceedances at the nearest residences and some other contaminants may be close to their thresholds. A more detailed odour and air quality emissions analysis should be conducted during detailed design along with mitigation measures such as an enclosed ventilated loadout area for sludge transfer or other physical mitigations.

8.3.3 Noise Impacts

It is understood that construction activities will generate noise, however, this impact is temporary, and the Contractor will be made responsible to follow local noise bylaws and limit work during the times permitted by noise bylaws.

Aditionally, a Noise Assessment was completed to quantify potential future noise levels based on existing and potential operations, and to provide mitigation measures to address any issues. The Ontario MECP Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning (NPC-300) was used as the guideline for exclusion (sound level limits). Site visits were conducted to measure current sound levels at the four sites: Well #2, Well #5 and Well #6, WRRF, and Janet Avenue PS.

8.3.3.1 Well #2

The main noise sources are the pumps and the scrubber. Under normal operating conditions, with the scrubber off, the sound level at the nearest residence is in compliance. During emergency operations (scrubber on) or scrubber testing, noise levels are in compliance during daytime and slightly above the criteria at nighttime hours.

Proposed upgrades at this site will only marginally increase sound levels but overall noise levels will remain in compliance. Potential mitigation measures for this site include the following:

- An acoustical roll-up door.
- Acoustical louvers.
- Scrubber exhaust stack silencer.

8.3.3.2 Well #5

The main noise sources are the pumps, scrubber, and an emergency generator that gets tested on a monthly basis. Under normal operating conditions, the scrubber and generator are off; the sound level at nearby residences is in compliance and just above limit in outdoor amenity spaces. During emergency operations, the scrubber and/or generator are on or scrubber and/or generator are testing; sound levels are above the applicable criteria but are not audible in comparison to the noise of traffic along Highway 27.

The proposed upgrades are expected to increase sound levels. Potential mitigation measures include the following:

- Exhaust silencers for scrubber.
- Acoustical enclosure and exhaust silencer for generator.
- The new generators should be designed in such a manner to meet the noise exemption criteria outlined in O.Reg. 524/98.

8.3.3.3 Water Resource Recovery Facility

An acoustical model was prepared for the existing WRRF operations. Sound levels at the nearest residence were slightly above the applicable criteria, but after all the proposed improvements, sound levels are predicted to increase considerably above the applicable criteria. Potential mitigation measures include the following:

- Locate rooftop equipment at the southern portion of the property (further away from residences) or behind structures to take advantage of barrier effects.
- Conduct sludge operations indoors.
- Use low noise motors/blowers or enclosures if operating outdoors.
- Use low noise rooftop exhaust fans and locate them as far south as possible.
- Use of acoustical louvers for openings facing farmhouse.

Upgrades to the WRRF will require Environmental Compliance Approval (Air and Noise). In support of this approval, MECP will require WRRF to show compliance with the NPC-300 under an operating scenario that would result in the highest theoretical sound level at the nearest residence. A more up-to-date acoustical model will be completed during detailed design to ensure the design minimizes noise levels.

8.3.3.4 Janet Avenue Pump Station

The main source of noise is the generator. On-site measurement showed that noise levels are slightly above daytime compliance limits and above compliance during nighttime. The upsizing of the generator is expected to increase noise levels above compliance. Potential mitigation measures include the following:

- The new generators should be designed in such a manner to meet the noise exemption criteria outlined in O.Reg. 524/98.
- Acoustical enclosure, inclusive of appropriate intake and exhaust silencers, if the unit is located outdoors.
- Acoustical louvers on ventilation openings and exhaust stack silencer if unit is located indoors.

8.3.4 Traffic Impacts

The existing traffic in roads nearby the facilities being upgraded and constructed will be impacted. During times when heavy construction traffic is anticipated, such as concrete pours, adequate traffic control measures will be implemented by the contractor. The construction contract documents will include provisions to have the contractor provide adequate traffic control.

8.4 Proposed Monitoring Program

As noted in Section A.2.5 (Phase 4 – Environmental Study Report) of the MCEA document, the ESR should include "a description of the monitoring program which will be carried out during construction and, if necessary, for a specific time during operation. Details of the ways in which the results of the monitoring program will be communicated to the public and review agencies shall be included". This monitoring plan will be prepared in detail during the detailed design stage of the project.

9.0 Future Commitments

The ESR identifies specific items to be reviewed and confirmed during detailed design. Some of these commitments will address specific concerns raised by property owners and review agencies during the EA process. Items of interest to be addressed include:

1. Archaeology and Cultural Heritage

a. The Stage 1 Assessment Report identified areas either having archaeological potential removed or having no or low archaeological potential and noted that these areas were exempt from requiring Stage 2 Archaeological Assessment.

b. The Stage 1 Archaeological Assessment Report identified areas as retaining archaeological potential and noted that these areas must be subjected to a Stage 2 Archaeological Assessment.

c. Based a detailed evaluation of the water and wastewater servicing alternatives, the recommended alternatives identified all expansion work within existing property boundaries. The Stage 1 Archaeological Assessment did not identify any significant risks to Built Heritage Resources (BHRs) or Cultural Heritage Landscapes (CHLs). Therefore, no further Archaeological Assessment is recommended. During the next stages of design, if significant risks to BHRs or CHLs are identified, a qualified consultant will be retained to confirm the impacts of the proposed works on the BHRs and CHLs, and Stage 2/Stage 3 Archaeological Assessment will be carried out as recommended by the consultant.

2. Air

a. During the Detailed Design stage, site specific odour sampling could be carried out. In addition, a field odour survey could be conducted for outdoor/fugitive sources using portable dilution meters (olefactometers) to verify odour levels at discrete locations.

b. Mitigation measures will be considered for sludge loading and other areas as required. Identification of mitigation measures for existing as well as proposed infrastructure will be completed during the Detailed Design stage. This will also include consultation with the MECP, odour sampling and review of MECP's "Best Management Practices for Industrial Sources of Odour."

3. Noise

a. During the Detailed Design stage, the acoustic model prepared during the ESR stage will be updated by including additional equipment for the expanded facilities.

4. Natural Environment

a. The development footprints of all infrastructure upgrades and expansions will be contained within the existing property boundaries of the facilities.

b. Care will be taken to locate laydown areas away from sensitive natural heritage features and functions.

c. Effort will be made to schedule construction during the time that would minimize wildlife disturbance. If construction must be scheduled during time periods that are sensitive to wildlife, approaches recommended in the Environmental Impact Assessment (EIS) Report will be implemented in the construction drawings and specifications. These approaches will be implemented during construction through the construction contractor. Some of these approaches are:

d. Exclusion fencing will be used during the construction phase to separate the surrounding zone form the construction habitat. This will be done in accordance with the best practices as described in Ministry of Natural Resources and Forestry (MNRF) (2013).

e. Effort will be taken to avoid illuminating the construction areas during the bird migratory periods. Where this is not possible, care will be taken to restrict lighting to localized areas required for safety and security, avoid projecting light upward into the sky by providing shields on light fixtures, consider motion sensor lights instead of continuous illumination, and turning off or minimizing light usage from 11 pm to 6 am.

f. Specifications will require the Construction Contractor to inspect the site before commending work each day for wildlife that may have become disoriented, or reptiles trapped by fencing and safely removing them from the construction area.

g. The construction sites will be managed to prevent wildlife from being attracted to the area. This will be achieved by minimizing the occurrence of standing pools of water, securing and properly disposing of food wastes and garbage, and securing construction features that could offer shelter such as open pipes, bins, trailers, piles of construction material etc.

h. A plan will be developed to control erosion and subsequent sedimentation that could negatively impact adjacent watercourses and wetlands. The specifications will include the provisions of control measures such as silt control fencing, staked strawbales etc.

i. Emphasis will placed for protection of native plant species during construction. Any vegetation that must be removed during construction will be replaced with plantings of native species once development is complete. Topsoil management will be implemented as part of revegetation efforts.

j. Care will be taken to prevent the introduction and spread of invasive plant species to the construction site and from the construction site to other construction sites and surrounding natural areas.

5. Drainage and Stormwater Management

a. Detailed Design will allow for drainage from impervious areas to landscape areas. Runoff calculations and drainage will be further developed during preliminary and detailed design.

b. Structural design to ensure all infrastructure is resilient to flooding will be carried out during detailed design. Structural engineering letters confirming structures will withstand floodplain and velocity will be drafted and provided to TRCA during detail design.

6. Utilities

a. Coordination during Detailed Design with construction of the York Region Sanitary Trunk Sewer project to avoid potential conflicts

b. During Detailed Design coordinate with Hydro One regarding terms and conditions of approval they identified to the project team

c. Location of existing utilities and resulting impacts and required relocations are to be confirmed

d. Coordination of utilities, including hydro pole relocation and overhead wiring, is to be reviewed during Detailed Design

e. Formal definition of impacts on utilities will be determined during Detailed Design, in consultation with individual utility companies

f. All utility information will be updated prior to construction to ensure that the data is accurate and to finalize relocation requirements as necessary

g. During Detailed Design, meetings will be held with utility companies as required where potential impacts to existing or future services are identified

7. Constructability and Staging

a. During Detailed design staging and construction sequencing will be developed to keep the facilities in operation and minimize downtimes. Consideration will also be given to traffic control during periods of heavy concrete pours or heavy equipment deliveries.

8. Property Requirements

Although no additional property was identified during the ESR, the following will be addressed during the Detailed Design stage.

a. Review various design alternatives and options to reduce and minimize property impacts.

b. Where required, prepare and obtain permission to enter forms/agreements from landowners where access to private property is required.

c. Obtain temporary construction access agreements or encroachment agreements as required.

d. Consult with local stakeholders and property owners prior to and during construction to confirm construction staging plans and to maintain access to private property and minimize impacts during construction

9. Geotechnical and Hydrogeotechnical Ingestions

a. During Detailed Design conduct Geotechnical and Hydrogeotechnical Investigations and Studies to confirm soil conditions and to confirm dewatering estimates to inform permitting requirements, as required.

10. Contamination

a. If subsurface work is to be conducted in the vicinity of any of the properties identified with potential environmental concern, further investigations including Phase I and Phase II ESAs may be required and will be undertaken during Detailed Design. If impact is encountered, it will be managed in consultation with a qualified professional.

11. Facility Designs

a. The Region will review and address design requirements through the preparation of detailed contract drawings and specifications.

b. At the time of Detailed Design, any changes to design standards and/or industry best practices compared to those available at the time of the EA are to be considered.

12. Additional Consultation and Coordination

a. Consult with various approval agencies, regulatory agencies and municipalities as required.

b. Consult with affected Stakeholders and property owners where their property may be impacted or affected as a result of the proposed works.

c. Consult and coordinate proposed works with the local municipality.

13. Summary of Anticipated Permits and Approvals

The following permits and approvals are anticipated for the Nobleton WRRF and Janet Ave PS:

a. MECP ECA amendment.

b. Township of King Site Plan Approval.

c. Township of King Building Permit.

d. ESA plan approval.

e. TRCA approval.

The following permits and approvals are anticipated for the expanded pump house for Well H:

a. Amendment to the MECP DWWP, Municipal Drinking Water License (MDWL), PTTW, updated WHPAs, and updated Source Protection Plan.

b. Township of King Site Plan Approval.

c. Township of King Building Permit.

d. Electrical Safety Authority (ESA) plan approval.

e. TRCA Approval – Source Protection Notice. Also to be forwarded to the MECP.

f. Technical Standard and Safety Authority Approval.

It is anticipated that the following permits and approvals will be needed for Well #2:

a. Amendment to the MECP DWWP, MDWL, PTTW, updated WHPAs, and updated Source Protection Plan.

10.0 Completion of the Environmental Study Report

The identified preferred design concepts meet the objectives of the study and would fulfill the capacity and treatment requirements to accommodate Nobleton's growth to the 2041 horizon. As part of the EA process, the ESR is placed on Public Record when the Notice of Completion is released for 30 calendar days for review by public, stakeholder agencies, and other interested parties.

If concerns arise regarding this project, that relate to Aboriginal or treaty rights, which cannot be resolved with discussion with the Regional Municipality of York, a person or party may request that the Minister of the Environment, Conservation and Parks issue a Part II Order. After the review period, provided that no Part II Orders are received, the Region may proceed to Phase 5 of the Class EA process – implementation.

The preliminary design is scheduled to start immediately upon completion of the 30-calendar day mandatory review period. The preliminary design is scheduled to be completed within 4 months from the start date, which is expected to be in April 2022.

After preliminary design, the implementation phase of the project will include the following stages:

- Preliminary design.
- Detailed design, permits, and approvals.
- Tender and award of construction contract.
- Construction and commissioning.

*Note:
As noted in this report, although it was determined that a Stage 2 archaeological assessment study is not required to support the preferred solutions, however, should it be determined during the detailed design stage that additional archaeological assessment work is required or that a Stage 2 Report needs to be completed, the Region will engage with Indigenous communities who have expressed interest in future archaeological assessments. (Updated on August 8th, 2022; based on the email chain received from York region and MECP, to ensure that it is captured in the records for future reference)

Appendix A. Class EA Technical Memos

Appendix A is under separate cover and contains the following:

- TM 1 – Identify Problem or Opportunity
- TM 2 – Identify Alternative Solutions
- TM 3 – Alternative Design Concepts
- TM 4 – Conceptual Design

Appendix B. Studies

Appendix B is under separate cover and contains the following:

- Study 1A: Water System Capacity and Optimization
- Study 1B: Wastewater System Capacity and Optimization
- Study 2A: Water Hydraulic Analysis (Phase 1)
- Study 2A: Water Hydraulic Analysis (Phase 2)
- Study 2B: Wastewater Hydraulic Analysis
- Study 3A: Water Needs Assessment and Justification
- Study 3B: Wastewater Needs Assessment and Justification
- Study 4: Technology Options to Meet Receiving Water Requirements
- Study 5: Assimilative Capacity Study and Receiver Evaluation
- Study 6: Fluvial Geomorphology
- Study 7: Hydrogeological Study
- Groundwater Exploration Study – Site Selection Report
- Archeological Assessment
- Environmental Impact Study
- Heritage Study
- Air Quality Effect
- Noise Impact Assessment
- Source Water Protection Memo

Appendix C. Public Consultation

Appendix C is under separate cover and contains the following:

- Notice of Study Commencement
- Public Engagement and Communications Plan
- Stakeholder Sensitivity Analysis and Communications Approach
- PCC #1 Summary
- PCC #2 Summary
- PCC #3 Summary
- PCC Feedback
- Notice of Completion
- Stakeholder Contact List
- Comment Tracking Log
- Emails
- Letters
- Indigenous Consultation Log