Notice of Comments Received

Following Completion of the Public Review Period

The Regional Municipality of Niagara filed the 2021 Water and Wastewater Master Servicing Plan Update report for the 45-day public review period From Thursday June 22, 2023 to Monday August 7, 2023.

All comments received were tracked in the attached summary table and responses were issued where required. A copy of all comments and responses are attached in Volume 5. Revisions to the 2021 Water and Wastewater Master Servicing Plan Update include the following:

Volume 3

Modifications to table headings for the Comparison of Alternatives including Table 3.A.12, Table 3.B12, Table 3.E.12, and Table 3.F.12 to identify the Preferred Alternative within the table heading.

Figure captions were updated to address numbering and naming inconsistencies.

Volume 4

Text updated in Section 4.1.6 to address formatting error.

Text updated in Part A: Figure 4.A.2, Table 4.A.3, Table 4.A.8, Table 4.A.9, Section A.6.2, Table 4.A.10, to update the operational firm capacity for Biggar Lagoon.

Text updated in Part A: Table 4.A.3 and Table 4.A.9 to revise the Smithville SPS forcemain diameter.

Text updated in Part B: Table 4.B.8 to revise the PDWF for Cole Farm SPS.

Figure captions were updated to address numbering and naming inconsistencies.

Volume 5

Record of consultation dates updated.

Contact list updated in Appendix B.

Regional Municipality of Niagara
2021 Water and Wastewater Master Servicing Plan Update
Public Review Period Consultation Summary and Records

Date Received (MM/DD/YYYY)	Contact Name / Organization	Comment	Response / Action	Response Date (MM/DD/YYYY)	Status	Related ESR Updates
6/1/2023	Newspaper Ads	Notice of Study Completion and Public Review ads appearing in newspapers.	- No action required	N/A	Complete	- Record of consultation provded in Volume 5
6/20/2023	Project Study Contact List	Notice of Study Completion sent by GM BluePlan on behalf of Niagara Region to project stakeholders (see Appendix V4.2 Contact List) using mass email newsletter.	- No action required	N/A	Complete	- Record of consultation provded in Volume 5
6/20/2023	Niagara Peninsula Energy	Niagara Peninsula Energy acknowledged receipt of Notice of Study Completion.	- No action required	N/A	Complete	- Record of consultation provded in Volume 5
6/22/2023	Indigenous Groups	Reminder email sent from GMBP to the following indigenous groups separate from mass email to notify them that the document is available for review from June 22 to August 7. - Haudenosaunee Development Institute (HDI) - Mississaugas of the Credit First Nations (MCFN) - Six Nations of the Grand River (SNGR)	- No action required	6/22/2023	Complete	- Record of consultation provded in Volume 5
6/27/2023	[redacted] (Resident)	**Resident brought up the following concerns:** - Potential underestimation of future sewage flow from Stevensville-Douglastown Lagoons, the new Spring Creek Estates development, and major commercial development in the Netherby and Townline Rd area of Fort Erie. - Sewage redirection from Stevensville-Douglastown lagoons being reconsidered after being identified as not practical or cost effective in the 2016 MSPU. **Resident inquired about the following:** - Is directing sewage from the Stevensville-Douglastown lagoons to the new SNF WWTP practical and cost effective or not? Resident provided estimate for amount of sewage projected to flow from the proposed commercial development in the Towline and Netherby roads area into the Stevensville-Douglastown sewage lagoons to assist in available capacity projections for the sewage lagoons.	- Region responded with information on growth projections, analysis and evaluation process for the Stevensville and Douglastown lagoons and the recommended projects to be undertaken as a result of the Master Servicing Plan	11/10/2023	Complete	- No further action required.
6/29/2023	[redacted] (Resident)	**Resident brought up the following concerns:** - Trouble accessing documents from project website for review.	- Project Manager (Ilija S.) was able to direct [redacted] (Resident) to download the appropriate document.	6/29/2023	Complete	- Record of consultation provded in Volume 5
7/7/2023	Mr. Moir (Urbantech)	Mr. Moir reached out via contact form on the project website and inquired about the northern reach property in the Town of Welland and wanted to speak about existing sewer capacity at area pump stations.	- Project Manager (Ilija S.) directed Mr. Moir to download and review the project web page and documents	7/10/2023	Complete	- No further action required.
7/31/2023	MECP Project Review Unit	The project team received detailed MECP Project Review Unit comments (see below)	- Documents were revised after the review period based on comments received. See notes below.	N/A	Complete	- See notes below
7/31/2023	MECP Project Review Unit Comment 1	**Volume 4 (Wastewater Master Servicing Plan Update) - Introduction, Section 4.1.6** -Grammatical errors where a space should be added in between the words in bold and the rest of the bullet point. For example, there should be a space between "Strategy and "Without" on the second bullet point of this section.	- Section 4.1.6 updated to address formatting concerns.	N/A	Complete	- Text updated in Section 4.1.6 to address formatting errors
7/31/2023	MECP Project Review Unit Comment 2	**Appendix V5-B (Public and Agency Consultion)** Shareholder Contact List in Volume 5 of the MSP should be revised to have the correct titles for stakeholders. In this case Joan Del Villar Cuicas of the MECP is mislabeled as 'Project Information Form - Online Submission" and should be revised to Regional Environmental Planner. The table should be reviewed to ensure there are no other errors.	- Contact list list updated in Volume 5, Appendix B.	N/A	Complete	- Contact list updated in Volume 5, Appendix B
7/31/2023	MECP Project Review Unit Comment 3	**Volume 3 (Comparison of Alternatives)** It is recommended that the identified preferred alternative is labeled on Tables 3.A.12, 3.B.12, 3.C.12, 3.D.12, 3.E.12, and 3.F.12 Comparison of Alternatives in Volume 3 of the MSP.	- Tables 3.A.12, 3.B.12, 3.E.12, and 3.F.12 updated to identify the preferred alternative.	N/A	Complete	- Tables 3.A.12, 3.B.12, 3.E.12, and 3.F.12 updated (Parts C and D do not have a Comparison of Alternatives table - text only)
7/31/2023	MECP Project Review Unit Comment 4	**Volume 5 (Indigenous Engagement)** The proponent should continue to document communication with all communities that have been engaged with as the Class EA proceeds.	- No further action required.	N/A	Complete	- Record of consultation provded in Volume 5
7/31/2023	MECP Project Review Unit Comment 5	Please note that it is the responsibility of the proponent to ensure that Species at Risk (SAR) are not killed, harmed, or harassed, and that their habitat is not damaged or destroyed through the proposed activities to be carried out on the site. If the proposed activities cannot avoid impacting protected species and their habitats, then the proponent will need to apply for an authorization under the Endangered Species Act (ESA). As is noted in the Report, if the proponent believes that their proposed activities are going to have an impact or are uncertain about the impacts, they should contact SAROntario@ontario.ca to undergo a formal review under the ESA.	- No further action required.	N/A	Complete	- Record of consultation provded in Volume 5
8/4/2023	Robert Babic (Crozier Consulting Engineers)	Crozier Consulting Engineers provided comments related to the Stevensville Secondary Plan area and the Douglas Town-Black Creek Secondary area plans servicing strategy and concerns and indicated this is a continued and ongoing effort to further discussion regarding development and servicing of these lands. The letter included a request to be included in updates and discussions related to recommendations and preferred strategies to be undertaken by the Region.	- Region responded noting reccomendation in the MSP Update were based on the best available planning information and that capacity needs will be reevaluated as new development application are projected. The Region noted Crozier requested to be included in updates and discussions related to recommendation and preferred strategies undertaken within the Stevensville Secondary Plan and Douglastown Black Creek Secondary Plan areas.	11/10/2023	Complete	- No further action required.

Date Received (MM/DD/YYYY)	Contact Name / Organization	Comment	Response / Action	Response Date (MM/DD/YYYY)	Status	Related ESR Updates
8/10/2023	Livia McEachern (City of Welland)	City of Welland provided comments from City staff requesting responses and supplemental information. 1) There are Regional projects identified in Welland's 2020 PPCP & MSP Update that were not identified in the Regional MSP Update. Those projects include: Dain City SPS Storage Optimization Woodlawn Trunk Sewer Upgrade Can staff provide some clarification as to why these projects were not identified in the Regional study? 2) The Ontario Rd Sewer upgrade identified in the City 2020 PPCP & MSP meets the requirements of a Regional Wastewater Trunk Main as identified in the Niagara Region's Development Charges Background Study Appendix E: Local Service Policy. Regional trunk mains are defined by having 170 l/s or more DWF. This upgrade was not identified in the Regional MSP. When investigated more closely though the City's Commercial Street MSP the following DWF were calculated for the Ontario Rd Sewer upgrade: - Ontario Rd – Southworth to Empress – 172 l/s - Ontario Rd – Empress to Ontario Rd SPS – 205 l/s Can staff provide some clarification as to why this project was not identified in the Regional study? 3) There were low pressures identified in the Hunter's Point Area. Can staff confirm if the water analysis incorporated the Hunter's Point Booster Station?	- Comprehensive response provided to address comments and will form part of the communication record. - Input was incorporated in final document preparation.	10/17/2023 and 11/10/2023	Complete	- Provided collaborative response that will form part of the communication document included in the final MSP.
8/16/2023	Mr. Moir (Urbantech)	Mr. Moir reached out to request a meeting to get clarification on items from the MSP as it relates to the towpath pump station (WW-SPS-037).	- Region provided clarification on question related to the towpath pump station site. - Region formally met with Urbantech to discuss the related questions.	9/18/2023	Complete	- No further action required.
9/6/2023	Project Team	Received comments regarding clarification around average and peak flows for the Cole Farm SPS.	- GMBP response provided to Region on 9/8/2023 indicating pump start/stop levels are causing an artificial increase in peak flows but the station wasn't flagged for any capacity issues.	N/A	Complete	- See below for adjustments made within the MSPU documentation
9/18/2023	Project Team	Received comments regarding Cole Farm SPS flows and Biggar Lagoon operational firm capacity Email from Ilija: Here, I have two corrections to incorporate: Cole Farm SPS – PDWF 14 L/s based on the upstream pipe segment. This is very similar to the flow numbers from Glenn; Biggar Lagoon – Operational firm capacity is 74 L/s instead of 54 L/s; If you know of any other correction that would prevent additional questions and confusion, please feel free to make it and let us know.	- Text updated in Part A: Figure 4.A.2, Table 4.A.3, Table 4.A.8, Table 4.A.9, Section A.6.2, Table 4.A.10, to update the operational firm capacity for Biggar Lagoon. - Text updated in Part A: Table 4.A.3 and Table 4.A.9 to revise the Smithville SPS forcemain diameter. - Text updated in Part B: Table 4.B.8 to revise the PDWF for Cole Farm SPS.	N/A	Complete	- Text updated in Part A: Figure 4.A.2, Table 4.A.3, Table 4.A.8, Table 4.A.9, Section A.6.2, Table 4.A.10, to update the operational firm capacity for Biggar Lagoon. - Text updated in Part A: Table 4.A.3 and Table 4.A.9 to revise the Smithville SPS forcemain diameter. - Text updated in Part B: Table 4.B.8 to revise the PDWF for Cole Farm SPS.

Niagara Region

2021 Water and Wastewater
Master Servicing Plan Update

Volume 4 – Wastewater Master Servicing Plan Update

Final Report

December 5, 2023

Niagara Region is committed to reviewing its practices, processes and the built environment for barriers to access for persons with disabilities. If you require additional or other formats for communicating the details of the appendices in this attached report, please contact the project team at niagaramspu@niagararegion.ca

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Volume 4 Parts

LIST OF ABBREVIATIONS

Acronym	Definition
2016 MSPU	2016 Water and Wastewater Master Servicing Plan Update
ANSI	Areas of Natural and Scientific Interest
BOD	Biochemical Oxygen Demand
BPS	Booster Pumping Station
CSO	Combined Sewer Overflow
CT	Contact Time
DFO	Department of Fisheries and Oceans Canada
EA(A)	Environmental Assessment (Act)
ECA	Environmental Compliance Assessment
ESR	Environmental Study Report
ET	Elevated Tank
FF	Fire Flow
GGH	Greater Golden Horseshoe
HADD	Harmful Alterations, Disruption, or Destruction of Fish Habitat
HCA	Hamilton Conservation Authority
HDI	Haudenosaunee Development Institute
HGL	Hydraulic Grade Line
I/I	Inflow and Infiltration
L/c/d	Litres per capita per day
L/e/d	Litres per employment per day
L/s/ha	Litres per second per hectare
LAM	Local Area Municipality
MCP	Master Community Plan
MCFN	Mississaugas of the Credit First Nation
MDD	Max Day Demand
MEA	Municipal Engineers Association
MECP	Ministry of the Environment, Conservation and Parks
MLD	Million Litres per Day
MMAH	Ministry of Municipal Affairs and Housing
MNRF	Ministry of Natural Resources and Forestry
MOE	Ministry of the Environment
MOECC	Ministry of the Environment and Climate Change
MSPU	Master Servicing Plan Update
NEP	Niagara Escarpment Plan
NOTL	Niagara-On-The-Lake

Acronym	Definition
NPCA	Niagara Peninsula Conservation Authority
NRW	Non-Revenue Water
OP	Official Plan
ORMCP	Oak Ridges Moraine Conservation Plan
PHD	Peak Hour Demand
PIC	Public Information Centre
PPCP	Pollution Prevention Control Plan
PPS	Provincial Policy Statement
PRV	Pressure Reducing Valves
PWC	Public Works Committee
PWWF	Peak Wet Weather Flow
QEW	Queen Elizabeth Way
SARA	Species at Risk Act
SCADA	Supervisory Control and Data Acquisition
SD	Stevensville-Douglastown
SNGR	Six Nations of the Grand River
SOGR	State of Good Repair
SPS	Sanitary Pumping Station
TAZ	Traffic Analysis Zones
TRC	Total Residual Chlorine
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

I. INTRODUCTION

1.1 Background

Niagara Region currently services the urban area of the municipalities of Grimsby, West Lincoln, Lincoln, St. Catharines, Thorold, Welland, Pelham, Port Colborne, Niagara-on-the-Lake, Niagara Falls, and Fort Erie. Water and wastewater servicing is operated under a two-tier system. Niagara Region is responsible for water treatment, transmission mains, feedermains, storage facilities and major booster pumping stations; as well as wastewater treatment, trunk sewers and sewage pumping stations. The area municipalities are responsible for local water distribution networks and local sewer collection systems.

Niagara Region is part of the Greater Golden Horseshoe (GGH) area situated around the western and southern end of Lake Ontario that continues to be one of the fastest growing regions in North America. The Government of Ontario’s legislative growth plan, Places to Grow Act 2005 and recent amendments, identifies substantial population and employment growth for the GGH to year 2051.

Readily available and accessible public infrastructure is essential to the viability of existing and growing communities. Infrastructure planning, land use planning and infrastructure investment require close integration to ensure efficient, safe, and economically achievable solutions to provide the required water and wastewater infrastructure. To balance the needs of growth and sustainability with the protection and preservation of natural, environmental and heritage resources, Niagara Region initiated a Water and Wastewater Master Servicing Plan Update.

The 2021 Master Servicing Plan Update (MSPU) provides a review, evaluation and development of water and wastewater servicing strategies for all servicing within the urban areas of the Region. The 2021 MSPU uses updated population and employment growth forecasts based on a 2051 planning horizon, and accounts for changes in regulatory and legislative requirements.

The Study Area for the 2021 MSPU covers primarily the urban areas of the local municipalities in Niagara Region serviced by the lake-based systems. The Township of Wainfleet is not included in the scope of this 2021 MSPU.

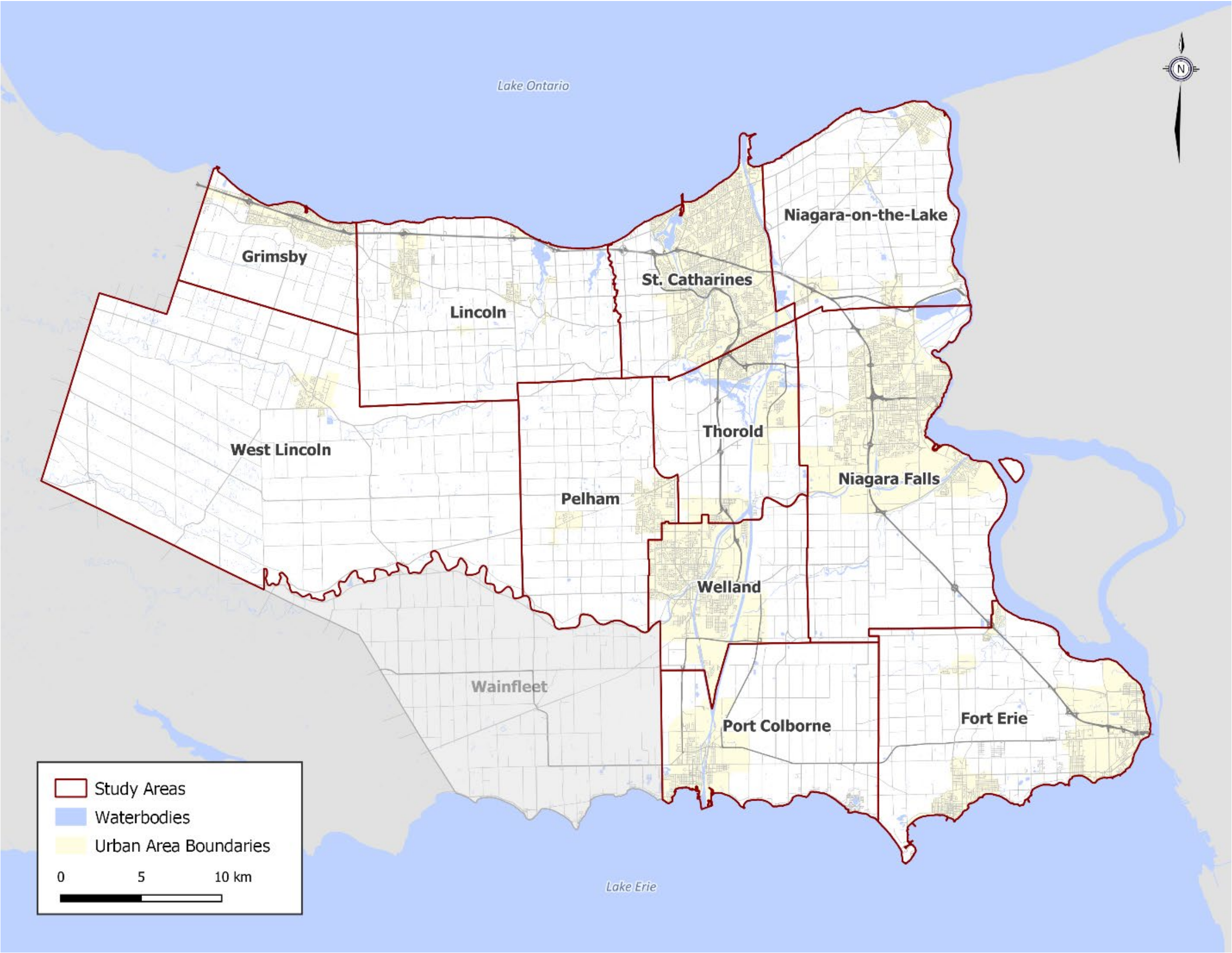

Figure 4.1 Study Area

The 2021 MSPU builds on previous work undertaken as part of the 2016 Master Servicing Plan and previous long term infrastructure planning studies. The 2021 MSPU is a critical component in the Region's planning for growth and will provide the framework and vision for the water and wastewater servicing needs for the lake-based service areas of the Region to year 2051.

1.2 Integrated Planning Process

The Niagara Region is proactively planning to facilitate the anticipated growth for a total of 694,000 people and 272,000 jobs by 2051 in an integrated process that includes the Niagara Official Plan, 2022 Development Charges Background Study and By-Law Update, and the 2021 Water and Wastewater Master Servicing Plan Update (2021 MSPU). These strategic projects are aligned and interconnected to collectively form the foundation to support and foster Niagara's anticipated growth.

1.2.1 Region Official Plan Update (2022)

As part of the Niagara Official Plan, the Region completed extensive background review, consultation, and supporting studies which resulted in policies and mapping to managing growth and the economy, protecting the natural environment, resources, and agricultural land, and providing infrastructure.

On November 4, 2022, the Minister of Municipal Affairs and Housing approved the Niagara Official Plan, with modifications. This approval helps the Niagara Region prepare for the anticipated population of 694,000 people and 272,000 jobs by 2051. Through the Niagara Official Plan and working with the local area municipalities, it helps provide more housing and jobs within the region.

The anticipated growth out to 2051 from the Niagara Official Plan process was utilized in the 2021 MSPU to determine the required water and wastewater growth capital projects.

1.2.2 Niagara Region's Development Charges Background Study and By-Law Update

The estimated capital costs of the recommended growth capital projects in the 2021 MSPU over the 30-year forecast period were included in the 2022 Development Charges Background Study and By-law. The 2022 Development Charges By-law was approved by Regional Council on August 25, 2022 and took effect on September 1, 2022.

1.2.3 Water and Wastewater Master Servicing Plan (MSPU)

The 2021 MSPU is a critical component in the Region's planning for growth and provides the framework and vision for the water and wastewater servicing needs for the lake-based service areas of the Region to 2051. The 2021 MSPU evaluates the ability of the existing and planned water and wastewater infrastructure to continue to efficiently and effectively service the Region's existing users, service anticipated growth, and to evaluate and develop recommended strategies. This included having consideration for Regional water and wastewater infrastructure to be aligned with the urban expansion and intensification areas identified in the Niagara Official Plan review. Additionally, the potential impacts of estimated growth beyond 2051 was considered due to the longer useful life of water and wastewater infrastructure assets.

1.3 Master Servicing Plan Update Report Objectives

The 2021 MSPU comprehensively documents the development, evaluation and selection of the preferred water and wastewater servicing strategies to meet the servicing needs of existing users and future development to 2051.

The 2021 MSPU evaluates the ability of existing and planned water and wastewater infrastructure in Niagara Region to service the Region's existing users, service anticipated growth, and to evaluate and develop recommended servicing strategies efficiently and effectively.

The key objectives of the 2021 MSPU are as follows:

- Review planning forecasts to 2051 and determine the impacts on servicing needs for the Region's lake-based water and wastewater infrastructure
- Evaluate the ability of existing and planned water and wastewater infrastructure to efficiently and effectively service the Region's existing users and anticipated growth
- Undertake a comprehensive review and analysis for both water and wastewater servicing requirements
- Address key servicing considerations as part of the development and evaluation of water and wastewater servicing strategies including:
    - Level of service to existing users and approved growth;
    - Operational flexibility and system security and reliability;
    - Mitigation of impacts to natural, social, and economic environments;
    - Opportunity to meet policy, policy statements, regulations, and technical criteria;
    - Opportunity to optimize existing infrastructure and servicing strategies; and,
    - Ensuring the strategies are cost effective.
- Consider and develop sustainable servicing solutions with lifecycle considerations
- Update the capital program cost estimating methodology and utilize updated industry trends and more detailed information from relevant Region studies and projects to provide appropriate capital cost estimates
- Utilize the updated water and wastewater hydraulic models for the analysis of servicing alternatives
- Establish conceptual level water and wastewater servicing strategies, with corresponding capital programs, implementation plans based on the projected growth, and flexibility to be adjusted as growth is realized in the future
- Provide extensive consultation with the public and stakeholders; and
- Complete the Master Servicing Plan Update in accordance with the MEA Class EA process for Master Plans

1.4 Master Servicing Plan Class EA Report Outline

The 2021 Water and Wastewater Master Servicing Plan Update Report, including all supporting volumes, is the documentation placed on public record for the prescribed review period. The documentation, in its entirety, describes all required phases of the planning process and incorporates the procedure considered essential for compliance with the Environmental Assessment Act.

The 2021 MSPU documentation is organized into five volumes as illustrated in the following Figure and as described below:

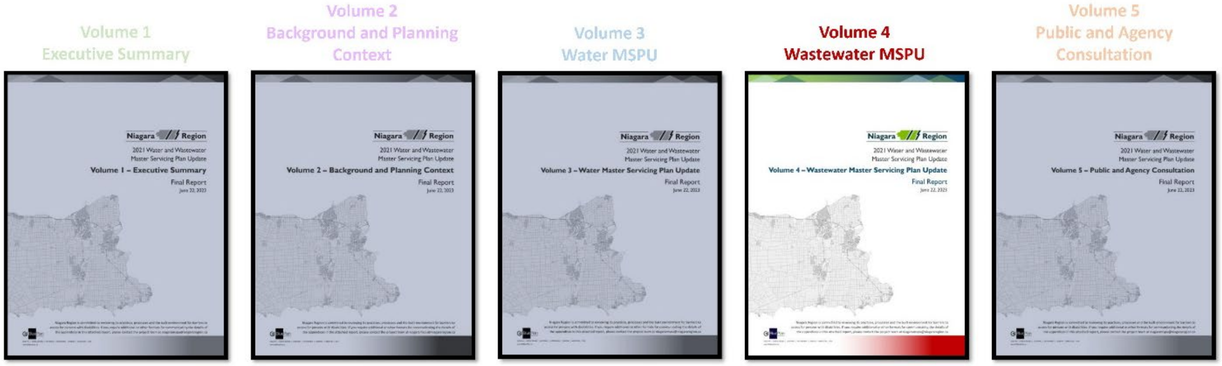

Figure 4.2 Master Servicing Plan Update Documentation

1.4.1 Volume 1 – Executive Summary

Volume 1 provides a brief overview of the 2021 MSPU. It summarizes the information contained in Volumes 2, 3, 4, and 5, including problem statement, purpose of the study, significant planning, policy and technical considerations, and description of the preferred water and wastewater servicing strategies including depiction of the projects and documentation of the capital programs.

1.4.2 Volume 2 – Background and Planning Context

Volume 2 details the master planning process including the Master Plan Class EA process, related studies, legislative and policy planning context, water and wastewater servicing principles and policies, population and employment growth forecasts, existing environmental and servicing conditions, and future considerations.

1.4.3 Volume 3 – Water Master Servicing Plan Update and Project File

Volume 3 is the principal document summarizing the study objectives, approach, methodologies, technical analyses, evaluation, and selection of the preferred water servicing strategy for each of the water systems. This volume contains baseline water system data and performance information. This volume documents the water servicing strategy development with detailed information on the projects and capital program associated with the preferred water servicing strategy.

1.4.4 Volume 4 – Wastewater Master Servicing Plan Update and Project File

Volume 4 is the principal document summarizing the study objectives, approach, methodologies, technical analyses, evaluation and selection of the preferred wastewater servicing strategy for each of the wastewater systems. This volume contains baseline wastewater system data and performance information. This volume documents the wastewater servicing strategy development with detailed information on the projects and capital program associated with the preferred wastewater servicing strategy.

1.4.5 Volume 5 – Public and Agency Consultation

Volume 5 contains all relevant documentation of the public consultation process including notices, comments and responses, and distribution information. Presentation material from all Public Information Centres (PICs) held during the process is included. Other presentation material and discussion information from workshops held with relevant agencies, approval bodies and other stakeholders are also included.

1.5 Master Servicing Plan Report Volume 4

The current volume provides the overall approach, methodologies, technical analyses, evaluation and selection of the preferred wastewater servicing strategy for each of the wastewater systems.

This main section of Volume 4 has been organized into four sections as described below, outlining the general approach, methodologies, and technical analysis used to develop the preferred wastewater servicing strategy.

This volume’s Introduction has been organized in 4 sections as described below:

1. Introduction
2. Analysis Methodology
3. Wastewater Servicing Strategy
4. Wastewater Capital Program

Eleven individual Sub-Parts A to K – one for each wastewater system – is also included to summarize the technical analyses and evaluation of the preferred wastewater servicing strategy for each system.

Each Sub-Part A to K has been organized in 8 sections as described below:

1. Existing System Overview
2. Basis for Analysis
3. System Performance

4. System Opportunities and Constraints
5. Assessment of Alternatives
6. Preferred Servicing Strategy
7. Capital Program
8. Project Implementation and Considerations

Volume 4 is one of five volumes that make up the complete Master Servicing Plan Class EA Study Report and should be read in conjunction with the other volumes.

2. ANALYSIS METHODOLOGY

The current analysis calculates the following:

- Total equivalent population fed by each wastewater treatment plant at the following time horizons: 2021, 2051, post-2051.
- Total equivalent population fed by each sanitary pumping station sewershed at each time horizon.
- Peak dry weather and peak wet weather flows each pumping station sewershed at each time horizon.

The results of this analysis are used as input to this Master Servicing Plan, which identifies the problem and opportunity and develops alternative solutions to address.

2.1 Project Assumptions

The following key assumptions have been made as part of the analysis:

- Growth projections were based on the following two sources of information received from the Region:
    - Traffic Area Zone population projections to 2051 and post-2051 were used:
        - To estimate growth related flows within the wastewater catchments.
        - To spatially allocate growth flows within the individual wastewater sewersheds.
    - Parcel-specific population projections for known development locations throughout the Region
- Institutional, industrial, and commercial growth flows were estimated using equivalent employment projections.
- Pumping station firm capacity is the firm capacity given in the latest Environmental Certificate of Approval (ECA) for each station. System capacity analysis was completed using the lesser of the ECA firm capacity or actual operational capacity as provided by Regional operational staff (where provided).
    - Where this value is not provided, for the purpose of this master plan, the firm capacity is taken as the sum of individual pump capacities with the largest pump out of service.
- That ongoing asset renewal programs will maintain the capacity and good working order of existing infrastructure

2.2 Flow Projections and Allocations

The study area consists of the existing service area as well as residential and industrial land supply within the existing urban boundary. The population and employment projects were provided on a traffic survey zone basis.

Tributary population employment numbers to each pump station sewersheds and treatment facility were calculated using the following process:

- A shapefile of known development locations was provided by the Region. This shapefile included the development type (planned, redevelopment, vacant), land use (employment, mixed, or residential), development timing (pre or post-2051), and the equivalent population.
- Traffic survey zones and development locations were overlaid with the Region's parcels shapefile. The growth data was brought down to the most granular parcel level in order to have flexibility and transparency in the growth allocation process.
- For 2051 growth allocation:
    - For traffic survey zones with no corresponding development locations, all growth was assumed to be proportionally applied across the serviced parcels within the traffic survey zone
    - For traffic survey zones with corresponding development locations:
        - If the total population equivalent from all of the corresponding development locations was greater than the traffic survey zone growth, the traffic survey zone growth number was utilized and spread across the development locations (proportionally, by development location growth). This means that the development location growth was reduced proportionally to match the traffic survey zone projection.
        - If the total equivalent population from all of the corresponding development locations was less than the traffic survey zone growth, the development location growth was allocated first to the development locations as provided by the Region, then the remainder of the traffic survey zone growth was spread across the remaining serviced parcels within the traffic survey zone.
- For post-2051 growth allocation:
    - For traffic survey zones with no corresponding development locations, all growth was assumed to be proportionally applied across the serviced parcels within the traffic survey zone
    - For traffic survey zone with development locations:
        - If the total pre-2051 population equivalent from all of the corresponding development locations was greater than the traffic survey zone growth, the equivalent population that was removed from 2051 growth was spread to their respective development locations. Post-2051 population equivalent from the development locations was spread to their respective development locations. The remainder of post-2051 growth from the traffic survey zone growth number was then spread across remaining serviced parcels within the TAZ.

        - If the total pre-2051 population equivalent from all of the corresponding development locations was less than the traffic survey zone growth, the post-2051 development location growth was spread to their respective development locations, and the remainder of post-2051 traffic survey zone growth was spread across remaining serviced parcels within the TAZ.
- For traffic survey zones partially in the urban boundary, all growth was assumed to occur within the urban boundary with no growth outside the urban boundary.
- The total population growth serviced by wastewater out to 2051 will be less than the total growth presented in **Table 4.1** as this includes unserviced areas outside the urban area boundary.
- The growth shapes were overlaid with the existing sewershed area boundary to assign growth to individual sewersheds.
- For unassigned growth shapes, a manual review of existing service network, topographic, and existing natural and physical features was conducted, and growth was assigned to individual sewersheds based on likely service connection.
- For allocation to the InfoSWMM model, the growth area shapes where then allocated to the closest existing sewershed within the growth shape's previously assigned sewershed area.
    - Basic local sewers were drawn within large development areas, and development growth was assigned to these placeholder local pipes. The alignments of these pipes are not based on draft plans and will be updated to reflect actual alignments within future model updates as the developments are built out.

Figure 4.3 provides an example of the process used to allocate system demands.

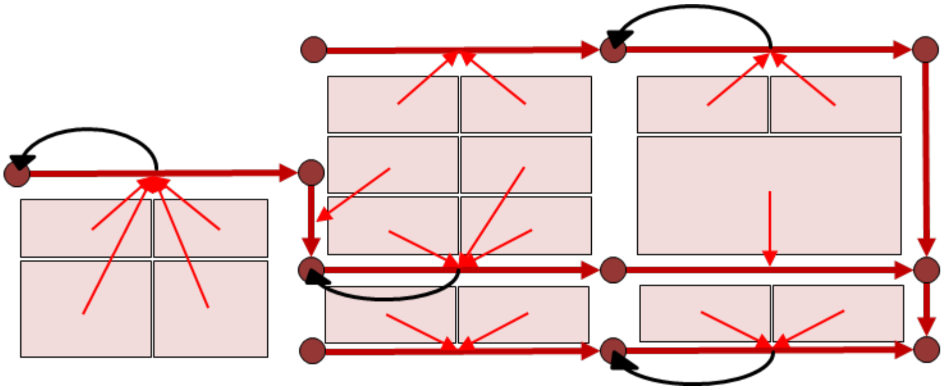

Figure 4.3 Process for Allocating System Demands

2.3 Study Area Population and Employment

Table 4.1 presents the projected residential population and employment population by municipality to 2051, as presented within the Region's Official Plan.

Table 4.1 Niagara Region 2021 Official Plan – 2051 Population and Employment Forecast Allocations by Local Municipality

Municipality	2051 Residential Population	2051 Employment Population
Fort Erie	48,050	18,430
Grimsby	37,000	14,960
Lincoln	45,660	15,220
Niagara Falls	141,650	58,110
Niagara-on-the-Lake	28,900	17,610
Pelham	28,830	7,140
Port Colborne	23,230	7,550
St. Catharines	171,890	79,350
Thorold	39,690	12,510
Wainfleet	7,730	1,830
Welland	83,000	28,790
West Lincoln	38,370	10,480
Niagara Region	**694,000**	**272,000**

Table 4.2 presents the existing and projected serviced residential and employment population by municipality. Note that Wainfleet is not included in this table as it is not serviced by Regional water or wastewater infrastructure. The presented population and employment totals are based on the Region's 2021 allocation of Traffic Area Zones planning data and have been processed through the allocation methodology presented in **Section 2.2** to refine the data to include only serviced populations. As such, the population and employment total does not directly match the system totals using the Region's unprocessed planning data, or the Region's Official Plan populations.

Table 4.2 Existing and Projected Wastewater Serviced Residential and Employment Population by Local Area Municipality

Municipality	2021		2051		Post-2051	
	Residential	Employment	Residential	Employment	Residential	Employment
Fort Erie	30,287	9,583	44,004	16,284	56,752	18,023
Grimsby	29,612	9,859	36,932	14,486	48,464	19,284
Lincoln	23,348	8,792	41,288	12,646	48,548	16,494
Niagara Falls	93,941	37,253	138,442	57,885	159,576	61,864
NOTL	15,982	9,622	23,523	13,521	26,689	17,769
Pelham	15,462	3,360	24,957	5,557	26,914	5,764
Port Colborne	15,969	4,693	20,094	6,592	35,096	10,771
St. Catharines	136,974	59,764	169,735	76,844	182,111	82,081
Thorold	22,552	7,143	38,506	11,160	52,502	15,813
Welland	55,229	17,337	81,120	27,782	105,024	34,524
West Lincoln	8,386	2,400	30,279	8,091	34,585	9,409
Total	**447,741**	**169,807**	**648,880**	**250,850**	**776,260**	**291,796**

2.4 Design Criteria

The 2021 MSPU has used the following design criteria to project wastewater flows, determine capacity requirements and establish the wastewater infrastructure program:

- Residential Flow Generation: 255 Lpcd
- Employment Flow Generation: 310 Lped
- Peaking Factor based on Harmon formula with values between 2 and 4.
- Extraneous Flow Design Allowance:
    - 0.4 L/s/ha for existing areas[1]
    - 0.286 L/s/ha for new developments

2.4.1 Updated Per Capita Flow Criteria

The Region's 2016 Master Servicing Plan Update utilized 275 Lpcd for both residential and employment land uses to project growth average wastewater generation rate. More granular data was analysed through this MSPU to reassess the per capita demand criteria as it is important to maintain a reasonable factor of safety within the consumption criteria while avoiding over-conservatism which ultimately impacts the capital projects that are triggered and when they are triggered.

Through this MSPU, ten years of daily flow data was provided for each WWTP. For the purposes of evaluating the wastewater flow criteria an in-depth review of a three-year period of records (2018-2020) was completed for each wastewater treatment plant. **Table 4.3** presents the average per capita rate (combined population and employment) that was calculated for each wastewater treatment plant. To account for the influence of wet weather flows on the daily wastewater treatment plant flows, two additional average daily flows criteria were used:

- Dry average daily flows, which excluded days with greater than 5 mm of precipitation and preceding day
- Summer dry average daily flows: same as dry average daily flows but only accounted for flows within the month of June through to September.

The identification of appropriate wastewater per capita growth criteria was complicated due to:

- The observed inflow and infiltration which included:
    - Substantial local and seasonal variability in daily flows
    - Observed flows to the wastewater treatment plants exceeding the water generated from the water treatment plants
- Limited ability to completed detailed employment vs. residential-based analysis
- Distribution of total equivalent population by treatment plant and ratio of residential and employment within each treatment plant catchment

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[1] Refer to Section 2.4.2 for additional details

Through the review several potential per capita growth rates scenarios were considered including:

- Increasing to match the average daily flows
- Aligning to match the water daily demands
- Maintain the existing criteria
- Align with the observed dry average daily flows.

In consultation with the Region, it was decided that the per capital flow criteria would be adjusted to match the median average dry weather flow and while also applying the same ratio for residential and employment from the observed (local meter billing) water per capita rates. It should be noted that the use of the median flows was based on the Niagara Falls WWTP and not the Stevensville Douglastown Lagoons due to the majority of the WWTP with flow rates higher than the median represented smaller services areas including less than 50% of service population. Under this approach:

- The residential per capita rate was decreased to 255 Lpcd
- The employment per capita rate was increase to 310 Lpcd

The recommended residential and employment per capita rates represent a 7% reduction for the residential rate and a 12% increase for the employment rate compared to the Region's previous rate of 275 Lpcd for both residential and employment land uses.

Table 4.3 Per Capita Wastewater Flows by WWTP

WWTP	Per Capita Criteria (L/cap/d)		
	Average Flow	Average Dry Weather Flow (DWF)	Summer Average DWF – June to September Only
Baker Road WWTP	254	229	178
Port Dalhousie WWTP	286	260	210
Port Weller WWTP	312	291	215
NOTL Lagoon/WWTP	347	344	303
Queenston WWTP	142	114	132
Niagara Falls WWTP	299	262	219
SD Lagoon	323	297	257
Anger Ave WWTP	588	503	359
Crystal Beach WWTP	548	497	410
Seaway WWTP	581	568	511
Welland WWTP	374	337	261
Average	**369**	**336**	**278**
Median	**323**	**262-297**	**219-257**

2.4.2 Extraneous Flow Criteria

The Region’s extraneous flow allowance criteria was also reviewed against historic flow monitoring and pump station performance records. The review of historic wet weather flows found that typically 2-year design storm peak flows within existing built systems exceeded the Region’s existing extraneous flow design allowance of 0.286 L/s/ha; however, that a 2-year design storm peak flow below 0.286 L/s/ha was achievable as demonstrated in multiple catchment areas. Based on the analysis and an industry review, for the purpose of future planning, the extraneous flow design allowance for existing areas was increased to 0.4 L/s/ha but was maintained at 0.286 L/s/ha for new greenfield development areas to better reflect the existing high wet weather flows, while minimizing the magnitude of system upgrades with wet weather flow management as a critical priority. In areas where available historic flow monitoring and modelling results identify existing peak 5 year design flows below the 0.4 L/s/ha criteria, the lower 5 year design flows should be utilized.

2.5 Flow Projection

2.5.1 Starting Point Methodology

2.5.1.1 Treatment Plants

Niagara Region provided daily flow at each wastewater treatment plant for 2011 – 2020. Using this data, an average daily flow was calculated for each year. The five-year rolling average of average daily flows was used to establish baseline (2021) system average daily flows to assess wastewater treatment plant capacity. **Table 4.4** presents the average daily flow for each WWTP system. Further detail regarding historic flows within each system can be found in their respective Volume 4 parts.

Table 4.4 Wastewater Treatment Plant Average Daily Flow

Wastewater Treatment Plant	2021 MSPU Daily Average Flow (MLD)
Baker Road WWTP	19.4
Port Dalhousie WWTP	34.2
Port Weller WWTP	34.4
Niagara-on-the-Lake WWTP	4.7
Queenston WWTP	0.2
Niagara Falls WWTP	39.9
Stevensville and Douglastown WWTP	1.6
Anger Avenue WWTP	14.2
Crystal Beach WWTP	5.7
Seaway WWTP	11.8
Welland WWTP	34.2

2.5.1.2 Sewage Pumping Stations

The baseline scenario for system modelling and assessment of facility capacity by sewage pumping station (SPS) catchment was established using calibrated hydraulic models with three years of historic local billing meter records from each local area municipality (discussed in **Section 2.4.1**), SCADA records, and flow monitoring data.

2.5.2 Growth Flow Projections

Future system average daily flows were developed using a starting point methodology incorporating 25% reduction for NRW and are presented in **Table 4.5**. Expected flows due to growth were added to the starting point flows to establish future flows. A sample calculation for the Anger Avenue WWTP system is provided below.

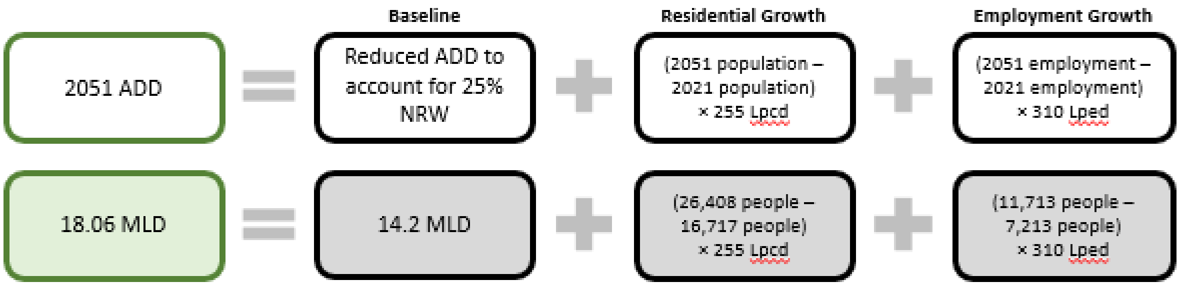


Figure 4.4 Sample Calculation of Expected Growth Flows

Table 4.5 Wastewater Flow Projections

Wastewater System	2021 – 2051 Growth[1]			2021 – Post-2051 Growth[1]			2021 Demands	2051 Demands	Post-2051
	Growth Population	Growth Employment	Total Equivalent Growth	Growth Population	Growth Employment	Total Equivalent Growth	Average Daily Flow (MLD)	Average Daily Flow (MLD)	Average Daily Flow (MLD)
Baker Road WWTP	47,154	14,173	61,327	70,251	24,136	94,387	19.4	35.8	44.8
Port Dalhousie WWTP	27,860	13,491	41,351	38,218	19,418	57,637	34.2	45.5	50.0
Port Weller WWTP	14,949	7,575	22,525	19,745	12,246	31,991	34.4	40.6	43.2
Niagara-on-the-Lake WWTP	1,621	1,487	3,108	2,451	1,696	4,147	4.7	5.6	5.9
Queenston WWTP	15	86	101	83	101	185	0.2	0.3	0.3
Niagara Falls WWTP	18,568	10,415	28,983	24,186	11,017	35,203	39.9	59.7	69.2
Stevensville and Douglastown WWTP	1,329	1,653	2,983	2,006	1,726	3,732	1.6	2.5	2.6
Anger Avenue WWTP	9,691	4,500	14,191	20,393	6,086	26,479	14.2	18.1	21.3
Crystal Beach WWTP	2,697	547	3,244	4,067	628	4,695	5.7	6.6	6.9
Seaway WWTP	4,125	1,899	6,024	19,127	6,078	25,205	11.8	13.4	18.6
Welland WWTP	41,634	13,070	54,704	71,789	21,326	93,115	34.2	48.9	59.1

[1] Note: The 2021 MSPU has an established baseline condition of year 2021. 2021 represents the best available system information and system calibration data for the water and wastewater models at the time of study initiation. The 2021 MSPU has projected water demands from year 2021 to establish the 2051 infrastructure needs.

[2] The values shown for the Niagara Falls WWTP do not consider the implementation of the South Niagara Falls WWTP and strategy.

2.6 Wastewater Infrastructure Capacity

2.6.1 Sizing of Treatment Plant

Treatment plants are designed to treat the average daily flows. The following criteria were used to assess when wastewater treatment facilities require expansion, as agreed upon with the Region.

- When flows reach 80% of plant capacity, the planning process for plant expansion will be flagged.
- When 90% of plant capacity has been reached, expansion should be completed.

2.6.2 Sizing of Pumping Station

Although it is the Region’s design philosophy to size SPS inline with the Region’s extraneous flow design criteria, the MSPU undertook a hybrid evaluation approach in an effort to acknowledge that SPS are a major contributor to local wastewater system performance and that many legacy system’s exiting wet weather flows exceed the extraneous flow design allowance. The SPS hybrid performance evaluation and upgrade framework are summarized in **Table 4.6** and strives to balance the magnitude of capacity upgrades, potential cascading downstream upgrades, and managing the potential risk of local sewer surcharging and system overflows.

Under the hybrid performance evaluation and upgrade framework, the SPS capacity was sized to meet the lesser of peak wet weather flow (PWWF) using the extraneous flow design allowance, referred to as “Design Allowance PWWF” or the estimated 5-year storm PWWF. Further, consideration for the SPS actual performance under the estimated 5-year design storm peak wet weather flow was evaluated to determine if the available system storage including the wet well, storage tanks, and in system capacity was sufficient to manage excess flows while maintaining the system hydraulic grade line (HGL) below the basement flooding level of 1.8 m below grade and/or below the local overflow level.

In instances where the 5-year storm PWWF flow exceeded the available system storage, additional system solutions such as wet weather management, system storage, and/or additional SPS capacity upgrades were incorporated into the servicing solution. The most efficient solution to manage capacity and flow reduction was determined through the assessment of calculated flows from the 2051 design allowance PWWF and modelled 5-year storm PWWF against the operational firm capacity of the station and system storage.

Each SPS with a preferred solution of a capacity upgrade was individually reviewed in detail to determine how capacity upgrades should best be achieved:

- Pump replacement
- Pump upgrades
- Pump additions
- Station replacement
- Existing wet well sizing changes.

Due to data quality and availability, a prioritization of upgrade needs, and flow monitoring (data collection) was assigned to each case for the Region implementation plan, discussed later in **Section 4.4.**

Table 4.6 SPS Assessment Framework

Case	2051 Design PWWF	2051 5 Year Storm PWWF	2051 5-Year Storm Storage Need	Preferred Solution	Upgrade Priority	Flow Monitoring Priority
Case 1	> Firm Capacity	> Firm Capacity	> Available Storage	Upgrade pumps to future design allowance flow with potential storage upgrades and wet weather management	High	Medium
Case 2	< Firm Capacity	> Firm Capacity	> Available Storage	Upgrade storage and wet weather management	High	High
Case 3	> Firm Capacity	> Firm Capacity	< Available Storage	Potential upgrade to design allowance flow and wet weather management	Medium	High
Case 4	< Firm Capacity	> Firm Capacity	< Available Storage	Potential wet weather management	Low	Medium
Case 5	> Firm Capacity	< Firm Capacity	< Available Storage	No upgrade, use actual peak flows	N/A	Low
Case 6	< Firm Capacity	< Firm Capacity	< Available Storage	No upgrade	N/A	Low

2.6.3 Sizing of Forcemains

Forcemain capacity is sized based on the firm capacity of the pumping station.

The following criterion is used to assess when a forcemain for a pumping station requires expansion:

- Flag velocities less than 0.6 m/s for operational issues.

- Flag velocities greater than 2.0 m/s.
- Capacity expansion will be triggered once the forcemain design velocity exceeds 2.5 m/s and considering condition and age.

Sizing of new forcemains will target the following criteria:

- Design velocity between 1.0 m/s and 2 m/s.
- Where presently feasible, capacity requirements will be achieved by twinning of existing forcemain with same size as existing.

2.6.4 Sizing of Trunk Sewers

Trunk sewers are sized to manage peak wet weather flows, using the extraneous flow design allowance (hybrid 0.4 L/s/ha for existing areas and 0.286 L/s/ha for new areas), within the sewer obvert.

Trunk sewers were also reviewed for minimum freeboard (depth between hydraulic grade line and surface) resulting from peak wet weather flows from the 5-year design storm. The basement flooding protection freeboard is 1.8 m

The following criterion is used to assess when a sewer requires expansion:

- Capacity expansion will be triggered once the sewer peak hydraulic grade line exceeds the pipe obvert from the design allowance peak wet weather flows.
- Freeboard (depth between hydraulic grade line and surface) greater than 1.8 m below surface in 5-year design storm (this criteria was reviewed in combination with the downstream SPS capacity)
- Flag velocities less than 0.6 m/s for operational issues.
- Flag velocities greater than 2.0 m/s.

Sizing of new sewer will have the following criterion:

- Sized for full flow under post-2051 design allowance peak wet weather flow.
- Assess 5-year design storm performance to minimize basement flooding risks and overflows

2.7 Summary of Flow Criteria, Performance, and Sizing Methodology

Table 4.7 presents a summary of the flow criteria, performance, and sizing methodology that was utilized.

Table 4.7 Flow Criteria, Scenarios, System Performance, and Sizing Methodology

	Component	Criteria	
Flow Criteria	Existing System Flows	Starting Point Methodology • Based on local billing meter records and flow monitoring data to establish existing dry and wet weather flows • Growth flows are added to the existing system baseline using design criteria	
	Flow Generation	Residential	255 L/c/d
		Employment	310 L/e/d
	Peaking Factor	Peak Dry Weather Flow	Harmon's Peaking Factor
	Extraneous Flow Design Criteria	• 0.4 L/s/ha for existing areas[2] • 0.286 L/s/ha for new developments	
WWTP	System Performance and Triggers	• MECP Procedure F-5-1 • Trigger upgrade study at 80% capacity • Trigger upgrade construction at 90% capacity	
	Upgrade Sizing	• Average daily flow plus growth based on population design flows	

Pump Station	System Performance and Triggers Sizing	• Refer to **Section B.2.1.1.**
		• Two flow scenarios considered
		  • **Design Allowance**: Peak wet weather flow using the peaked dry weather flow plus the extraneous flow design allowance
		  • **5-Year Storm**: Modelled peak wet weather flow using the 5-year design storm
		• Peak flow capacity to meet design peak wet weather flow using the extraneous flow design allowance
		• Wet well and system storage considerations under 5-year storm to minimize basement flooding and overflow risks	

Forcemain	System Performance and Triggers	• Flag velocities less than 0.6 m/s • Flag velocities greater than 2 m/s • Upgrade when velocities exceed 2.5 m/s and considering condition and age	

---

[2] Refer to section 2.4.2

	Component	Criteria
	Upgrade Sizing	• Design velocity target between 1 m/s and 2 m/s • Forcemain twinning to increase capacity where feasible
Trunk	System Performance and Triggers	• Design allowance peak wet weather flows, using the extraneous flow design allowance, to be managed within pipe • Freeboard (depth between hydraulic grade line and surface) greater than 1.8 m below surface in 5-year design storm • Flag pipes velocities less than 0.6 m/s • Flag pipes velocities greater than 3.0 m/s
	Upgrade Sizing	• Sized for full flow under post-2051 design peak wet weather flow • Assess 5-year design storm performance to minimize basement flooding risks and overflows

3. WASTEWATER SERVICING STRATEGY

3.1 Servicing Principles

Development of water and wastewater principles are integral to provide guidelines and direction to the 2021 MSPU process, as well as to the identification and evaluation of servicing strategies. Refer to **Volume 2** for more details regarding servicing principles.

Through the course of the 2021 MSPU, priority areas were reviewed from the previous 2016 MSPU and further refined for application under this 2021 MSPU including:

- Health and safety;
- System reliability and security;
- Reserve capacity for operational flexibility and level of service;
- Impacts of climate change;
- Considerations to energy use and efficiency;
- Recognition of impacts from water efficiency and conservation; and
- Addressing issues related to the full lifecycle of water and wastewater services.

A comprehensive list of general, water, and wastewater principles were established. As a result, from the priority policy areas, key principle and policy statements were developed as highlighted below:

- Niagara Region will endeavor to maintain sufficient reserve capacity in its water and wastewater infrastructure and facilities to provide operational flexibility and meet potential changes in servicing conditions;
- Niagara Region shall endeavor to provide reliability, redundancy, and security in its water and wastewater systems with attention to high risk and critical areas;
- Niagara Region shall be aware of and consider the potential impact of climate change on the planning and sizing of infrastructure;
- Niagara region shall design water and wastewater facilities with consideration to energy use;
- Niagara Region will consider levels of storage beyond MECP guidelines where appropriate in order to provide operational flexibility, energy management, and system security. Further, system storage requirements should be exclusive of the volume required to achieve sufficient disinfection requirements at the Region’s water treatment plants;
- Niagara Region will review a combination of servicing strategies including infrastructure and non-infrastructure (e.g., I/I reduction) solutions to meet wet weather level of service and provide sufficient wastewater capacity.
- Niagara Region will approach Guidelines F-5-5 and F-5-1 such that new development will not put the Region out of compliance with regulations and the Region will consider opportunities to not increase wet weather overflows beyond current conditions; and,

- Niagara Region will work to ensure that new developments do not increase wet weather flows and consider the potential for new developments to work collaboratively with the Region and local area municipalities to reduce I/I in upstream catchments in order to gain some capacity for new developments.

3.2 Evaluation Methodology

The process for developing, evaluating and selecting the preferred wastewater servicing strategy followed these key steps:

- Review of baseline performances across each wastewater system;
- Identify opportunities and constraints for each system;
- Develop high level servicing concepts;
- Review each concept with respect to environmental, social, legal, technical, and financial factors. Develop advantages and disadvantages for each;
- Provide additional detail for the preferred concept ensuring alignment, siting, capacity, timing, and other technical factors are identified; and
- Develop a conceptual cost estimate for each project.

Each alternative was evaluated through the reasoned argument approach which provided a clear and thorough rationale of the trade-offs among the various options based on the anticipated impacts caused by various evaluation criteria and factors. The basis of this approach is to qualitatively evaluate the relative advantages, disadvantages, and impacts of each alternative against the established criteria. This process was intended to highlight why the preferred alternative was chosen through evaluation of technical, environmental, social/cultural, and financial criteria.

3.3 Alternatives

The general infrastructure strategies remained the same as the 2016 MSP, however the details including alignment, sizing, or wet weather areas have been updated to reflect the latest system understanding and reflect updated criteria changed through this iteration of the MSPU.

- Providing capacity within Region-owned pumping stations and trunk sewers to convey peak wet weather flows up to the extraneous flow design allowance criteria of 0.4 L/s/ha for existing areas and 0.286 L/s/ha for growth areas, based on the updated flow criteria and actual flows.
- Provide upstream flow management to address high peak flows in the system where peak wet weather flows exceed the extraneous flow design allowance criteria of 0.4 L/s/ha resulting in basement flooding and overflow risks. Upstream flow management can include but is not limited to these options, in the preferred order of implementation:
    - Inflow and infiltration reduction in public right of way

  - Inflow and infiltration reduction from private properties
  - Enhanced system storage
  - Peak flow control using system controls or engineered solutions
- As shown in **Section 2.5.1.2**, pump station capacity assessments were completed by reviewing the projected design allowance peak flows and 5-year storm flows against the operational firm capacity of each station.
  - Where the 5-year peak storm flows were less than design flows and the operational firm capacity of the station, the 5-year storm flows were used as actual flows, and therefore would not have triggered an upgrade.
  - Where the projected peak design allowance flows and 5-year storm flows exceeded the operational firm capacity of the station, a pump upgrade was recommended. Additional storage considerations and wet weather management were also considered.

4. CAPITAL PROGRAM

4.1 Wastewater System Recommendations Overview

A summary of the key aspects of the water servicing strategy is provided below.

4.1.1 Baker Road

- Based on the anticipated growth in the service area, the Baker Wastewater Treatment Plant will require additional treatment capacity prior to 2051
- The projected growth and wet weather flow needs across much of the service area has triggered many sewage pumping station upgrades
- Significant growth is expected from the Smithville Master Community Plan (MCP) through an urban boundary expansion. The population is expected to more than triple by 2051.
    - Infrastructure supporting the lands within the urban boundary expansion area are anticipated to be built by developers and have not been included in the capital program. Refer to the Water and Wastewater Servicing Plan for the Smithville MCP for further details.
    - The level of growth in the Smithville area will require upgrades to the sewage pumping stations and forcemains. The Smithville SPS forcemain and downstream gravity sewers will require upgrades, and due to corridor capacity constraints downstream in Grimsby, an EA is proposed to determine the appropriate alignment to accommodate the forcemain upgrades.
- A key strategy for the Baker Road WWTP system is to provide wet weather management across the system to manage growth capacity interim to infrastructure upgrades and for long-term system sustainability as identified in the latest PPCP. This will require Regional solutions as well as local municipality solutions.

4.1.2 Port Dalhousie

- While infrastructure capacity upgrades were considered, the recommended solution for the Port Dalhousie WWTP system is to provide wet weather management across the system at a rate that manages growth related impacts. This will require Regional solutions as well as local municipal solutions.
- An upgrade at the Beaverdams SPS and forcemain was identified to support growth in the area
- With the implementation of the wet weather management program, the Port Dalhousie Wastewater Treatment Plant will have sufficient capacity to meet growth to year 2051

4.1.3 Port Weller

- The Port Weller Wastewater Treatment Plant has sufficient capacity to support growth to year 2051 and beyond

- The projected growth will require pumping station expansions to Spring Gardens SPS and forcemain and the Haulage Road SPS and forcemain
- A key strategy for the Port Weller system is to provide wet weather management across the system. This will require Regional solutions as well as local municipality solutions .
- The preferred servicing for the Thorold South projects including the Peel SPS, Black Horse SPS and Centre Street SPS are governed by the South Niagara Falls Wastewater Solutions Schedule ‘C’ Class Environmental Assessment
    - The strategy consists of the redirection of the Thorold South pump stations to pump to a trunk sewer connecting Thorold South to the South Niagara Falls system instead of to the Port Weller WWTP, which will provide the Port Weller trunk sewer and WWTP additional capacity to address existing capacity restrictions and to support growth.
    - The reconfiguration of Thorold South to the new Niagara Falls trunk sewer consists of
        - A new forcemain from Peel Street SPS to a new Black Horse SPS, and some upgrade work the Peel Street SPS to facilitate the new forcemain
        - A new, upgraded Black Horse SPS and forcemain to the new trunk sewer; and
        - Centre Street SPS will maintain the current configuration pumping into the Black Horse SPS catchment

4.1.4 Niagara-On-The-Lake

- The Niagara-on-the-Lake Wastewater Treatment Plant has sufficient capacity to support growth to year 2051 and beyond.
- The projected growth will require pumping station expansions to Lakeshore Road SPS, Line 2 SPS, Front Street SPS.
- A key strategy for the Niagara-on-the-Lake system is to provide wet weather management across the system. This will require Regional solutions as well as local municipality solutions. Further, it is expected that the Town’s planned PPCP update will further identify catchments and strategies for inflow and infiltration reduction and other wet weather management solutions.

4.1.5 Queenston

- The Queenston wastewater system is a small system in Niagara-on-the-Lake. There is not much growth projected and the system has capacity to support its needs. However, from a lifecycle perspective, it can be inefficient to operate small independent systems.
- The South Niagara Falls wastewater strategy presents opportunities for adjacent systems. On this basis, it is recommended to include the redirection of the Queenston flows to Niagara Falls via a new SPS and forcemain to the St. David’s #1 SPS catchment, upgrades to the St David’s #1 and #2 SPS and forcemains and decommissioning the

Queenston WWTP. The preferred servicing strategy and proposed works are to be confirmed through the ongoing Queenston – St. David's Wastewater Servicing Strategy EA.

4.1.6 Niagara Falls

- Several of the strategies for the Niagara Falls WWTP service area are governed by the following environmental assessments:
    - South Niagara Falls Wastewater Solutions Schedule 'C' Class EA was completed in 2022
    - Queenston – St. David's Wastewater Servicing Strategy EA, which is ongoing

Niagara Falls Strategy

- Without the implementation of the South Niagara Falls strategy, the current rated average daily flow capacity of the Niagara Falls WWTP is 68.3 MLD, with an existing flow of 39.9 MLD and a projected 2051 average daily flow of 61.6 MLD, which exceeds 90% of the wastewater treatment plant rated capacity. The projected post-2051 flow is 71.2 MLD, which would exceed the wastewater treatment plant rated capacity. The South Niagara Falls Wastewater Treatment Plant will reduce the 2051 flows to the existing Niagara Falls WWTP to 33.0 MLD and the post-2051 flow to 34.6 MLD. As such, the existing plant has surplus capacity and will not reach 80% capacity within the 2051 time horizon.
- The projected growth will require pumping station expansions to Bender Hill SPS, Central SPS, Lundy's Lane SPS, Royal Manor SPS, and Dorchester Road SPS and forcemain.

South Niagara Falls

- The evaluation of alternatives for the South Niagara Falls plant location, trunk and forcemain alignment, and new SPS locations were all completed as a part of the South Niagara Falls Wastewater Solutions Schedule 'C' Class EA, which includes the following projects:
    - New South Niagara Falls WWTP
    - New WWTP Outfall
    - New tunneled trunk sewer from South Side Low Lift SPS to new WWTP
    - New shallow trunk sewer to Thorold South
    - New trunk sewer to eliminate CSO overflow upstream of the South Side Low Lift SPS
    - New Black Horse SPS and new upgraded forcemain and alignment
    - New Peel Street SPS forcemain and alignment
    - Decommission South Side High Lift SPS, Grass Brook SPS and Garner Road SPS, all to be replace by gravity connections to the new trunk system
    - Inflow and infiltration reduction in South Niagara Falls and Thorold South

- The Chippawa trunk sewer (new strategy to identified in this 2021 MSPU) is recommended as the preferred alternative compared to the future upgrade/rehabilitation of the South Side Low Lift SPS and forcemain. In addition to servicing the South Side Low Lift SPS catchment, a tunneled trunk will also provide servicing flexibility for lands to the southeast of the new WWTP.
    - The trunk sewer is proposed in two phases:
        - Phase 1 is a tunneled trunk sewer from west of Lyons Creek (waterbody) to the new South Niagara Falls WWTP
        - Phase 2 is a tunneled trunk sewer from the South side Low Lift SPS to west of Lyons Creek (waterbody)
    - A Schedule B EA will be required to confirm the alignment of the trunk sewer with various water body crossings

St. David's and Queenston

- The South Niagara Falls wastewater strategy presents opportunities for the Niagara Falls WWTP system as a result of reduced flows to the Niagara Falls WWTP. On this basis, it is recommended to include the redirection of the Queenston flows to Niagara Falls WWTP via a new SPS and forcemain to the St. David's #1 SPS catchment, upgrades to the St David's #1 and #2 SPS and forcemains and decommissioning the Queenston WWTP. The preferred servicing strategy and proposed works are to be confirmed through the ongoing Queenston – St. David's Wastewater Servicing Strategy EA.
- In the event that the Queenston WWTP is not re-directed to the Niagara Falls WWTP catchment, the upgrades to the St. David's #1 SPS and St. David's #2 SPS and supporting forcemains are still required to service growth.

Systemwide

- A key strategy for the Niagara Falls system is to provide wet weather management across the system. This will require Regional solutions as well as local municipality solutions. Further, it is expected that the City of Niagara Falls' planned Master Plan and Wet Weather Management Study and the Town of Niagara-on-the-Lake's planned PPCP will further identify catchments and strategies for inflow and infiltration reduction and other wet weather management solutions.

4.1.7 Stevensville Douglastown

- Based on the level of growth expected in the service area, the Stevensville Douglastown Lagoons will require additional treatment capacity. A Long-Term Servicing Strategy Study is recommended to assess wastewater treatment options for the Fort Erie area, which would include reviewing potential options, such as:
    - Maintain or expand the existing treatment lagoons

  - Decommission the Stevensville Douglastown Lagoons by replacing the Lagoons with a new SPS and forcemain to convey flows to either the Anger Avenue WWTP or new South Niagara Falls WWTP
- The projected growth will require pumping station expansions at both Stevensville SPS and Douglastown SPS.
- A key strategy for the Stevensville Douglastown system is to provide wet weather management through both catchments as identified in the Town's latest PPCP. This will require Regional solutions as well as local municipality solutions.

4.1.8 Anger Avenue

- The Anger Avenue Wastewater Treatment Plant has sufficient capacity to support growth to year 2051. The post-2051 flows are expected to exceed the 80% capacity. However, a Long-Term Servicing Strategy Study is recommended to assess wastewater treatment options for the Fort Erie area, which would include reviewing potential options, such as:
  - Assessing the viability of decommissioning the Crystal Beach WWTP and conveying Crystal Beach system flows to the Anger Ave WWTP service area via a new SPS and forcemain.
  - Assessing options to decommission the Stevensville Douglastown Lagoons by replacing the Lagoons with a new SPS and forcemain to convey flows to either the Anger Avenue WWTP or new South Niagara Falls WWTP.
  - Perform a capacity assessment of the Anger Avenue WWTP based on the preferred servicing strategy for Crystal Beach and Stevensville Douglastown areas.
- Several large residential and employment growth areas have been identified outside the existing serviced area. A local servicing strategy was identified in the Bridgeburg Wastewater Servicing Strategy; however, it will be implemented by developers and the to be determined solutions were not carried forward into the Region's capital program.
- The projected growth will require pumping station expansions at Alliston SPS and forcemain, Lakeshore SPS and forcemain, Catherine Street SPS and Thompson SPS.
- A key strategy for the Anger Avenue system is to provide aggressive wet weather management throughout the whole system as identified in the Town's latest PPCP. This will require Regional solutions as well as local municipality solutions.

4.1.9 Crystal Beach

- The Crystal Beach Wastewater Treatment Plant has sufficient capacity to support growth to year 2051; however, due to the age and condition of the plant, a Long-Term Servicing Strategy Study is recommended to assess wastewater treatment options for the Fort Erie area, which would include reviewing potential options, such as:
  - Maintain and rehabilitate the existing Crystal Beach WWTP
  - Replace the Crystal Beach WWTP at a new location

  - Convey Crystal Beach system flows to the Anger Ave WWTP service area via a new SPS and forcemain
- The existing system deficiencies and projected growth will require pumping station upgrades to Nigh Road SPS and Shirley SPS.
- A key strategy for the Crystal Beach system is to provide wet weather management in the Nigh Road SPS and Crystal Beach WWTP catchments, which were also identified as moderate priority areas in the Town's latest PPCP. This will require Regional solutions as well as local municipality solutions.

4.1.10 Seaway

- The Seaway Wastewater Treatment Plant has sufficient capacity to support growth to year 2051. The post-2051 flows are expected to exceed the 80% capacity, at which time a potential upgrade study may be triggered.
- The projected growth will require pumping station expansions to Oxford SPS, Steele SPS, Union SPS and Omer SPS.
- A key strategy for the Seaway system is to provide wet weather management across the system. This will require Regional solutions as well as local municipality solutions including improving the system understanding through flow monitoring data collection. It is expected that the City of Port Colborne's planned PPCP update will further identify catchments and strategies for inflow and infiltration reduction and other wet weather management solutions.

4.1.11 Welland

- The Welland Wastewater Treatment Plant has sufficient capacity to support growth to year 2051, however the projected 2051 flows will pass the 80% capacity around 2041, at which time a study may be triggered.
- A key strategy for the Welland system is to provide wet weather management across the system to support growth as identified in the latest PPCP. This will require Regional solutions as well as local municipality solutions, especially in the City Welland.
- The existing system deficiencies and projected growth will require pumping station expansions to Foss Road SPS and forcemain, Towpath Road SPS and forcemain, Dain City SPS, Hurricane Road SPS.
- Quaker Road trunk sewer will provide servicing flexibility for Pelham growth flows.

4.2 Wet Weather Management Strategy

As in the 2016 MSPU, a significant and critical element of this 2021 MSPU servicing strategy is implementation of a wet weather management program across the Local Area Municipalities.

The Niagara wastewater systems are a mix of separated and combined sewer systems. Each system is experiencing varying levels of impact during wet weather conditions. Climate change continues to create changing weather conditions and the wastewater systems are experiencing in most cases high peak flows under rainfall events. Providing infrastructure capacity for the peak flow events would require significant upgrades not only for local sewers, but also trunk sewers, pumping stations and ultimately the treatment plants. It is not economically feasible to continue building larger infrastructure to accommodate these peak flows consisting mostly of rainwater, known as inflow and infiltration (I/I). There is opportunity to consider a balance of infrastructure upgrades with other strategies to remove the I/I to save costs, optimize treatment capacity, optimize operation and maintenance practices, and manage staff resources.

The wet weather management program in the 2021 MSPU has been updated to reflect the Regional and Local Area Municipalities efforts to better identify and quantify existing wet weather flows and to address high priority areas. The updated program identifies targeted areas and amounts of inflow and infiltration reduction intended to deal with existing capacity constraints as well as provide for growth related capacity without or minimizing expanding/upgrading existing infrastructure.

The wet weather program in the 2021 MSPU currently identifies overall preliminary priority, staging of location and target amount of inflow and infiltration reduction across all systems. This program provides for a proactive and targeted approach to addressing wet weather impacts.

4.3 Capital Program

A summary of the wastewater servicing strategy capital program with details for each project is provided in **Table 4.8**.

Table 4.8 Wastewater Servicing Strategy

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost
WW-D-001	Decommissioning of Queenston WWTP	Decommissioning of Queenston WWTP, to be replaced by new SPS and forcemain to St. David's #1	N/A	2027-2031	Niagara-on-the-Lake	B	To be Satisfied Under Consolidated Queenston Schedule B EA - Separate Study	Treatment	$2,256,000
WW-D-003	Decommissioning of South Side High Lift SPS	Decommissioning of SSHL SPS, to be replaced by gravity trunk sewer to SNF WWTP	N/A	2037-2041	Niagara Falls	A+	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Forcemain	$500,000
WW-D-004	Decommissioning of Garner SPS	Decommissioning of Garner SPS to be replaced by gravity connection to SNF WWTP	N/A	2032-2036	Niagara Falls	A+	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Forcemain	$450,000
WW-D-006	Decommissioning of Grassy Brook SPS	Decommissioning of Grassy Brook SPS to be replaced by gravity connection to SNF WWTP	N/A	2032-2036	Niagara Falls	A+	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Sewer	$450,000
WW-FM-003	Upgrade Foss Road SPS Forcemain	Replace existing 200 mm Foss Road SPS Forcemain with new single 250 mm forcemain in Welland.	250 mm	2027-2031	Pelham	A+	Satisfied	Forcemain	$9,883,000
WW-FM-004	Laurie Avenue SPS Forcemain Upgrade	New 250 mm Laurie Avenue SPS Forcemain Upgrade in Lincoln	250 mm	2022-2026	Lincoln	A+	Satisfied	Forcemain	$2,605,000
WW-FM-005	New Peel Street SPS Forcemain	New 400 mm Peel Street SPS Forcemain in Thorold from station to Black Horse SPS	400 mm	2027-2031	Thorold	B	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Forcemain	$5,062,000
WW-FM-006	New Black Horse Forcemain to Niagara Falls	New Black Horse Forcemain to New South Niagara Falls Trunk on Barron Road to the Montrose Trunk Sewer	400 mm	2027-2031	Thorold	B	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Forcemain	$2,839,000
WW-FM-009	Dorchester Forcemain Upgrade	Replace Existing 350 mm Dorchester SPS Forcemain with new single 500 mm forcemain in Niagara Falls.	500 mm	2027-2031	Niagara Falls	A+	Satisfied	Forcemain	$659,000

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost
WW-FM-010	St. Davids #1 Forcemain Upgrade	Replace existing 200 mm St. Davids #1 Forcemain with new single 400 mm in Niagara-on-the-Lake	400 mm	2027-2031	Niagara-on-the-Lake	A+	To be Satisfied Under Consolidated Queenstown Schedule B EA - Separate Study	Forcemain	$5,803,000
WW-FM-011	Smithville Forcemain Upgrade	Replace existing 400 mm Smithville SPS Forcemain with new single 750 mm forcemain in Smithville.	750 mm	2027-2031	West Lincoln	B	Separate EA Required	Forcemain	$41,785,000
WW-FM-012	New Queenston Forcemain	New 250 mm Queenston Forcemain into Niagara Falls system	250 mm	2027-2031	Niagara-on-the-Lake	B	To be Satisfied Under Consolidated Queenston Schedule B EA - Separate Study	Forcemain	$12,427,000
WW-FM-013	Lake Street Forcemain Upgrade	Replace existing 445 mm Lake Street SPS Forcemain with new single 600 mm forcemain in Grimsby.	750 mm	2022-2026	Grimsby	A+	Satisfied	Forcemain	$3,454,000
WW-FM-014	Ontario Street Forcemain Upgrade	Replace Existing 534 mm Ontario Street SPS Forcemain with new single 750 mm forcemain in Grimsby.	750 mm	2022-2026	Lincoln	B	Separate EA Required	Forcemain	$11,408,000
WW-FM-017	New Streamside Forcemain and Outlet	New 200 mm forcemain and alignment	200 mm	2032-2036	West Lincoln	A+	Satisfied	Forcemain	$2,350,000
WW-FM-018	Beaverdams Forcemain Replacement	Replace existing 150 mm Beaverdams SPS forcemain with new single 200 mm in Thorold	200 mm	2022-2026	Thorold	B	Satisfied through completed EA	Forcemain	$3,660,000
WW-FM-019	Haulage Road Forcemain Upgrade	Upgrade existing 150 mm Haulage Road SPS forcemain with new single 250 mm	250 mm	2037-2041	St. Catharines	A+	Dependent on outcome of wet weather flow study	Forcemain	$4,500,000
WW-FM-022	Commission 600 mm Towpath Road Forcemain	Bring constructed 600 mm Towpath SPS forcemain into service	600 mm	2032-2036	Welland	A+	Satisfied	Forcemain	$250,000
WW-FM-024	St. David's #2 Forcemain Upgrade	Replace existing 250 mm St David's #2 SPS forcemain with new single 400 mm in Niagara Falls	400 mm	2027-2031	Niagara-on-the-Lake	A+	To be Satisfied Under Consolidated Queenstown Schedule B EA - Separate Study	Forcemain	$5,689,000
WW-FM-025	Alliston Road Forcemain Upgrade	Replace existing 250 mm Alliston Road SPS forcemain with new single 300 mm in Fort Erie	350 mm	2027-2031	Fort Erie	A+	Satisfied	Forcemain	$4,233,000

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost
WW-FM-026	Lakeshore Forcemain Replacement	Upgrade existing 200 mm Lakeshore SPS forcemain with new single 250 mm in Fort Erie	250 mm	2022-2026	Fort Erie	A+	Satisfied	Forcemain	$1,155,000
WW-FM-027	Spring Gardens Forcemain Replacement	Upgrade existing 400 mm Spring Gardens SPS forcemain with new single 500 mm in St Catharines	500 mm	2022-2026	St. Catharines	B	Separate EA Required	Forcemain	$3,058,000
WW-FM-028	Jordan Valley Forcemain Replacement	Replace existing 200 mm Jordan Valley SPS forcemain with new single 300 mm in Lincoln	300 mm	2022-2026	Lincoln	A+	Satisfied	Forcemain	$2,915,000
WW-II-017	Region Wide Wet weather Reduction	Wet weather reduction program in all systems to be executed from 2022-2051	N/A	2022-2051	Region-Wide		Dependent on outcome of wet weather flow study	Wet Weather Reduction	$225,000,000
WW-SPS-001	Alliston SPS Upgrade	Upgrade from 67 L/s to ultimate ECA of 130 L/s by adding final pump.	130 L/s	2027-2031	Fort Erie	A+	Satisfied	Pumping	$1,107,000
WW-SPS-002	Catherine Street SPS Replacement	Increase station capacity from 150.8 L/s to 190 L/s by replacing station at new location.	190 L/s	2022-2026	Fort Erie	B	Separate EA Ongoing	Pumping	$9,372,000
WW-SPS-003	Lakeshore SPS Upgrade (Fort Erie - Anger Ave WWTP)	Increase station capacity from 63 L/s to 79 L/s by replacing the station at a new location.	79 L/s	2022-2026	Fort Erie	B	Separate EA Ongoing	Pumping	$7,748,000
WW-SPS-004	Shirley SPS Upgrade	Increase station capacity from 29 L/s to 57 L/s; Also includes sustainability upgrades to the station	57 L/s	2021 (Already Complete)	Fort Erie	A+	Satisfied	Pumping	$4,845,000
WW-SPS-005	Nigh Road SPS Pump Replacement	Increase station capacity from 22 L/s to 54 L/s by replacing the existing two pumps.	54 L/s	2027-2031	Fort Erie	A+	Dependent on outcome of wet weather flow study	Pumping	$2,053,000
WW-SPS-006	Stevensville SPS Upgrade	Increase station capacity from 41 L/s to 109 L/s. Scope includes wet well expansion and replacing the two existing pumps.	109 L/s	2022-2026	Fort Erie	A+	Satisfied	Pumping	$2,797,000
WW-SPS-008	Oxford SPS Pump Replacement	Increase station capacity from 6 L/s to re-establish 8 L/s ECA capacity by replacing the existing two pumps.	8 L/s	2022-2026	Port Colborne	A+	Satisfied	Pumping	$1,213,000
WW-SPS-009	Steele SPS Relocation	Increase station capacity from 25 L/s to re-establish 35 L/s ECA	35 L/s	2032-2036	Port Colborne	B	Separate EA Required	Pumping	$3,485,000

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost
		capacity by replacing the station at a new location							
WW-SPS-011	Foss Road SPS Upgrade	Increase station capacity from 25 L/s to 52 L/s by replacing the existing two pumps.	52 L/s	2027-2031	Pelham	A+	Satisfied	Pumping	$2,778,000
WW-SPS-012	Smithville SPS Upgrade	Increase station capacity from 104 L/s to 705 L/s. Scope includes wet well expansion, pump upgrade and adding two pumps.	705 L/s	2027-2031	West Lincoln	B	Separate EA Required	Pumping	$17,623,000
WW-SPS-013	Campden SPS Pump Replacement	Increase station capacity from 11 L/s to 21 L/s by replacing the existing two pumps. (Construction 2022)	21 L/s	2022-2026	Lincoln	A+	Satisfied	Pumping	$1,430,000
WW-SPS-014	Laurie Avenue SPS Upgrade	Increase station capacity from 28 L/s to 90 L/s. Scope includes new wet well and pump upgrades.	90 L/s	2022-2026	Lincoln	A+	Satisfied	Pumping	$3,354,000
WW-SPS-015	Victoria Avenue SPS Pump Replacement	Increase station capacity from 120 L/s to 380 L/s by replacing the existing three pumps	380 L/s	2027-2031	Lincoln	A+	Satisfied	Pumping	$5,070,000
WW-SPS-016	Bridgeport SPS Pump Replacement	Increase station capacity from 11 L/s to 25 L/s, as planned in 2022 design, by replacing the existing two pumps	25 L/s	2022-2026	Lincoln	A+	Satisfied	Pumping	$3,475,000
WW-SPS-017	Jordan Valley SPS Pump Replacement	Increase station capacity from 40 L/s to 74 L/s, as planned in 2022 design, by replacing the existing two pumps.	74 L/s	2022-2026	Lincoln	A+	Satisfied	Pumping	$3,593,000
WW-SPS-018	Ontario Street SPS Upgrade	Increase station capacity from 420 L/s to 840 L/s. Upgrades include dry and wet well expansions and two additional pumps.	840 L/s	2027-2031	Lincoln	B	Separate EA Required	Pumping	$14,316,000
WW-SPS-019	Biggar Lagoon Pump Replacement	Increase station capacity from 54 L/s to re-establish 95 L/s ECA capacity by replacing the existing two pumps.	95 L/s	2022-2026	Grimsby	A+	Satisfied	Pumping	$2,898,000

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost
WW-SPS-020	Lake Street SPS Pump Replacement	Increase station capacity from 375 L/s to 600 L/s by replacing existing four pumps.	600 L/s	2022-2026	Grimsby	A+	Satisfied	Pumping	$6,762,000
WW-SPS-021	Beaverdams SPS Pump Replacement	Increase station capacity from 10 L/s to 40 L/s as planned in 2022 design	40 L/s	2022-2026	Thorold	B	Satisfied by previous EA	Pumping	$4,161,000
WW-SPS-026	Dorchester SPS Pump Replacement	Increase station capacity from 185 L/s to 345 L/s by replacing the existing three pumps. Use implementation plan prior to upgrade: Flow monitoring, validate wet weather flows, re-evaluate required upgrades	345 L/s	2027-2031	Niagara Falls	A+	Satisfied	Pumping	$5,070,000
WW-SPS-028	Black Horse SPS Upgrade	New SPS location with increased capacity from 67 L/s to 180 L/s.	180 L/s	2027-2031	Thorold	B	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Pumping	$5,054,000
WW-SPS-031	St. David's #2 SPS Upgrade	Increase station capacity from 42 L/s to 202 L/s with a full station Reconstruction	202 L/s	2027-2031	Niagara-on-the-Lake	B	To be Satisfied Under Consolidated Queenstown Schedule B EA - Separate Study	Pumping	$6,571,000
WW-SPS-032	St. David's #1 SPS Upgrade	Increase station capacity from 29 L/s to 174 L/s. with a full station reconstruction.	174 L/s	2027-2031	Niagara-on-the-Lake	B	To be Satisfied Under Consolidated Queenstown Schedule B EA - Separate Study	Pumping	$5,740,000
WW-SPS-035	Line 2 SPS Pump Replacement	Increase station capacity from 7 L/s to re-establish 8 L/s ECA capacity by replacing the existing two pumps, as per 2022 design.	8 L/s	2022-2026	Niagara-on-the-Lake	A+	Satisfied	Pumping	$1,213,000
WW-SPS-037	Towpath SPS Upgrade	Increase station capacity from 118 L/s to 600 L/s. Scope includes pump upgrades and one additional pump.	600 L/s	2022-2026	Thorold	A+	Satisfied	Pumping	$6,519,000
WW-SPS-038	Hurricane Road SPS Pump Replacement	Increase station capacity from 39 L/s to 67 L/s by replacing existing two pumps.	67 L/s	2022-2026	Pelham	A+	Satisfied	Pumping	$2,415,000

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost
WW-SPS-039	New Queenston SPS	New Queenston SPS with firm capacity of 62 L/s	62 L/s	2027-2031	Niagara-on-the-Lake	B	To be Satisfied Under Consolidated Queenston Schedule B EA - Separate Study	Pumping	$2,996,000
WW-SPS-040	Woodsview SPS Upgrade	Increase station capacity from 35.5 L/s to 53 L/s by replacing the station at location.	53 L/s	2022-2026	Grimsby	A+	Satisfied	Pumping	$4,189,000
WW-SPS-041	Streamside SPS Upgrade	Increase station capacity from 16 L/s to 41 L/s. Scope includes wet well expansion and pump upgrades.	41 L/s	2022-2026	West Lincoln	A+	Satisfied	Pumping	$1,314,000
WW-SPS-042	Haulage Road SPS Pump Replacement	Increase station capacity from 45 L/s to 80 L/s by replacing both pumps.	80 L/s	2037-2041	St. Catharines	A+	Dependent on outcome of wet weather flow study	Pumping	$2,415,000
WW-SPS-043	Spring Gardens SPS Pump Replacement	Increase station capacity from 291 L/s to 349 L/s by replacing existing three pumps.	349 L/s	2022-2026	St. Catharines	A+	Satisfied	Pumping	$6,519,000
WW-SPS-045	Front Street SPS Pump Replacement	Increase station capacity from 25 L/s to 56 L/s by replacing existing two pumps. Use implementation plan prior to upgrade: Flow monitoring, validate wet weather flows, re-evaluate required upgrades	56 L/s	2032-2036	Niagara-on-the-Lake	A+	Satisfied	Pumping	$2,778,000
WW-SPS-046	Omer SPS Pump Replacement	Increase station capacity from 108 L/s to 131 L/s by replacing existing three pumps	131 L/s	2032-2036	Port Colborne	A+	Satisfied	Pumping	$3,621,000
WW-SPS-047	Union SPS Pump Replacement	Increase station capacity from 100.9 L/s to re-establish 126 L/s ECA capacity by replacing the existing three pumps. Use implementation plan prior to upgrade: Flow monitoring, validate wet weather flows, re-evaluate required upgrades	126 L/s	2027-2031	Port Colborne	A+	Satisfied	Pumping	$3,621,000

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost
WW-SPS-049	Dain City SPS Pump Replacement	Increase station capacity from 90 L/s to 164 L/s by replacing existing three pumps.	164 L/s	2037-2041	Welland	A+	Satisfied	Pumping	$4,346,000
WW-SPS-050	Bender Hill SPS Pump Replacement	Full station replacement at new location from 237 L/s to re-establish 330 L/s ECA capacity.	330 L/s	2022-2026	Niagara Falls	B	Satisfied through previous EA	Pumping	$15,234,000
WW-SPS-051	Central SPS Pump Replacement	Increase station capacity from 800 L/s to re-establish 1000 L/s ECA capacity by replacing the existing five pumps.	1000 L/s	2037-2041	Niagara Falls	A+	Satisfied	Pumping	$10,777,000
WW-SPS-052	Lundy's Lane SPS Pump Replacement	Increase station capacity from 56 L/s to re-establish 98 L/s ECA capacity by replacing the existing three pumps.	98 L/s	2037-2041	Niagara Falls	A+	Satisfied	Pumping	$3,079,000
WW-SPS-053	Royal Manor SPS Pump Replacement	Increase station capacity from 9 L/s to 16 L/s by replacing existing two pumps	16 L/s	2022-2026	Niagara Falls	A+	Satisfied	Pumping	$1,213,000
WW-SPS-054	Thompson SPS Upgrade	Increase station capacity from 362 L/s to 510 L/s by installing one additional planned pump: consistent with phased approach under ultimate ECA capacity of 680 L/s	510 L/s	2032-2036	Fort Erie	A+	Satisfied	Pumping	$1,690,000
WW-SPS-055	Douglastown SPS Upgrade	Increase station capacity from 33 L/s to 79 L/s. Scope includes wet well expansion and pump upgrades. Use implementation plan prior to upgrade: Flow monitoring, validate wet weather flows, re-evaluate required upgrades	79 L/s	2037-2041	Fort Erie	A+	Satisfied	Pumping	$2,428,000
WW-SPS-058	Peel Street SPS Upgrade	Station upgrades which may be required to accommodate new forcemain	N/A	2027-2031	Thorold	A+	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Pumping	$500,000

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost
WW-SPS-059	Lakeshore Road SPS Pump Replacement	Increase station capacity from 90 L/s to 168 L/s by replacing existing two pumps, Includes wet well upgrades	168 L/s	2037-2041	Niagara-on-the-Lake	A+	Satisfied	Pumping	$4,055,000
WW-SS-002	Quaker Road Trunk Sewer	New 600 mm trunk sewer on Quaker Rd. between Pelham Street trunk and Rice Road trunk sewers.	600 mm	2022-2026	Welland	A+	Satisfied	Sewer	$3,106,000
WW-SS-006	New Montrose Trunk Sewer	New tunneled trunk sewer on Montrose conveying flows from South Side High Lift SPS to the new South Niagara Falls WWTP	1500 mm	2027-2031	Niagara Falls	B	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Sewer	$88,622,000
WW-SS-007	New Brown Road Trunk Sewer	Shallow gravity trunk from South Thorold to Garner SPS-South Niagara Falls trunk connection	600 mm	2027-2031	Niagara Falls	B	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Sewer	$16,765,000
WW-SS-008	Chippawa Trunk Sewer Phase 1	New tunneled 1200 mm trunk sewer from west of Lyon's Creek to South Niagara Falls WWTP	1200 mm	2032-2036	Niagara Falls	B	Separate EA Required (WW-SS-015)	Sewer	$60,923,000
WW-SS-009	Lister Road Trunk Upgrade 1	Replace existing 600 mm gravity sewer downstream of Victoria Ave forcemain with new 750 mm gravity sewer	750 mm	2027-2031	Lincoln	A+	Satisfied	Sewer	$1,758,000
WW-SS-010	Lister Road Trunk Upgrade 2	Replace existing 675 mm gravity sewer downstream of Victoria Ave forcemain with new 825 mm gravity sewer	825 mm	2027-2031	Lincoln	A+	Satisfied	Sewer	$5,747,000
WW-SS-011	Beamsville Trunk Upgrade 1	Replace existing 600 mm gravity sewer with new 825 mm gravity sewer	825 mm	2027-2031	Lincoln	A+	Satisfied	Sewer	$7,766,000
WW-SS-012	Beamsville Trunk Upgrade 2	Replace existing 750 mm gravity sewer with new 1050 mm gravity sewer	1050 mm	2027-2031	Lincoln	A+	Satisfied	Sewer	$1,575,000
WW-SS-013	Smithville Trunk Upgrade	Sewer upgrades along an alternate alignment to WWTP. Replaces old MSP SS-(003-004).	600 mm	2027-2031	Grimsby	B	Separate EA Required	Sewer	$49,272,000

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost
WW-SS-014	South Niagara Falls SSO Trunk	New sewer to eliminate overflows upstream of South Side High Lift SPS	1050 mm	2022-2026	Niagara Falls	B	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Sewer	$1,554,000
WW-SS-015	Chippawa Trunk Sewer Phase 2	New tunneled 1200 mm trunk sewer from South Side Low Lift to west of Lyon's Creek	1200 mm	2037-2041	Niagara Falls	B	Separate EA Required (WW-SS-008)	Sewer	$27,082,000
WW-TP-001	Baker Road WWTP Upgrade	Baker Road WWTP Upgrade to provide an additional 16 MLD	14 MLD	2032-2036	Grimsby	C	Separate EA Required	Treatment	$123,895,000
WW-TP-002	South Niagara Falls Wastewater Treatment Plant - Phase 1	New South Niagara Falls WWTP Phase 1 with 30 MLD capacity	30 MLD	2022-2026	Niagara Falls	C	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Treatment	$203,557,000
WW-TP-003	South Niagara Falls Wastewater Treatment Plant Phase 2	New South Niagara Falls WWTP Upgrade from 30 MLD to 60 MLD	30 MLD	2037-2041	Niagara Falls	C	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Treatment	$200,000,000
WW-TP-004	South Niagara Falls Wastewater Treatment Plant Outfall	New South Niagara Falls WWTP Outfall Structure	1800 mm	2022-2026	Niagara Falls	C	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Treatment	$4,718,000
WW-TP-005	Region-wide WWTP Process Upgrades	Process upgrades to re-establish ECA capacity	N/A	2022-2051	Region-Wide			Treatment	$50,000,000
WW-TP-006	Region-wide WWTP Process Upgrades	Upgrades for odour control across the Region at forcemains, pump stations, and other locations.	N/A	2022-2051	Region-Wide			Treatment	$40,000,000
WW-ST-001	Region Wide Flow Monitoring and Data Collection	Funding to support flow monitoring and data collection initiatives	N/A	2022-2051	Region-Wide			Wet Weather Reduction	$12,000,000
WW-ST-002	Fort Erie QEW Corridor Long-Term Study	Crystal Beach WWTP, SD WWTP long term strategy	N/A	2022-2026	Fort Erie		Separate EA Required	Treatment	$500,000
WW-ST-003	Additional Studies	Wastewater Master Servicing Plan, Wastewater Servicing Study, CSO Program	N/A		Region-Wide	N/A	N/A	Study	$20,750,000
								TOTAL	**$1,473,418,000**

4.4 Project Implementation Flow Chart

The recommended design capacities within the capital program are based on the best available information at the time of analysis, including existing system demands, facility capacities, and projected growth. It is understood that this data is not static and often changes over the years between the regular updates of the Region's Master Plan. Design assumptions should be revisited before initiation of projects to reconfirm the appropriate design capacities, along with identification of any associated or dependent projects which can be combined or staged to optimize implementation efficiency and cost, and/or system operation.

To support the Region's process in implementing recommended MSPU capital projects, the following flow chart has been developed for the wastewater system. This flow chart document is intended to be a reference resource for the Region and should be treated as a guideline to support existing internal Region processes in project implementation.

The wastewater implementation flow chart is shown in **Figure 4.5.**

Niagara Region

WASTEWATER PROJECT IMPLEMENTATION

The intent of this document is to support the Region in confirming the scope of work for wastewater infrastructure projects.

CONFIRM PROJECT SCOPE

To define Terms of Reference

☐ **What triggered this project?**
- Known development growth
- Forecasted growth
- Sustainability needs

☐ **Are there related or dependent projects that should be identified for streamlining opportunities or for project phasing?**
- Are there upstream projects with increasing capacity?
- Are there projects within the same alignment or project area that could be combined? (e.g., growth projects, SPS, forcemain, sewer, corridor planning, sustainability projects, water, stormwater, etc.)
- If there are related projects, could the project timing be adjusted to combine or stage projects more efficiently?

☐ **What is the project EA Schedule and status?**

☐ **Are there historic or ongoing operational issues in the project area?**
- Confirm with Regional and LAM operations and maintenance groups
- i.e. historic overflows, low flow/odour issues, clogging issues, work order history, etc.

☐ **Are there any data gaps that should be incorporated into the Terms of Reference?**
- Refer to the Required Data section below for details
- How much does the project timeline and budget need to change to allow for the data collection?

☐ **Have the planning projections been updated to the best available information?**
- Consultation with Region and LAM planning groups to confirm planning projection
- Are projected needs for the project in place? Is actual growth in line with projected growth?)

☐ **Should the project be deferred until identified related works are completed?**

REQUIRED DATA

To support terms of reference and detailed design

☐ **Recently completed EA or servicing study**
(for growth triggered projects)

☐ **Historic flow records**
- Within the last 3 years
- Ideally one full year of flow monitoring data that covers 80% of the total contributing area
- Can be included in project scope if feasible

☐ **Existing pump, flow, and pressure data to identify/verify existing system issues**

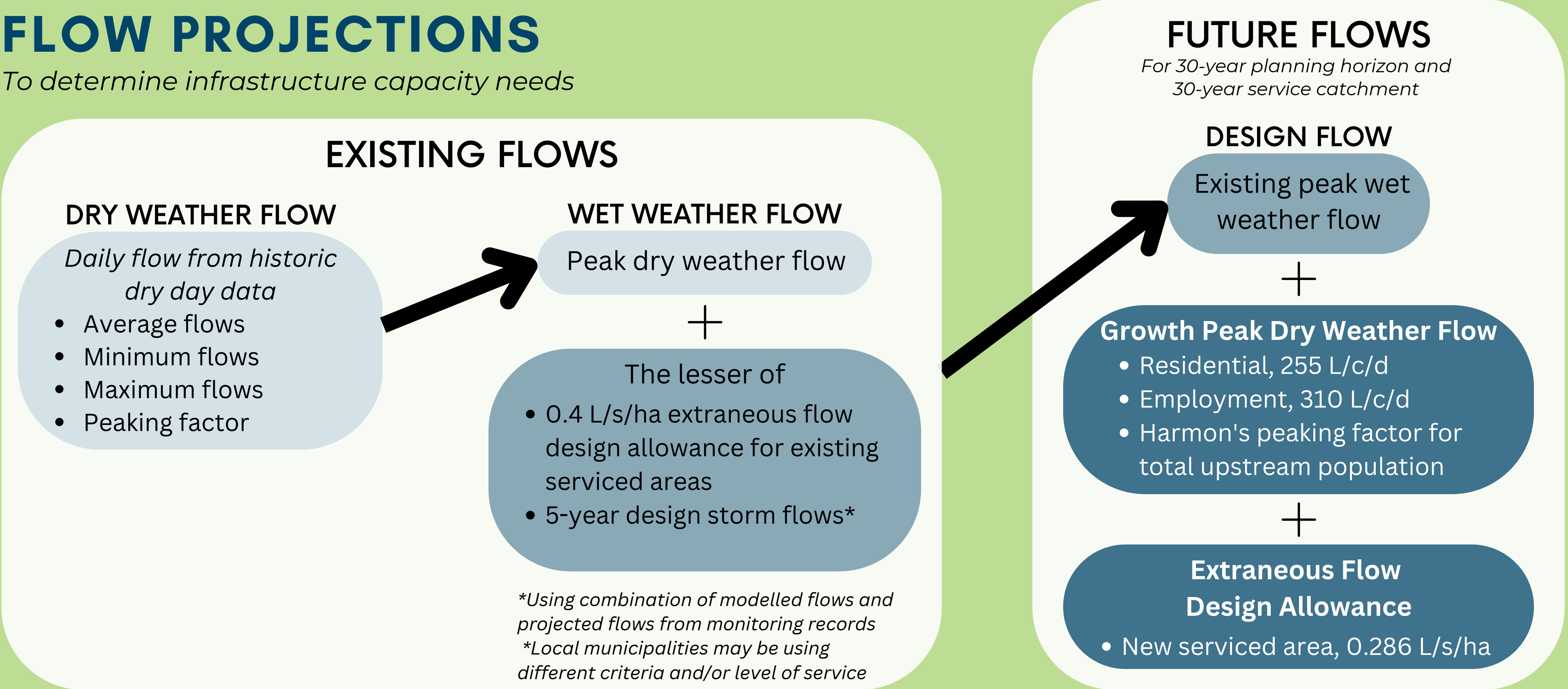
☐ **Asset inventory and condition assessment**
- All asset classes within the infrastructure type (sewer, forcemain, storage, pumping, or treatment facility)
- Within the last 5 years
- Can be part of project scope if the data is not available and would not significantly alter project scope - to assess need for related works (i.e. electrical, HVAC, structural upgrades at an SPS)

☐ **Service area growth potential to confirm projected population and demands**
- Consultation with Region and LAM planning groups within the past year
- Growth information for 30-year horizon and beyond (maximum service catchment)
  - Population, jobs, land use, area
  - Current inventory of development areas with associated development status

IF THE REQUIRED DATA IS NOT AVAILABLE AND IF IT HAS THE POTENTIAL TO SIGNIFICANTLY ALTER SCOPE OF THE DESIGN, IT IS STRONGLY RECOMMENDED THAT THE APPROPRIATE DATA COLLECTION AND FIELD INVESTIGATION BE COMPLETED PRIOR TO PROCEEDING WITH DESIGN. ALTERNATIVELY, WHERE FEASIBLE, DATA COLLECTION SHOULD BE INCLUDED IN THE PROJECT SCOPE AND INTEGRATED INTO THE DESIGN PROCESS.

FLOW PROJECTIONS

To determine infrastructure capacity needs



EXISTING FLOWS

DRY WEATHER FLOW

Daily flow from historic dry day data
- Average flows
- Minimum flows
- Maximum flows
- Peaking factor

WET WEATHER FLOW

Peak dry weather flow

+

The lesser of
- 0.4 L/s/ha extraneous flow design allowance for existing serviced areas
- 5-year design storm flows*

**Using combination of modelled flows and projected flows from monitoring records*
**Local municipalities may be using different criteria and/or level of service*

FUTURE FLOWS

For 30-year planning horizon and 30-year service catchment

DESIGN FLOW

Existing peak wet weather flow

+

Growth Peak Dry Weather Flow
- Residential, 255 L/c/d
- Employment, 310 L/c/d
- Harmon's peaking factor for total upstream population

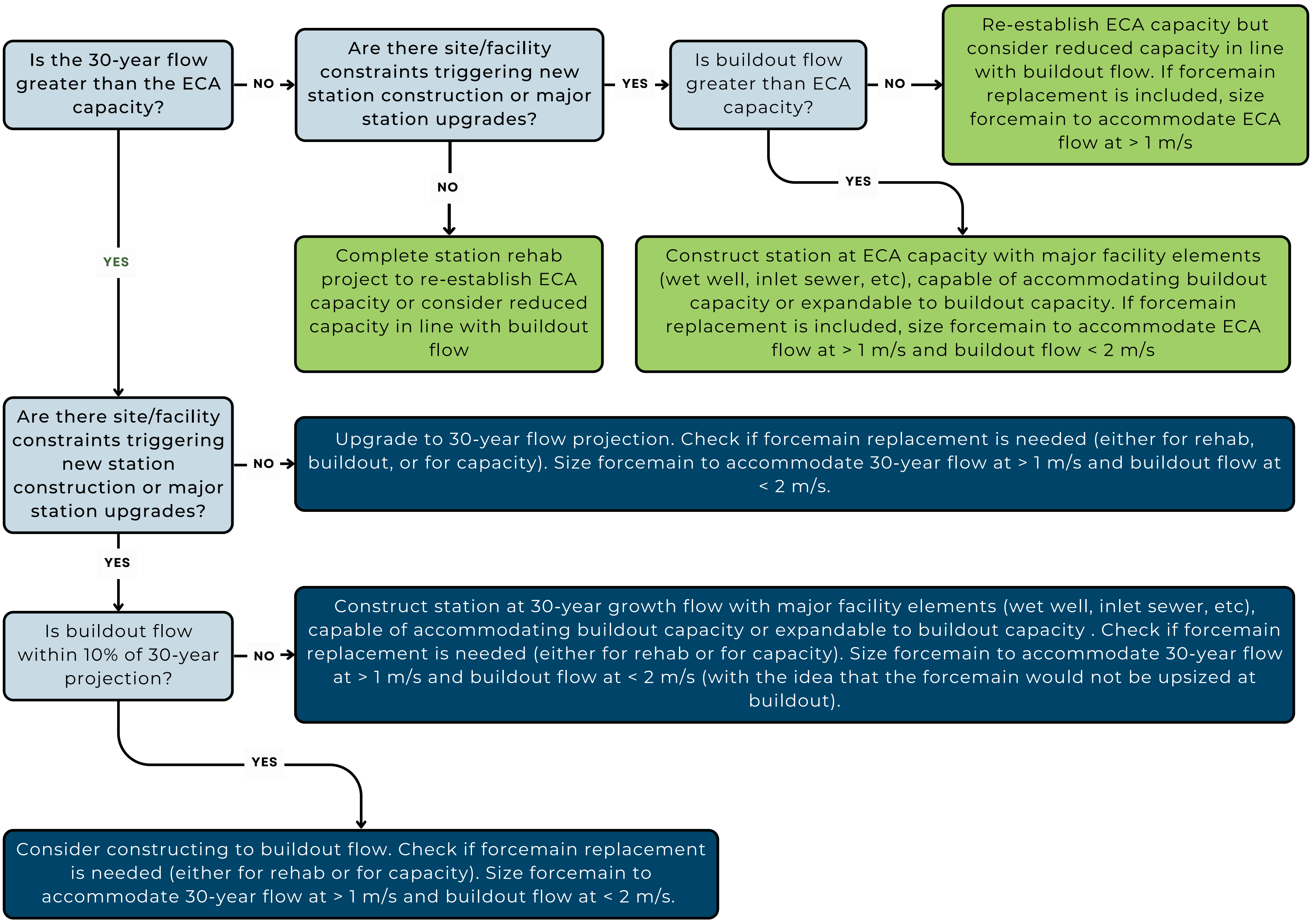
+

Extraneous Flow Design Allowance
- New serviced area, 0.286 L/s/ha

The design criteria presented in this document are based on the 2021 Master Servicing Plan Update Study

BluePlan ENGINEERING

SEWAGE PUMPING STATIONS



Is the 30-year flow greater than the ECA capacity?

NO

Are there site/facility constraints triggering new station construction or major station upgrades?

YES

Is buildout flow greater than ECA capacity?

NO

Re-establish ECA capacity but consider reduced capacity in line with buildout flow. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s

NO

Complete station rehab project to re-establish ECA capacity or consider reduced capacity in line with buildout flow

YES

Construct station at ECA capacity with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s and buildout flow < 2 m/s

YES

Are there site/facility constraints triggering new station construction or major station upgrades?

NO

Upgrade to 30-year flow projection. Check if forcemain replacement is needed (either for rehab, buildout, or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

YES

Is buildout flow within 10% of 30-year projection?

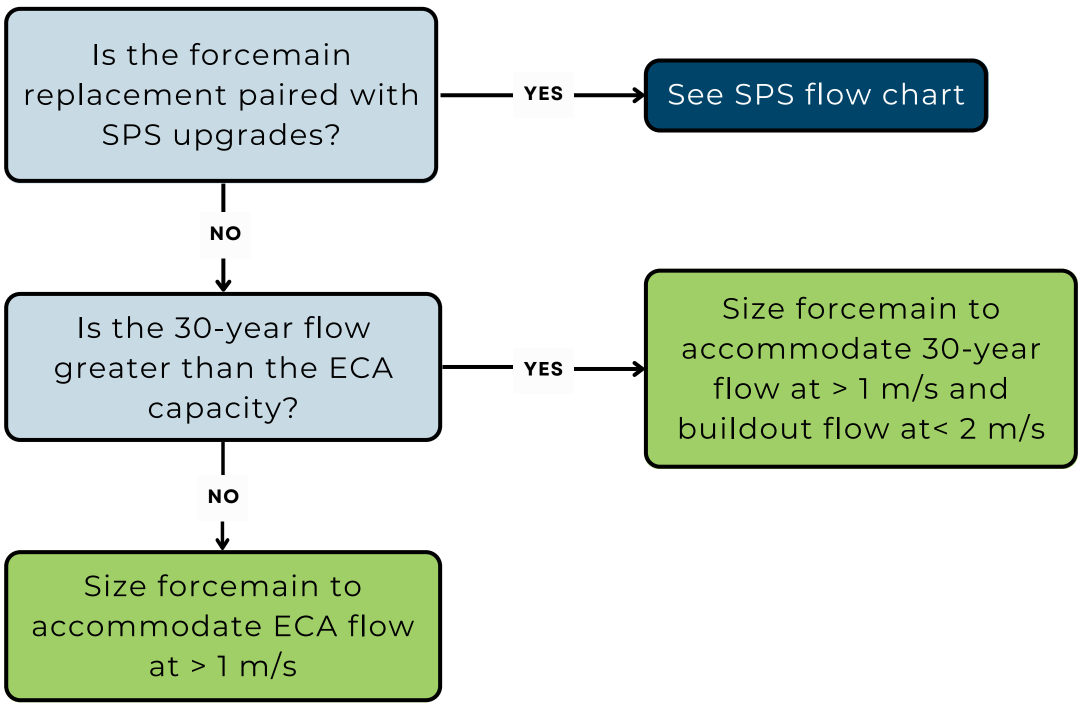
NO

Construct station at 30-year growth flow with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity . Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s (with the idea that the forcemain would not be upsized at buildout).

YES

Consider constructing to buildout flow. Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

FORCEMAINS



Is the forcemain replacement paired with SPS upgrades?

YES

See SPS flow chart

NO

Is the 30-year flow greater than the ECA capacity?

YES

Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at< 2 m/s

NO

Size forcemain to accommodate ECA flow at > 1 m/s

A

Regional Municipality of Niagara

Part A

BAKER ROAD WASTEWATER SYSTEM

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A. BAKER WASTEWATER TREATMENT PLANT

A.1 Existing System Infrastructure

The Baker Road wastewater system services the areas of the Town of Grimsby, Beamsville, Vineland, Jordan and Campden in the Town of Lincoln, and the Smithville area in the Township of West Lincoln. The system services an existing population of 61,345 and 21,050 employees. Note that this population and employment total is based on the Region's 2021 allocation of Traffic Area Zones planning data and has been processed through the allocation methodology presented in **Volume 2** to refine the data to include only serviced populations. As such, the population and employment total may not directly match the system totals using the Region's unprocessed planning data.

The system is serviced by the Baker Road Wastewater Treatment Plant, located on 347 Baker Road, Grimsby. Baker Road Wastewater Treatment Plant is a conventional activated sludge facility with a current rated capacity of 31.3 MLD, a peak dry weather flow capacity of 62.2 MLD and a peak wet weather flow capacity of 120.0 MLD.

System flows are conveyed to the treatment plant via a network of local and Regionally owned sewer, and Regionally owned pump stations and forcemains.

Figure 4.A.1 presents an overview of the wastewater system, and **Figure 4.A.2** shows a schematic of the wastewater system.

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

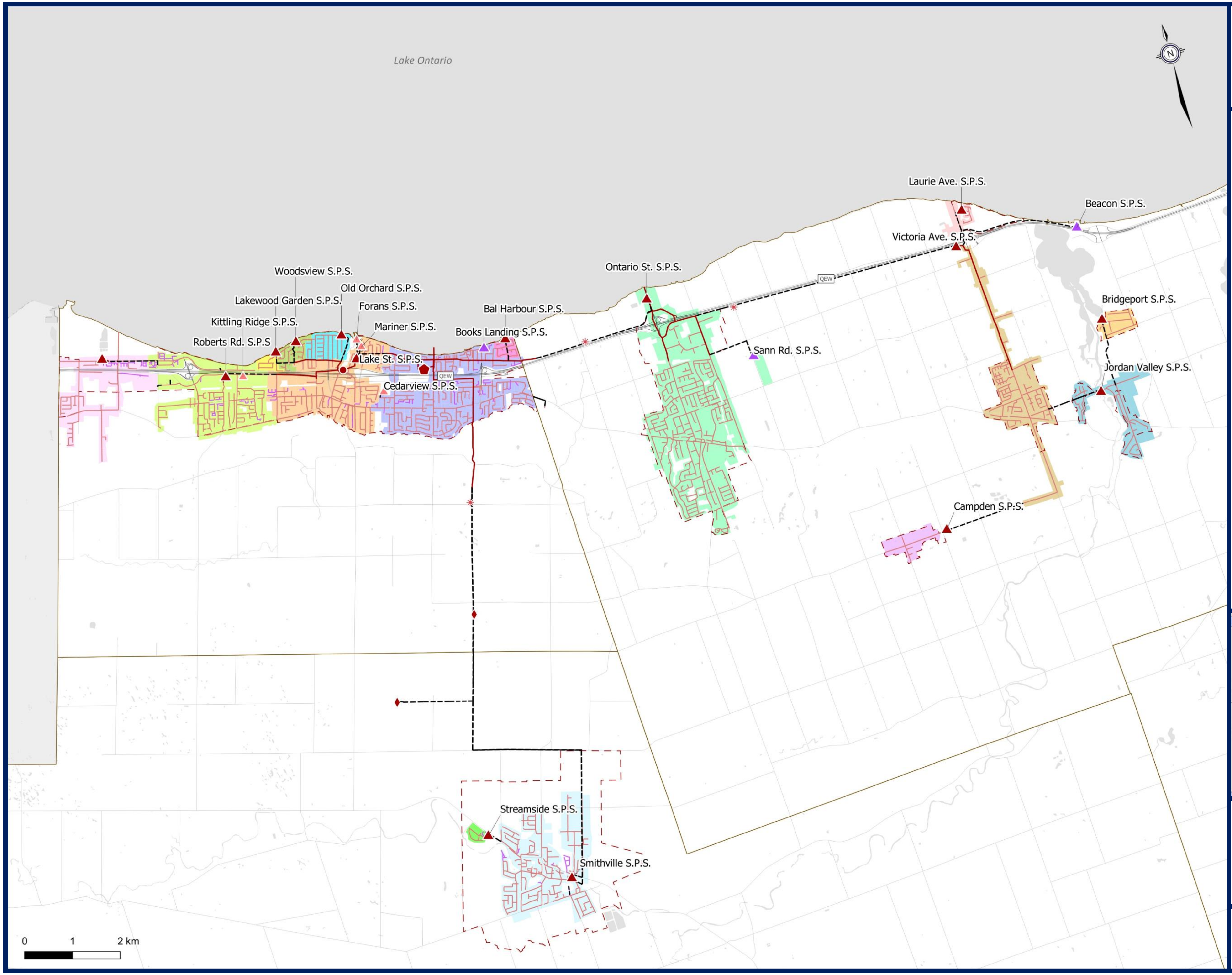


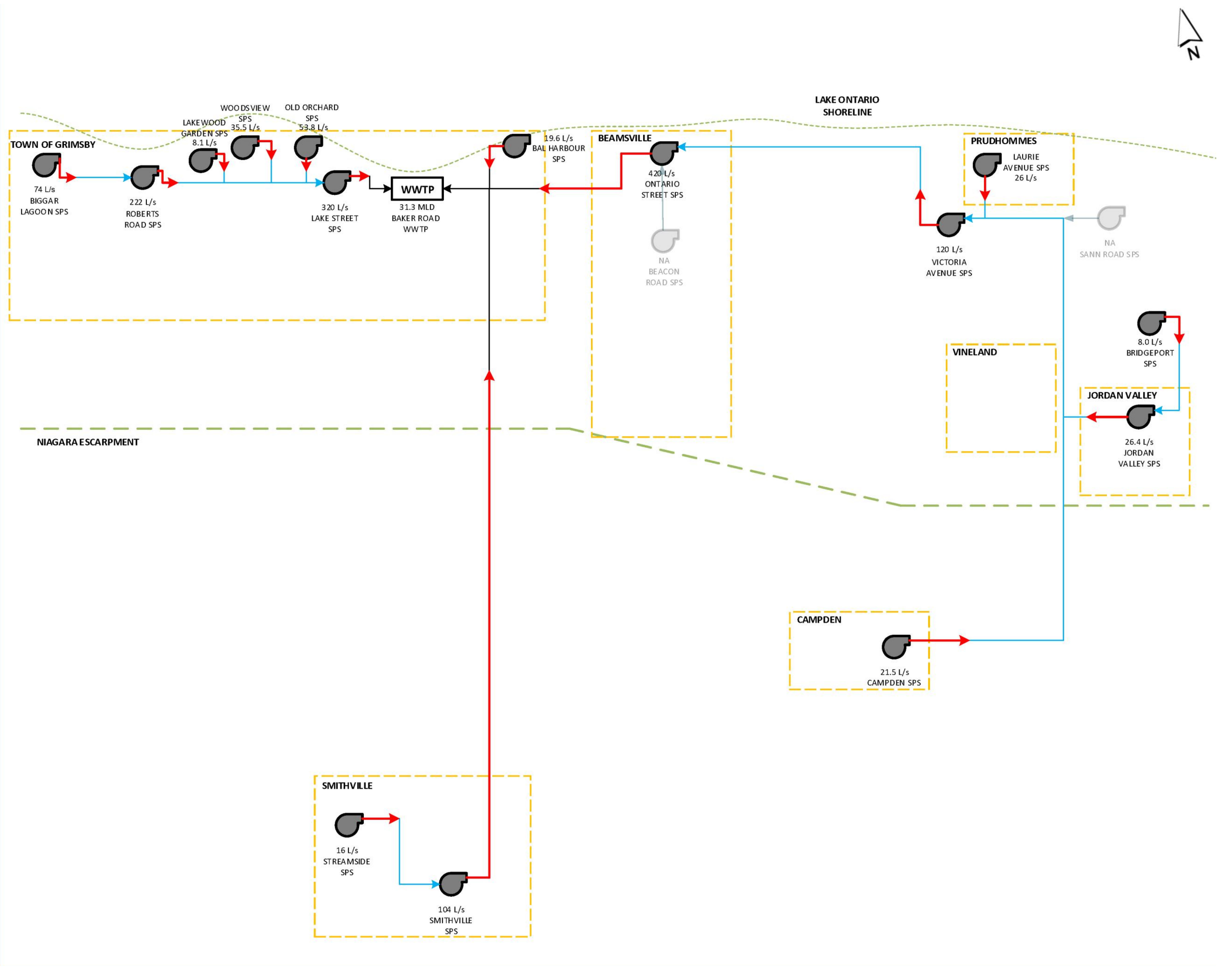
Figure 4.A.1
Baker Road WWTP System
Existing Wastewater Infrastructure

BluePlan ENGINEERING

March 2023
620126-WW-001
WKID: 26917

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



WWTP RATED CAPACITY	Wastewater Treatment Plant
FIRM CAPACITY	Sewage Pumping Station
🟥 →	Forcemain
🟦 →	Connection from SPS to SPS
⬛ →	Connection from SPS to WWTP

Figure 4.A.2
Baker Road WWTP

Existing Wastewater Infrastructure Schematic

GM BluePlan ENGINEERING

December 2022
621016-W-000
WKID: 26917

A.1.1 Facility Overview

Table 4.A.1 to **Table 4.A.2** present a summary of the environmental compliance approval (ECA) for the Baker Road wastewater treatment plant (WWTP) usage, operation, and effluent concentration objectives.

Table 4.A.1 Wastewater Treatment Plant Overview

Plant Name	Baker Wastewater Treatment Plant
ECA #	5755-AEFJVC Issued March 30, 2017
Address	347 Baker Road, Grimsby
Discharge Water	Lake Ontario
Rated Capacity: Average Daily Flow	31.3 MLD
Rated Capacity: Peak Flow Rate (Dry Weather)	62.6 MLD
Rated Capacity: Peak Flow Rate (Wet Weather)	120 MLD
Key Processes	• Conventional activated sludge treatment with screening • Grit removal • Effluent disinfection • UV treatment of secondary effluent • Chlorination of secondary bypass flow

Table 4.A.2 Wastewater Treatment Plant Effluent Objectives

Effluent Parameter	Objective Concentration[1]
$CBOD_5$	15.0 mg/L
TSS	15.0 mg/L
Total Phosphorus	0.4 mg/L
Total Ammonia Nitrogen	
January-April	8 mg/L
May – June	5 mg/L
July - October	3 mg/L
November - December	5 mg/L
E. Coli	100 organisms/100 mL
Total Chlorine Residual	0.01 mg/L

---

[1] *Ministry of Environment and Climate Change, 8 April 2015. Amended Environmental Compliance Approval. Number 3704-9UALK5*

Table 4.A.3 lists each sewage pumping station's (SPS) ECA firm capacity as well as the station's existing operational firm capacity (the current operating capacity of the pumps station based on performance testing and/or supervisory control and data acquisition (SCADA) trending). As identified in **Volume 4**, the operational firm capacity was used as the basis of assessment for the 2021 MSPU. In some cases where the operational firm capacity was larger than the ECA firm capacity; the registered ECA capacity was used.

Table 4.A.3 Pumping Station and Forcemain Overview

Station Name	Location	Catchment Details		Pump Station Details			Forcemain Details		
		Area Exclusive of Upstream Catchments (ha)	Area Inclusive of Upstream Catchments (ha)	Number of Pumps	ECA Firm Capacity (L/s)	Operational Firm Capacity (L/s)	Single or Twinned Forcemain	Forcemain Diameter (mm)	Length (m)
└→**Lake Street SPS**	418 Robinson Road, Grimsby	298.0	880.0	4	365.0	320.0	Single	445	785
└→**Roberts Road SPS**	323 South Service Road, Grimsby	293.1	487.3	3	295.0	222.0	Single	450	1,150
└→**Biggar Lagoon SPS**	Part of 21, Broken Front Concession, Grimsby	194.2	194.2	2	95.0	74.0	Single	300	1,253
└→**Old Orchard SPS**	Old Orchard Avenue, Grimsby	48.6	48.6	2	55.0	53.8	Single	200	663
└→**Woodsview SPS**	Lakeside Drive, Grimsby	31.5	31.5	3	37.5	35.5	Single	200	472
└→**Lakewood Garden SPS**	Block 72, Grimsby	14.6	14.6	2	14.5	8.1	Single	150	590
└→**Smithville SPS**	214 St. Catharine Street, Smithville	355.0	367.7	2	120.0	104.0	Single	400	10,788
└→**Streamside SPS**	Streamside Subdivision, Smithville	12.7	12.7	2	23.6	16.0	Single	150	325
└→**Ontario Street SPS**	4880 Ontario Street North, Lincoln	646.3	1115.1	3	420.0	420.0	Single	534	2,965
└→**Victoria Ave SPS**	3450 South Service Road, Lincoln	234.2	468.8	3	120.0	120.0	Single	450	5,600
└→**Campden SPS**	3985 Fly Road, Campden	46.2	46.2	2	21.5[1]	21.5	Single	150	1,700
└→**Jordan Valley SPS**	21st Street, Lincoln	125.0	160.3	2	40.0	26.4	Single	200	1,225
└→**Bridgeport SPS**	4168 Bridgeport Drive, Lincoln	35.3	35.3	2	11.5	8.0	Single	147	1,440
└→**Laurie Ave SPS**	Laurie Avenue, Lincoln	28.1	28.1	2	28.0	26.0	Single	150/250[2]	848
└→**Bal Harbour SPS**	Lot 2, Broken Front Concession, Grimsby	18.8	18.8	2	19.6	19.6	Single	147	440

[1] Campden SPS upgrade to 22.5 L/s was completed in 2022, within the duration of the Master Plan Update Project. The SPS capacity was updated to reflect the upgraded capacity; however, the Campden SPS upgrade remained in the final capital program recommendations.

[2] The Laurie Ave SPS forcemain is comprised of two sizes: 150 mm from the station to the Queen Elizabeth Way highway crossing and 250 mm from the crossing to the outlet to the Victoria Ave SPS catchment.

A.2 Basis for Analysis

A.2.1 Flow Criteria, System Performance, and Sizing Methodology

The Niagara Region Traffic Area Zone planning data was used to estimate growth related flow generation within the wastewater system and to spatially allocate growth flows within each individual system**. Table 4.A.4** presents a summary of the flow criteria, performance, and sizing methodology that was utilized. Refer to **Volume 4 - Introduction** for additional information.

The Region's per capita wastewater flows criteria were updated based on a historic review of the previous 3-year period for local billing meter and flow monitoring records. Given that more granular data was available to complete this analysis compared to previous master plan updates, the population and employment per capita rates were differentiated. The data showed a slight reduction in the population criteria and slight increase in the employment criteria, which more closely reflect existing flow generation trends compared to the Region's previous per capita rate. Further detail regarding the per capita flow generation is presented in **Volume 4 – Introduction.**

The Region's extraneous flow allowance criteria was also reviewed against historic flow monitoring and pump station performance records where available. The review of historic wet weather flows found that typically 2-year design storm peak flows within existing built systems exceeded the Region's existing extraneous flow design allowance of 0.286 L/s/ha; however, that a 2-year design storm peak flow below 0.286 L/s/ha was achievable as demonstrated in multiple catchment areas. Based on the analysis and an industry review, for the purpose of future planning, the extraneous flow design allowance for existing areas was increased to 0.4 L/s/ha but was maintained at 0.286 L/s/ha for new greenfield development areas to better reflect the existing high wet weather flows, while minimizing the magnitude of system upgrades with wet weather flow management as a critical priority. In areas where available historic flow monitoring and modelling results identify existing peak 5 year design flows below the 0.4 L/s/ha criteria, the lower 5 year design flows should be utilized. Further details regarding the extraneous flow design allowance are presented in **Volume 4 – Introduction.**

Table 4.A.4 Flow Criteria, Scenarios, System Performance, and Sizing Methodology

	Component	Criteria	
Flow Criteria	Existing System Flows	Starting Point Methodology • Based on local billing meter records and flow monitoring data to establish existing dry and wet weather flows • Growth flows are added to the existing system baseline using design criteria	
	Flow Generation	Residential	255 L/c/d
		Employment	310 L/e/d

	Component	Criteria	
	Peaking Factor	Peak Dry Weather Flow	Harmon’s Peaking Factor
	Extraneous Flow Design Allowance	• 0.4 L/s/ha for existing areas • 0.286 L/s/ha for new developments	
WWTP	System Performance and Triggers	• MECP Procedure F-5-1 • Trigger upgrade study at 80% capacity • Trigger upgrade construction at 90% capacity	
	Upgrade Sizing	• Average daily flow plus growth based on population design flows	
Pump Station	System Performance and Triggers Sizing	• Refer to **Section B.2.1.1.** • Two flow scenarios considered • **Design Allowance**: Peak wet weather flow using the peaked dry weather flow plus the extraneous flow design allowance • **5-Year Storm**: Modelled peak wet weather flow using the 5-year design storm • Peak flow capacity to meet design peak wet weather flow using the extraneous flow design allowance • Wet well and system storage considerations under 5-year storm to minimize basement flooding and overflow risks	
Forcemain	System Performance and Triggers	• Flag velocities less than 0.6 m/s • Flag velocities greater than 2 m/s • Upgrade when velocities exceed 2.5 m/s and considering condition and age	
	Upgrade Sizing	• Design velocity target between 1 m/s and 2 m/s • Forcemain twinning to increase capacity where feasible	
Trunk	System Performance and Triggers	• Design allowance peak wet weather flows, using the extraneous flow design allowance, to be managed within pipe • Freeboard (depth between hydraulic grade line and surface) greater than 1.8 m below surface in 5-year design storm • Flag pipes velocities less than 0.6 m/s • Flag pipes velocities greater than 3.0 m/s	
	Upgrade Sizing	• Sized for full flow under post-2051 design peak wet weather flow • Assess 5-year design storm performance to minimize basement flooding risks and overflows	

A.2.1.1 SPS Performance Evaluation and Upgrade Framework

Although it is the Region's design philosophy to size SPS inline with the Region's extraneous flow design allowance, the 2021 MSPU undertook a hybrid evaluation approach to acknowledge that SPS are a major contributor to local wastewater system performance and that many legacy system's existing wet weather flows exceed the extraneous flow design allowance. The SPS hybrid performance evaluation and upgrade framework are summarized in **Table 4.A.5** and strives to balance the magnitude of capacity upgrades, potential cascading downstream upgrades, and managing the potential risk of local sewer surcharging and system overflows.

Under the hybrid performance evaluation and upgrade framework, the SPS capacity was sized to meet the lesser of peak wet weather flow (PWWF) using the extraneous flow design allowance, referred to as "Design Allowance PWWF" or the estimated 5-year storm PWWF. Further, consideration for the SPS actual performance under the estimated 5-year design storm peak wet weather flow was evaluated to determine if the available system storage including the wet well, storage tanks, and in system capacity was sufficient to manage excess flows while maintaining the system hydraulic grade line (HGL) below the basement flooding level of 1.8 m below grade and/or below the local overflow level.

In instances where the 5-year storm PWWF flow exceeded the available system storage, additional system solutions such as wet weather management, system storage, and/or additional SPS capacity upgrades were incorporated into the servicing solution. The most efficient solution to manage capacity and flow reduction was determined through the assessment of calculated flows from the 2051 design allowance PWWF and modelled 5-year storm PWWF against the operational firm capacity of the station and system storage.

Each SPS with a preferred solution of a capacity upgrade was individually reviewed in detail to determine how capacity upgrades should best be achieved:

- Pump replacement
- Pump upgrades
- Pump additions
- Station replacement
- Existing wet well sizing changes
- FM sizing and capacity.

Due to data quality and availability, a prioritization of upgrade needs, and flow monitoring (data collection) was assigned to each case for the Region implementation plan, discussed later in **Section A.8.**

Table 4.A.5 SPS Assessment Framework

Case	2051 Design PWWF	2051 5 Year Storm PWWF	2051 5-Year Storm Storage Need	Preferred Solution	Upgrade Priority	Flow Monitoring Priority
Case 1	> Firm Capacity	> Firm Capacity	> Available Storage	Upgrade pumps to future design allowance flow with potential storage upgrades or wet weather management	High	Medium
Case 2	< Firm Capacity	> Firm Capacity	> Available Storage	Upgrade storage and/or wet weather management	High	High
Case 3	> Firm Capacity	> Firm Capacity	< Available Storage	Potential upgrade to design allowance flow and/or wet weather management	Medium	High
Case 4	< Firm Capacity	> Firm Capacity	< Available Storage	Potential wet weather management	Low	Medium
Case 5	> Firm Capacity	< Firm Capacity	< Available Storage	No upgrade, use actual peak flows	N/A	Low
Case 6	< Firm Capacity	< Firm Capacity	< Available Storage	No upgrade	N/A	Low

A.2.2 Growth Population Projections and Allocations

Table 4.A.6 outlines the existing and projected serviced population and employment by catchment.

Table 4.A.6 Baker Wastewater Treatment Plant Existing and Projected Serviced Population by Catchment

Sewage Pumping Station (SPS)	Existing Population & Employment			2051 Population & Employment			Post 2051 Population & Employment			2021-2051 Growth		
	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population Growth	Employment Growth	Total Growth
Baker Road WWTP	10,917	2,596	13,513	11,703	3,496	15,199	12,946	3,622	16,568	786	900	1,686
└→Lake Street SPS	6,401	3,408	9,809	7,654	4,570	12,224	8,928	5,362	14,290	1,253	1,162	2,415
| └→Roberts Road SPS	6,240	2,297	8,536	9,335	3,880	13,215	12,954	6,616	19,570	3,095	1,583	4,679
| └→Biggar Lagoon SPS	3,247	1,338	4,586	5,691	2,257	7,947	11,319	3,387	14,706	2,443	919	3,362
| └→Old Orchard SPS	1,305	141	1,445	1,296	174	1,470	1,311	181	1,492	-9	33	25
| └→Woodsview SPS	772	83	855	772	103	875	772	107	879	0	20	20
└→Lakewood Garden SPS	357	38	395	357	48	405	357	50	407	0	9	9
└→Smithville SPS	7,809	2,338	10,146	27,889	7,908	35,797	32,080	9,215	41,295	20,081	5,570	25,651
| └→Streamside SPS	577	62	639	2,390	183	2,573	2,505	194	2,699	1,813	121	1,934
└→Ontario Street SPS	13,831	4,691	18,522	21,113	7,255	28,368	23,074	8,884	31,957	7,282	2,564	9,846
| └→Victoria Ave SPS	5,074	1,555	6,629	7,572	2,283	9,855	7,844	2,358	10,202	2,498	728	3,226
| └→Campden SPS	1,022	776	1,798	1,310	975	2,285	1,437	1,002	2,439	288	199	487
| └→Jordan Valley SPS	2,059	763	2,822	2,650	772	3,422	2,718	786	3,504	591	9	600
| | └→Bridgeport SPS	850	416	1,265	1,174	419	1,593	1,175	420	1,595	324	4	328
| └→Laurie Ave SPS	423	504	927	7,131	853	7,984	11,715	2,952	14,667	6,708	349	7,057
└→Bal Harbour SPS	462	44	507	462	48	510	462	50	512	0	4	4
TOTAL	**61,345**	**21,050**	**82,396**	**108,499**	**35,223**	**143,723**	**131,596**	**45,187**	**176,783**	**47,154**	**14,173**	**61,327**

Note: Population numbers may not sum due to rounding.

A.3 System Performance

A.3.1 Wastewater Treatment Plant

The starting point flow for the Baker Road WWTP was calculated using historic SCADA flow data. Ten years of data (2011 to 2020) was reviewed to provide historical context and assess overall long-term trends; however, the most recent five years of data was used to determine the average daily flow. **Table 4.A.7** shows the historical system flows obtained from wastewater treatment plant production data.

Table 4.A.7 Historic Baker Wastewater Treatment Plant Flows

Year	Average Daily Flow		Peak Daily Flow	
	(MLD)	(L/s)	(MLD)	(L/s)
2011	23.9	276.5	66.8	773.1
2012	18.8	217.8	56.9	658.7
2013	21.3	246.2	65.9	763.2
2014	20.5	237.1	58.1	672.0
2015	18.0	207.9	52.3	605.8
5 Year Average	20.5	237.1	60.0	694.6
5 Year Peak	23.9	276.5	66.8	773.1
2016	17.0	197.2	55.3	640.2
2017	20.9	241.9	63.6	735.7
2018	20.0	231.2	66.8	772.8
2019	20.9	242.0	61.7	713.8
2020	18.0	207.8	59.5	688.6
5-Year Average	**19.4**	**224.0**	**61.4**	**710.2**
5-Year Peak	**20.9**	**242.0**	**66.8**	**772.8**
10-Year Average	**19.9**	**230.6**	**60.7**	**702.4**
10-Year Peak	**23.9**	**276.5**	**66.8**	**773.1**

The 10-year trend analysis showed that flows to the Baker Road WWTP continue to reflect high flows in wetter years. The 5-year average flow has decreased 5% from the 2016 MSP starting point.

The starting point flow used for the Baker Road WWTP was 19.4 MLD.

Figure 4.A.3 shows the projected future flows at the Baker Road Wastewater Treatment Plant. The plant is approaching capacity, reaching the 80% planning trigger by 2031, and will require an upgrade within the 2051-time horizon.

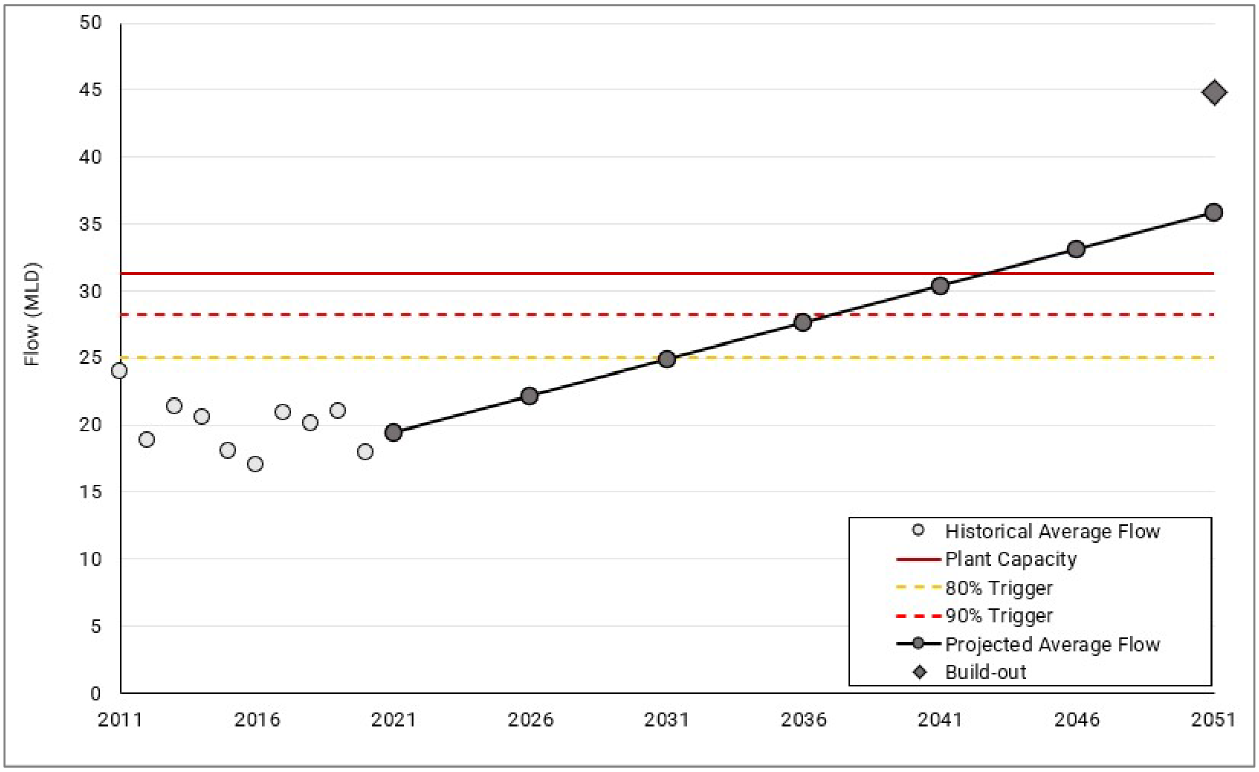


Figure 4.A.3 Projected Sewage Generation at Baker Wastewater Treatment Plant

A.3.2 Sewage Pumping Station

Table 4.A.8 highlights the sewage pumping station operational firm capacities and the existing and projected flows. The existing average and peak dry weather flows were estimated using the wastewater system model, which was updated using the best available billing, flow monitoring, and SCADA data from 2018 to 2020.

Table 4.A.8 System Sewage Pumping Station Performance

Sewage Pumping System	Station Capacity	2021 Flows				2051 Flows			Post-2051 Flows		
	Operational Firm Capacity	Average Dry Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow
	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)
└→Lake Street SPS	**320.0**	69.7	117.8	469.8	431.7	215.8	575.6	537.5	324.5	697.1	659.0
└→Roberts Road SPS	**222.0**	35.8	50.1	245.0	124.0	127.3	329.6	208.5	224.8	439.9	318.9
| └→Biggar Lagoon SPS	**74.0**	16.5	19.4	97.1	146.9	55.2	140.2	189.9	111.4	207.5	257.3
| └→Old Orchard SPS	**53.8**	4.3	5.0	24.5	65.6	5.5	24.9	66.0	5.8	25.2	66.3
| └→Woodsview SPS	**35.5**	1.9	2.4	15.0	129.8	2.7	15.3	130.1	2.7	15.3	130.2
└→Lakewood Garden SPS	**8.1**	1.1	1.8	7.6	9.3	1.9	7.7	9.4	1.9	7.8	9.4
└→Smithville SPS	**104.0**	32.2	83.7	230.7	322.9	297.4	668.8	760.9	333.1	704.5	796.6
| └→Streamside SPS	**16.0**	1.6	1.9	6.9	20.5	22.7	35.1	48.7	23.9	36.4	49.9
└→Ontario Street SPS	**420.0**	117.5	153.6	599.6	515.6	326.6	787.9	703.9	399.3	862.7	778.7
| └→Victoria Ave SPS	**120.0**	36.3	64.0	251.5	253.5	166.0	358.8	360.9	219.7	414.6	416.7
| └→Campden SPS*	**21.5**	1.8	2.7	21.2	22.6	9.0	27.5	28.8	10.7	29.2	30.6
| └→Jordan Valley SPS	**26.4**	9.0	12.0	76.1	44.0	22.4	86.6	54.5	23.4	87.5	55.4
| | └→Bridgeport SPS	**8.0**	4.4	4.8	19.0	10.0	8.8	22.9	13.9	8.8	22.9	14.0
| └→Laurie Ave SPS	**26.0**	2.4	4.9	16.1	34.5	70.2	86.7	105.1	123.5	142.1	160.5
└→Bal Harbour SPS	**19.6**	1.2	1.8	9.3	4.3	1.8	9.3	4.3	1.9	9.4	4.4

*Campden SPS upgrade to 22.5 L/s was completed in 2022; within the duration of the Master Plan Project. The SPS capacity was updated to reflect the upgraded capacity; however, the Campden SPS upgrade remained in the final capital program recommendations.

The following SPS have existing and future deficiencies under both design allowance PWWF and 5-year storm, requiring upgrades to support existing and future flows.

- Lake Street SPS
- Biggar Lagoon SPS
- Smithville SPS
- Ontario Street SPS
- Victoria Ave SPS
- Jordan Valley SPS
- Bridgeport SPS

The following SPS have future deficiencies under design allowance PWWF and 5-year storm, requiring upgrades to support future flows.

- Streamside SPS
- Laurie Ave SPS
- Campden SPS

The following SPS have sufficient capacity to support 2051 flows using the design allowance PWWF, however, the projected 5-year storm PWWF exceeds the operational firm capacity as such potential system or facility upgrades may be required.

- Old Orchard SPS
- Woodsview SPS
- Lakewood Garden SPS

The following SPS have existing and future deficiencies under the design allowance PWWF; however, the existing and projected 5-year storm PWWF is within the station's capacity, as such, the stations capacity is sufficient to support future flows.

- Roberts Road SPS

The following stations have surplus capacity to support future flows.

- Bal Harbour SPS

A.3.3 Forcemain

Table 4.A.9 highlights the existing and projected forcemain performance. Velocities less than 0.6 m/s were flagged in yellow and velocities exceeding 2.5 m/s were flagged in red. Note, if a pumping deficit was identified in **Table 4.A.8**, then projected forcemain velocities were based on the higher of the station's ECA firm capacity or the governing peak wet weather flow scenario, otherwise if no pumping deficit was identified, the operational firm capacity was used for future capacity assessment.

Table 4.A.9 Forcemain Performance

Station Name	Forcemain Diameter (mm)	Operational Firm Capacity		2051		Post-2051	
		Pumped Flow (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)
└→Lake Street SPS	**445**	320.0	2.1	537.5[3]	3.5	659[3]	4.2
| └→Roberts Road SPS	**450**	222.0	1.4	222[1]	1.4	222[1]	1.4
| └→Biggar Lagoon SPS	**300**	74.0	1.0	140.2[3]	2.0	207.5[3]	2.9
| └→Old Orchard SPS	**200**	53.8	1.7	53.8[1]	1.7	53.8[1]	1.7
| └→Woodsview SPS	**200**	35.5	1.1	35.5[1]	1.1	35.5[1]	1.1
└→Lakewood Garden SPS	**150**	8.1	0.5	8.1[1]	0.5	8.1[1]	0.5
└→Smithville SPS	**400**	104.0	0.8	668.8[3]	5.3	704.5[3]	5.6
| └→Streamside SPS	**150**	16.0	0.9	35.1[3]	2.0	36.4[3]	2.1
└→Ontario Street SPS	**534**	420.0	1.9	703.9[3]	3.1	778.7[3]	3.5
└→Victoria Ave SPS	**450**	120.0	0.8	358.8[3]	2.3	414.6[3]	2.6
| └→Campden SPS	**150**	21.5	1.2	27.5[3]	1.6	29.2[3]	1.7
| └→Jordan Valley SPS	**200**	26.4	0.8	54.5[3]	2.8	55.4[3]	4.5
| | └→Bridgeport SPS	**147**	8.0	0.5	13.9[3]	0.8	14[3]	0.8
| └→Laurie Ave SPS	**150**	26.0	0.8	86.7[3]	4.9	142.1[3]	8.0
└→Bal Harbour SPS	**147**	19.6	1.2	19.6[1]	1.2	19.6[1]	1.2

[1] Operational firm capacity

[2] ECA capacity

[3] Minimum of future design allowance PWWF or 5-year storm PWWF

The existing Lakewood Garden SPS and Bridgeport SPS forcemains were flagged for low velocities in the existing operating regime. Growth flows are anticipated to improve the velocity in the future.

The following forcemains had a projected forcemain capacity deficit in the 2051 growth scenario:

- Lake St SPS
- Smithville SPS
- Jordan Valley SPS
- Ontario Street SPS
- Laurie Ave SPS

The following stations' forcemain have sufficient capacity to meet future flows:

- Roberts Road SPS
- Biggar Lagoon SPS
- Lakewood Garden SPS
- Old Orchard SPS
- Woodsview SPS
- Bal Harbour SPS
- Victoria Ave SPS
- Bridgeport
- Campden SPS

A.3.4 Trunk Sewer

Figure 4.A.4 and **Figure 4.A.5** highlight the trunk performance in the existing and 2051 projected design allowance peak wet weather flow scenarios, respectively.

- There are Region trunk sewers with existing and future capacity deficits under the design allowance peak wet weather flows.
    - Beamsville trunk sewer from north of Greenlane to the Ontario Street SPS
    - Lister Road trunk sewers from the Victoria Ave SPS forcemain to the Ontario Street SPS
    - Trunk sewer downstream of the Smithville forcemain to the Baker Road WWTP
- Smithville SPS shows surcharging in the Region inlet and local sewers from the future design allowance peak wet weather flows and the 5-year storm. This is the result of limited capacity at the Smithville SPS, not sewer capacity.
- Note that the Baker Road WWTP system has several combined sewer overflows (CSO), that help regulate the hydraulic grade line (HGL) within the trunk system to reduce basement flooding risks.
- Local surcharging above the basement flooding freeboard was identified in the Baker Road WWTP Pollution Prevention and Control Plan (PPCP) based on each local area municipalities' (LAM) identified level of service. The PPCP identified sewers which required upgrades for local sewers; those projects were not carried forward into the MSP as they will be funded and implemented by the LAMs.

A.3.5 Overflows

Under the design allowance peak flows no overflows are anticipated; however, many of the CSOs become active from 5-year storm peak wet weather flows. The adverse risks of wet weather inflows are currently partially managed through CSOs; however, the Region and LAMs are working together to reduce wet weather inflows to the system in order to reduce system overflows.

Detailed assessment of system CSO are addressed in the Baker Road PPCP; which outlines the proposed wet weather flow management approach to manage CSO volumes.

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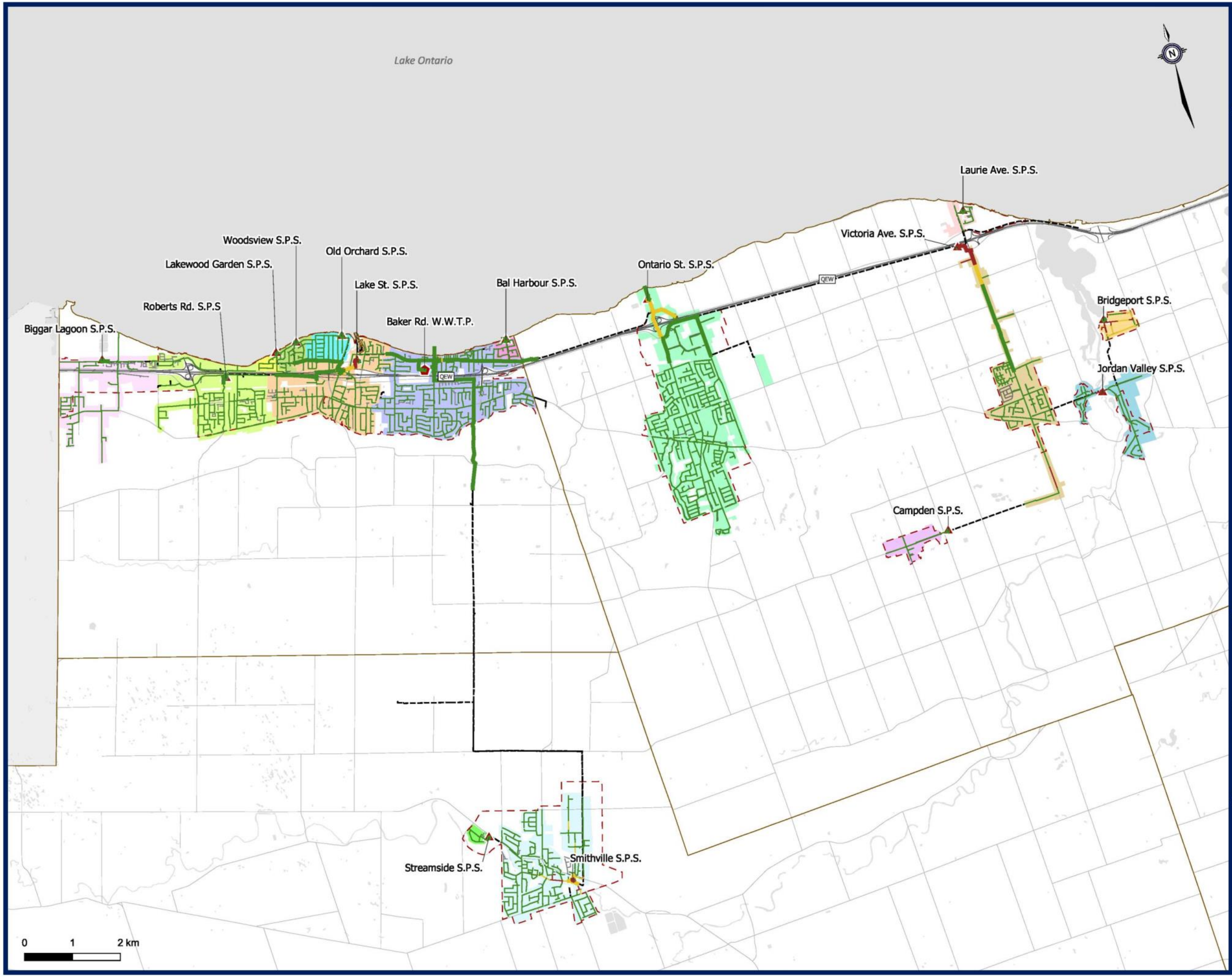

Figure 4.A.4
Existing Design Peak Wet Weather Flows
Baker Road WWTP

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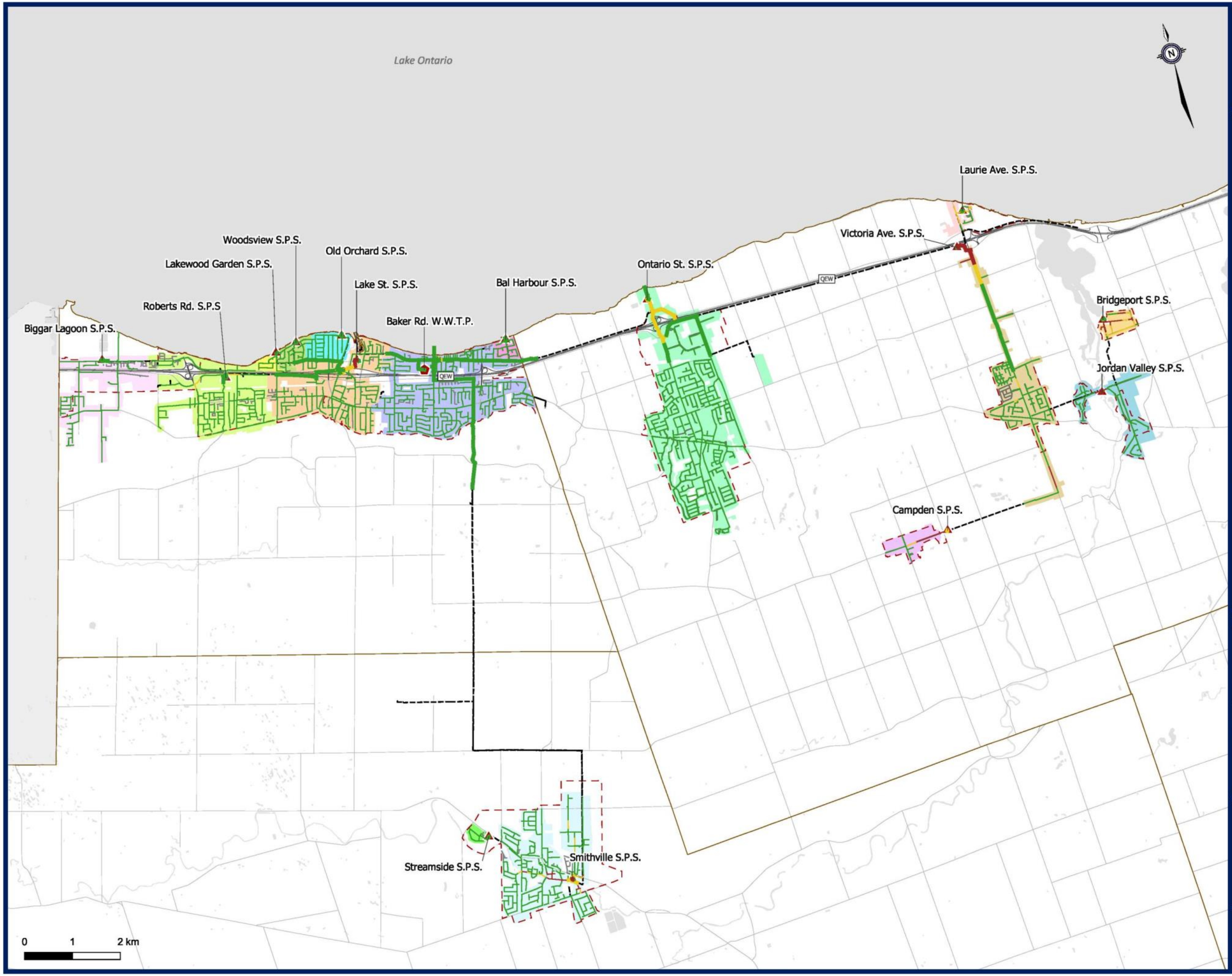

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Existing Wastewater Infrastructure

- ● Combined Sewage Detention Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Local)

Wastewater Network

- ---- Force Mains
- — Regional Mains
- — Local Sewers
- — Private Sewers

Wastewater Catchments

🟦 Baker Road WWTP	🟥 Laurie Avenue
🟪 Bal Harbour	🟦 Old Orchard
🟪 Biggar Lagoon	🟩 Ontario Street
🟧 Bridgeport	🟩 Roberts Road
🟪 Campden	🟦 Smithville
🟦 Jordan Valley	🟩 Streamside
🟧 Lake Street	🟫 Victoria Avenue
🟨 Lakewood Gardens	🟩 Woodsview

Other Features

- ☐ Municipal Boundary
- ▭ Urban Area Boundaries
- ⬜ Waterbodies

System Performance

- — Surplus Capacity
- — Surcharging Sewer
- — Surcharging Sewer with Basement Flooding Risk

Figure 4.A.5

2051 Design

Peak Wet Weather Flows

Baker Road WWTP

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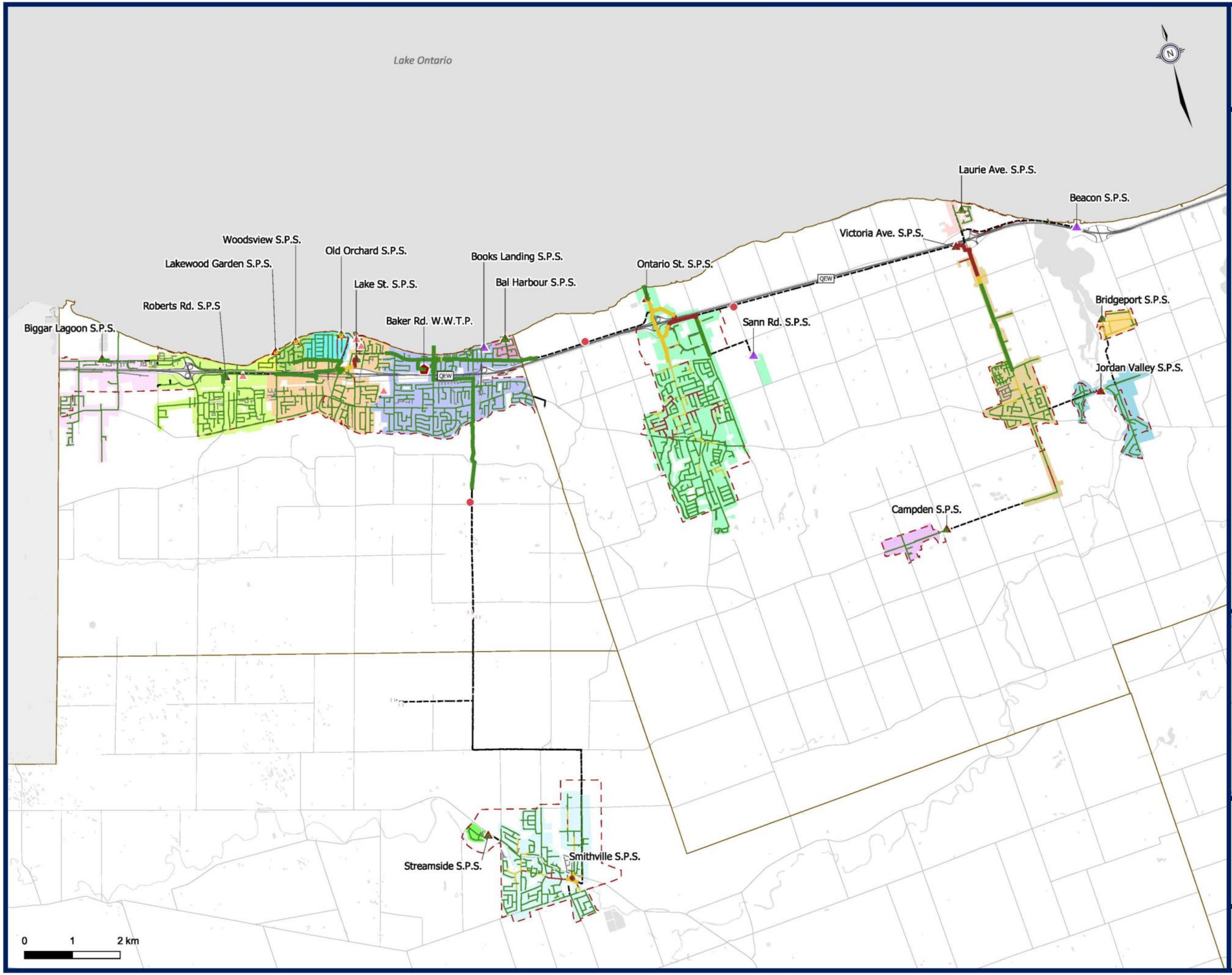

Existing Wastewater Infrastructure

- ■ Biosolids Storage Facility
- ● Combined Sewage Detention Facility
- Leachate Pumping Station
- ● Odour Control Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant

Wastewater Network

- Force Main
- Local
- Regional
- Private

Wastewater Catchments

🟦 Baker Road WWTP	🟥 Laurie Avenue
🟪 Bal Harbour	🟦 Old Orchard
🟪 Biggar Lagoon	🟩 Ontario Street
🟧 Bridgeport	🟩 Roberts Road
🟪 Campden	🟦 Smithville
🟦 Jordan Valley	🟩 Streamside
🟧 Lake Street	🟫 Victoria Avenue
🟨 Lakewood Gardens	🟩 Woodsview

Other Features

- Municipal Boundary
- Urban Area Boundaries
- Waterbodies

System Performance

- Surplus Capacity
- Surcharging Sewer
- Surcharging Sewer with Basement Flooding Risk

Figure 4.A.6

Existing 5-Year Storm Peak Wet Weather Flows

Baker Road WWTP

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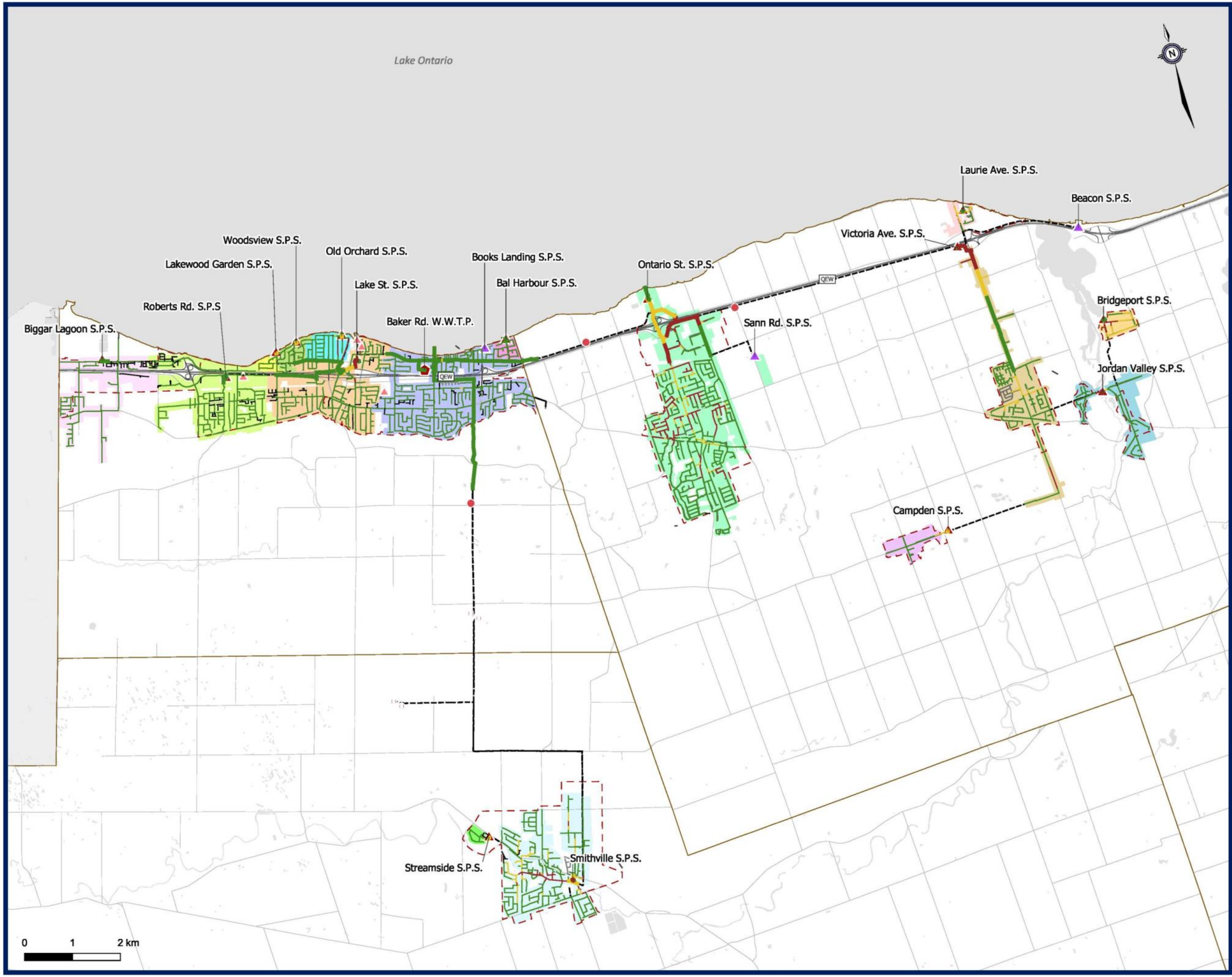

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

Existing Wastewater Infrastructure

- ● Combined Sewage Detention Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Local)

Wastewater Network

- Force Mains
- Regional Mains
- Local Sewers
- Private Sewers

Wastewater Catchments

- Baker Road WWTP
- Bal Harbour
- Biggar Lagoon
- Bridgeport
- Campden
- Jordan Valley
- Lake Street
- Lakewood Gardens
- Laurie Avenue
- Old Orchard
- Ontario Street
- Roberts Road
- Smithville
- Streamside
- Victoria Avenue
- Woodsview

Other Features

- Municipal Boundary
- Urban Area Boundaries
- Waterbodies

System Performance

- Surplus Capacity
- Surcharging Sewer
- Surcharging Sewer with Basement Flooding Risk

Figure 4.A.7
2051 5-year Storm Peak Wet Weather Flows

Baker Road WWTP

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A.4 System Opportunities and Constraints

Figure 4.A.8 highlights the existing opportunities and constraints.

A.4.1 Baker Wastewater Treatment Plant

- The current rated average daily flow capacity of the plant is 31.3 MLD, with an existing flow of 19.4 MLD. The plant has limited capacity in the future, with treatment plant capacity upgrades required to support future projected flows
- The 2051 projected average daily flow is 35.8 MLD and the post-2051 projected average daily flows is 44.8 MLD

A.4.2 Grimsby

- A large part of the system drains via gravity directly to the wastewater treatment plant.
- Residential and employment growth primarily consists of intensification within the urban boundary and is spread out along the highway and service road corridors.
- Some areas of high wet weather flows and system overflows, primarily along the lakeshore in the Biggar Lagoon SPS, Lakewood Garden SPS, Woodsview SPS, and Old Orchard SPS catchments. The Town is currently undertaking works to manage existing wet weather flow issues.
- Growth is expected to trigger a capacity deficit at the following stations:
    - Biggar Lagoon SPS
    - Lake Street SPS and forcemain
- There is an opportunity to upgrade the Woodsview SPS to a larger capacity, triggered by sustainability upgrade requirements.
- Growth is expected to trigger a capacity deficit to the Region-owned Park Street trunk sewer, which conveys flows from the Smithville service area but is located in Grimsby. The Town flagged congestion issues with the Park Street corridor which may not have space to accommodate the required upgrades. An EA is recommended to consider alternative alignments for the Smithville forcemain and gravity sewer.

A.4.3 Lincoln

- Growth is expected to occur within all settlement areas.
- Generally, there are high wet weather flows observed across the system. The Town is currently undertaking works to manage existing wet weather flow issues.
- There are existing and growth-related wet weather capacity deficits in most catchments.
- Growth is expected to trigger a capacity deficit at the following stations:
    - Ontario Street SPS and forcemain
    - Victoria Ave SPS
    - Laurie Ave SPS and forcemain
    - Campden SPS

  - Jordan Valley SPS and forcemain
  - Bridgeport SPS
- Based on ongoing design findings, the Laurie Ave SPS site can support a station upgrade to 90 L/s. Future flows beyond 90 L/s in the Laurie Ave SPS catchment will require alternative servicing strategy.
  - The 2051 projected flows are below this 90 L/s threshold; however, the post-2051 flows exceed the 90 L/s threshold.
- The recently completed Campden SPS is sufficient to meet existing and near-term growth. However, 2051 growth may trigger further pump station upgrades that may also trigger downstream forcemain and sewer upgrades. The current approach will be to manage additional growth beyond the existing capacity through wet weather flow management.
- The Region-owned sewers in Beamsville do not have sufficient capacity to support growth and will require upgrades.
  - Beamsville trunk sewer from north of Greenlane to the Ontario Street SPS
  - Lister Road trunk sewers from the Victoria Ave SPS forcemain to the Ontario Street SPS

A.4.4 West Lincoln

- Significant growth is expected from the Smithville Master Community Plan through an urban boundary expansion. The population is expected to more than triple by 2051. Infrastructure supporting the lands within the urban boundary expansion area are anticipated to be built by developers and have not been included in the capital program.
- The Town is currently undertaking works to manage existing wet weather flow issues.
- Growth will trigger upgrade needs at the following stations:
  - Streamside SPS and forcemain
  - Smithville SPS and forcemain
- Smithville Master Community Plan has identified a phased upgrade plan for the Streamside SPS and forcemain. In the interim, the Streamside SPS capacity will be upgraded to match the existing capacity of the Streamside SPS forcemain, in order to facilitate growth. In the future a new larger diameter forcemain will be constructed to connect the Streamside SPS to a new trunk sewer in the north, in the proposed urban boundary expansion.
- Growth in the expanded urban boundary will require new sewage pumping stations.
- The existing sewer network upstream of Smithville SPS has capacity to meet design criteria wet weather flows however, actual wet weather flows exceed sewer capacity in several areas and cause sewer surcharging and overflows at the Smithville SPS CSO.

A.4.5 System Optimization Opportunities

- Significant opportunity to provide capacity for growth through implementation of wet weather flow management within the Baker Road system.

- A larger number of in-series pumping stations generates cascading impacts.
- The existing system configuration provides limited opportunities to optimize the system including system diversions to reduce sewage pumping station upgrades and/or eliminate existing sewage pumping stations.
- There is an opportunity to change the alignment of the Smithville SPS forcemain and trunk sewer to avoid extensive upgrades in the congested right of way on Park Street in Grimsby.

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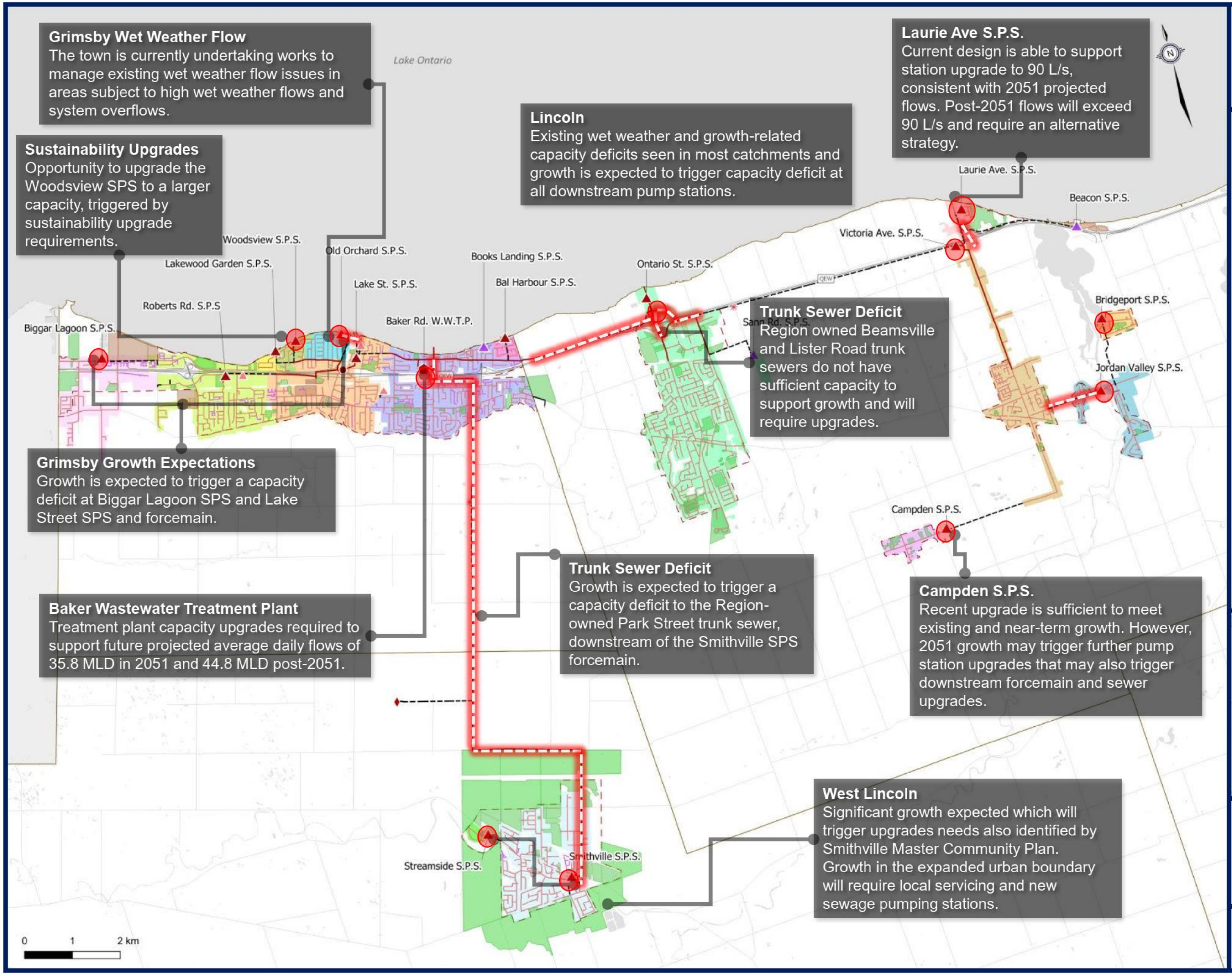

Grimsby Wet Weather Flow
The town is currently undertaking works to manage existing wet weather flow issues in areas subject to high wet weather flows and system overflows.

Sustainability Upgrades
Opportunity to upgrade the Woodsview SPS to a larger capacity, triggered by sustainability upgrade requirements.

Lincoln
Existing wet weather and growth-related capacity deficits seen in most catchments and growth is expected to trigger capacity deficit at all downstream pump stations.

Laurie Ave S.P.S.
Current design is able to support station upgrade to 90 L/s, consistent with 2051 projected flows. Post-2051 flows will exceed 90 L/s and require an alternative strategy.

Trunk Sewer Deficit
Region owned Beamsville and Lister Road trunk sewers do not have sufficient capacity to support growth and will require upgrades.

Grimsby Growth Expectations
Growth is expected to trigger a capacity deficit at Biggar Lagoon SPS and Lake Street SPS and forcemain.

Trunk Sewer Deficit
Growth is expected to trigger a capacity deficit to the Region-owned Park Street trunk sewer, downstream of the Smithville SPS forcemain.

Campden S.P.S.
Recent upgrade is sufficient to meet existing and near-term growth. However, 2051 growth may trigger further pump station upgrades that may also trigger downstream forcemain and sewer upgrades.

Baker Wastewater Treatment Plant
Treatment plant capacity upgrades required to support future projected average daily flows of 35.8 MLD in 2051 and 44.8 MLD post-2051.

West Lincoln
Significant growth expected which will trigger upgrades needs also identified by Smithville Master Community Plan. Growth in the expanded urban boundary will require local servicing and new sewage pumping stations.

Figure 4.A.8
Baker Road WWTP
Opportunities and Constraints

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February 2023
6210126-WW-002

A.5 Assessment of Alternatives

Generally, the previously recommended strategies from the 2016 MSP program and subsequent Baker Road Wastewater Treatment Plant Pollution Prevention Control Plan were carried forward which included capacity upgrades at most stations, and wet weather management strategies in key areas.

While the strategies remained the same, the following details including alignment, sizing, or wet weather areas have been updated to reflect the latest system understanding and reflect updated criteria changed through this iteration of the 2021 MSPU.

- Providing capacity within Region-owned pumping stations and trunk sewers to convey peak wet weather flows up to the lesser of the 5-year design storm or extraneous flow design allowance criteria of 0.4 L/s/ha for existing areas and 0.286 L/s/ha for growth areas, needs to be verified based on the updated flow criteria and actual flows.
- Provide upstream flow management to address high peak flows in the system where peak wet weather flows exceed the extraneous flow design allowance criteria of 0.4 L/s/ha resulting in basement flooding and overflow risks. Upstream flow management can include but is not limited to these options, in the preferred order of implementation:
    - Inflow and infiltration reduction in public right of way
    - Inflow and infiltration reduction from private properties
    - Enhanced system storage
    - Peak flow control using system controls or engineered solutions
- As shown in **Section A.3.2**, pump station capacity assessments were completed by reviewing the projected design allowance peak flows and 5-year storm flows against the operational firm capacity of each station.
    - Where the peak storm flows were less than design flows and the operational firm capacity of the station, the storm flows were used as actual flows, and therefore would not have triggered an upgrade.
    - Where the projected peak design allowance flows and 5-year storm flows exceeded the operational firm capacity of the station, a pump upgrade was recommended. Additional storage options and wet weather management were also considered.

To address existing and growth-related capacity needs, the following servicing concepts were evaluated:

- Do nothing
- Station capacity upgrade for pumping or storage
- Wet weather management
- Hybrid solution

A.6 Preferred Servicing Strategy

The following is a summary of Baker Road WWTP system as recommended through the 2016 Master Servicing Plan Update and carried forward through this update:

- A key strategy for the Baker Road system is to provide wet weather management across the system. This will require Regional solutions as well as local municipality solutions.
- Upgrades to most sewage pumping stations in the system due to high growth and existing deficiencies.
- The level of growth in the Smithville area requires upgrades to the sewage pumping stations and forcemains. The Smithville forcemain and downstream gravity sewers will require upgrades, and due to corridor capacity constraints downstream in Grimsby, an EA is proposed to determine the appropriate alignment to accommodate the upgrades.

Strategies that were changed since the 2016 MSP were:

- Lake Street SPS forcemain upgrade was added,
- Streamside SPS upgrade and new forcemain alignment were added
- The local Smithville trunk sewer upstream is not required as growth flows will be conveyed to a new Town owned trunk sewer. .

Figure 4.A.10 and **Figure 4.A.11** show the preferred servicing strategy, consisting of:

A.6.1 Treatment Plant Works

- Baker Road WWTP upgrade to provide an additional 16 MLD.
- The 80% threshold for an upgrade study is expected to be passed in 2031.

A.6.2 Pumping Stations

- Grimsby
    - Increase Biggar Lagoon SPS capacity from 74 L/s to re-establish 95 L/s ECA capacity.
    - Increase Lake Street SPS capacity from 375 L/s to 600 L/s.
    - Increase Woodsview SPS capacity from 35.5 L/s to 53 L/s as par of the station’s planned relocation.
- Lincoln
    - Increase Ontario Street SPS capacity from 420 L/s to 840 L/s.
    - Increase Victoria Ave SPS capacity from 120 L/s to 380 L/s
    - Increase Jordan Valley SPS capacity from 40 L/s to 74 L/s, as planned in 2022 design.
    - Increase Bridgeport SPS capacity from 11 L/s to 25 L/s, as planned in 2022 design.
    - Increase Laurie Ave SPS capacity from 28 L/s to 90 L/s, as planned in 2022 design.
    - Increase Campden SPS capacity from 11 L/s to 21 L/s. (Note station upgrade to 21.5 L/s has been completed during the course of this Master Plan)

- West Lincoln
    - Increase Smithville SPS capacity from 104 L/s to 705 L/s.
    - Increase Streamside SPS capacity from 16 L/s to 41 L/s.

Further to the pump station upgrades, the Region-wide allowance to address odour control needs that are the result of growth-related system upgrades has been included.

- WWTP Process Upgrades (WW-TP-006) which funds in-system and plant upgrades to control odour.

A.6.3 Forcemains

- Grimsby
    - Replace existing 445 mm Lake Street SPS Forcemain with new single 600 mm forcemain in Grimsby.
- Lincoln
    - Replace Existing 534 mm Ontario Street SPS Forcemain with new single 750 mm forcemain in Grimsby.
    - Replace existing 200 mm Jordan Valley SPS forcemain with new single 300 mm in Lincoln.
    - New 250 mm Laurie Avenue SPS Forcemain Upgrade in Lincoln.
- West Lincoln
    - Replace existing 400 mm Smithville SPS Forcemain with new single 750 mm forcemain in Smithville, to be coordinated with downstream trunk sewer upgrades.
    - New Streamside SPS 200 mm forcemain and alignment.

A.6.4 Trunk Sewers

- Lister Road trunk upgrades:
    - Replace existing 600 mm Lister Road gravity sewer downstream of Victoria Ave forcemain with new 750 mm gravity sewer
    - Replace existing 675 mm Lister Road gravity sewer downstream of Victoria Ave forcemain with new 825 mm gravity sewer
- Beamsville trunk upgrades:
    - Replace existing 600 mm gravity sewer with new 825 mm gravity sewer.
    - Replace existing 750 mm gravity sewer with new 1050 mm gravity sewer.
- Smithville trunk upgrade
    - Sewer upgrades along a new alignment, to be coordinated with the new Smithville forcemain, to WWTP.

A.6.5 Decommissioning of Existing Facilities

- No decommissioning projects are recommended in the Baker Road WWTP system.

A.6.6 Prudhommes Post-2051 Servicing Strategy

Based on ongoing design findings, the Laurie Ave SPS site can support a station upgrade to 90 L/s. Future flows beyond 90 L/s in the Laurie Ave SPS catchment will require an alternative servicing strategy. The current capital program recommendation is to upgrade the Laurie Avenue SPS to the 90 L/s threshold which should have sufficient capacity to support the projected 2051 flows.

However, the post-2051 flows are anticipated to substantially exceed the 90 L/s threshold. As such, a post 2051 servicing strategy has been provisionally identified consisting of:

- A new 40 L/s second SPS, with potential to be upsized to 70 L/s in the event that the future Beacon Hotel area is also developed, located in the eastern half of the Prudhommes Secondary Plan area
- A new 200 mm forcemain crossing the QEW Highway to support the new SPS to discharge either directly to the existing Victoria Avenue Serwer or via new 375 mm gravity sewer along South Service Road.

Additionally, the post-2051 flows have the potential to further increase the Victoria Ave SPS upgrade needs from the currently identified 380 L/s to 410 L/s and to trigger the upgrade or twinning of the existing Victoria Ave SPS forcemain with a new 600 mm forcemain; which is not currently included in the 2051 capital program.

The post-2051 flows are not anticipated to have infrastructure impacts beyond the Victoria Ave SPS and forcemain, with the planned Beamsville sewer upgrades being sufficiently sized to accommodate the additional flows and the ability to accommodate the additional flows with the proposed Ontario St SPS capacity upgrade (increasing from 840 L/s to 860 L/s).

A.6.7 Wet Weather Flow Management Program

A significant element of the Niagara Region wastewater servicing strategy is the wet weather management program. The program is intended to address existing capacity constraints, and to provide for growth-related capacity without expanding/upgrading existing trunk infrastructure, or by minimizing the required expansion/upgrades.

The wet weather management program currently identifies overall preliminary priority, staging of location and target amount of inflow and infiltration reduction across all systems. This program provides for a proactive and targeted approach to addressing wet weather impacts. These wet weather management programs will need to be a joint initiative between the Region and local municipalities.

For the Baker Road system, the following priority areas were identified corresponding with recommendations from the 2021 Baker Road WWTP System PPCP:

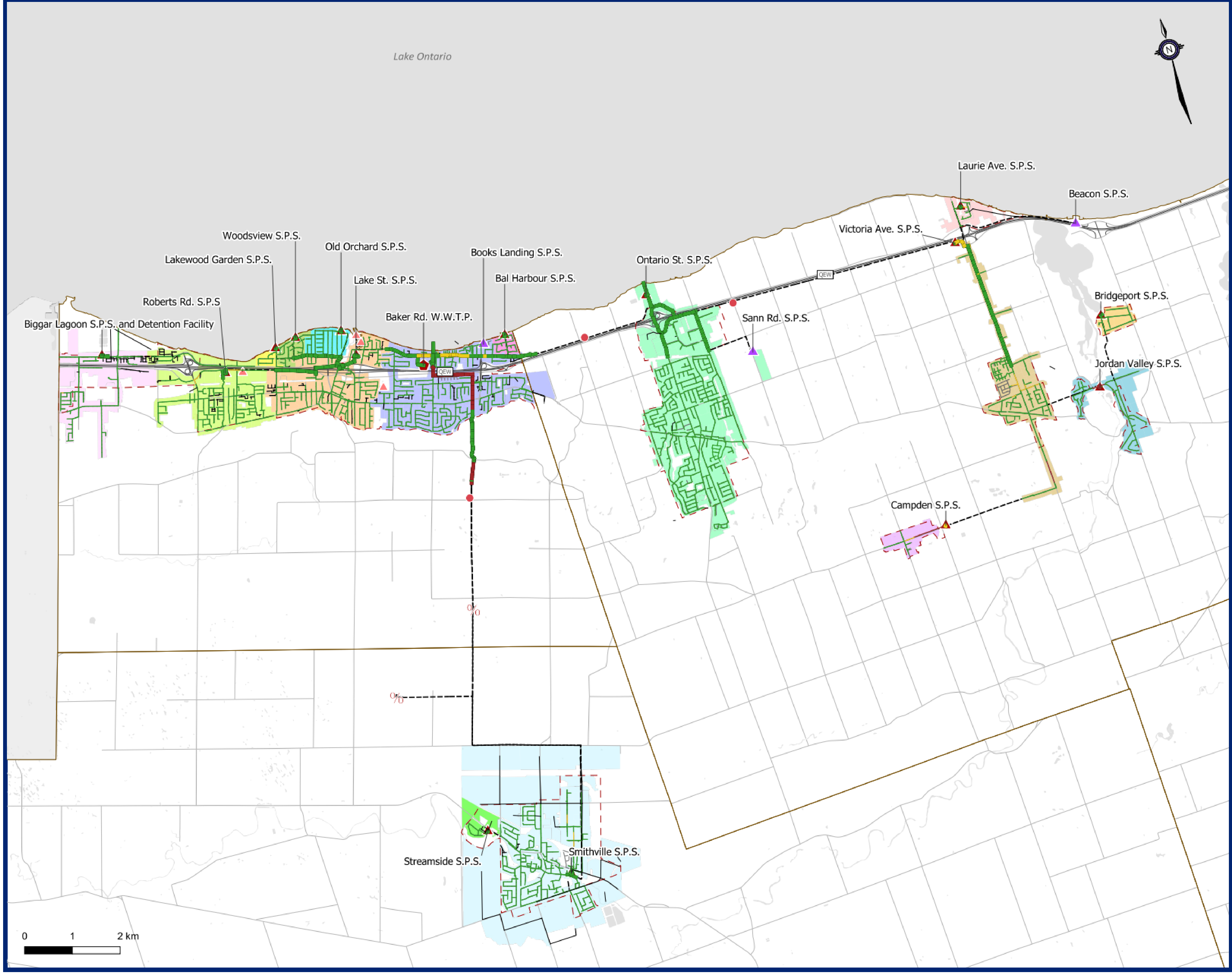
- Grimsby
    - West Grimsby including the Biggar Lagoon SPS catchment
    - Downtown area
    - Lakeshore area including Old Orchard SPS and Woodsview SPS
- Lincoln
    - Local areas within Beamsville
    - Bridgeport SPS
    - Campden SPS
    - Small areas in Vineland (Victoria Ave SPS) and the west area in the Jordan Valley SPS catchment
- West Lincoln
    - Areas in the northwest and west of Smithville
    - Streamside SPS

A.6.8 Additional Studies and Investigations

Due to the work recently completed for the PPCP, data in the Baker Road system is generally quite mature. The PPCP identified areas for additional data collection and all the LAMs have undertaken next steps in the flagged areas including more extensive flow monitoring and field investigations such as smoke and dye testing and other fieldwork. The LAMs are expected to continue with the inflow and infiltration reduction studies and action programs to address sources of inflow and infiltration.

A.6.9 Future System Performance

Figure 4.A.9 presents the future system performance, based on the preferred servicing strategy configuration and capacities; but excludes the potential benefits of the local wet weather flow management program.



Niagara Region

2021 Water and Wastewater
Master Servicing Plan Update

Existing Wastewater Infrastructure
- ■ Biosolids Storage Facility
- ● Combined Sewage Detention Facility
- % Leachate Pumping Station
- ● Odour Control Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Private)
- ▲ Sewage Pumping Station (Local)

Wastewater Network
- Force Mains
- Local Sewers
- Regional Mains
- Private Sewers

Wastewater Catchments
- Baker Road WWTP
- Laurie Avenue
- Bal Harbour
- Old Orchard
- Biggar Lagoon
- Ontario Street
- Bridgeport
- Roberts Road
- Campden
- Smithville
- Jordan Valley
- Streamside
- Lake Street
- Victoria Avenue
- Lakewood Gardens
- Woodsview

Other Features
- Municipal Boundary
- Urban Area Boundaries
- Waterbodies

System Performance
- Surplus Capacity
- Surcharging Sewer
- Surcharging Sewer with Basement Flooding Risk

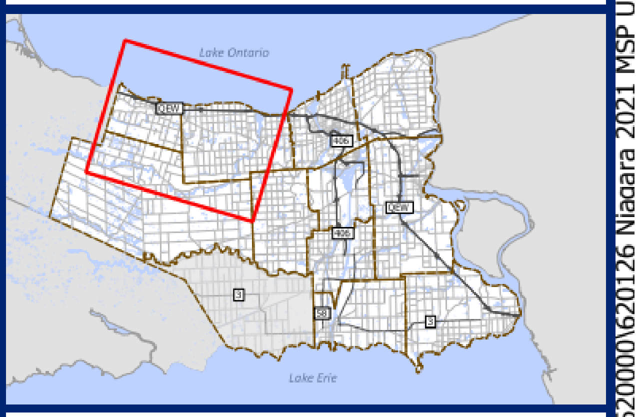


Figure 4.A.9

Future Capital Program Peak Wet Weather Flow

Baker Road WWTP

BluePlan

May, 2023
620126
Projection EPSG:26917

Document Path: W:\Hamilton\620000\620126 Niagara 2021 MSP Update\5 Work in Progress\5. GIS and Databases\4. Wastewater\System

A.7 Capital Program

Figure 4.A.10 and **Figure 4.A.11** present the preferred servicing strategy map and schematic

Table 4.A.10 summarizes the recommended project costing timing and Class EA requirements. Individual detailed costing sheets are presented in **Section A.8.6**.

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

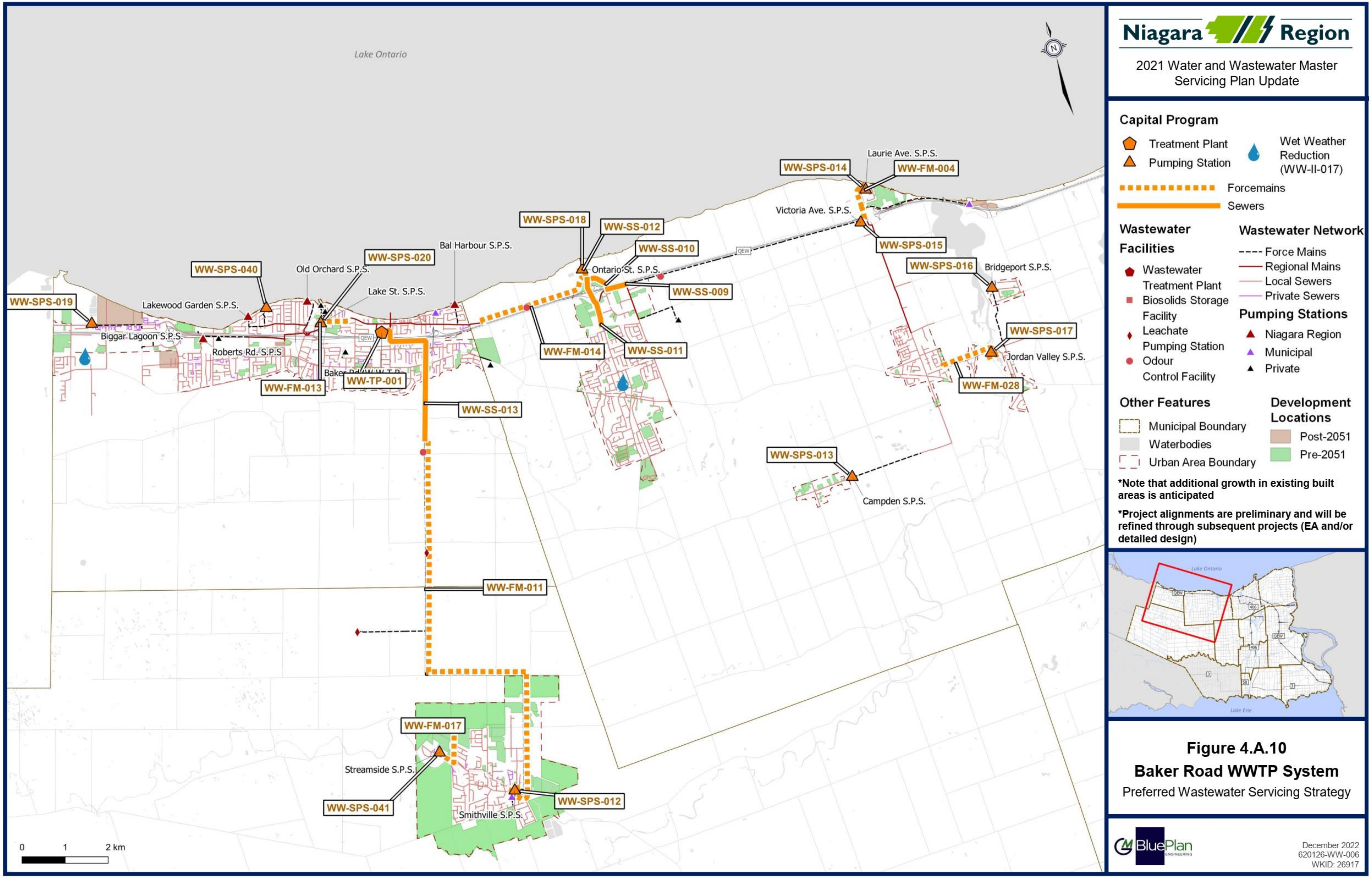
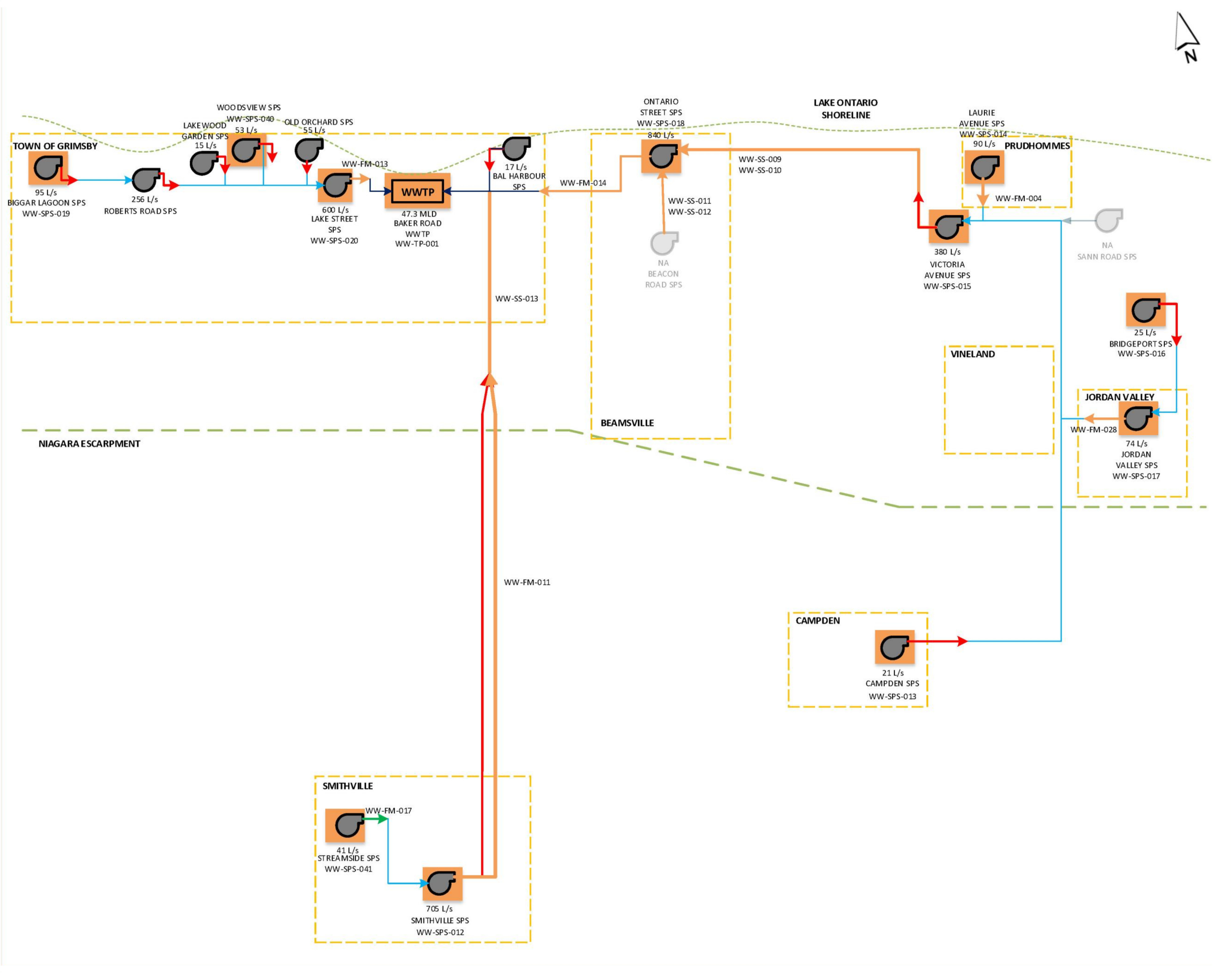


Figure 4.A.10
Baker Road WWTP System

Preferred Wastewater Servicing Strategy

GM BluePlan ENGINEERING

December 2022
620126-WW-006
WKID: 26917



Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

WWTP RATED CAPACITY	Wastewater Treatment Plant
FIRM CAPACITY	Sewage Pumping Station
→	Forcemain
→	Connection from SPS to SPS
→	Connection from SPS to WWTP
🟧	Facility Upgrade
🟩	New Facility
—	Upgrade Forcemain or Sewer
—	New Forcemain or Sewer
⊗	Decommission Project
FIRM CAPACITY	Decommission Project by External Party

Figure 4.A.11
Baker Road WWTP
Future Wastewater Infrastructure Schematic

BluePlan ENGINEERING

December 2022
621016-W-000
WKID: 26917

Table 4.A.10 Summary of Baker Wastewater Treatment Plant Capital Program

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost ($)
WW-FM-004	Laurie Avenue SPS Forcemain Upgrade	New 250 mm Laurie Avenue SPS Forcemain Upgrade in Lincoln	250 mm	2022-2026	Lincoln	A+	Satisfied	Forcemain	$2,605,000
WW-FM-011	Smithville Forcemain Upgrade	Replace existing 400 mm Smithville SPS Forcemain with new single 750 mm forcemain in Smithville.	750 mm	2027-2031	West Lincoln	B	Separate EA Required	Forcemain	$41,785,000
WW-FM-013	Lake Street Forcemain Upgrade	Replace existing 445 mm Lake Street SPS Forcemain with new single 600 mm forcemain in Grimsby.	750 mm	2022-2026	Grimsby	A+	Satisfied	Forcemain	$3,454,000
WW-FM-014	Ontario Street Forcemain Upgrade	Replace Existing 534 mm Ontario Street SPS Forcemain with new single 750 mm forcemain in Grimsby.	750 mm	2022-2026	Lincoln	B	Separate EA Required	Forcemain	$11,408,000
WW-FM-017	New Streamside Forcemain and Outlet	New 200 mm forcemain and alignment	200 mm	2032-2036	West Lincoln	A+	Satisfied	Forcemain	$2,350,000
WW-FM-028	Jordan Valley Forcemain Replacement	Replace existing 200 mm Jordan Valley SPS forcemain with new single 300 mm in Lincoln	300 mm	2022-2026	Lincoln	A+	Satisfied	Forcemain	$2,915,000
WW-SPS-012	Smithville SPS Upgrade	Increase station capacity from 104 L/s to 705 L/s. Scope includes wet well expansion, pump upgrade and adding two pumps.	705 L/s	2027-2031	West Lincoln	B	Separate EA Required	Pumping	$17,623,000
WW-SPS-013	Campden SPS Pump Replacement	Increase station capacity from 11 L/s to 21 L/s by replacing the existing two pumps. (Construction 2022)	21 L/s	2022-2026	Lincoln	A+	Satisfied	Pumping	$1,430,000
WW-SPS-014	Laurie Avenue SPS Upgrade	Increase station capacity from 28 L/s to 90 L/s. Scope includes new wet well and pump upgrades.	90 L/s	2022-2026	Lincoln	A+	Satisfied	Pumping	$3,354,000
WW-SPS-015	Victoria Avenue SPS Pump Replacement	Increase station capacity from 120 L/s to 380 L/s by replacing the existing three pumps	380 L/s	2027-2031	Lincoln	A+	Satisfied	Pumping	$5,070,000
WW-SPS-016	Bridgeport SPS Pump Replacement	Increase station capacity from 11 L/s to 25 L/s, as planned in 2022 design, by replacing the existing two pumps	25 L/s	2022-2026	Lincoln	A+	Satisfied	Pumping	$3,475,000
WW-SPS-017	Jordan Valley SPS Pump Replacement	Increase station capacity from 40 L/s to 74 L/s, as planned in 2022 design, by replacing the existing two pumps.	74 L/s	2022-2026	Lincoln	A+	Satisfied	Pumping	$3,593,000
WW-SPS-018	Ontario Street SPS Upgrade	Increase station capacity from 420 L/s to 840 L/s. Upgrades include dry and wet well expansions and two additional pumps.	840 L/s	2027-2031	Lincoln	B	Separate EA Required	Pumping	$14,316,000
WW-SPS-019	Biggar Lagoon Pump Replacement	Increase station capacity from 74 L/s to re-establish 95 L/s ECA capacity by replacing the existing two pumps.	95 L/s	2022-2026	Grimsby	A+	Satisfied	Pumping	$2,898,000

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost ($)
WW-SPS-020	Lake Street SPS Pump Replacement	Increase station capacity from 375 L/s to 600 L/s by replacing existing four pumps.	600 L/s	2022-2026	Grimsby	A+	Satisfied	Pumping	$6,762,000
WW-SPS-040	Woodsview SPS Upgrade	Increase station capacity from 35.5 L/s to 53 L/s by replacing the station at location.	53 L/s	2022-2026	Grimsby	A+	Satisfied	Pumping	$4,189,000
WW-SPS-041	Streamside SPS Upgrade	Increase station capacity from 16 L/s to 41 L/s. Scope includes wet well expansion and pump upgrades.	41 L/s	2022-2026	West Lincoln	A+	Satisfied	Pumping	$1,314,000
WW-SS-009	Lister Road Trunk Upgrade 1	Replace existing 600 mm gravity sewer downstream of Victoria Ave forcemain with new 750 mm gravity sewer	750 mm	2027-2031	Lincoln	A+	Satisfied	Sewer	$1,758,000
WW-SS-010	Lister Road Trunk Upgrade 2	Replace existing 675 mm gravity sewer downstream of Victoria Ave forcemain with new 825 mm gravity sewer	825 mm	2027-2031	Lincoln	A+	Satisfied	Sewer	$5,747,000
WW-SS-011	Beamsville Trunk Upgrade 1	Replace existing 600 mm gravity sewer with new 825 mm gravity sewer	825 mm	2027-2031	Lincoln	A+	Satisfied	Sewer	$7,766,000
WW-SS-012	Beamsville Trunk Upgrade 2	Replace existing 750 mm gravity sewer with new 1050 mm gravity sewer	1050 mm	2027-2031	Lincoln	A+	Satisfied	Sewer	$1,575,000
WW-SS-013	Smithville Trunk Upgrade	Sewer upgrades along an alternate alignment to WWTP. Replaces old MSP SS-(003-004).	600 mm	2027-2031	Grimsby	B	Separate EA Required	Sewer	$49,272,000
WW-TP-001	Baker Road WWTP Upgrade	Baker Road WWTP Upgrade to provide an additional 16 MLD	14 MLD	2032-2036	Grimsby	C	Separate EA Required	Treatment	$123,895,000
WW-II-017(1)	Region-Wide Wet weather Reduction	Wet weather reduction program in all systems to be executed from 2022-2051	N/A	2022-2051	Region-Wide		Dependent on outcome of wet weather flow study	Wet Weather Reduction	$225,000,000
WW-ST-001(1)	Region-Wide Flow Monitoring and Data Collection	Funding to support flow monitoring and data collection initiatives	N/A	2022-2051	Region-Wide			Wet Weather Reduction	$12,000,000 -
WW-TP-005(1)	Region-Wide WWTP Process Upgrades	Process upgrades to re-establish ECA capacity	N/A	2022-2051	Region-Wide			Treatment	$50,000,000
WW-TP-006(1)	Region-Wide WWTP Process Upgrades	Upgrades for odour control across the Region at forcemains, pump stations, and other locations.	N/A	2022-2051	Region-Wide			Treatment	$40,000,000
								Total	**$318,554,000**

(1) Project cost not included in subtotal as it is a Region-wide project

A.8 Project Implementation and Considerations

A.8.1 10-Year Program Sequencing

The recommended year in service for the capital projects is presented in **Section A.6.7**. Most projects in the Baker Road system were prioritized for the first 10 years of the capital plan because of existing deficiencies and cascading downstream impacts for upgrades to sewage pumping stations in series. Special project implementation and considerations for the preferred servicing strategy consist of:

- Projects within each LAM (Grimsby, Lincoln, and West Lincoln) are independent; for example, a Grimsby project is not required to happen before any given Lincoln or West Lincoln project.
- Timing of the Campden SPS, Bridgeport SPS, Woodsview SPS, and Laurie Ave SPS upgrades will be constructed in the 2022-2026 time horizon, as they are understood to have design and construction in progress.
- The Ontario Street SPS and forcemain upgrades must be completed before the trunk upgrades for Lister Road and the Beamsville trunks on Ontario Street. The Lister Road trunk upgrades must be completed before the Victoria Ave SPS upgrade but are independent from the Beamsville trunk upgrades.
- Timing of the Baker Road WWTP upgrade study was assigned to 2031, although the upgrade itself would occur later in the 2032-2041 time horizon.

It is understood that the timing for the recommended projects may be subject to change due to a variety of external factors such as overall balancing of the Region's capital budget, changes to growth projections, and other unforeseen circumstances. As such, **Table 4.A.11** presents the preferred priority of the projects within the first 10-years of the capital program.

Table 4.A.11 Preferred Project Order

Master Plan ID	Name	In-Service Period	Project Sequencing
WW-SPS-013	Campden SPS Pump Replacement	2022-2026	1
WW-SPS-016	Bridgeport SPS Pump Replacement	2022-2026	1
WW-SPS-040	Woodsview SPS Upgrade	2022-2026	2
WW-FM-004	Laurie Avenue SPS Forcemain Upgrade	2022-2026	2
WW-SPS-014	Laurie Avenue SPS Upgrade	2022-2026	2
WW-SPS-041	Streamside SPS Upgrade	2022-2026	2
WW-SPS-019	Biggar Lagoon Pump Replacement	2022-2026	3
WW-SPS-017	Jordan Valley SPS Pump Replacement	2022-2026	3
WW-FM-028	Jordan Valley Forcemain Replacement	2022-2026	3
WW-FM-013	Lake Street Forcemain Upgrade	2022-2026	4
WW-SPS-020	Lake Street SPS Pump Replacement	2022-2026	4
WW-FM-014	Ontario Street Forcemain Upgrade	2022-2026	4
WW-SPS-018	Ontario Street SPS Upgrade	2027-2031	4

Master Plan ID	Name	In-Service Period	Project Sequencing
WW-SS-009	Lister Road Trunk Upgrade 1	2027-2031	5
WW-SS-010	Lister Road Trunk Upgrade 2	2027-2031	5
WW-SPS-015	Victoria Avenue SPS Pump Replacement	2027-2031	6
WW-FM-011	Smithville Forcemain Upgrade	2027-2031	6
WW-SPS-012	Smithville SPS Upgrade	2027-2031	6
WW-SS-013	Smithville Trunk Upgrade	2027-2031	6
WW-SS-012	Beamsville Trunk Upgrade 2	2027-2031	7
WW-SS-011	Beamsville Trunk Upgrade 1	2027-2031	7
WW-TP-001	Baker Road WWTP Upgrade	2032-2036* Study in 2031	8

A.8.2 EA Requirements and Studies

The following summarizes the status of EA requirements for recommended capital projects which will require Schedule B or C EAs.

- EA has been satisfied through previous projects:
  - None.
- Currently ongoing separate EA studies:
  - WW-TP-001 (Baker Road WWTP Upgrade) – Schedule C
- EA studies to be completed through separate studies:
  - WW-FM-011, WW-SS-013 (Smithville SPS forcemain and downstream gravity sewers) - Schedule B
  - WW-SPS-018 and WW-FM-014 (Ontario Street SPS and forcemain upgrades) – Schedule B

A.8.3 Region-Wide Projects and Collaboration with Local Area Municipalities

Acknowledging that the overall wastewater systems are jointly owned and operated by the Region and LAM, the continued operation and expansion of the wastewater systems to support existing users and accommodate projected growth relies upon the cooperation of the upper and lower tier municipalities. Major updates and adjustments to planning projections should be continued to be communicated as this may affect project details such as trigger timelines and design capacities, which is discussed further in **Section A.8.5**.

One initiative that will be predominately driven by the LAMs is wet weather management. While wet weather management should be completed in all municipalities, this 2021 MSPU assumes that the catchments where the peak wet weather flows exceed the peak design flows and contribute to increased risk of basement flooding or overflows will put a specific focus on wet weather management. The Region is committed to continuing the joint CSO funding program through which LAMs can apply for funding support for inflow and infiltration reduction programs and projects such as those identified through the PPCP.

Additional flow monitoring and system data collection, in partnership with LAM, is needed to improve system understanding, support proposed wet weather flow reductions, and identify opportunities for system optimization and overflow removals.

A.8.4 Sustainability Projects

It is important to recognize that the 2021 MSPU servicing strategies identify new infrastructure to service the additional growth out to year 2051 but these strategies are built by extending infrastructure from the existing systems and leveraging the existing Region infrastructure in place. It is essential that the existing infrastructure is maintained in good condition and performance to support servicing growth.

The Region continually establishes and implements a sustainability program that addresses priority projects to ensure the existing infrastructure is in a state-of-good-repair and continues to perform and meet the intended level of services. Region-wide programs including but not limited to replacement programs for pipes and manholes, boilers, meters, generators, SCADA upgrades, sludge management programs, laboratory and sampling equipment upgrades, process electrical, process instrumentation. Pump station upgrades through the sustainability capital plan re-establish the SPS ECA capacity.

Independent of the 2021 MSPU, the Region has completed a sustainability program analysis to identify the projects on a yearly basis, with focus on a 10 year program, to address the sustainability needs. This Sustainability Capital Plan is first developed to demonstrate the total investment needs and may identify a level of investment and implementation exceeding Region resources. The next steps for the Sustainability Capital Plan will be the development of the Financial Plan for existing Water and Wastewater assets which is anticipated to be completed in 2024. It should be noted that the Sustainability Capital Plan represents investment required over and above the growth-related 2021 MSPU program.

Baker Road system specific projects include:

- Bal Harbour SPS Electrical Upgrades
- Lakewood Gardens SPS Upgrades
- Woodsview SPS CSO Tank and FM Replacement
- Smithville Lagoon Decommissioning

A.8.5 Project Implementation Flow Chart

The recommended design capacities within the growth capital program are based on the best available information at the time of analysis, including existing system flows, facility capacities, and projected growth. It is understood that this data is not static and often changes over the years between the regular updates of the Region's Master Plan and between those updates. Design assumptions should be revisited before initiation of all projects to reconfirm the appropriate design capacities, along with identification of any associated or dependent projects which can be combined or staged to optimize implementation efficiency and cost, and/or system operation.

To support the Region's process in implementing all recommended 2021 MSPU capital projects, the following flow chart has been developed for the wastewater system. This flow chart document is intended to be a reference resource for the Region and should be treated as a guideline to support existing internal Region processes in project implementation.

The wastewater implementation flow chart is shown in **Figure 4.A.12.**

Niagara Region

WASTEWATER PROJECT IMPLEMENTATION

The intent of this document is to support the Region in confirming the scope of work for wastewater infrastructure projects.

CONFIRM PROJECT SCOPE

To define Terms of Reference

☐ **What triggered this project?**
- Known development growth
- Forecasted growth
- Sustainability needs

☐ **Are there related or dependent projects that should be identified for streamlining opportunities or for project phasing?**
- Are there upstream projects with increasing capacity?
- Are there projects within the same alignment or project area that could be combined? (e.g., growth projects, SPS, forcemain, sewer, corridor planning, sustainability projects, water, stormwater, etc.)
- If there are related projects, could the project timing be adjusted to combine or stage projects more efficiently?

☐ **What is the project EA Schedule and status?**

☐ **Are there historic or ongoing operational issues in the project area?**
- Confirm with Regional and LAM operations and maintenance groups
- i.e. historic overflows, low flow/odour issues, clogging issues, work order history, etc.

☐ **Are there any data gaps that should be incorporated into the Terms of Reference?**
- Refer to the Required Data section below for details
- How much does the project timeline and budget need to change to allow for the data collection?

☐ **Have the planning projections been updated to the best available information?**
- Consultation with Region and LAM planning groups to confirm planning projection
- Are projected needs for the project in place? Is actual growth in line with projected growth?)

☐ **Should the project be deferred until identified related works are completed?**

REQUIRED DATA

To support terms of reference and detailed design

☐ **Recently completed EA or servicing study**
(for growth triggered projects)

☐ **Historic flow records**
- Within the last 3 years
- Ideally one full year of flow monitoring data that covers 80% of the total contributing area
- Can be included in project scope if feasible

☐ **Existing pump, flow, and pressure data to identify/verify existing system issues**

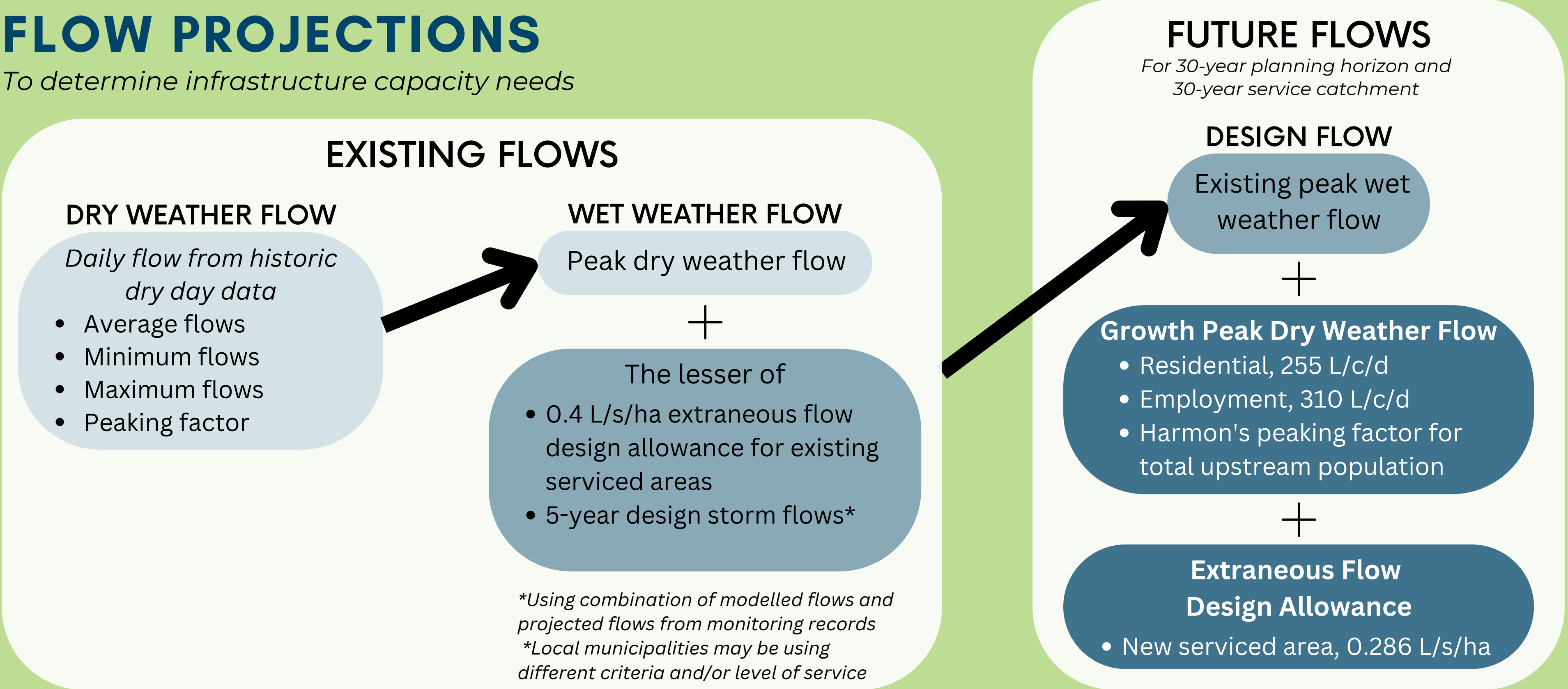
☐ **Asset inventory and condition assessment**
- All asset classes within the infrastructure type (sewer, forcemain, storage, pumping, or treatment facility)
- Within the last 5 years
- Can be part of project scope if the data is not available and would not significantly alter project scope - to assess need for related works (i.e. electrical, HVAC, structural upgrades at an SPS)

☐ **Service area growth potential to confirm projected population and demands**
- Consultation with Region and LAM planning groups within the past year
- Growth information for 30-year horizon and beyond (maximum service catchment)
  - Population, jobs, land use, area
  - Current inventory of development areas with associated development status

IF THE REQUIRED DATA IS NOT AVAILABLE AND IF IT HAS THE POTENTIAL TO SIGNIFICANTLY ALTER SCOPE OF THE DESIGN, IT IS STRONGLY RECOMMENDED THAT THE APPROPRIATE DATA COLLECTION AND FIELD INVESTIGATION BE COMPLETED PRIOR TO PROCEEDING WITH DESIGN. ALTERNATIVELY, WHERE FEASIBLE, DATA COLLECTION SHOULD BE INCLUDED IN THE PROJECT SCOPE AND INTEGRATED INTO THE DESIGN PROCESS.

FLOW PROJECTIONS

To determine infrastructure capacity needs



EXISTING FLOWS

DRY WEATHER FLOW

Daily flow from historic dry day data
- Average flows
- Minimum flows
- Maximum flows
- Peaking factor

WET WEATHER FLOW

Peak dry weather flow

+

The lesser of
- 0.4 L/s/ha extraneous flow design allowance for existing serviced areas
- 5-year design storm flows*

**Using combination of modelled flows and projected flows from monitoring records*
**Local municipalities may be using different criteria and/or level of service*

FUTURE FLOWS

For 30-year planning horizon and 30-year service catchment

DESIGN FLOW

Existing peak wet weather flow

+

Growth Peak Dry Weather Flow
- Residential, 255 L/c/d
- Employment, 310 L/c/d
- Harmon's peaking factor for total upstream population

+

Extraneous Flow Design Allowance
- New serviced area, 0.286 L/s/ha

The design criteria presented in this document are based on the 2021 Master Servicing Plan Update Study

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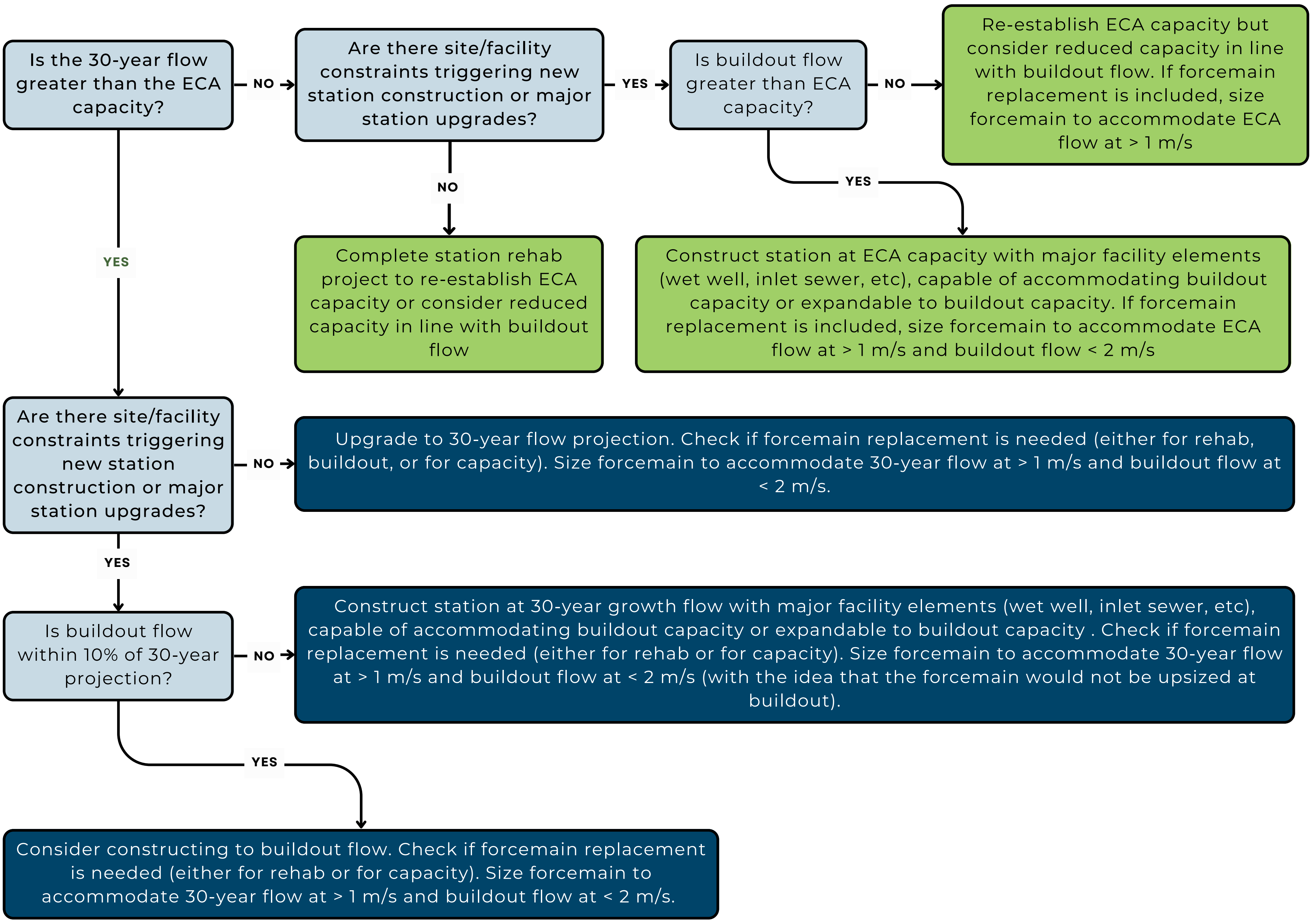
SEWAGE PUMPING STATIONS



Is the 30-year flow greater than the ECA capacity?

NO

Are there site/facility constraints triggering new station construction or major station upgrades?

YES

Is buildout flow greater than ECA capacity?

NO

Re-establish ECA capacity but consider reduced capacity in line with buildout flow. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s

YES

Construct station at ECA capacity with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s and buildout flow < 2 m/s

NO

Complete station rehab project to re-establish ECA capacity or consider reduced capacity in line with buildout flow

YES

Are there site/facility constraints triggering new station construction or major station upgrades?

NO

Upgrade to 30-year flow projection. Check if forcemain replacement is needed (either for rehab, buildout, or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

YES

Is buildout flow within 10% of 30-year projection?

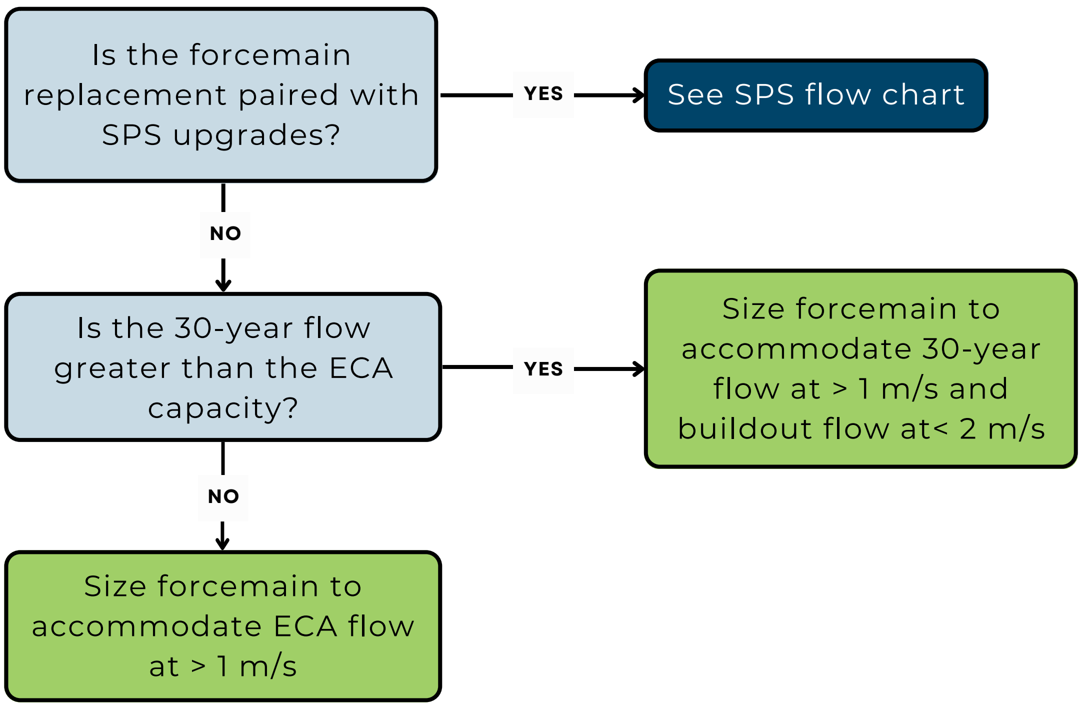
NO

Construct station at 30-year growth flow with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity . Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s (with the idea that the forcemain would not be upsized at buildout).

YES

Consider constructing to buildout flow. Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

FORCEMAINS



Is the forcemain replacement paired with SPS upgrades?

YES

See SPS flow chart

NO

Is the 30-year flow greater than the ECA capacity?

YES

Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at< 2 m/s

NO

Size forcemain to accommodate ECA flow at > 1 m/s

A.8.6 Detailed Project Costing Sheets

The detailed project costing sheets for the recommended 2021 MSPU capital projects within the Baker Road WWTP system are presented below.

PROJECT NO.: **WW-FM-004**
PROJECT NAME: **Laurie Avenue SPS Forcemain Upgrade**
PROJECT DESCRIPTION: New 250 mm Laurie Avenue SPS Forcemain Upgrade in Lincoln

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-FM-004**

Pump Station	**WW-SPS-014**	
ECA	28	0.57
Proposed	90	1.83
Buildout	142	2.90
Number of Pumps	2	1.83

PROPOSED DIAMETER:	250 mm	
TOTAL LENGTH:	850 m	
Tunnelled	0 m	0%
Open Cut	850 m	100%

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Forcemain

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	850 m	$965	$819,999	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$1,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	20%					$164,000	
Minor Creek Crossings			ea.	2	$31,000	$62,000	
Major Creek Crossings			ea.	0	$200,000	$0	
Road Crossings			ea.	0	$83,000	$0	
Major Road Crossings (Highway)			ea.	1	$200,000	$200,000	QEW
Utility Crossings			ea.	0	$83,000	$0	
Updated Soils Regulation Uplift	2%					$16,400	
Additional Construction Costs	20%		ea.			$252,480	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$151,488	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$1,666,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$33,300	
Geotechnical Sub-Total Cost						**$33,300**	
Property Requirements	2.0%					$ 33,300	
Property Requirements Sub-Total						**$33,300**	
Consultant Engineering/Design	15%					$ 249,900	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$249,900**	
In House Labour/Engineering/Wages/CA	4.0%					$ 66,640	
In-house Labour/Wages Sub-Total						**$66,640**	
Project Contingency	25%					$512,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$512,000**	
Non-Refundable HST	1.76%					$43,900	
Non-Refundable HST Sub-Total						**$43,900**	
Total (2022 Dollars)						**$2,605,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$2,605,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$52,100		
Design	Design fees, Town fees for design, contract admin	13%	$338,650		
Construction	Town fees, base costs and project contingency	85%	$2,214,250		
TOTAL			**$2,605,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-FM-011**
PROJECT NAME:	**Smithville Forcemain Upgrade**
PROJECT DESCRIPTION:	Replace existing 400 mm Smithville SPS Forcemain with new single 750 mm forcemain in Smithville.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Rural	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-FM-011**

Pump Station	**WW-SPS-012**	
ECA	120	0.27
Proposed	705	1.60
Buildout	705	1.60
Number of Pumps	4	0.53
	3.00	0.80

PROPOSED DIAMETER:	750 mm	
TOTAL LENGTH:	10790 m	
Tunnelled		0%
Open Cut	10790 m	100%

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Forcemain

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	10790 m	$1,720	$18,561,848	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$6,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	0%					$0	
Minor Creek Crossings			ea.	3	$314,000	$942,000	
Major Creek Crossings			ea.	0	$1,133,000	$0	
Road Crossings			ea.	1	$566,000	$566,000	Rail
Major Road Crossings (Highway)			ea.	0	$1,133,000	$0	
Utility Crossings			ea.	1	$566,000	$566,000	Additional cost for chambers
Updated Soils Regulation Uplift	2%					$371,237	
Additional Construction Costs	20%		ea.			$4,201,417	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$2,520,850	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$27,729,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$554,600	
Geotechnical Sub-Total Cost						**$554,600**	
Property Requirements	2.0%					$ 554,600	
Property Requirements Sub-Total						**$554,600**	
Consultant Engineering/Design	12%					$ 3,327,500	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$3,327,500**	
In House Labour/Engineering/Wages/CA	2.5%					$ 693,225	
In-house Labour/Wages Sub-Total						**$693,225**	
Project Contingency	25%					$8,215,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$8,215,000**	
Non-Refundable HST	1.76%					$710,700	
Non-Refundable HST Sub-Total						**$710,700**	
Total (2022 Dollars)						**$41,785,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$41,785,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$835,700		
Design	Design fees, Town fees for design, contract admin	13%	$5,432,050		
Construction	Town fees, base costs and project contingency	85%	$35,517,250		
TOTAL			**$41,785,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-FM-013**
PROJECT NAME:	**Lake Street Forcemain Upgrade**
PROJECT DESCRIPTION:	Replace existing 445 mm Lake Street SPS Forcemain with new single 600 mm forcemain in Grimsby.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-FM-013**

Pump Station	**WW-SPS-020**	
ECA	365	0.83
Proposed	600	1.36
Buildout	697	1.58
Number of Pumps	4	0.45

PROPOSED DIAMETER:	750 mm	
TOTAL LENGTH:	790 m	
Tunnelled		0%
Open Cut	790 m	100%

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Forcemain

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	790 m	$1,720	$1,359,023	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$6,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	30%					$407,707	
Minor Creek Crossings			ea.	1	$314,000	$314,000	
Major Creek Crossings			ea.	0	$1,133,000	$0	
Road Crossings			ea.	0	$566,000	$0	
Major Road Crossings (Highway)			ea.	0	$1,133,000	$0	
Utility Crossings			ea.	0	$566,000	$0	
Updated Soils Regulation Uplift	2%					$27,180	
Additional Construction Costs	10%		ea.			$210,791	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$231,870	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$2,551,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$25,500	
Geotechnical Sub-Total Cost						**$25,500**	
Property Requirements	1.0%					$ 25,500	
Property Requirements Sub-Total						**$25,500**	
Consultant Engineering/Design	15%					$ 382,700	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$382,700**	
In House Labour/Engineering/Wages/CA	4.0%					$ 102,040	
In-house Labour/Wages Sub-Total						**$102,040**	
Project Contingency	10%					$309,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$309,000**	
Non-Refundable HST	1.76%					$58,000	
Non-Refundable HST Sub-Total						**$58,000**	
Total (2022 Dollars)						**$3,454,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$3,454,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$69,080		
Design	Design fees, Town fees for design, contract admin	13%	$449,020		
Construction	Town fees, base costs and project contingency	85%	$2,935,900		
TOTAL			**$3,454,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-FM-014**
PROJECT NAME:	**Ontario Street Forcemain Upgrade**
PROJECT DESCRIPTION:	Replace Existing 534 mm Ontario Street SPS Forcemain with new single 750 mm forcemain in Grimsby.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Rural	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-FM-014

Pump Station	**WW-SPS-018**	
ECA	420	0.95
Proposed	840	1.90
Buildout	863	1.95
Number of Pumps	4	0.63

PROPOSED DIAMETER:	750 mm	
TOTAL LENGTH:	2930 m	
Tunnelled		0%
Open Cut	2930 m	100%

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Forcemain

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	2930 m	$1,720	$5,040,428	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$6,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	0%					$0	
Minor Creek Crossings			ea.	4	$314,000	$1,256,000	
Major Creek Crossings			ea.	0	$1,133,000	$0	
Road Crossings			ea.	0	$566,000	$0	
Major Road Crossings (Highway)			ea.	0	$1,133,000	$0	
Utility Crossings			ea.	0	$566,000	$0	
Updated Soils Regulation Uplift	2%					$100,809	
Additional Construction Costs	15%		ea.			$959,585	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$735,682	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$8,093,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$80,900	
Geotechnical Sub-Total Cost						**$80,900**	
Property Requirements	1.5%					$ 121,400	
Property Requirements Sub-Total						**$121,400**	
Consultant Engineering/Design	15%					$ 1,214,000	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$1,214,000**	
In House Labour/Engineering/Wages/CA	3.0%					$ 242,790	
In-house Labour/Wages Sub-Total						**$242,790**	
Project Contingency	15%					$1,463,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$1,463,000**	
Non-Refundable HST	1.76%					$193,100	
Non-Refundable HST Sub-Total						**$193,100**	
Total (2022 Dollars)						**$11,408,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$11,408,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$228,160		
Design	Design fees, Town fees for design, contract admin	13%	$1,483,040		
Construction	Town fees, base costs and project contingency	85%	$9,696,800		
TOTAL			$11,408,000		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-FM-017**
PROJECT NAME:	**New Streamside Forcemain and Outlet**
PROJECT DESCRIPTION:	New 200 mm forcemain and alignment

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-FM-017

Pump Station	**WW-SPS-041**	
ECA	24	0.75
Proposed	41	1.31
Buildout	36	1.16
Number of Pumps	2	1.31

PROPOSED DIAMETER:	200 mm	
TOTAL LENGTH:	980 m	
Tunnelled		0%
Open Cut	980 m	100%

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Forcemain

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	980 m	$965	$945,410	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$1,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	20%					$189,082	
Minor Creek Crossings			ea.	0	$30,000	$0	
Major Creek Crossings			ea.	0	$199,000	$0	
Road Crossings			ea.	1	$82,000	$82,000	Regional Road 20
Major Road Crossings (Highway)			ea.	1	$199,000	$199,000	Rail Crossing
Utility Crossings			ea.	0	$82,000	$0	
Updated Soils Regulation Uplift	2%					$18,908	
Additional Construction Costs	10%		ea.			$143,440	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$157,784	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$1,736,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$17,400	
Geotechnical Sub-Total Cost						**$17,400**	
Property Requirements	1.0%					$ 17,400	
Property Requirements Sub-Total						**$17,400**	
Consultant Engineering/Design	15%					$ 260,400	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$260,400**	
In House Labour/Engineering/Wages/CA	4.0%					$ 69,440	
In-house Labour/Wages Sub-Total						**$69,440**	
Project Contingency	10%					$210,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$210,000**	
Non-Refundable HST	1.76%					$39,400	
Non-Refundable HST Sub-Total						**$39,400**	
Total (2022 Dollars)						**$2,350,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$2,350,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$47,000		
Design	Design fees, Town fees for design, contract admin	13%	$305,500		
Construction	Town fees, base costs and project contingency	85%	$1,997,500		
TOTAL			**$2,350,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-FM-028**
PROJECT NAME: **Jordan Valley Forcemain Replacement**
PROJECT DESCRIPTION: Replace existing 200 mm Jordan Valley SPS forcemain with new single 300 mm in Lincoln

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-FM-028

Pump Station	**WW-SPS-017**	
ECA	40	0.57
Proposed	74	1.05
Buildout	88	1.25
Number of Pumps	2	1.05

PROPOSED DIAMETER:	300 mm	
TOTAL LENGTH:	1125 m	
Tunnelled	600 m	53%
Open Cut	525 m	47%

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Forcemain

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	525 m	$965	$506,470	Existing road ROW
Pipe Construction - Tunneling			m	600 m	$1,300	$780,000	
Pipe Construction Uplift (Based on Area Conditions)	20%					$101,294	
Minor Creek Crossings			ea.	0	$39,000	$0	
Major Creek Crossings			ea.	1	$208,000	$208,000	
Road Crossings			ea.	0	$91,000	$0	
Major Road Crossings (Highway)			ea.	0	$208,000	$0	
Utility Crossings			ea.	0	$91,000	$0	
Updated Soils Regulation Uplift	2%					$25,729	
Additional Construction Costs	15%		ea.			$243,224	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$186,472	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$2,051,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$20,500	
Geotechnical Sub-Total Cost						**$20,500**	
Property Requirements	1.5%					$ 30,800	
Property Requirements Sub-Total						**$30,800**	
Consultant Engineering/Design	15%					$ 307,700	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$307,700**	
In House Labour/Engineering/Wages/CA	4.0%					$ 82,040	
In-house Labour/Wages Sub-Total						**$82,040**	
Project Contingency	15%					$374,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$374,000**	
Non-Refundable HST	1.76%					$49,000	
Non-Refundable HST Sub-Total						**$49,000**	
Total (2022 Dollars)						**$2,915,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$2,915,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$58,300		
Design	Design fees, Town fees for design, contract admin	13%	$378,950		
Construction	Town fees, base costs and project contingency	85%	$2,477,750		
TOTAL			**$2,915,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SS-009**
PROJECT NAME:	**Lister Road Trunk Upgrade 1**
PROJECT DESCRIPTION:	Replace existing 600 mm gravity sewer downstream of Victoria Ave forcemain with new 750 mm gravity sewer

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-SS-009

PROPOSED DIAMETER:	750 mm	
TOTAL LENGTH:	465 m	
Tunnelled	0 m	0%
Open Cut	465 m	100%

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Sewer 5m

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	465 m	$1,501	$697,901	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$6,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	20%					$139,580	
Minor Creek Crossings			ea.	0	$246,000	$0	
Major Creek Crossings			ea.	0	$1,065,000	$0	
Road Crossings			ea.	0	$498,000	$0	
Major Road Crossings (Highway)			ea.	0	$1,065,000	$0	
Utility Crossings			ea.	0	$498,000	$0	
Updated Soils Regulation Uplift	2%					$13,958	
Additional Construction Costs	20%		ea.			$170,288	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$102,173	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$1,124,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$22,500	
Geotechnical Sub-Total Cost						**$22,500**	
Property Requirements	2.0%					$ 22,500	
Property Requirements Sub-Total						**$22,500**	
Consultant Engineering/Design	15%					$ 168,600	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$168,600**	
In House Labour/Engineering/Wages/CA	4.0%					$ 44,960	
In-house Labour/Wages Sub-Total						**$44,960**	
Project Contingency	25%					$346,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$346,000**	
Non-Refundable HST	1.76%					$29,600	
Non-Refundable HST Sub-Total						**$29,600**	
Total (2022 Dollars)						**$1,758,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$1,758,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$35,160		
Design	Design fees, Town fees for design, contract admin	13%	$228,540		
Construction	Town fees, base costs and project contingency	85%	$1,494,300		
TOTAL			**$1,758,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SS-010**
PROJECT NAME:	**Lister Road Trunk Upgrade 2**
PROJECT DESCRIPTION:	Replace existing 675 mm gravity sewer downstream of Victoria Ave forcemain with new 825 mm gravity sewer

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-SS-010

PROPOSED DIAMETER:	825 mm	
TOTAL LENGTH:	610 m	
Tunnelled	0 m	0%
Open Cut	610 m	100%

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Sewer 5m

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	610 m	$1,605	$978,825	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$9,800	$0	
Pipe Construction Uplift (Based on Area Conditions)	20%					$195,765	
Minor Creek Crossings			ea.	0	$316,000	$0	
Major Creek Crossings			ea.	0	$1,590,000	$0	
Road Crossings			ea.	0	$708,000	$0	
Major Road Crossings (Highway)			ea.	1	$1,590,000	$1,590,000	QEW Crossing
Utility Crossings			ea.	0	$708,000	$0	
Updated Soils Regulation Uplift	2%					$19,577	
Additional Construction Costs	20%		ea.			$556,833	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$334,100	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$3,675,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$73,500	
Geotechnical Sub-Total Cost						**$73,500**	
Property Requirements	2.0%					$ 73,500	
Property Requirements Sub-Total						**$73,500**	
Consultant Engineering/Design	15%					$ 551,300	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$551,300**	
In House Labour/Engineering/Wages/CA	4.0%					$ 147,000	
In-house Labour/Wages Sub-Total						**$147,000**	
Project Contingency	25%					$1,130,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$1,130,000**	
Non-Refundable HST	1.76%					$96,900	
Non-Refundable HST Sub-Total						**$96,900**	
Total (2022 Dollars)						**$5,747,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$5,747,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$114,940		
Design	Design fees, Town fees for design, contract admin	13%	$747,110		
Construction	Town fees, base costs and project contingency	85%	$4,884,950		
TOTAL			**$5,747,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SS-011**
PROJECT NAME:	**Beamsville Trunk Upgrade 1**
PROJECT DESCRIPTION:	Replace existing 600 mm gravity sewer with new 825 mm gravity sewer

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-SS-011

PROPOSED DIAMETER:	825 mm	
TOTAL LENGTH:	1125 m	
Tunnelled	0 m	0%
Open Cut	1125 m	100%

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Sewer 5m

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	1125 m	$1,605	$1,805,210	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$9,800	$0	
Pipe Construction Uplift (Based on Area Conditions)	20%					$361,042	
Minor Creek Crossings			ea.	0	$316,000	$0	
Major Creek Crossings			ea.	0	$1,590,000	$0	
Road Crossings			ea.	0	$708,000	$0	
Major Road Crossings (Highway)			ea.	1	$1,590,000	$1,590,000	QEW Crossing
Utility Crossings			ea.	0	$708,000	$0	
Updated Soils Regulation Uplift	2%					$36,104	
Additional Construction Costs	20%		ea.			$758,471	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$455,083	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$5,006,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$100,100	
Geotechnical Sub-Total Cost						**$100,100**	
Property Requirements	2.0%					$ 100,100	
Property Requirements Sub-Total						**$100,100**	
Consultant Engineering/Design	15%					$ 750,900	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$750,900**	
In House Labour/Engineering/Wages/CA	3.0%					$ 150,180	
In-house Labour/Wages Sub-Total						**$150,180**	
Project Contingency	25%					$1,527,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$1,527,000**	
Non-Refundable HST	1.76%					$131,700	
Non-Refundable HST Sub-Total						**$131,700**	
Total (2022 Dollars)						**$7,766,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$7,766,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$155,320		
Design	Design fees, Town fees for design, contract admin	13%	$1,009,580		
Construction	Town fees, base costs and project contingency	85%	$6,601,100		
TOTAL			**$7,766,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SS-012**
PROJECT NAME:	**Beamsville Trunk Upgrade 2**
PROJECT DESCRIPTION:	Replace existing 750 mm gravity sewer with new 1050 mm gravity sewer

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-SS-012

PROPOSED DIAMETER:		1050 mm	
TOTAL LENGTH:		280 m	
	Tunnelled	0 m	0%
	Open Cut	280 m	100%

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Sewer 5m

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	280 m	$2,233	$625,328	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$9,800	$0	
Pipe Construction Uplift (Based on Area Conditions)	20%					$125,066	
Minor Creek Crossings			ea.	0	$416,000	$0	
Major Creek Crossings			ea.	0	$1,690,000	$0	
Road Crossings			ea.	0	$808,000	$0	
Major Road Crossings (Highway)			ea.	0	$1,690,000	$0	
Utility Crossings			ea.	0	$808,000	$0	
Updated Soils Regulation Uplift	2%					$12,507	
Additional Construction Costs	20%		ea.			$152,580	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$91,548	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$1,007,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$20,100	
Geotechnical Sub-Total Cost						**$20,100**	
Property Requirements	2.0%					$ 20,100	
Property Requirements Sub-Total						**$20,100**	
Consultant Engineering/Design	15%					$ 151,100	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$151,100**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,280	
In-house Labour/Wages Sub-Total						**$40,280**	
Project Contingency	25%					$310,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$310,000**	
Non-Refundable HST	1.76%					$26,500	
Non-Refundable HST Sub-Total						**$26,500**	
Total (2022 Dollars)						**$1,575,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$1,575,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$31,500		
Design	Design fees, Town fees for design, contract admin	13%	$204,750		
Construction	Town fees, base costs and project contingency	85%	$1,338,750		
TOTAL			$1,575,000		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SS-013**
PROJECT NAME:	**Smithville Trunk Upgrade**
PROJECT DESCRIPTION:	Sewer upgrades along an alternate alignment to WWTP. Replaces old MSP SS-(003-004).

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-SS-013

		top end	near plant
PROPOSED DIAMETER:		600 mm	825 mm
TOTAL LENGTH:		4300 m	
	Tunnelled	3300 m	77%
	Open Cut	1000 m	23%

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Sewer 5m
	Sewer 10m

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	1000 m	$1,605	$1,604,631	
Pipe Construction - Escapment			m	3300 m	$6,000	$19,800,000	Unit Rate Increased to Account for Escapment Crossing
Pipe Construction Uplift (Based on Area Conditions)	20%					$320,926	
Minor Creek Crossings			ea.	1	$316,000	$316,000	
Major Creek Crossings			ea.	0	$1,015,000	$0	
Road Crossings			ea.	0	$448,000	$0	
Major Road Crossings (Highway)			ea.	1	$1,590,000	$1,590,000	QEW Crossing
Utility Crossings			ea.	1	$708,000	$708,000	Railway Crossing
Updated Soils Regulation Uplift	2%					$428,093	
Additional Construction Costs	20%		ea.			$4,957,988	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$2,972,564	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$32,698,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$654,000	
Geotechnical Sub-Total Cost						**$654,000**	
Property Requirements	2.0%					$ 654,000	
Property Requirements Sub-Total						**$654,000**	
Consultant Engineering/Design	12%					$ 3,923,800	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$3,923,800**	
In House Labour/Engineering/Wages/CA	2.5%					$ 817,450	
In-house Labour/Wages Sub-Total						**$817,450**	
Project Contingency	25%					$9,687,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$9,687,000**	
Non-Refundable HST	1.76%					$838,100	
Non-Refundable HST Sub-Total						**$838,100**	
Total (2022 Dollars)						**$49,272,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$49,272,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$985,440		
Design	Design fees, Town fees for design, contract admin	13%	$6,405,360		
Construction	Town fees, base costs and project contingency	85%	$41,881,200		
TOTAL			**$49,272,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PL
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-II-017**
PROJECT NAME:	**Region Wide Wet weather Reduction**
PROJECT DESCRIPTION:	Wet weather reduction program in all systems to be executed from 2022-2051

Old ID		**Focus Areas**	Amount
_WW-II-001	Anger Ave WWTP	Lakeshore Road, Catharine Street, Dominion Road, Rose Avenue SPS, Anger Ave WWTP Catchments	
_WW-II-002	Crystal Beach WWTP	Nigh Road SPS and Crystal Beach WWTP Catchments	
_WW-II-003	Stevensville Douglastown	Stevensville, Douglastown catchments	
_WW-II-004	Welland WWTP	Feeder Road, Seaway Heights, Ontario Road SPS, Dain City, and Welland WWTP Catchments	
_WW-II-005	Baker - Grimsby	Woodsview, Biggar Lagoon, Old Orchard SPS Catchments	
_WW-II-006	Baker - Lincoln Beamsville	Ontario Street SPS Catchment	
_WW-II-007	Baker - Lincoln Vineland	Wet weather reduction in Jordan Valley***	
_WW-II-008	Port Dalhousie	Eastchester, Lakeside, Argyle, Renown SPS and Port Dalhousie WWTP Catchments	
_WW-II-009	Port Weller/Port Dalhousie	Wet weather reduction in North Thorold	
_WW-II-010	Port Weller	Haulage Road, Carlton Street SPS, and Port Weller WWTP Catchments	
_WW-II-011	Seaway WWTP	Union, Clarke Street, Arena, Elm Street, City Hall, Sugarloaf, Rosemount North and South SPS Catchments	
_WW-II-012	Niagara Falls WWTP	Central, Muddy Run, Seneca, Meadowvale, Drummond, Kalar Road SPS Catchments	
_WW-II-013	South Niagara Falls WWTP	South Side High Lift and South Side Low Lift SPS Catchments	
_WW-II-014	NOTL	Wet weather reduction in Northeast Niagara-on-the-Lake	
_WW-II-015	NOTL	Wet weather reduction in Virgil - NOTL	
_WW-II-016	Baker - West Lincoln	Wet weather reduction in West Lincoln - Baker	

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SPS-012**
PROJECT NAME:	**Smithville SPS Upgrade**
PROJECT DESCRIPTION:	Increase station capacity from 104 L/s to 705 L/s. Scope includes wet well expansion, pump upgrade and adding two pumps.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-012**

	L/s	162.5
ECA	120.0	
Operational Firm (2021)	104.0	

PROPOSED CAPACITY	705 L/s	Firm Capacity
Design PWWF Existing	231 L/s	323 L/s
2051	668 L/s	761 L/s
Buildout	705 L/s	797 L/s
	RDII	**5Y Design**

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)*
1	120	235.0
2	120	235.0
3	NA	235.0
4	NA	235.0

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	601 L/s	$13,383	$8,043,292	Station expansion including wet well, upgrades to existing 2 pumps and addition of 2 new pumps. Cost estimate based off unit rate applied to capacity increase
Related Upgrades	20%						does not apply with unit based upgrade
Bypass Pumping Allowance	7%					$563,030	
Additional Construction Costs	20%		ea.			$1,721,265	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$1,032,759	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$11,360,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$227,200	
Geotechnical Sub-Total Cost						**$227,200**	
Property Requirements	5.0%					$ 568,000	
Property Requirements Sub-Total						**$568,000**	
Consultant Engineering/Design	12%					$ 1,363,200	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$1,363,200**	
In House Labour/Engineering/Wages/CA	3.0%					$ 340,800	
In-house Labour/Wages Sub-Total						**$340,800**	
Project Contingency	25%					$3,465,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$3,465,000**	
Non-Refundable HST	1.76%					$298,900	
Non-Refundable HST Sub-Total						**$298,900**	
Total (2022 Dollars)						**$17,623,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$17,623,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$352,460		
Design	Design fees, Town fees for design, contract admin	13%	$2,290,990		
Construction	Town fees, base costs and project contingency	85%	$14,979,550		
TOTAL			**$17,623,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-013**

PROJECT NAME: **Campden SPS Pump Replacement**

PROJECT DESCRIPTION: Increase station capacity from 11 L/s to 21 L/s by replacing the existing two pumps. (Construction 2022)

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Rural	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-013**

	L/s
ECA	21.5
Operational	21.5

PROPOSED CAPACITY		21 L/s	Firm capacity
Design PWWF	**Existing**	21 L/s	23 L/s
	2051	27 L/s	29 L/s
	Buildout	29 L/s	31 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)*
1	21	21
2	21	21

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	-1 L/s	$27,983	$650,000	$325k per pump, replace 2 existing pumps
Related Upgrades	30%					$195,000	
Bypass Pumping Allowance	5%					$42,250	
Additional Construction Costs	10%		ea.			$88,725	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$97,598	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$1,074,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 161,100	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$161,100**	
In House Labour/Engineering/Wages/CA	4.0%					$ 42,960	
In-house Labour/Wages Sub-Total						**$42,960**	
Project Contingency	10%					$128,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$128,000**	
Non-Refundable HST	1.76%					$24,000	
Non-Refundable HST Sub-Total						**$24,000**	
Total (202 Dollars)						**$1,430,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$1,430,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$28,600		
Design	Design fees, Town fees for design, contract admin	13%	$185,900		
Construction	Town fees, base costs and project contingency	85%	$1,215,500		
TOTAL			**$1,430,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-014**

PROJECT NAME: **Laurie Avenue SPS Upgrade**

PROJECT DESCRIPTION: Increase station capacity from 28 L/s to 90 L/s. Scope includes new wet well and pump upgrades.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-014**

	L/s
ECA	28.0
Operational Firm (2021)	26.0

PROPOSED CAPACITY	90 L/s	Firm capacity
Design PWWF Existing	16 L/s	34 L/s
2051	87 L/s	105 L/s
Buildout	142 L/s	160 L/s
	RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)*
1	28	90
2	28	90

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	64 L/s	$27,983	$1,790,913	Pumping station upgrade, expect deeper sewer, new wet well and existing station retrofit. Cost estimate based off unit rate applied to capacity increase
Related Upgrades	40%						
Bypass Pumping Allowance	6%					$98,500	
Additional Construction Costs	15%		ea.			$283,412	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$217,283	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$2,390,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$23,900	
Geotechnical Sub-Total Cost						**$23,900**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 358,500	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$358,500**	
In House Labour/Engineering/Wages/CA	4.0%					$ 95,600	
In-house Labour/Wages Sub-Total						**$95,600**	
Project Contingency	15%					$430,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$430,000**	
Non-Refundable HST	1.76%					$56,400	
Non-Refundable HST Sub-Total						**$56,400**	
Total (2022 Dollars)						**$3,354,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$3,354,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$67,080		
Design	Design fees, Town fees for design, contract admin	13%	$436,020		
Construction	Town fees, base costs and project contingency	85%	$2,850,900		
TOTAL			**$3,354,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-015**

PROJECT NAME: **Victoria Avenue SPS Pump Replacement**

PROJECT DESCRIPTION: Increase station capacity from 120 L/s to 380 L/s by replacing the existing three pumps

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-015**

	L/s
ECA	120.0
Operational Firm (2021)	120.0

PROPOSED CAPACITY		380 L/s	Firm capacity
Design PWWF	**Existing**	252 L/s	254 L/s
	2051	357 L/s	361 L/s
	Buildout	415 L/s	417 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	60	190
2	60	190
3	60	190

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	320 L/s		$2,100,000	$700k per pump, replacement of 3 existing pumps
Related Upgrades	30%					$630,000	
Bypass Pumping Allowance	6%					$150,150	
Additional Construction Costs	15%		ea.			$432,023	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$331,217	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$3,643,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 546,500	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$546,500**	
In House Labour/Engineering/Wages/CA	4.0%					$ 145,720	
In-house Labour/Wages Sub-Total						**$145,720**	
Project Contingency	15%					$650,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$650,000**	
Non-Refundable HST	1.76%					$85,200	
Non-Refundable HST Sub-Total						**$85,200**	
Total (2022 Dollars)						**$5,070,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$5,070,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$101,400		
Design	Design fees, Town fees for design, contract admin	13%	$659,100		
Construction	Town fees, base costs and project contingency	85%	$4,309,500		
TOTAL			**$5,070,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SPS-016**
PROJECT NAME:	**Bridgeport SPS Pump Replacement**
PROJECT DESCRIPTION:	Increase station capacity from 11 L/s to 25 L/s, as planned in 2022 design, by replacing the existing two pumps

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-016**

	L/s
ECA	11.5
Operational	8.0

PROPOSED CAPACITY		25 L/s	Firm capacity
Design PWWF	**Existing**	19 L/s	10 L/s
	2051	23 L/s	14 L/s
	Buildout	23 L/s	14 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	8	25
2	8	25

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	25 L/s		$650,000	$325k per pump, replacement of 2 existing pumps
Related Upgrades	30%					$195,000	
Bypass Pumping Allowance	6%					$46,475	
Additional Construction Costs	15%		ea.			$133,721	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$102,520	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$2,220,000**	**Tender Price**
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 333,000	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$333,000**	
In House Labour/Engineering/Wages/CA	4.0%					$ 88,800	
In-house Labour/Wages Sub-Total						**$88,800**	
Project Contingency	15%					$396,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$396,000**	
Non-Refundable HST	1.76%					$51,900	
Non-Refundable HST Sub-Total						**$51,900**	
Total (2022 Dollars)						**$3,090,000**	Rounded to nearest $1,000
Other Estimate						**$3,475,000**	Region Total Cost
Chosen Estimate						**$3,475,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$69,500		
Design	Design fees, Town fees for design, contract admin	13%	$451,750		
Construction	Town fees, base costs and project contingency	85%	$2,953,750		
TOTAL			$3,475,000		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-017**

PROJECT NAME: **Jordan Valley SPS Pump Replacement**

PROJECT DESCRIPTION: Increase station capacity from 40 L/s to 74 L/s, as planned in 2022 design, by replacing the existing two pumps.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-017**

	L/s
ECA	40.0
Operational	26.4

PROPOSED CAPACITY			74 L/s	Firm capacity
Design PWWF - 5 Y	**Existing**		76 L/s	44 L/s
	2051		87 L/s	55 L/s
	Buildout		88 L/s	56 L/s
			RDII	5Y Design

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	40	74.0
2	40	74.0

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	74 L/s	$27,983	$1,000,000	$500k per pump,replacement of 2 existing pumps
Related Upgrades	30%					$300,000	
Bypass Pumping Allowance	6%					$71,500	
Additional Construction Costs	15%		ea.			$205,725	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$157,723	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$2,581,000**	**Region Internal Cost Esimate**
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 387,200	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$387,200**	
In House Labour/Engineering/Wages/CA	4.0%					$ 103,240	
In-house Labour/Wages Sub-Total						**$103,240**	
Project Contingency	15%					$461,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$461,000**	
Non-Refundable HST	1.76%					$60,400	
Non-Refundable HST Sub-Total						**$60,400**	
Total (2022 Dollars)						**$3,593,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$3,593,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$71,860		
Design	Design fees, Town fees for design, contract admin	13%	$467,090		
Construction	Town fees, base costs and project contingency	85%	$3,054,050		
TOTAL			**$3,593,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SPS-018**
PROJECT NAME:	**Ontario Street SPS Upgrade**
PROJECT DESCRIPTION:	Increase station capacity from 420 L/s to 840 L/s. Upgrades include dry and wet well expansions and two additional pumps.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-018**

	L/s
ECA	420.0
Operational Firm (2021)	420.0

PROPOSED CAPACITY		840 L/s	Firm Capacity	
Design PWWF	**Existing**	600 L/s	516 L/s	
	2051	788 L/s	704 L/s	
	Buildout	863 L/s	779 L/s	Flow Restricted
		RDII	**5Y Design**	

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	210	210.0
2	210	210.0
3	210	210.0
4	NA	210.0
5	NA	210.0

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	420 L/s	$15,816	$6,642,925	Pumping station upgrade to include a wet well expansion, dry well, two additional pumps of the same size, and maintain existing three pumps.
Related Upgrades	30%						
Bypass Pumping Allowance	7%					$465,005	
Additional Construction Costs	20%		ea.			$1,421,586	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$852,952	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$9,382,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$187,640	
Geotechnical Sub-Total Cost						**$187,640**	
Property Requirements	5.0%					$ -	
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 1,407,300	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$1,407,300**	
In House Labour/Engineering/Wages/CA	3.0%					$ 281,460	
In-house Labour/Wages Sub-Total						**$281,460**	
Project Contingency	25%					$2,815,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$2,815,000**	
Non-Refundable HST	1.76%					$242,700	
Non-Refundable HST Sub-Total						**$242,700**	
Total (2022 Dollars)						**$14,316,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$14,316,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$286,320		
Design	Design fees, Town fees for design, contract admin	13%	$1,861,080		
Construction	Town fees, base costs and project contingency	85%	$12,168,600		
TOTAL			**$14,316,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SPS-019**
PROJECT NAME:	**Biggar Lagoon Pump Replacement**
PROJECT DESCRIPTION:	Increase station capacity from 54 L/s to re-establish 95 L/s ECA capacity by replacing the existing two pumps.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-019**

	L/s
ECA	95.0
Operational	54.0

PROPOSED CAPACITY		95 L/s	Firm Capacity
Design PWWF	**Existing**	97 L/s	147 L/s
	2051	140 L/s	190 L/s
	Buildout	208 L/s	257 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	54.0	95.0
2	54.0	54.0

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s			$1,200,000	$600k per pump, replace 2 existing pumps
Related Upgrades	30%					$360,000	
Bypass Pumping Allowance	6%					$85,800	
Additional Construction Costs	15%		ea.			$246,870	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$189,267	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$2,082,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 312,300	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$312,300**	
In House Labour/Engineering/Wages/CA	4.0%					$ 83,280	
In-house Labour/Wages Sub-Total						**$83,280**	
Project Contingency	15%					$372,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$372,000**	
Non-Refundable HST	1.76%					$48,700	
Non-Refundable HST Sub-Total						**$48,700**	
Total (2022 Dollars)						**$2,898,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$2,898,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$57,960		
Design	Design fees, Town fees for design, contract admin	13%	$376,740		
Construction	Town fees, base costs and project contingency	85%	$2,463,300		
TOTAL			**$2,898,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SPS-020**
PROJECT NAME:	**Lake Street SPS Pump Replacement**
PROJECT DESCRIPTION:	Increase station capacity from 375 L/s to 600 L/s by replacing existing four pumps.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-020**

	L/s
ECA	365.0
Operational Firm (2021)	320.0

PROPOSED CAPACITY	600 L/s	Final Firm Capacity
Design PWWF Existing	470 L/s	432 L/s
2051	575 L/s	538 L/s
Buildout	697 L/s	659 L/s
	RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	125	200.0
2	125	200.0
3	125	200.0
4	125	200.0

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	280 L/s	$15,816	$2,800,000	$700K per pump, replace existing 4 pumps
Related Upgrades	30%					$840,000	
Bypass Pumping Allowance	6%					$200,200	
Additional Construction Costs	15%		ea.			$576,030	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$441,623	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$4,858,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 728,700	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$728,700**	
In House Labour/Engineering/Wages/CA	4.0%					$ 194,320	
In-house Labour/Wages Sub-Total						**$194,320**	
Project Contingency	15%					$867,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$867,000**	
Non-Refundable HST	1.76%					$113,600	
Non-Refundable HST Sub-Total						**$113,600**	
Total (2022 Dollars)						**$6,762,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$6,762,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$135,240		
Design	Design fees, Town fees for design, contract admin	13%	$879,060		
Construction	Town fees, base costs and project contingency	85%	$5,747,700		
TOTAL			**$6,762,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SPS-040**
PROJECT NAME:	**Woodsview SPS Upgrade**
PROJECT DESCRIPTION:	Increase station capacity from 35.5 L/s to 53 L/s by replacing the station at location.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-040**

	L/s
ECA	37.5
Operational	35.5

PROPOSED CAPACITY		53 L/s	Firm capacity
Design PWWF	**Existing**	15 L/s	130 L/s
	2051	15 L/s	130 L/s
	Buildout	15 L/s	130 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	35	53.0
2	35	53.0

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	53 L/s	$27,983	$1,483,100	Full pump station replacement as per sustainability upgrades.
Shoreline Protection and Additional Site	30%					$444,930	
Bypass Pumping Allowance	7%					$134,962	
Additional Construction Costs	20%		ea.			$412,598	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$247,559	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$2,723,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$54,460	
Geotechnical Sub-Total Cost						**$54,460**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 408,500	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$408,500**	
In House Labour/Engineering/Wages/CA	4.0%					$ 108,920	
In-house Labour/Wages Sub-Total						**$108,920**	
Project Contingency	25%					$824,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$824,000**	
Non-Refundable HST	1.76%					$70,600	
Non-Refundable HST Sub-Total						**$70,600**	
Total (2022 Dollars)						**$4,189,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$4,189,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$83,780		
Design	Design fees, Town fees for design, contract admin	13%	$544,570		
Construction	Town fees, base costs and project contingency	85%	$3,560,650		
TOTAL			**$4,189,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-041**

PROJECT NAME: **Streamside SPS Upgrade**

PROJECT DESCRIPTION: Increase station capacity from 16 L/s to 41 L/s. Scope includes wet well expansion and pump upgrades.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-041**

	L/s
ECA	23.6
Operational	16.0

PROPOSED CAPACITY		41 L/s	Firm capacity
Design PWWF	**Existing**	7 L/s	20 L/s
	2051	35 L/s	49 L/s
	Buildout	36 L/s	50 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	16	41.0
2	16	41.0

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	25 L/s	$27,983	$699,575	Pumping station expansion, cost estimate based off unit rate applied to capacity increase
Related Upgrades	30%						
Bypass Pumping Allowance	6%					$38,477	
Additional Construction Costs	15%		ea.			$110,708	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$84,876	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$934,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$9,340	
Geotechnical Sub-Total Cost						**$9,340**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 140,100	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$140,100**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	15%					$169,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$169,000**	
Non-Refundable HST	1.76%					$22,000	
Non-Refundable HST Sub-Total						**$22,000**	
Total (2022 Dollars)						**$1,314,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$1,314,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$26,280		
Design	Design fees, Town fees for design, contract admin	13%	$170,820		
Construction	Town fees, base costs and project contingency	85%	$1,116,900		
TOTAL			**$1,314,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-TP-001**
PROJECT NAME: **Baker Road WWTP Upgrade**
PROJECT DESCRIPTION: Baker Road WWTP Upgrade to provide an additional 16 MLD

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-001**

PROPOSED CAPACITY	14 MLD

CLASS EA REQUIREMENTS:	C
CONSTRUCTION ASSUMPTION:	Other

Existing	31 MLD
Future	45 MLD

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	14 MLD	$4,000,000	$56,000,000	$3.75M per MLD - existing rated capacity is 32 MLD, 45 MLD will support current buildout projection
Related Works (Electrical, MCC, Generators, etc)	30%					$16,800,000	
Additional Construction Costs	15%		ea.			$10,920,000	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$8,372,000	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$92,092,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$920,900	
Geotechnical Sub-Total Cost						**$920,900**	
Property Requirements	1.5%					$ 1,381,400	
Property Requirements Sub-Total						**$1,381,400**	
Consultant Engineering/Design	10%					$ 9,209,200	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$9,209,200**	
In House Labour/Engineering/Wages/CA	2.5%					$ 2,302,300	
In-house Labour/Wages Sub-Total						**$2,302,300**	
Project Contingency	15%					$15,886,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$15,886,000**	
Non-Refundable HST	1.76%					$2,103,000	
Non-Refundable HST Sub-Total						**$2,103,000**	
Total (2022 Dollars)						**$123,895,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$123,895,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$2,477,900		
Design	Design fees, Town fees for design, contract admin	13%	$16,106,350		
Construction	Town fees, base costs and project contingency	85%	$105,310,750		
TOTAL			**$123,895,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-TP-005**
PROJECT NAME: **Region-wide WWTP Process Upgrades**
PROJECT DESCRIPTION: Process upgrades to re-establish ECA capacity

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY NA

CLASS EA REQUIREMENTS:
CONSTRUCTION ASSUMPTION: Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$50,000,000**	Placeholder Costs
Chosen Estimate						**$50,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$1,000,000		
Design	Design fees, Town fees for design, contract admin	13%	$6,500,000		
Construction	Town fees, base costs and project contingency	85%	$42,500,000		
TOTAL			**$50,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-TP-005**
PROJECT NAME:	**Region-wide WWTP Process Upgrades**
PROJECT DESCRIPTION:	Upgrades for odour control across the Region at forcemains, pump stations, and other locations.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$40,000,000**	Placeholder Costs
Chosen Estimate						**$40,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$800,000		
Design	Design fees, Town fees for design, contract admin	13%	$5,200,000		
Construction	Town fees, base costs and project contingency	85%	$34,000,000		
TOTAL			**$40,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-ST-001**
PROJECT NAME:	**Region Wide Flow Monitoring and Data Collection**
PROJECT DESCRIPTION:	Funding to support flow monitoring and data collection initiatives

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-ST-001

PROPOSED CAPACITY	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction							
Additional Construction Costs	10%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ -	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$0**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	10%					$4,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$4,000**	
Non-Refundable HST	1.76%					$100	
Non-Refundable HST Sub-Total						**$100**	
Total (2022 Dollars)						**$44,000**	Rounded to nearest $1,000
Other Estimate						**$12,000,000**	Assumes 400k/year for 30 y
Chosen Estimate						**$12,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$240,000		
Design	Design fees, Town fees for design, contract admin	13%	$1,560,000		
Construction	Town fees, base costs and project contingency	85%	$10,200,000		
TOTAL			**$12,000,000**		

B

Regional Municipality of Niagara

Part B

PORT DALHOUSIE WASTEWATER SYSTEM

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B. PORT DALHOUSIE WASTEWATER TREATMENT PLANT

B.1. Existing System Overview

The Port Dalhousie wastewater system services the western part of both the City of St. Catharines and the City of Thorold. The wastewater system services an existing population of 79,444 and 41,792 employees. Note that this population and employment total is based on the Region's 2021 allocation of Traffic Area Zones planning data and has been processed through the allocation methodology presented in **Volume 2** to refine the data to include only serviced populations. As such, the population and employment total may not directly match the system totals using the Region's unprocessed planning data.

The system is serviced by the Port Dalhousie Wastewater Treatment Plant located at 40 Lighthouse Road, City of St. Catharines. Port Dalhousie Wastewater Treatment Plant is a conventional activated sludge facility with screening, grit removal, primary clarification, aeration, and secondary clarification, with a current rated capacity of 61.4 MLD, and a peak flow capacity of 100 MLD.

System flows are conveyed to the treatment plant via a network of local and Regionally owned sewer, and Regionally owned pump stations and forcemains.

Figure 4.B.1 presents an overview of the wastewater system, and **Figure 4.B.2** shows a schematic of the wastewater system.

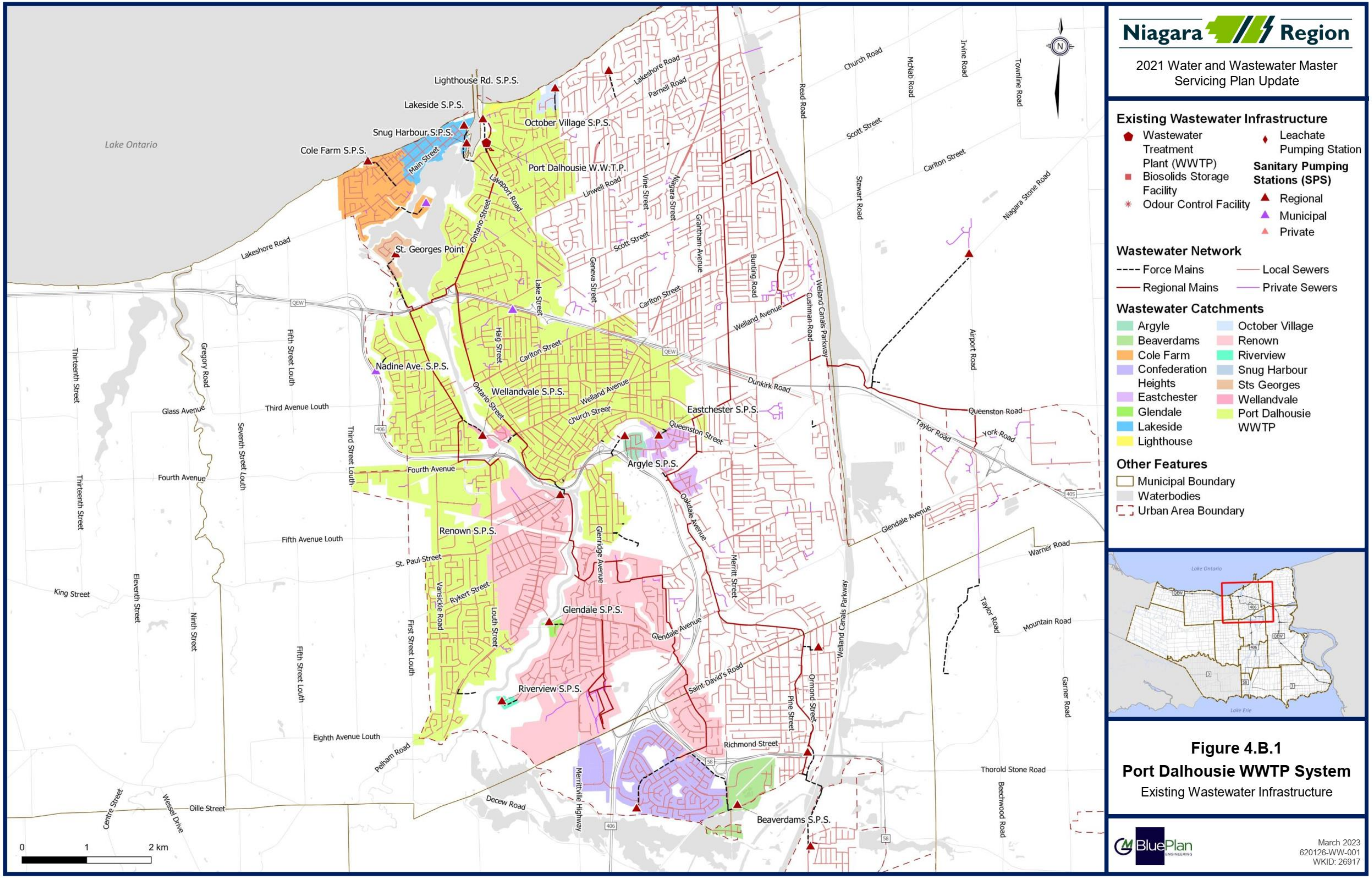
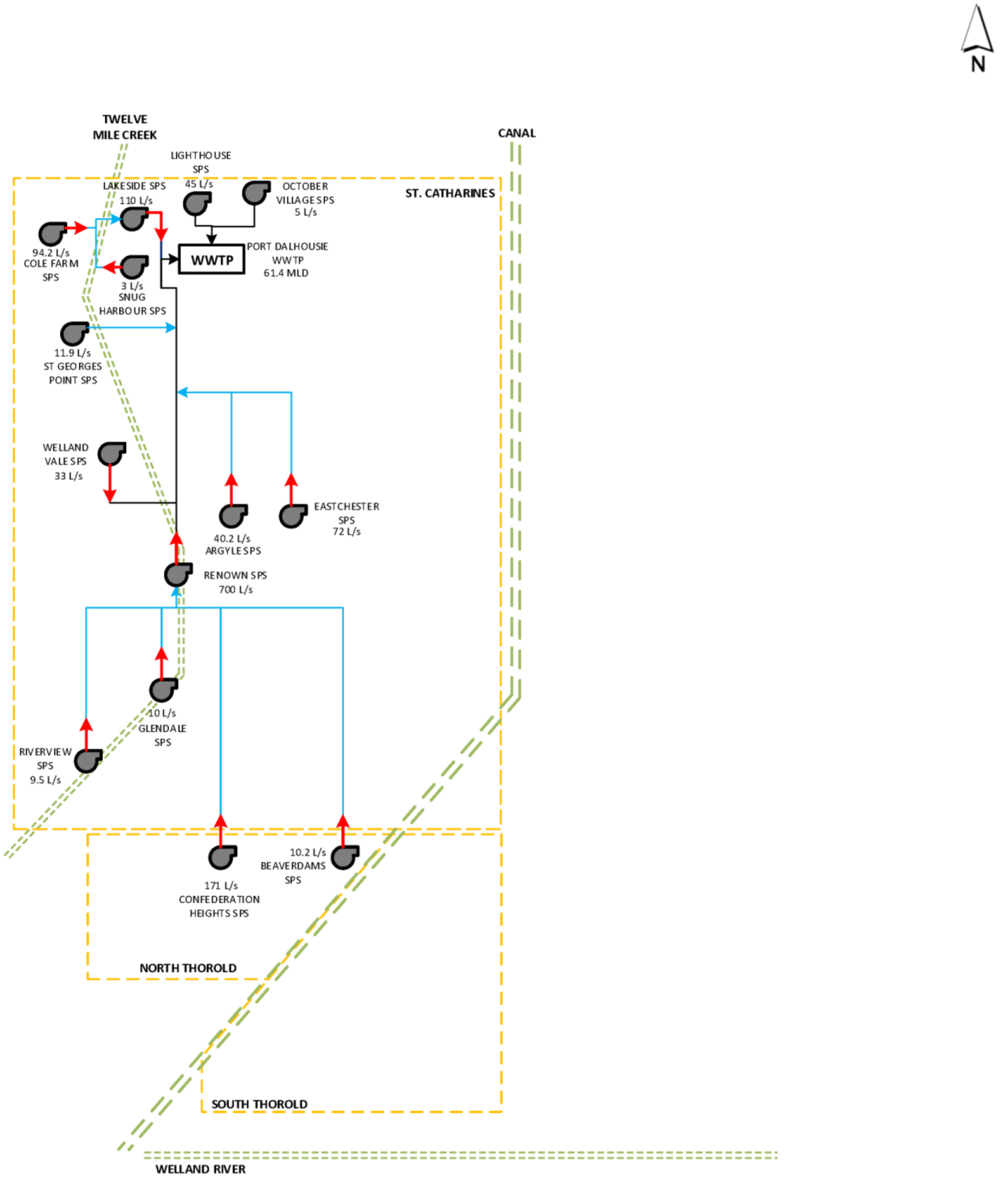


Figure 4.B.1
Port Dalhousie WWTP System
Existing Wastewater Infrastructure

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



WWTP RATED CAPACITY — Wastewater Treatment Plant

FIRM CAPACITY — Sewage Pumping Station

Forcemain

Connection from SPS to SPS

Connection from SPS to WWTP

Figure 4.B.2
Port Dalhousie WWTP
Existing Wastewater Infrastructure Schematic

GM BluePlan ENGINEERING

December 2022
621016-W-000
WKID: 26917

B.1.1. Facility Overview

Table 4.B.1 to **Table 4.B.2** present a summary of the environmental compliance approval (ECA) for the Port Dalhousie wastewater treatment plant (WWTP) usage, operation, and effluent concentration objectives.

Table 4.B.1 Wastewater Treatment Plant Overview

Plant Name	Port Dalhousie Wastewater Treatment Plant
ECA	8155-B8XS6U Issued June 19, 2019
Address	40 Lighthouse Road, St. Catharines
Discharge Water	Lake Ontario
Rated Capacity: Average Daily Flow	61.4 MLD
Rated Capacity: Peak Flow Rate (Dry Weather)	100 MLD
Rated Capacity: Peak Flow Rate (Wet Weather)	Not Available
Key Processes	• Conventional activated sludge treatment with screening • Grit removal • Primary Clarification • Aeration • Secondary clarification

Table 4.B.2 Wastewater Treatment Plant Effluent Objectives

Effluent Parameter	Objective Concentration
$CBOD_5$	15.0 mg/L
TSS	15.0 mg/L
Total Phosphorus	0.5 mg/L
E. Coli	200 organisms/100 mL
Total Chlorine Residual	0.5 mg/L

Table 4.B.3 lists each sewage pumping station's (SPS) ECA firm capacity as well as the station's existing operational firm capacity (the current operating capacity of the pumps station based on performance testing and/or supervisory control and data acquisition (SCADA) trending). As identified in Volume 4, the operational firm capacity was used as the basis of assessment for the 2021 MSPU. In some cases where the operational firm capacity was larger than the ECA firm capacity; the registered ECA capacity was used.

Table 4.B.3 Sewage Pumping Station and Forcemain Overview

Station Name	Location	Catchment Details		Pump Station Details			Forcemain Details		
		Area Exclusive of Upstream Catchments (ha)	Area Inclusive of Upstream Catchments (ha)	Number of Pumps	ECA Firm Capacity (L/s)	Operational Firm Capacity (L/s)	Single or Twinned Forcemain	Forcemain Diameter (mm)	Length (m)
└→Lakeside SPS	Lakeside Park, St. Catharines	47.7	153.0	3	120.0	110.0	Single	300	701
└→Cole Farm SPS	26 Colton Avenue, St. Catharines	104.4	104.4	3	111.0	94.2	Single	300	613
└→Snug Harbour SPS	Lakeport Road, St. Catharines	0.9	0.9	2	3.0	3.0	Single	100	58
└→Lighthouse Road SPS	Lot 20, Concession 1 Granthem, St. Catharines	2.7	2.7	2	28.1	45.0	Single	192	499
└→October Village SPS	October Drive, St. Catharines	11.8	11.8	2	9.4	5.0	Single	100	332
└→St. Georges Point SPS	St. George Subdivision, St. Catharines	18.1	18.1	2	10.2	11.9	Single	150	904
└→Wellandvale SPS	81 Welland Vale Road, St. Catharines	8.0	8.0	2	41.0	33.0	Single	200	506
└→Argyle SPS	Argyle Crescent, St. Catharines	12.5	12.5	3	45.0	40.2	Single	192	396
└→Eastchester SPS	2A Eastchester Avenue, St. Catharines	42.9	42.9	2	63.0	72.0	Single	200	218
└→Renown SPS	Renown Road, St. Catharines	741.9	1001.7	4	844.0	700.0	Single	750	343
└→Glendale SPS	Not Available St. Catharines	4.2	4.2	2	10.0	10.0	Single	100	250
└→Riverview SPS	Riverview Blvd, St. Catharines	4.4	4.4	2	9.5	9.5	Single	150	292
└→Confederation Heights SPS	Richmond Street, St. Catharines	194.0	194.0	2	174.2	171.0	Single	400	1,165
└→Beaverdams SPS	Beaverdams Road, Thorold	57.2	57.2	2	14.0	10.2	Single	150	1,404

B.2. Basis for Analysis

B.2.1. Flow Criteria, System Performance, and Sizing Methodology

The Niagara Region Traffic Area Zone planning data was used to estimate growth related flow generation within the wastewater system and to spatially allocate growth flows within each individual system. **Table 4.B.4** presents a summary of the flow criteria, performance, and sizing methodology that was utilized. Refer to **Volume 4 - Introduction** for additional information.

The Region's per capita wastewater flows criteria were updated based on a historic review of the previous 3-year period for local billing meter and flow monitoring records. Given that more granular data was available to complete this analysis compared to previous master plan updates, the population and employment per capita rates were differentiated. The data showed a slight reduction in the population criteria and slight increase in the employment criteria, which more closely reflect existing flow generation trends compared to the Region's previous per capita rate. Further detail regarding the per capita flow generation is presented in **Volume 4 – Introduction.**

The Region's extraneous flow allowance criteria was also reviewed against historic flow monitoring and pump station performance records where available. The review of historic wet weather flows found that typically 2-year design storm peak flows within existing built systems exceeded the Region's existing extraneous flow design allowance of 0.286 L/s/ha; however, that a 2-year design storm peak flow below 0.286 L/s/ha was achievable as demonstrated in multiple catchment areas. Based on the analysis and an industry review, for the purpose of future planning, the extraneous flow design allowance for existing areas was increased to 0.4 L/s/ha but was maintained at 0.286 L/s/ha for new greenfield development areas to better reflect the existing high wet weather flows, while minimizing the magnitude of system upgrades with wet weather flow management as a critical priority. In areas where available historic flow monitoring and modelling results identify existing peak 5 year design flows below the 0.4 L/s/ha criteria, the lower 5 year design flows should be utilized. Further details regarding the extraneous flow design allowance are presented in **Volume 4 – Introduction.**

Table 4.B.4 Flow Criteria, Scenarios, System Performance, and Sizing Methodology

	Component	Criteria	
Flow Criteria	Existing System Flows	Starting Point Methodology • Based on local billing meter records and flow monitoring data to establish existing dry and wet weather flows • Growth flows are added to the existing system baseline using design criteria	
	Flow Generation	Residential	255 L/c/d
		Employment	310 L/e/d
	Peaking Factor	Peak Dry Weather Flow	Harmon's Peaking Factor
	Extraneous Flow Design Allowance	• 0.4 L/s/ha for existing areas • 0.286 L/s/ha for new developments	
WWTP	System Performance and Triggers	• MECP Procedure F-5-1 • Trigger upgrade study at 80% capacity • Trigger upgrade construction at 90% capacity	
	Upgrade Sizing	• Average daily flow plus growth based on population design flows	

Pump Station	System Performance and Triggers Sizing	• Refer to **Section B.2.1.1.**
		• Two flow scenarios considered
		  • **Design Allowance**: Peak wet weather flow using the peaked dry weather flow plus the extraneous flow design allowance
		  • **5-Year Storm**: Modelled peak wet weather flow using the 5-year design storm
		• Peak flow capacity to meet design peak wet weather flow using the extraneous flow design allowance
		• Wet well and system storage considerations under 5-year storm to minimize basement flooding and overflow risks	

Forcemain	System Performance and Triggers	• Flag velocities less than 0.6 m/s • Flag velocities greater than 2 m/s • Upgrade when velocities exceed 2.5 m/s and considering condition and age	
	Upgrade Sizing	• Design velocity target between 1 m/s and 2 m/s • Forcemain twinning to increase capacity where feasible	
Trunk	System Performance and Triggers	• Design allowance peak wet weather flows, using the extraneous flow design allowance, to be managed within pipe • Freeboard (depth between hydraulic grade line and surface) greater than 1.8 m below surface in 5-year design storm	

	Component	Criteria
		- Flag pipes velocities less than 0.6 m/s - Flag pipes velocities greater than 3.0 m/s
	Upgrade Sizing	- Sized for full flow under post-2051 design peak wet weather flow - Assess 5-year design storm performance to minimize basement flooding risks and overflows

B.2.1.1. SPS Performance Evaluation and Upgrade Framework

Although it is the Region's design philosophy to size SPS inline with the Region's extraneous flow design allowance, the 2021 MSPU undertook a hybrid evaluation approach to acknowledge that SPS are a major contributor to local wastewater system performance and that many legacy system's exiting wet weather flows exceed the extraneous flow design allowance. The SPS hybrid performance evaluation and upgrade framework are summarized in **Table 4.B.5** and strives to balance the magnitude of capacity upgrades, potential cascading downstream upgrades, and managing the potential risk of local sewer surcharging and system overflows.

Under the hybrid performance evaluation and upgrade framework, the SPS capacity was sized to meet the lesser of peak wet weather flow (PWWF) using the extraneous flow design allowance, referred to as "Design Allowance PWWF" or the estimated 5-year storm PWWF. Further, consideration for the SPS actual performance under the estimated 5-year design storm peak wet weather flow was evaluated to determine if the available system storage including the wet well, storage tanks, and in system capacity was sufficient to manage excess flows while maintaining the system hydraulic grade line (HGL) below the basement flooding level of 1.8 m below grade and/or below the local overflow level.

In instances where the 5-year storm PWWF flow exceeded the available system storage, additional system solutions such as wet weather management, system storage, and/or additional SPS capacity upgrades were incorporated into the servicing solution. The most efficient solution to manage capacity and flow reduction was determined through the assessment of calculated flows from the 2051 design allowance PWWF and modelled 5-year storm PWWF against the operational firm capacity of the station and system storage.

Each SPS with a preferred solution of a capacity upgrade was individually reviewed in detail to determine how capacity upgrades should best be achieved:

- Pump replacement
- Pump upgrades
- Pump additions
- Station replacement
- Existing wet well sizing changes
- FM sizing and capacity.

Due to data quality and availability, a prioritization of upgrade needs, and flow monitoring (data collection) was assigned to each case for the Region implementation plan, discussed later in **Section 8**.

Table 4.B.5 SPS Assessment Framework

Case	2051 Design PWWF	2051 5 Year Storm PWWF	2051 5-Year Storm Storage Need	Preferred Solution	Upgrade Priority	Flow Monitoring Priority
Case 1	> Firm Capacity	> Firm Capacity	> Available Storage	Upgrade pumps to future design allowance flow with potential storage upgrades or wet weather management	High	Medium
Case 2	< Firm Capacity	> Firm Capacity	> Available Storage	Upgrade storage and/or wet weather management	High	High
Case 3	> Firm Capacity	> Firm Capacity	< Available Storage	Potential upgrade to design allowance flow and/or wet weather management	Medium	High
Case 4	< Firm Capacity	> Firm Capacity	< Available Storage	Potential wet weather management	Low	Medium
Case 5	> Firm Capacity	< Firm Capacity	< Available Storage	No upgrade, use actual peak flows	N/A	Low
Case 6	< Firm Capacity	< Firm Capacity	< Available Storage	No upgrade	N/A	Low

B.2.2. Growth Population Projections and Allocations

Table 4.B.6 outlines the existing and projected serviced population and employment by pumping station/WWTP catchment.

Table 4.B.6 Port Dalhousie Wastewater Treatment Plant Existing and Projected Serviced Population by Catchment

Catchment	Existing Population & Employment			2051 Population & Employment			Post 2051 Population & Employment			2021-2051 Growth		
	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population Growth	Employment Growth	Total Growth
Port Dalhousie WWTP	53,239	32,484	85,723	71,959	42,599	114,558	78,483	45,535	124,018	18,720	10,116	28,835
└→Lakeside SPS	1,073	246	1,319	1,633	297	1,930	1,702	309	2,011	560	51	611
| └→Cole Farm SPS	2,524	351	2,875	2,955	415	3,370	3,085	433	3,518	431	65	495
| └→Snug Harbour SPS	10	2	12	15	3	17	15	3	18	5	0	5
└→Lighthouse Road SPS	3	1	4	4	1	4	4	1	4	0	0	0
└→October Village SPS	244	50	294	258	58	316	268	60	328	14	7	21
└→St. Georges Point SPS	356	62	418	361	72	432	376	74	451	5	10	15
└→Wellandvale SPS	161	57	219	915	226	1,141	952	235	1,188	753	169	922
└→Argyle SPS	455	21	476	653	41	695	745	47	792	199	20	219
└→Eastchester SPS	1,522	146	1,668	2,054	375	2,428	2,359	419	2,778	531	229	760
└→Renown SPS	13,707	5,458	19,164	15,898	6,761	22,659	17,515	8,281	25,796	2,192	1,303	3,495
└→Glendale SPS	24	2	26	25	3	28	26	3	29	1	1	2
└→Riverview SPS	61	5	66	66	6	73	69	6	76	5	1	7
└→Confederation Heights SPS	5,512	2,591	8,104	8,902	3,550	12,452	9,845	4,638	14,483	3,390	958	4,348
└→Beaverdams SPS	553	317	870	1,607	878	2,485	2,216	1,167	3,383	1,054	560	1,614
TOTAL	**79,444**	**41,792**	**121,237**	**107,304**	**55,283**	**162,588**	**117,663**	**61,211**	**178,873**	**27,860**	**13,491**	**41,351**

Note: Population numbers may not sum due to rounding.

B.3. System Performance

B.3.1. Wastewater Treatment Plant

The starting point flow for the Port Dalhousie WWTP was calculated using historic SCADA flow data. Ten years of data (2011 to 2020) was reviewed to provide historical context and assess overall long-term trends; however, the most recent five years of data was used to determine the average daily flow. **Table 4.B.7** shows the historical system flows obtained from wastewater treatment plant production data.

Table 4.B.7 Historic Port Dalhousie Wastewater Treatment Plant Flows

Year	Average Daily Flow		Peak Daily Flow	
	(MLD)	(L/s)	(MLD)	(L/s)
2011	38.4	444.9	134.2	1,553.7
2012	32.0	370.2	118.7	1,374.2
2013	37.7	436.4	146.0	1,690.2
2014	34.8	403.1	124.0	1,434.9
2015	30.6	353.9	98.1	1,135.5
5 Year Average	*34.7*	*401.7*	*124.2*	*1,437.7*
5 Year Peak	*38.4*	*444.9*	*146.0*	*1,690.2*
2016	29.9	345.9	86.1	996.9
2017	34.8	403.0	122.4	1,416.3
2018	35.1	406.2	163.0	1,886.8
2019	36.7	424.5	120.1	1,389.6
2020	34.1	394.8	113.7	1,316.2
5-Year Average	**34.1**	**394.9**	**121.1**	**1,401.1**
5-Year Peak	**36.7**	**424.5**	**163.0**	**1,886.8**
10-Year Average	**34.4**	**398.3**	**122.6**	**1,419.4**
10-Year Peak	**38.4**	**444.9**	**163.0**	**1,886.8**

The 10-year trend analysis showed that flows to the Port Dalhousie WWTP continue to reflect high flows in wetter years. The 5-year average flow has not increased significantly from the 2016 MSP starting point.

The starting point flow used for the Port Dalhousie WWTP was 34.1 MLD.

Figure 4.B.3 shows the projected future flows at the Port Dalhousie WWTP. The plant has surplus capacity and will not reach 80% capacity within the 2051-time horizon. The post-2051 flows are expected to exceed the 80% capacity, at which time a potential upgrade study may be triggered.

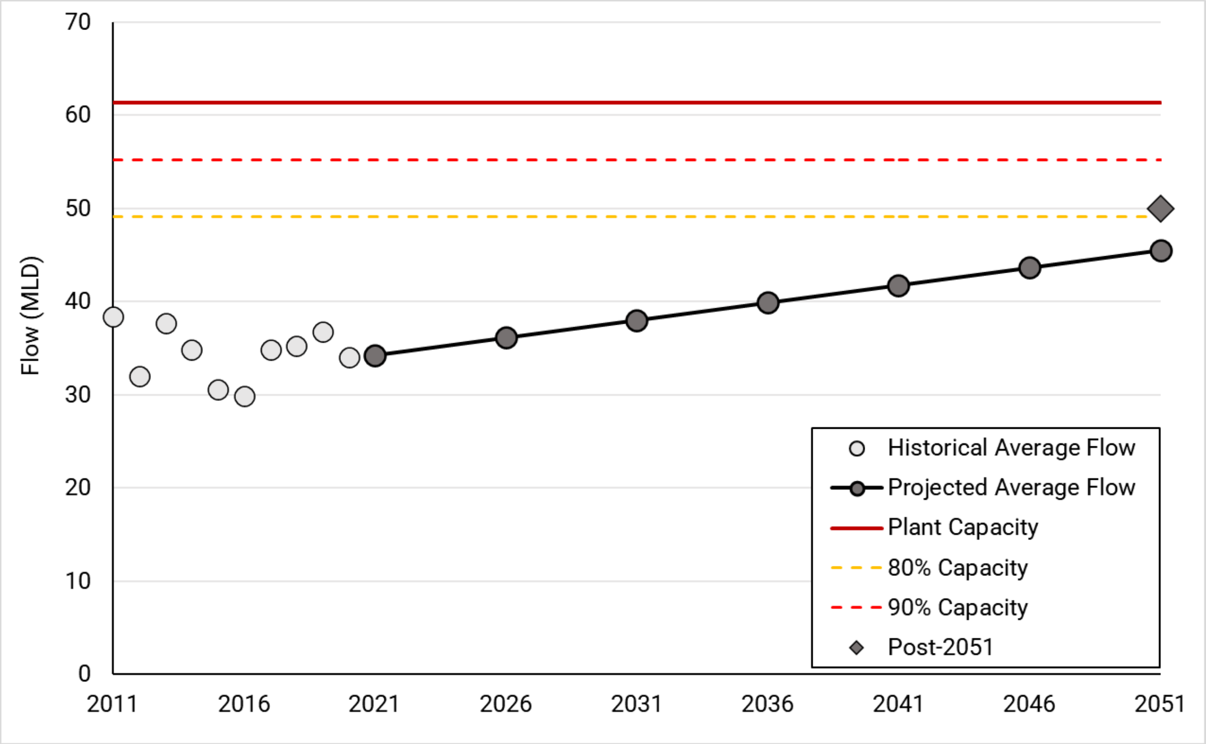


Figure 4.B.3 Projected Sewage Generation at Port Dalhousie Wastewater Treatment Plant

B.3.2. Sewage Pumping Station

Table 4.B.8 highlights the sewage pumping station operational firm capacities and the existing and projected flows. The existing average and peak dry weather flows were estimated using the wastewater system model, which was updated using the best available billing, flow monitoring, and SCADA data from 2018 to 2020.

Table 4.B.8 System Sewage Pumping Station Performance

Sewage Pumping System	Station Capacity	2021 Flows				2051 Flows			Post-2051 Flows		
	Operational Firm Capacity	Average Dry Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow
	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)
└→Lakeside SPS	**110.0**	19.5	26.1	87.3	275.3	38.8	100.0	288.0	41.2	102.4	290.4
└→Cole Farm SPS	**94.2**	9.6	14.0	55.8	62.5	20.0	61.7	68.4	21.6	63.4	70.1
└→Snug Harbour SPS	**3.0**	0.0	0.1	0.4	0.1	0.1	0.5	0.1	0.2	0.5	0.2
└→Lighthouse Road SPS	**45.0**	0.0	0.0	1.1	0.6	0.0	1.1	0.6	0.0	1.1	0.6
└→October Village SPS	**5.0**	0.6	0.6	5.3	3.4	0.9	5.6	3.7	1.0	5.7	3.9
└→St. Georges Point SPS	**11.9**	1.3	1.8	9.0	13.4	2.0	9.3	13.6	2.2	9.5	13.8
└→Wellandvale SPS	**33.0**	3.6	3.9	7.1	25.4	14.7	17.9	36.2	15.2	18.5	36.7
└→Argyle SPS	**40.2**	1.0	1.2	6.2	65.8	4.0	9.0	68.5	5.1	10.1	69.6
└→Eastchester SPS	**72.0**	5.7	7.8	25.0	143.6	17.1	34.3	152.9	20.8	38.0	156.6
└→Renown SPS	**700.0**	85.5	115.4	516.0	926.6	203.9	617.2	1,027.8	252.1	666.0	1,076.5
└→Glendale SPS	**10.0**	0.0	0.1	1.7	4.8	0.1	1.8	4.8	0.1	1.8	4.8
└→Riverview SPS	**9.5**	0.0	0.1	1.8	1.5	0.1	1.9	1.6	0.2	1.9	1.6
└→Confederation Heights SPS	**171.0**	19.8	26.3	103.9	95.5	70.6	154.7	146.3	89.6	174.2	165.9
└→Beaverdams SPS	**10.2**	2.1	2.5	25.4	17.3	21.2	44.2	36.2	30.4	53.4	45.4

The following SPS have existing and future deficiencies under both design allowance PWWF and 5-year storm, requiring upgrades to support existing and future flows.

- Beaverdams SPS

The following SPS have sufficient capacity to support 2051 flows using the design allowance PWWF, however, the projected 5-year storm PWWF exceeds the operational firm capacity as such potential system or facility upgrades may be required.

- Lakeside SPS
- St Georges Point SPS
- Wellandvale SPS
- Argyle SPS
- Eastchester SPS
- Renown SPS

The following SPS have existing and future deficiencies under the design allowance PWWF; however, the existing and projected 5-year storm PWWF is withing the station's capacity, as such, the stations capacity is sufficient to support future flows.

- October Village SPS
- Cole Farm SPS

The following SPS have surplus capacity to support future flows.

- Snug Harbour SPS
- Lighthouse Road SPS
- Glendale SPS
- Riverview SPS
- Confederation Heights SPS

B.3.3. Forcemain

Table 4.B.9 highlights the existing and projected forcemain performance. Velocities less than 0.6 m/s were flagged in yellow and velocities exceeding 2.5 m/s were flagged in red. Note, if a pumping deficit was identified in **Table 4.B.8**, then projected forcemain velocities were based on the higher of the station's ECA firm capacity or the governing peak wet weather flow scenario, otherwise if no pumping deficit was identified, the operational firm capacity was used for future capacity assessment.

Table 4.B.9 Forcemain Performance

Station Name	Forcemain Diameter (mm)	Operational Firm Capacity		2051		Post-2051	
		Pumped Flow (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)
└→Lakeside SPS	**300**	110.0	1.6	110.0[1]	1.6	110.0[1]	1.6
|— └→Cole Farm SPS	**300**	94.2	1.3	94.2[1]	1.3	94.2[1]	1.3
|— └→Snug Harbour SPS	**100**	3.0	0.4	3.0[1]	0.4	3.0[1]	0.4
└→Lighthouse Road SPS	**192**	45.0	1.6	45.0[1]	1.6	45.0[1]	1.6
└→October Village SPS	**100**	5.0	0.6	5.0[1]	0.6	5.0[1]	0.6
└→St. Georges Point SPS	**150**	11.9	0.7	11.9[1]	0.7	11.9[1]	0.7
└→Wellandvale SPS	**200**	33.0	1.0	33.0[1]	1.1	33.0[1]	1.1
└→Argyle SPS	**192**	40.2	1.4	40.2[1]	1.4	40.2[1]	1.4
└→Eastchester SPS	**200**	72.0	2.3	72.0[1]	2.3	72.0[1]	2.3
└→Renown SPS	**750**	700.0	1.6	700.0[1]	1.6	700.0[1]	1.6
└→Glendale SPS	**100**	10.0	1.3	10.0[1]	1.3	10.0[1]	1.3
└→Riverview SPS	**150**	9.5	0.5	9.5[1]	0.5	9.5[1]	0.5
└→Confederation Heights SPS	**400**	171.0	1.4	171.0[1]	1.4	171.0[1]	1.4
└→Beaverdams SPS	**150**	10.2	0.6	36.2[3]	2.0	45.4[3]	2.6

[1] Operational firm capacity

[2] ECA capacity

[3] Minimum of future design allowance PWWF or 5-year storm PWWF

The existing Snug Harbour and Riverview SPS were flagged for low velocities in the existing operating regime.

Beaverdams SPS forcemain had a projected forcemain capacity deficit in the post-2051 growth scenario.

B.3.4. Trunk Sewer

Figure 4.B.4 and **Figure 4.B.5** highlight the trunk performance in the existing and 2051 projected design allowance peak wet weather flow scenarios, respectively.

- There are no Region trunk sewers with existing or future pipe capacity deficits from the design allowance peak wet weather flows.
- Beaverdams SPS shows surcharging in the Region inlet and local sewers from the future design allowance peak wet weather flows and the 5-year storm. This is the result of limited capacity at the Beaverdams SPS, not sewer capacity.
- Note that the Port Dalhousie WWTP-Port Weller WWTP systems have over 100 combined sewer overflows (CSO), that help regulate the hydraulic grade line (HGL) within the trunk system to reduce basement flooding risks.
- There are some sewers surcharging above the basement flooding freeboard from the existing and future 5-year storm peak wet weather flows.
    - Renown SPS shows surcharging in Region trunks and local sewers due to SPS capacity and high wet weather inflows in the existing and future scenarios.
    - Some local sewers in the Lakeside SPS catchment.

B.3.5. Overflows

Under the design allowance peak flows no overflows are anticipated; however, many of the CSOs become active from 5-year storm peak wet weather flows; however, many of which become active from 5-year storm peak wet weather flows. The adverse risks of wet weather inflows are currently partially managed through CSOs; however, the Region and local area municipalities (LAM) are working together to reduce wet weather inflows to the system to reduce system overflows.

Detailed assessment of system CSO will be addressed jointly by the Region and LAM through future Pollution Prevention Control Plan Studies; which will outlines the proposed wet weather flow management approach to manage CSO volumes.

Niagara Region

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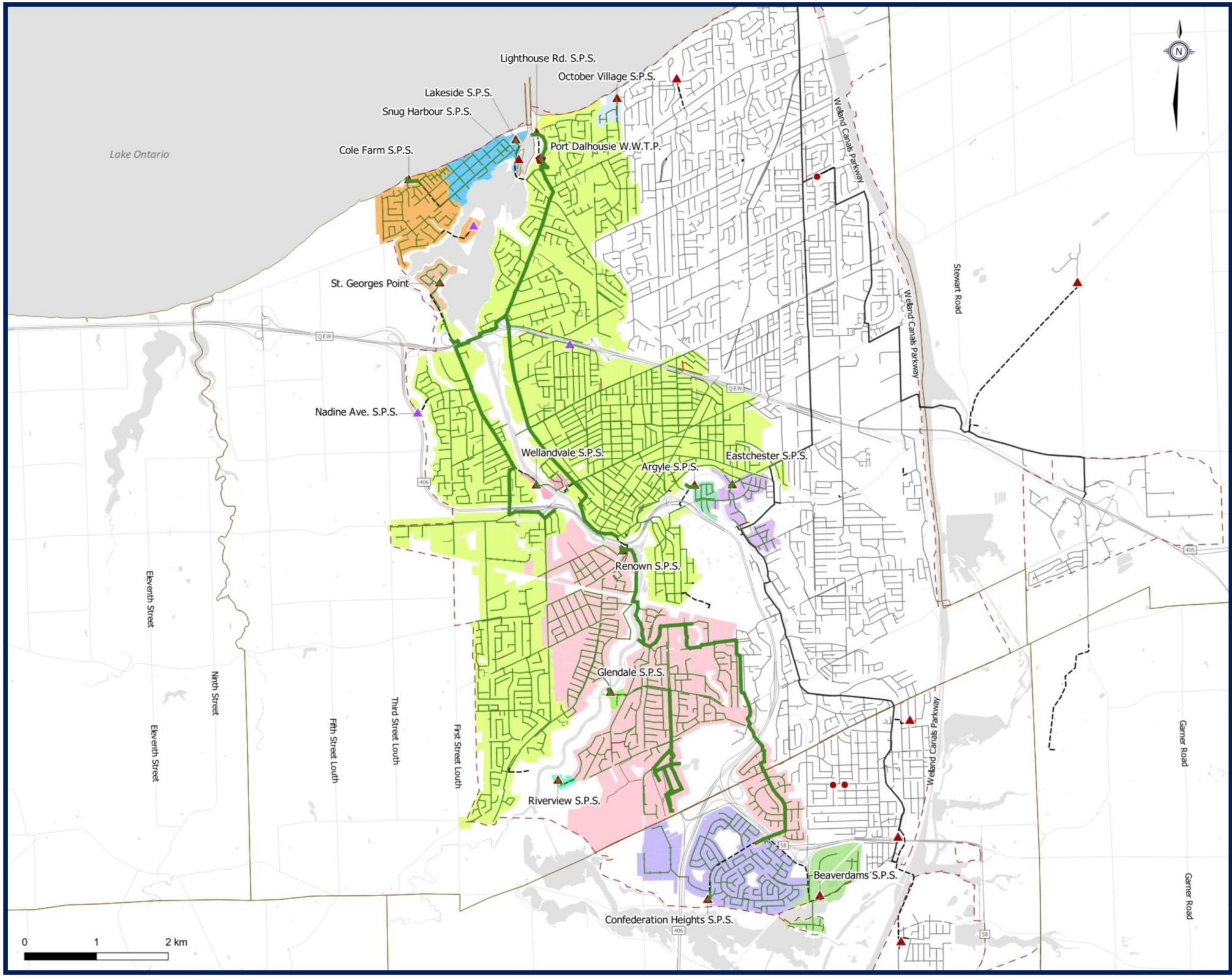

Figure 4.B.4

Existing Design

Peak Wet Weather Flows

Port Dalhousie WWTP

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Projection EPSG: 26917

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

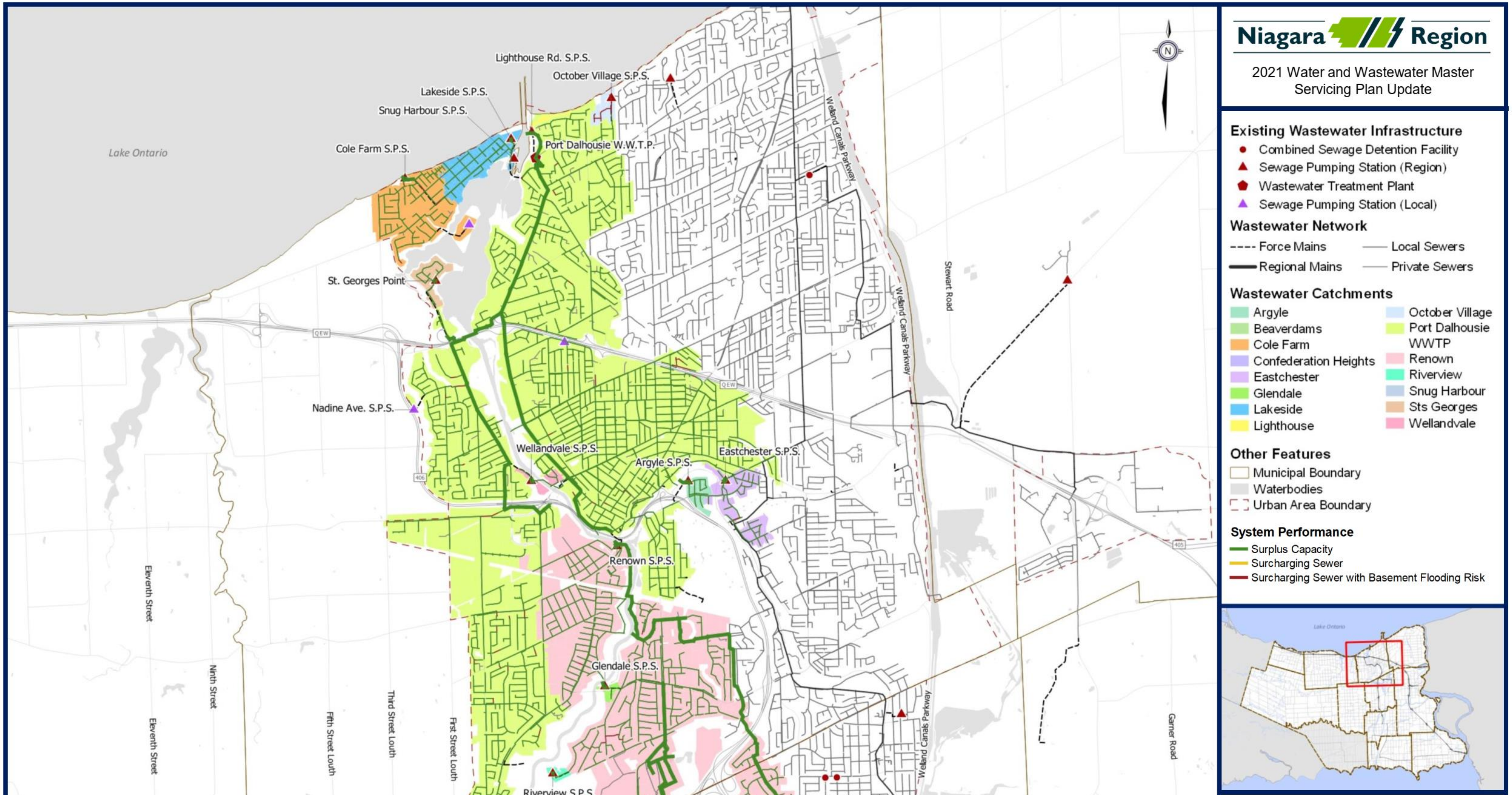

Figure 4.B.5

2051 Design

Peak Wet Weather Flows

Port Dalhousie WWTP

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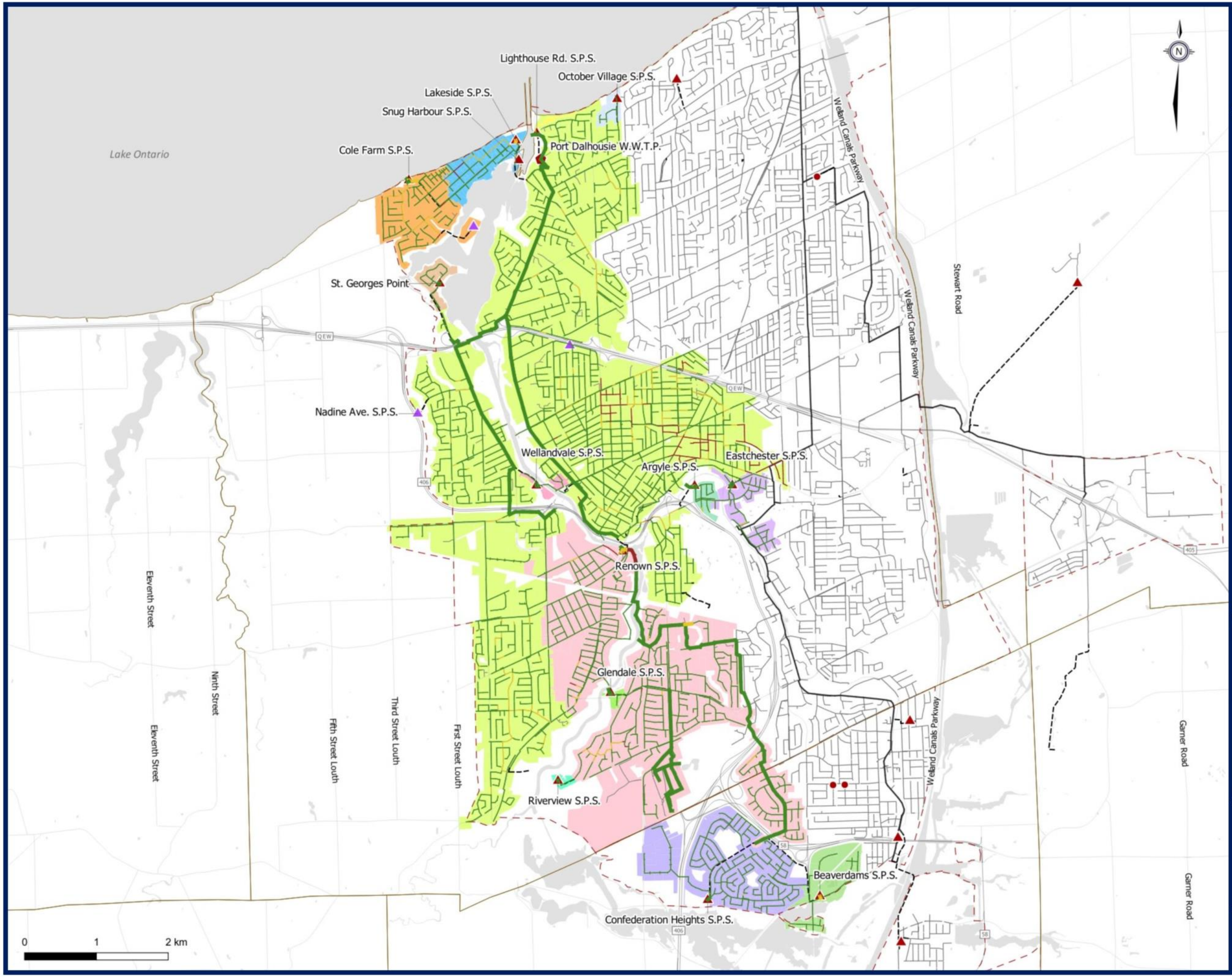

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

Existing Wastewater Infrastructure

- ● Combined Sewage Detention Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Local)

Wastewater Network

- - - - Force Mains
- —— Local Sewers
- ━━ Regional Mains
- —— Private Sewers

Wastewater Catchments

- 🟩 Argyle
- 🟩 Beaverdams
- 🟧 Cole Farm
- 🟪 Confederation Heights
- 🟪 Eastchester
- 🟩 Glendale
- 🟦 Lakeside
- 🟨 Lighthouse
- 🟦 October Village
- 🟩 Port Dalhousie WWTP
- 🟥 Renown
- 🟩 Riverview
- 🟦 Snug Harbour
- 🟧 Sts Georges
- 🟥 Wellandvale

Other Features

- ☐ Municipal Boundary
- ■ Waterbodies
- ☐ Urban Area Boundary

System Performance

- ━ Surplus Capacity
- ━ Surcharging Sewer
- ━ Surcharging Sewer with Basement Flooding Risk

Figure 4.B.6

Existing 5-Year Storm Peak Wet Weather Flows

Port Dalhousie WWTP

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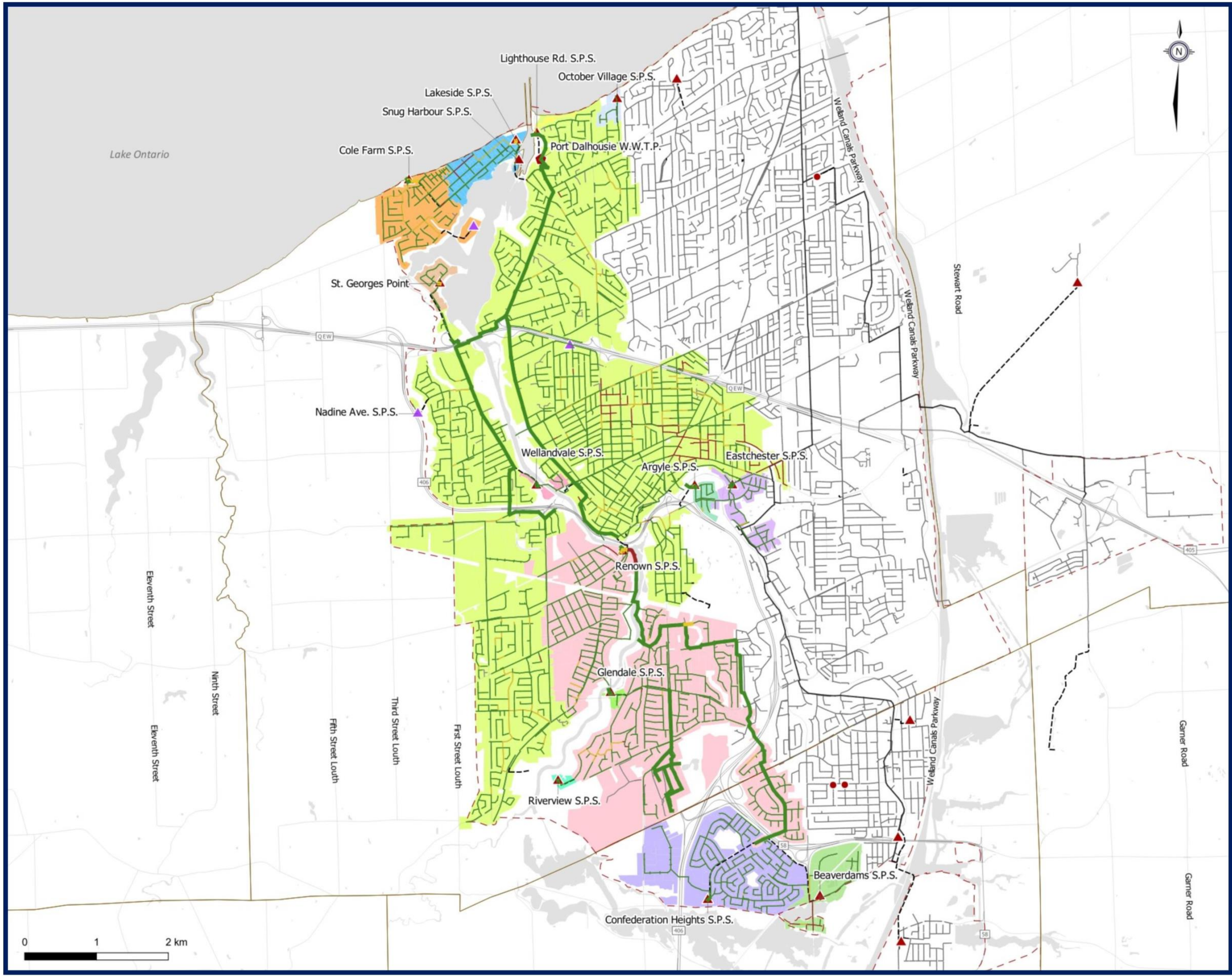
2021 Water and Wastewater Master Servicing Plan Update



Existing Wastewater Infrastructure

- ● Combined Sewage Detention Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Local)

Wastewater Network

- ---- Force Mains
- —— Regional Mains
- —— Local Sewers
- —— Private Sewers

Wastewater Catchments

- 🟩 Argyle
- 🟩 Beaverdams
- 🟧 Cole Farm
- 🟪 Confederation Heights
- 🟪 Eastchester
- 🟩 Glendale
- 🟦 Lakeside
- 🟨 Lighthouse
- 🟦 October Village
- 🟩 Port Dalhousie WWTP
- 🟥 Renown
- 🟩 Riverview
- 🟦 Snug Harbour
- 🟧 Sts Georges
- 🟥 Wellandvale

Other Features

- ☐ Municipal Boundary
- ⬜ Waterbodies
- ⬚ Urban Area Boundary

System Performance

- — Surplus Capacity
- — Surcharging Sewer
- — Surcharging Sewer with Basement Flooding Risk

Lake Ontario

Figure 4.B.7

2051 5-year Storm Peak Wet Weather Flows

Port Dalhousie WWTP

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May 2023
620126
Projection EPSG: 26917

B.4. System Opportunities and Constraints

Figure 4.B.8 highlights the existing opportunities and constraints.

B.4.1. Port Dalhousie Wastewater Treatment Plant

- The current rated average daily flow capacity of the plant is 61.4 MLD, with an existing flow of 34.1 MLD and a projected 2051 average daily flow of 45.5 MLD, which is below 80% of the wastewater treatment plant rated capacity. As such, the wastewater treatment plant has surplus capacity to accommodate growth beyond 2051.

B.4.2. St. Catharines

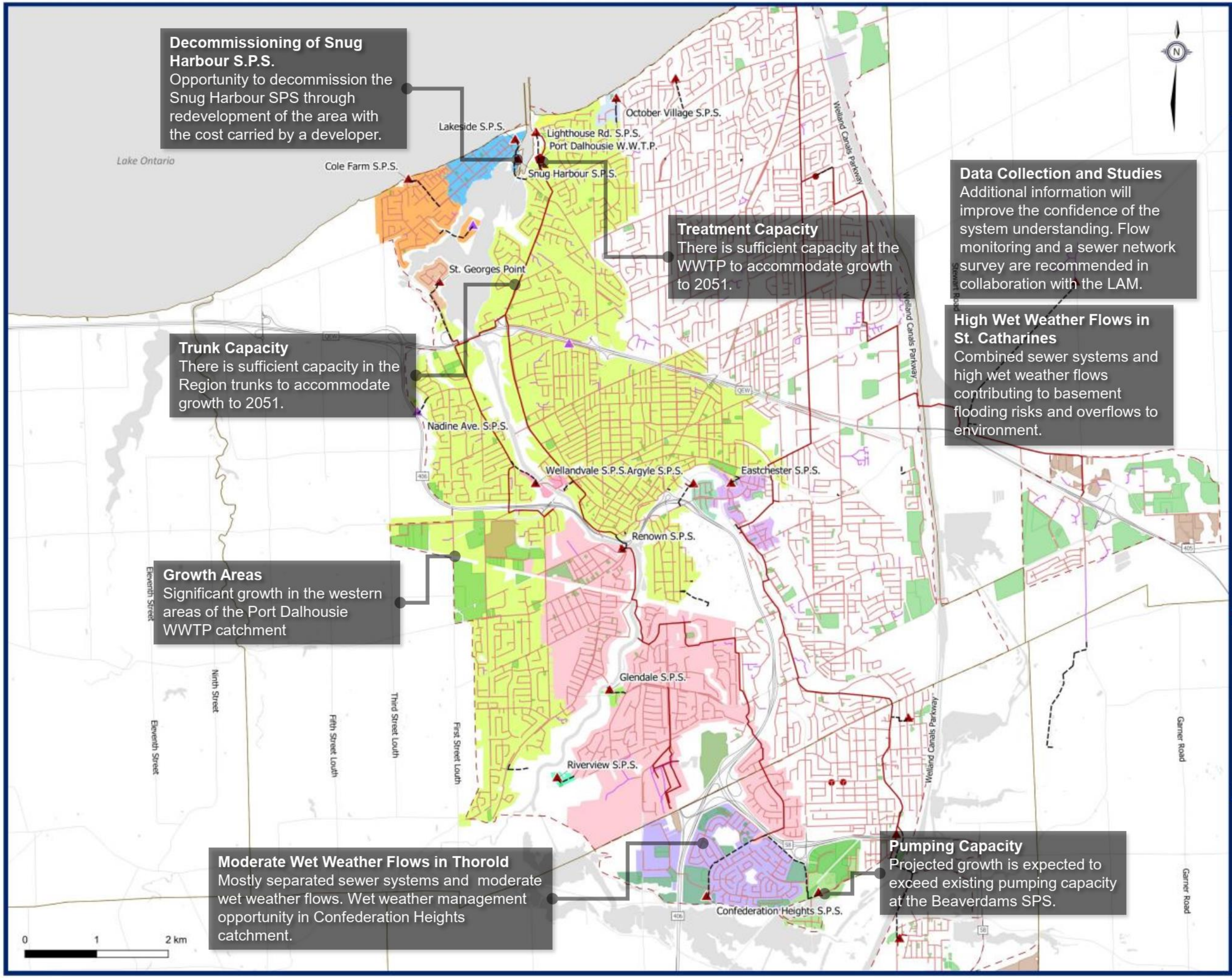
- Most of the system drains via gravity directly to the wastewater treatment plant.
- Residential and employment growth primarily consists of intensification in existing combined sewer areas.
- Significant combined sewer areas resulting in high wet weather flows and system overflows, which will need to be managed to allow for growth.
- Existing trunk infrastructure, sewers, and pumping stations have sufficient capacity to support design allowance peak wet weather flows.
- There is an opportunity to decommission the Snug Harbour SPS through redevelopment of the area with the cost carried by a developer. As such, the decommissioning of the Snug Harbour SPS would not be included in the capital program.

B.4.3. Thorold

- Most of the system consists of separated sewers with moderate wet weather flows.
- Growth is expected to trigger a capacity deficit at the Beaverdams SPS and forcemain.

B.4.4. System Optimization Opportunities

- Significant opportunity to provide capacity for growth through implementation of wet weather flow management within the St. Catharines system.
- The transfer of flow between the Port Dalhousie and Port Weller systems is not well understood. Enhanced data collection through flow monitoring and invert elevation surveys of key points would be required to improve the system understanding.
- Additional flow monitoring and system data collection, in partnership with LAM, is needed to improve system understanding, support proposed wet weather flow reductions, and identify opportunities for system optimization and overflow removals.



Decommissioning of Snug Harbour S.P.S.
Opportunity to decommission the Snug Harbour SPS through redevelopment of the area with the cost carried by a developer.

Treatment Capacity
There is sufficient capacity at the WWTP to accommodate growth to 2051.

Data Collection and Studies
Additional information will improve the confidence of the system understanding. Flow monitoring and a sewer network survey are recommended in collaboration with the LAM.

High Wet Weather Flows in St. Catharines
Combined sewer systems and high wet weather flows contributing to basement flooding risks and overflows to environment.

Trunk Capacity
There is sufficient capacity in the Region trunks to accommodate growth to 2051.

Growth Areas
Significant growth in the western areas of the Port Dalhousie WWTP catchment

Moderate Wet Weather Flows in Thorold
Mostly separated sewer systems and moderate wet weather flows. Wet weather management opportunity in Confederation Heights catchment.

Pumping Capacity
Projected growth is expected to exceed existing pumping capacity at the Beaverdams SPS.

Niagara Region

2021 Water and Wastewater
Master Servicing Plan Update

Existing Wastewater Infrastructure

- ⬟ Wastewater Treatment Plant (W.W.T.P.)
- ▲ Sewage Pumping Station (S.P.S.)
- ● Combined Sewage Detention Facility
- ■ Biosolids Storage Facility
- ● Odour Control Facility

Wastewater Network

- ---- Force Mains
- —— Regional Mains
- —— Local Sewers
- —— Private Sewers

Wastewater Catchments

- 🟩 Argyle
- 🟩 Beaverdams
- 🟧 Cole Farm
- 🟪 Confederation Heights
- 🟪 Eastchester
- 🟩 Glendale
- 🟦 Lakeside
- 🟨 Lighthouse
- 🟦 October Village
- 🟥 Renown
- 🟩 Riverview
- 🟦 Snug Harbour
- 🟫 St Georges
- 🟥 Wellandvale
- 🟨 Port Dalhousie WWTP

Other Features

- ☐ Municipal Boundary
- 🟦 Waterbodies
- ☐ Urban Area Boundary

Development Locations

- 🟩 Pre-2051
- 🟫 Post-2051

Figure 4.B.8

Port Dalhousie WWTP

Opportunities and Constraints

BluePlan

November, 2022
620126-WW-003
Projection EPSG:26917

B.5. Assessment of Alternatives

Generally, the previously recommended strategies from the 2016 MSP program were carried forward which included capacity upgrades at Beaverdams SPS and forcemain, and wet weather management strategies in key areas.

While the strategies remained the same, the following details including alignment, sizing, or wet weather areas have been updated to reflect the latest system understanding and reflect updated criteria changed through this iteration of the 2021 MSPU.

- Providing capacity within Region-owned pumping stations and trunk sewers to convey peak wet weather flows up to the lesser of the 5-year design storm or extraneous flow design allowance criteria of 0.4 L/s/ha for existing areas and 0.286 L/s/ha for growth areas, needs to be verified based on the updated flow criteria and actual flows.
- Provide upstream flow management to address high peak flows in the system where peak wet weather flows exceed the extraneous flow design allowance criteria of 0.4 L/s/ha resulting in basement flooding and overflow risks. Upstream flow management can include but is not limited to these options, in the preferred order of implementation:
    - Inflow and infiltration reduction in public right of way
    - Inflow and infiltration reduction from private properties
    - Enhanced system storage
    - Peak flow control using system controls or engineered solutions
- As shown in Section B.3.2, pump station capacity assessments were completed by reviewing the projected design allowance peak flows and 5-year storm flows against the operational firm capacity of each station.
    - Where the peak storm flows were less than design flows and the operational firm capacity of the station, the storm flows were used as actual flows, and therefore would not have triggered an upgrade.
    - Where the projected peak design allowance flows and 5-year storm flows exceeded the operational firm capacity of the station, a pump upgrade was recommended. Additional storage considerations and wet weather management were also considered.

To address existing and growth-related capacity needs, the following servicing concepts were evaluated:

- Do nothing
- Station capacity upgrade for pumping or storage
- Wet weather management
- Hybrid solution

B.6. Preferred Servicing Strategy

The following is a summary of the Port Dalhousie WWTP system as recommended through the 2016 Master Servicing Plan Update and carried forward through this update:

- While infrastructure capacity upgrades were considered, the recommended solution for the Port Dalhousie Wastewater Treatment Plant system is to provide wet weather management across the system. This will require Regional solutions as well as local municipality solutions.
- An upgrade at the Beaverdams SPS and forcemain was identified to support growth in the area.
- With the implementation of the wet weather program, the Port Dalhousie Wastewater Treatment Plant will have sufficient capacity to meet growth to year 2051.

Figure 4.B.10 and **Figure 4.B.11** show the preferred servicing strategy, consisting of:

B.6.1. Treatment Plant Works

- No capacity upgrades are required.

The Region has several Region-wide programs focused on maintaining and enhancing the treatment capacity at the Region’s existing WWTP. The programs applicable to the Port Dalhousie WWTP include:

- WWTP Process Upgrades (WW-TP-005) which funds projects to improve treatment processes to re-establish the ECA capacity at plants.

B.6.2. Pumping Stations

- Increase Beaverdams SPS capacity from 10 L/s to 40 L/s.

Further to the pump station upgrades, the Region-wide allowance to address odour control needs that are the result of growth-related system upgrades has been included.

- WWTP Process Upgrades (WW-TP-006) which funds in-system and plant upgrades to control odour.

B.6.3. Forcemains

- Upgrade existing 150 mm Beaverdams SPS forcemain to 200 mm.

B.6.4. Trunk Sewers

- No trunk sewer upgrades are recommended in the Port Dalhousie system.

B.6.5. Decommissioning of Existing Facilities

- Decommission the Snug Harbour SPS through redevelopment of the area with the cost carried by a developer. Cost for decommissioning not included in the capital program or shown on the map.

B.6.6. Wet Weather Flow Management Program

A significant element of the Niagara Region wastewater servicing strategy is the wet weather management program. The program is intended to address existing capacity constraints, and to provide for growth-related capacity without expanding/upgrading existing trunk infrastructure, or by minimizing the required expansion/upgrades.

The wet weather management program currently identifies overall preliminary priority, staging of location and target amount of inflow and infiltration reduction across all systems. This program provides for a proactive and targeted approach to addressing wet weather impacts. These wet weather management programs will need to be a joint initiative between the Region and local municipalities.

For the Port Dalhousie system, the following priority areas are identified:

- St. Catharines
    - Lakeside SPS catchment
    - St. Georges Point SPS catchment
    - Wellandvale SPS catchment
    - Argyle SPS catchment
    - Eastchester SPS catchment
    - Renown SPS catchment
    - Port Dalhousie WWTP catchment
- Thorold
    - Confederation Heights SPS catchment.

B.6.7. Additional Studies and Investigations

Flow Monitoring Program: Additional flow monitoring data collection will improve the confidence of the system performance results from the model. Best practices for improving understanding of wastewater systems include:

- Monitoring upstream from pump stations to capture peak wet weather flows
- Increasing the density of monitoring in catchments identified for wet weather flow management, where the flows from the 5-year design storm exceed the design flows.

Sewer Network Survey: Consideration for the LAM to complete sewer invert elevation surveys of key points where the Port Dalhousie and Port Weller systems connect.

B.6.8. Future System Performance

Figure 4.B.9 presents the future system performance, based on the preferred servicing strategy configuration and capacities; but excludes the potential benefits of the local wet weather flow management program.

Niagara Region

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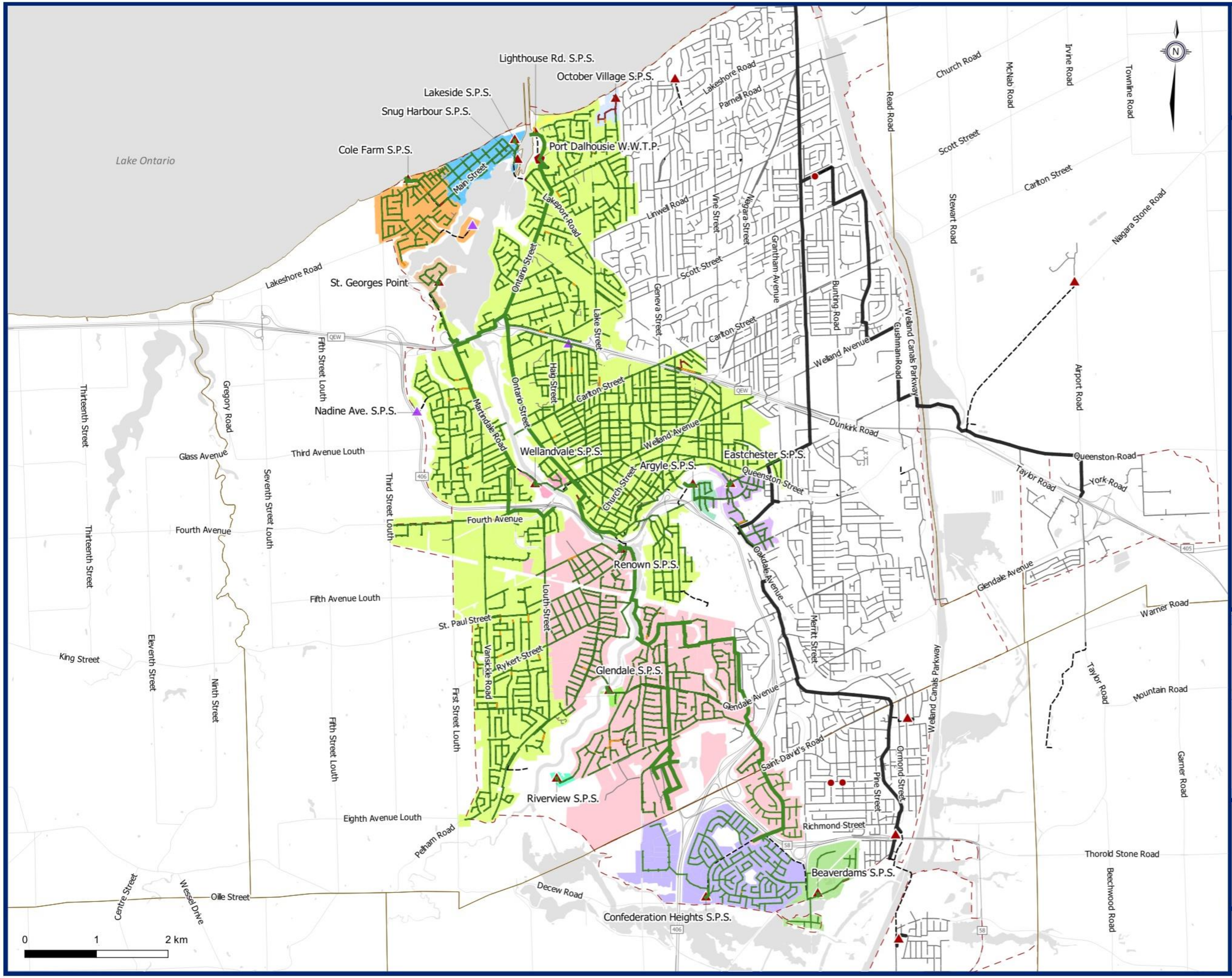

Figure 4.B.9

Future Capital Program Peak Wet Weather Flow

Port Dalhousie WWTP

BluePlan

May, 2023
620126
Projection EPSG:26917

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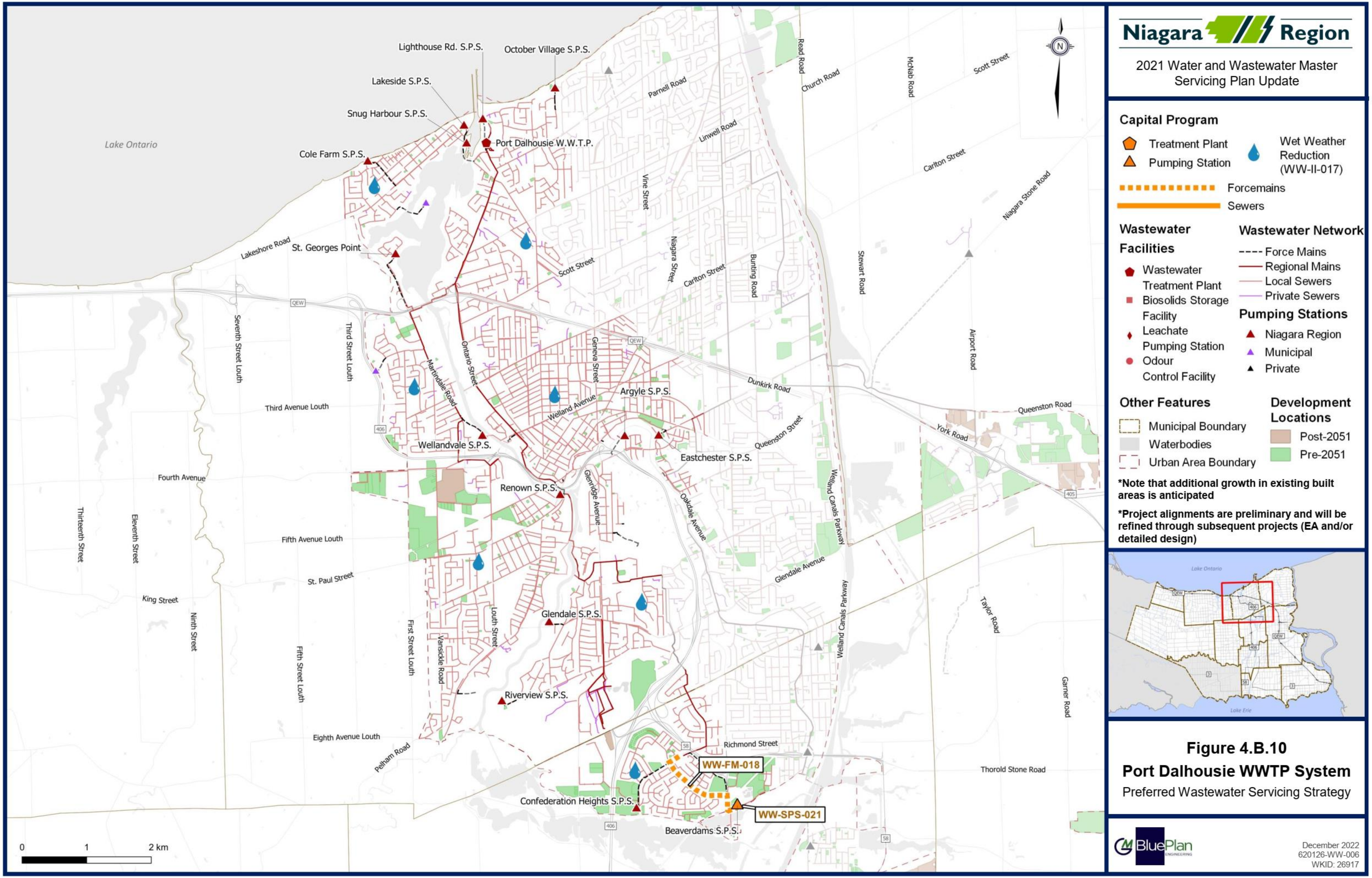
B.7. Capital Program

Figure 4.B.10 and **Figure 4.B.11** present the preferred servicing strategy map and schematic.

Table 4.B.10 summarizes the recommended project costing timing and Class EA requirements. Individual detailed costing sheets are presented in **Section B.8.6.**

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



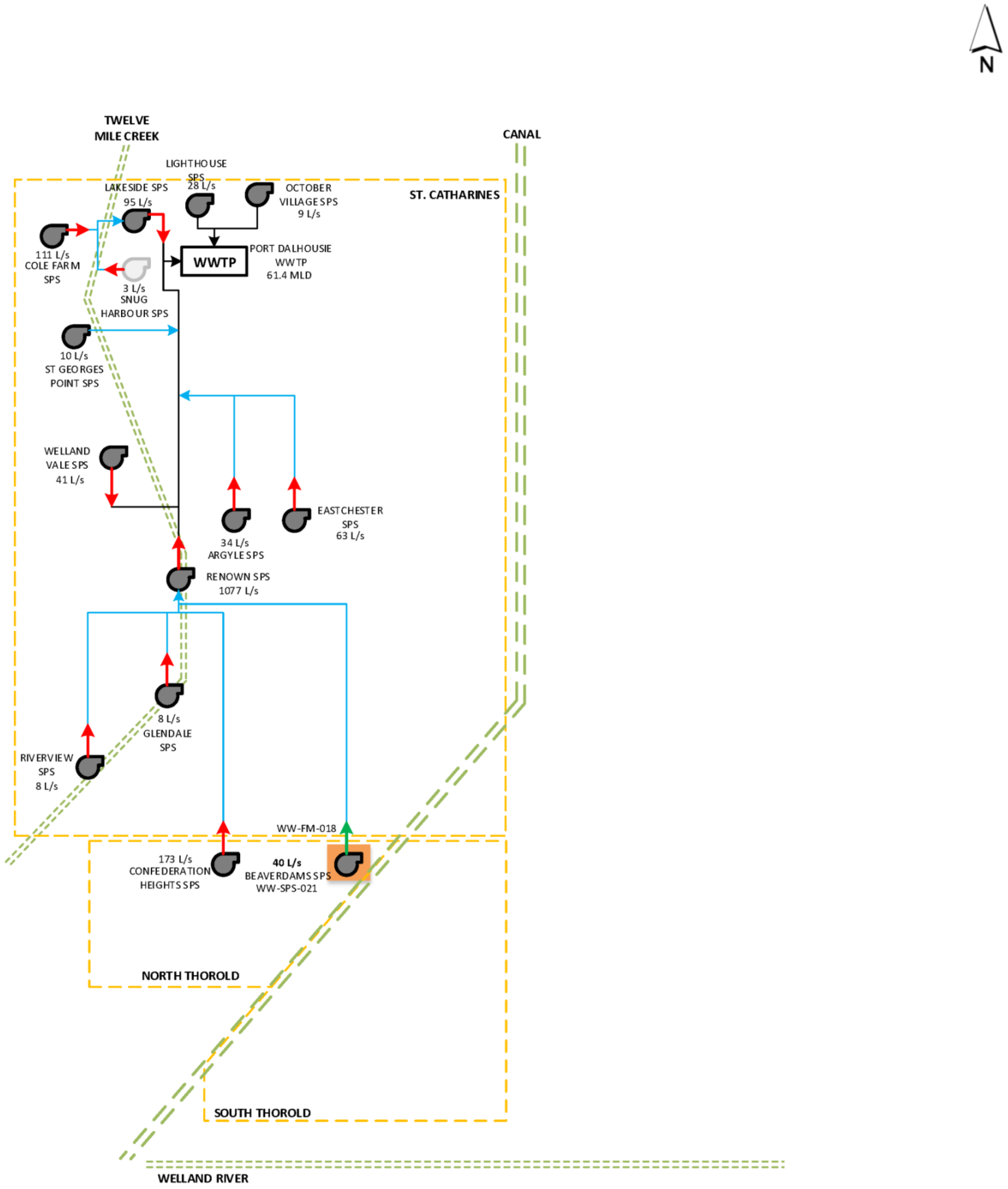
*Note that additional growth in existing built areas is anticipated

*Project alignments are preliminary and will be refined through subsequent projects (EA and/or detailed design)

Figure 4.B.10
Port Dalhousie WWTP System
Preferred Wastewater Servicing Strategy

GM BluePlan ENGINEERING

December 2022
620126-WW-006
WKID: 26917



Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

WWTP RATED CAPACITY	Wastewater Treatment Plant
FIRM CAPACITY	Sewage Pumping Station
→	Forcemain
→	Connection from SPS to SPS
→	Connection from SPS to WWTP
🟧	Facility Upgrade
🟩	New Facility
—	Upgrade Forcemain or Sewer
—	New Forcemain or Sewer
⊗	Decommission Project
FIRM CAPACITY	Decommission Project by External Party

Figure 4.B.11
Port Dalhousie WWTP

Future Wastewater Infrastructure Schematic

BluePlan ENGINEERING

December 2022
621016-W-000
WKID: 26917

Table 4.B.10 Summary of Port Dalhousie Wastewater Treatment Plant Capital Program

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost ($)
WW-FM-018	Beaverdams Forcemain Replacement	Replace existing 150 mm Beaverdams SPS forcemain with new single 200 mm in Thorold	200 mm	2022-2026	Thorold	B	Satisfied through previous EA	Forcemain	$3,660,000
WW-SPS-021	Beaverdams SPS Pump Replacement	Increase station capacity from 10 L/s to 40 L/s as planned in 2022 design	40 L/s	2022-2026	Thorold	B	Satisfied through previous EA	Pumping	$4,161,000
WW-II-017(1)	Region-Wide Wet weather Reduction	Wet weather reduction program in all systems to be executed from 2022-2051	N/A	2022-2051	Region-Wide		Dependent on outcome of wet weather flow study	Wet Weather Reduction	$225,000,000
WW-ST-001(1)	Region-Wide Flow Monitoring and Data Collection	Funding to support flow monitoring and data collection initiatives	N/A	2022-2051	Region-Wide			Wet Weather Reduction	$12,000,000
WW-TP-005(1)	Region-Wide WWTP Process Upgrades	Process upgrades to re-establish ECA capacity	N/A	2022-2051	Region-Wide			Treatment	$50,000,000
WW-TP-006(1)	Region-Wide WWTP Process Upgrades	Upgrades for odour control across the Region at forcemains, pump stations, and other locations.	N/A	2022-2051	Region-Wide			Treatment	$40,000,000
								Total	**$7,821,000**

(1) Project cost not included in subtotal as it is a Region-wide project

B.8. Project Implementation and Considerations

B.8.1. 10-Year Program Sequencing

The recommended year in service for the capital projects is presented in Section B.6.7. Special project implementation and considerations for the preferred servicing strategy consist of:

- Timing of the Beaverdams SPS and forcemain upgrades will be constructed in the 2022-2026 time horizon as the 100% design was completed in 2022.

It is understood that the timing for the recommended projects may be subject to change due to a variety of external factors such as overall balancing of the Region's capital budget, changes to growth projections, and other unforeseen circumstances. As such, **Table 4.B.11** presents the preferred priority of the projects within the first 10-years of the capital program.

Table 4.B.11 Preferred Project Order

Master Plan ID	Name	2021 MSPU Year in Service	Order
WW-FM-018	Beaverdams Forcemain Replacement	2022-2026	1
WW-SPS-021	Beaverdams SPS Pump Replacement - Port Dalhousie	2022-2026	1

B.8.2. EA Requirements and Studies

The following summarizes the status of EA requirements for recommended capital projects which will require Schedule B or C EAs.

- **EA has been satisfied through previous projects:**
    - WW-SPS-021 and WW-FM-018 (Beaverdams SPS and forcemain upgrades) Schedule B
- **Currently ongoing separate EA studies:**
    - None
- **EA studies to be completed through separate studies:**
    - None

B.8.3. Region-Wide Projects and Collaboration with Local Area Municipalities

Acknowledging that the overall wastewater systems are jointly owned and operated by the Region and LAM, the continued operation and expansion of the wastewater systems to support existing users and accommodate projected growth relies upon the cooperation of the upper and lower tier municipalities. Major updates and adjustments to planning projections should be continued to be communicated as this may affect project details such as trigger timelines and design capacities, which is discussed further in **Section B.8.5**.

One initiative that will be predominately driven by the LAMs is wet weather management. While wet weather management should be completed in all municipalities, this 2021 MSPU assumes that the catchments where the peak wet weather flows exceed the peak design flows and contribute to increased risk of basement flooding or overflows will put a specific focus on wet weather management. The Region is committed to continuing the joint CSO funding program through which LAMs can apply for funding support for inflow and infiltration reduction programs and projects such as those identified through the PPCP.

Additional flow monitoring and system data collection, in partnership with LAM, is needed to improve system understanding, support proposed wet weather flow reductions, and identify opportunities for system optimization and overflow removals.

B.8.4. Sustainability Projects

It is important to recognize that the 2021 MSPU servicing strategies identify new infrastructure to service the additional growth out to year 2051 but these strategies are built by extending infrastructure from the existing systems and leveraging the existing Region infrastructure in place. It is essential that the existing infrastructure is maintained in good condition and performance to support servicing growth.

The Region continually establishes and implements a sustainability program that addresses priority projects to ensure the existing infrastructure is in a state-of-good-repair and continues to perform and meet the intended level of services. Region-wide programs including but not limited to replacement programs for pipes and manholes, boilers, meters, generators, SCADA upgrades, sludge management programs, laboratory and sampling equipment upgrades, process electrical, process instrumentation. Pump station upgrades through the sustainability capital plan re-establish the SPS ECA capacity.

Independent of the 2021 MSPU, the Region has completed a sustainability program analysis to identify the projects on a yearly basis, with focus on a 10 year program, to address the sustainability needs. This Sustainability Capital Plan is first developed to demonstrate the total investment needs and may identify a level of investment and implementation exceeding Region resources. The next steps for the Sustainability Capital Plan will be the development of the Financial Plan for existing Water and Wastewater assets which is anticipated to be completed in 2024. It should be noted that the Sustainability Capital Plan represents investment required over and above the growth-related 2021 MSPU program.

Port Dalhousie system specific projects include:

- Port Dalhousie WWTP Upgrade
- Digester Management Program
- Argyle SPS Sustainability Upgrade
- Renown SPS Upgrade
- October Village SPS Upgrade
- St. George's Point SPS Upgrade

B.8.5. Project Implementation Flow Chart

The recommended design capacities within the growth capital program are based on the best available information at the time of analysis, including existing system flows, facility capacities, and projected growth. It is understood that this data is not static and often changes over the years between the regular updates of the Region's Master Plan and between those updates. Design assumptions should be revisited before initiation of all projects to confirm the actual flows and the appropriate design capacities, along with identification of any associated or dependent projects which can be combined or staged to optimize implementation efficiency and cost, and/or system operation.

To support the Region's process in implementing all recommended 2021 MSPU capital projects, the following flow chart has been developed for the wastewater system. This flow chart document is intended to be a reference resource for the Region and should be treated as a guideline to support existing internal Region processes in project implementation.

The wastewater implementation flow chart is shown in **Figure 4.B.12**.

Niagara Region

WASTEWATER PROJECT IMPLEMENTATION

The intent of this document is to support the Region in confirming the scope of work for wastewater infrastructure projects.

CONFIRM PROJECT SCOPE

To define Terms of Reference

☐ **What triggered this project?**
- Known development growth
- Forecasted growth
- Sustainability needs

☐ **Are there related or dependent projects that should be identified for streamlining opportunities or for project phasing?**
- Are there upstream projects with increasing capacity?
- Are there projects within the same alignment or project area that could be combined? (e.g., growth projects, SPS, forcemain, sewer, corridor planning, sustainability projects, water, stormwater, etc.)
- If there are related projects, could the project timing be adjusted to combine or stage projects more efficiently?

☐ **What is the project EA Schedule and status?**

☐ **Are there historic or ongoing operational issues in the project area?**
- Confirm with Regional and LAM operations and maintenance groups
- i.e. historic overflows, low flow/odour issues, clogging issues, work order history, etc.

☐ **Are there any data gaps that should be incorporated into the Terms of Reference?**
- Refer to the Required Data section below for details
- How much does the project timeline and budget need to change to allow for the data collection?

☐ **Have the planning projections been updated to the best available information?**
- Consultation with Region and LAM planning groups to confirm planning projection
- Are projected needs for the project in place? Is actual growth in line with projected growth?)

☐ **Should the project be deferred until identified related works are completed?**

REQUIRED DATA

To support terms of reference and detailed design

☐ **Recently completed EA or servicing study**
(for growth triggered projects)

☐ **Historic flow records**
- Within the last 3 years
- Ideally one full year of flow monitoring data that covers 80% of the total contributing area
- Can be included in project scope if feasible

☐ **Existing pump, flow, and pressure data to identify/verify existing system issues**

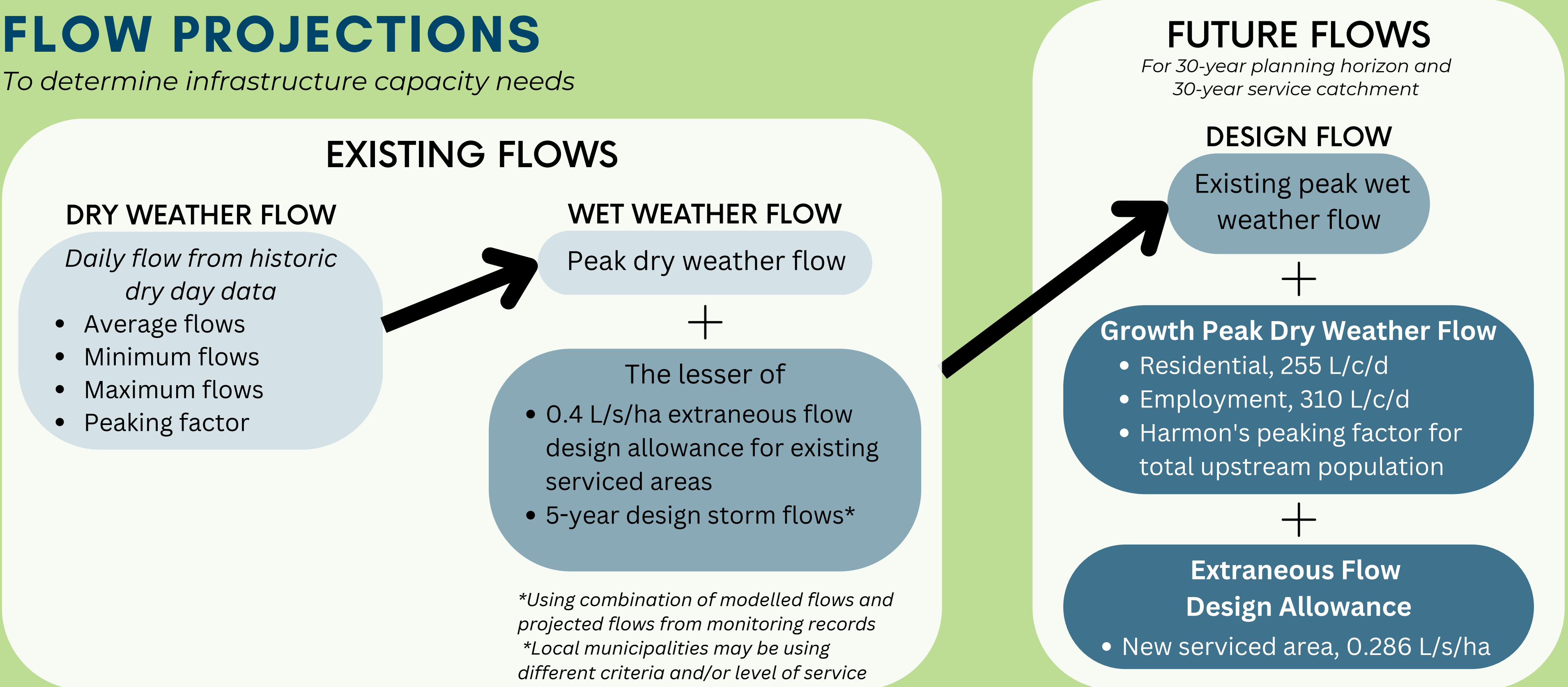
☐ **Asset inventory and condition assessment**
- All asset classes within the infrastructure type (sewer, forcemain, storage, pumping, or treatment facility)
- Within the last 5 years
- Can be part of project scope if the data is not available and would not significantly alter project scope - to assess need for related works (i.e. electrical, HVAC, structural upgrades at an SPS)

☐ **Service area growth potential to confirm projected population and demands**
- Consultation with Region and LAM planning groups within the past year
- Growth information for 30-year horizon and beyond (maximum service catchment)
  - Population, jobs, land use, area
  - Current inventory of development areas with associated development status

IF THE REQUIRED DATA IS NOT AVAILABLE AND IF IT HAS THE POTENTIAL TO SIGNIFICANTLY ALTER SCOPE OF THE DESIGN, IT IS STRONGLY RECOMMENDED THAT THE APPROPRIATE DATA COLLECTION AND FIELD INVESTIGATION BE COMPLETED PRIOR TO PROCEEDING WITH DESIGN. ALTERNATIVELY, WHERE FEASIBLE, DATA COLLECTION SHOULD BE INCLUDED IN THE PROJECT SCOPE AND INTEGRATED INTO THE DESIGN PROCESS.

FLOW PROJECTIONS

To determine infrastructure capacity needs



EXISTING FLOWS

DRY WEATHER FLOW

Daily flow from historic dry day data
- Average flows
- Minimum flows
- Maximum flows
- Peaking factor

WET WEATHER FLOW

Peak dry weather flow

+

The lesser of
- 0.4 L/s/ha extraneous flow design allowance for existing serviced areas
- 5-year design storm flows*

*Using combination of modelled flows and projected flows from monitoring records
*Local municipalities may be using different criteria and/or level of service

FUTURE FLOWS

For 30-year planning horizon and 30-year service catchment

DESIGN FLOW

Existing peak wet weather flow

+

Growth Peak Dry Weather Flow
- Residential, 255 L/c/d
- Employment, 310 L/c/d
- Harmon's peaking factor for total upstream population

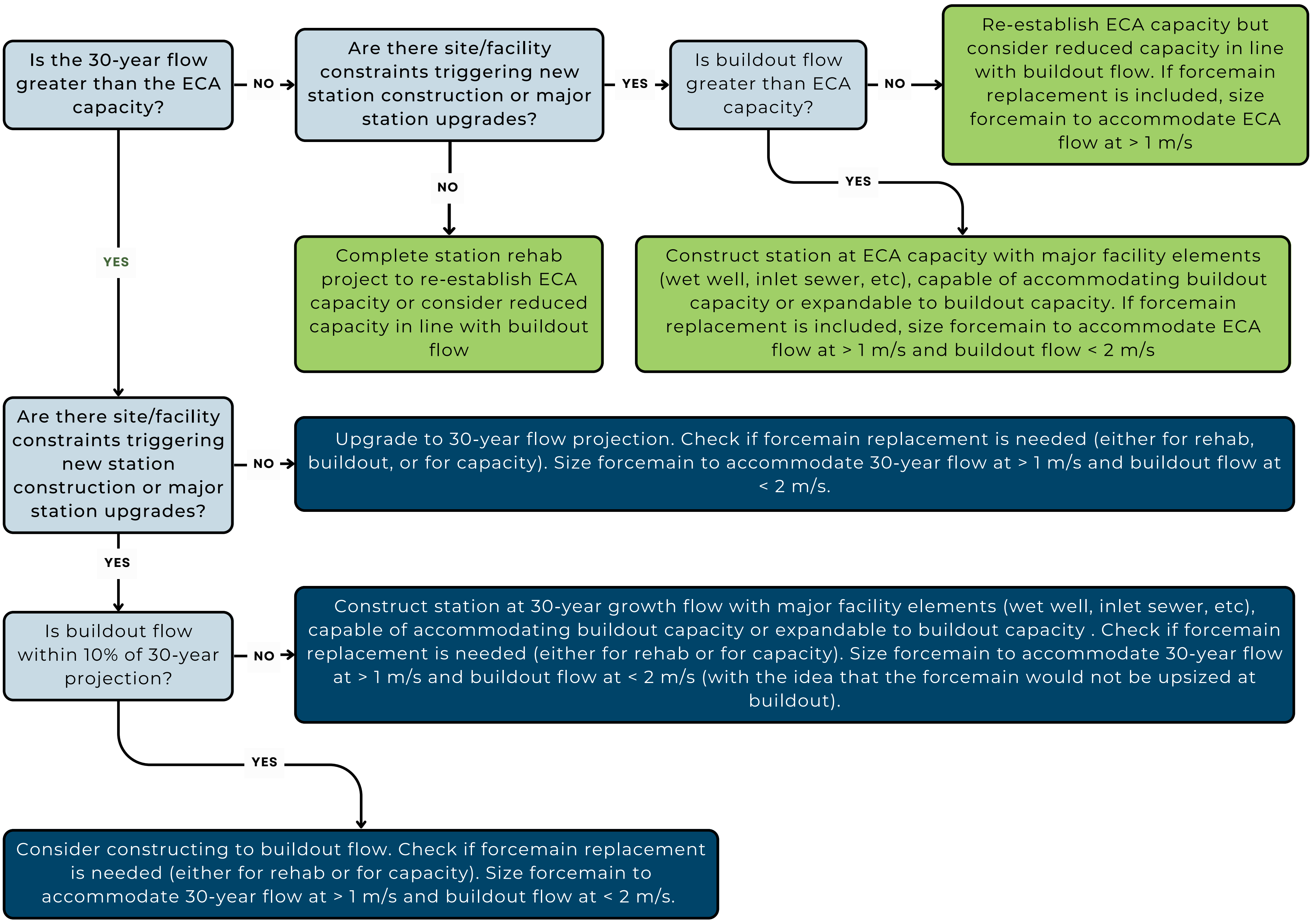
+

Extraneous Flow Design Allowance
- New serviced area, 0.286 L/s/ha

The design criteria presented in this document are based on the 2021 Master Servicing Plan Update Study

BluePlan ENGINEERING

SEWAGE PUMPING STATIONS



Is the 30-year flow greater than the ECA capacity?

Are there site/facility constraints triggering new station construction or major station upgrades?

Is buildout flow greater than ECA capacity?

Re-establish ECA capacity but consider reduced capacity in line with buildout flow. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s

Complete station rehab project to re-establish ECA capacity or consider reduced capacity in line with buildout flow

Construct station at ECA capacity with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s and buildout flow < 2 m/s

Are there site/facility constraints triggering new station construction or major station upgrades?

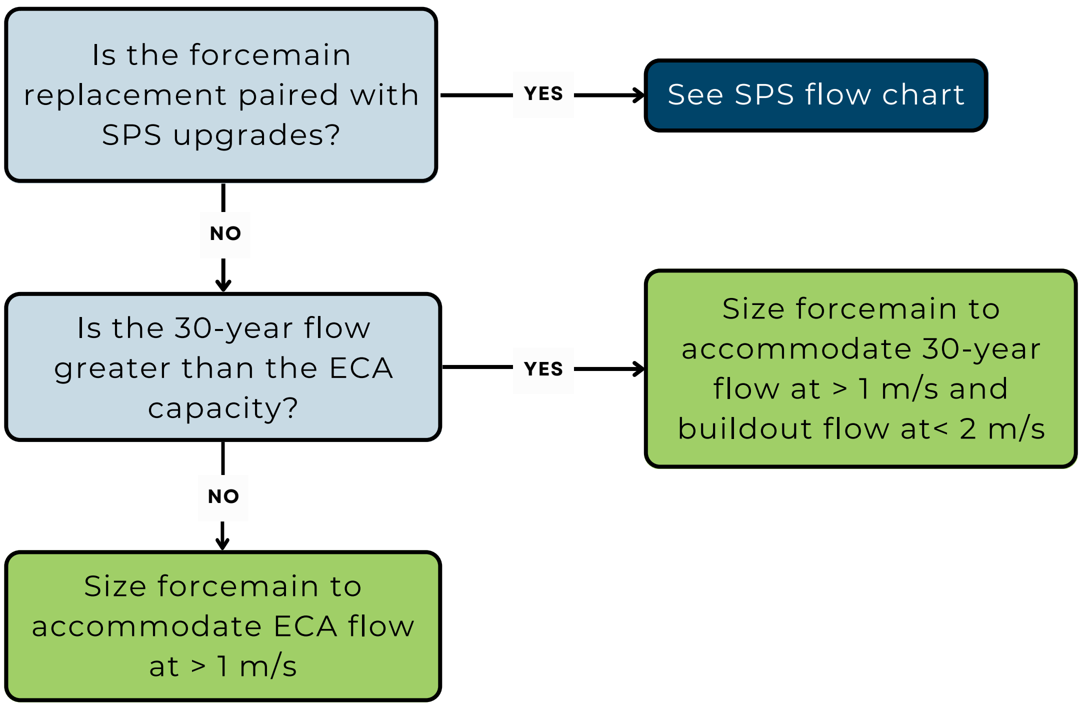
Upgrade to 30-year flow projection. Check if forcemain replacement is needed (either for rehab, buildout, or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

Is buildout flow within 10% of 30-year projection?

Construct station at 30-year growth flow with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity . Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s (with the idea that the forcemain would not be upsized at buildout).

Consider constructing to buildout flow. Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

FORCEMAINS



Is the forcemain replacement paired with SPS upgrades?

See SPS flow chart

Is the 30-year flow greater than the ECA capacity?

Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at< 2 m/s

Size forcemain to accommodate ECA flow at > 1 m/s

B.8.6. Detailed Project Costing Sheets

The detailed project costing sheets for the recommended 2021 MSPU capital projects within the Port Dalhousie WWTP system are presented below.

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-FM-018**
PROJECT NAME: **Beaverdams Forcemain Replacement**
PROJECT DESCRIPTION: Replace existing 150 mm Beaverdams SPS forcemain with new single 200 mm in Thorold

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-FM-018

Pump Station	**WW-SPS-021**	**Velocity**
ECA	14	0.45
Proposed	40	1.27
Buildout	45	1.44
Number of Pumps	2	1.27

PROPOSED DIAMETER:	200 mm	
TOTAL LENGTH:	1730 m	
Tunnelled		0%
Open Cut	1730 m	100%

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Forcemain

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	1730 m	$965	$1,668,939	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$1,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	20%					$333,788	
Minor Creek Crossings			ea.	0	$30,000	$0	
Major Creek Crossings			ea.	0	$199,000	$0	
Road Crossings			ea.	0	$82,000	$0	
Major Road Crossings (Highway)			ea.	0	$199,000	$0	
Utility Crossings			ea.	0	$82,000	$0	
Updated Soils Regulation Uplift	2%					$33,379	
Additional Construction Costs	15%		ea.			$305,416	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$234,152	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$2,576,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$25,800	
Geotechnical Sub-Total Cost						**$25,800**	
Property Requirements	1.5%					$ 38,600	
Property Requirements Sub-Total						**$38,600**	
Consultant Engineering/Design	15%					$ 386,400	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$386,400**	
In House Labour/Engineering/Wages/CA	4.0%					$ 103,040	
In-house Labour/Wages Sub-Total						**$103,040**	
Project Contingency	15%					$469,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$469,000**	
Non-Refundable HST	1.76%					$61,500	
Non-Refundable HST Sub-Total						**$61,500**	
Total (2022 Dollars)						**$3,660,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$3,660,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$73,200		
Design	Design fees, Town fees for design, contract admin	13%	$475,800		
Construction	Town fees, base costs and project contingency	85%	$3,111,000		
TOTAL			**$3,660,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PL
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-II-017**

PROJECT NAME: **Region Wide Wet weather Reduction**

PROJECT DESCRIPTION: Wet weather reduction program in all systems to be executed from 2022-2051

Old ID		**Focus Areas**	Amount
_WW-II-001	Anger Ave WWTP	Lakeshore Road, Catharine Street, Dominion Road, Rose Avenue SPS, Anger Ave WWTP Catchments	
_WW-II-002	Crystal Beach WWTP	Nigh Road SPS and Crystal Beach WWTP Catchments	
_WW-II-003	Stevensville Douglastown	Stevensville, Douglastown catchments	
_WW-II-004	Welland WWTP	Feeder Road, Seaway Heights, Ontario Road SPS, Dain City, and Welland WWTP Catchments	
_WW-II-005	Baker - Grimsby	Woodsview, Biggar Lagoon, Old Orchard SPS Catchments	
_WW-II-006	Baker - Lincoln Beamsville	Ontario Street SPS Catchment	
_WW-II-007	Baker - Lincoln Vineland	Wet weather reduction in Jordan Valley***	
_WW-II-008	Port Dalhousie	Eastchester, Lakeside, Argyle, Renown SPS and Port Dalhousie WWTP Catchments	
_WW-II-009	Port Weller/Port Dalhousie	Wet weather reduction in North Thorold	
_WW-II-010	Port Weller	Haulage Road, Carlton Street SPS, and Port Weller WWTP Catchments	
_WW-II-011	Seaway WWTP	Union, Clarke Street, Arena, Elm Street, City Hall, Sugarloaf, Rosemount North and South SPS Catchments	
_WW-II-012	Niagara Falls WWTP	Central, Muddy Run, Seneca, Meadowvale, Drummond, Kalar Road SPS Catchments	
_WW-II-013	South Niagara Falls WWTP	South Side High Lift and South Side Low Lift SPS Catchments	
_WW-II-014	NOTL	Wet weather reduction in Northeast Niagara-on-the-Lake	
_WW-II-015	NOTL	Wet weather reduction in Virgil - NOTL	
_WW-II-016	Baker - West Lincoln	Wet weather reduction in West Lincoln - Baker	

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SPS-021**
PROJECT NAME:	**Beaverdams SPS Pump Replacement**
PROJECT DESCRIPTION:	Increase station capacity from 10 L/s to 40 L/s as planned in 2022 design

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-021**

	L/s
ECA	14.0
Operational	10.2

PROPOSED CAPACITY	40 L/s	Firm Capacity
Design PWWF Existing	25 L/s	17 L/s
2051	44 L/s	36 L/s
Buildout	53 L/s	45 L/s
	Design Allowance	**5Y Design**

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)*
1	10	40.0
2	10	40.0

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	40 L/s	$27,983	$1,119,321	
Related Upgrades	30%					$335,796	
Bypass Pumping Allowance	7%					$101,858	
Additional Construction Costs	20%		ea.			$311,395	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$186,837	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$2,704,687**	**Override from Beaverdams Design (Full Station Replacement)**
Geotechnical / Hydrogeological / Materials	2.0%					$54,094	
Geotechnical Sub-Total Cost						**$54,094**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 405,700	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$405,700**	
In House Labour/Engineering/Wages/CA	4.0%					$ 108,187	
In-house Labour/Wages Sub-Total						**$108,187**	
Project Contingency	25%					$818,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$818,000**	
Non-Refundable HST	1.76%					$70,100	
Non-Refundable HST Sub-Total						**$70,100**	
Total (2022 Dollars)						**$4,161,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$4,161,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$83,220		
Design	Design fees, Town fees for design, contract admin	13%	$540,930		
Construction	Town fees, base costs and project contingency	85%	$3,536,850		
TOTAL			$4,161,000		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-TP-005**
PROJECT NAME: **Region-wide WWTP Process Upgrades**
PROJECT DESCRIPTION: Process upgrades to re-establish ECA capacity

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$50,000,000**	Placeholder Costs
Chosen Estimate						**$50,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$1,000,000		
Design	Design fees, Town fees for design, contract admin	13%	$6,500,000		
Construction	Town fees, base costs and project contingency	85%	$42,500,000		
TOTAL			**$50,000,000**		

PROJECT NO.:	**WW-TP-005**
PROJECT NAME:	**Region-wide WWTP Process Upgrades**
PROJECT DESCRIPTION:	Upgrades for odour control across the Region at forcemains, pump stations, and other locations.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$40,000,000**	Placeholder Costs
Chosen Estimate						**$40,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$800,000		
Design	Design fees, Town fees for design, contract admin	13%	$5,200,000		
Construction	Town fees, base costs and project contingency	85%	$34,000,000		
TOTAL			**$40,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-ST-001**
PROJECT NAME:	**Region Wide Flow Monitoring and Data Collection**
PROJECT DESCRIPTION:	Funding to support flow monitoring and data collection initiatives

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-ST-001

PROPOSED CAPACITY	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction							
Additional Construction Costs	10%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ -	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$0**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	10%					$4,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$4,000**	
Non-Refundable HST	1.76%					$100	
Non-Refundable HST Sub-Total						**$100**	
Total (2022 Dollars)						**$44,000**	Rounded to nearest $1,000
Other Estimate						**$12,000,000**	Assumes 400k/year for 30 y
Chosen Estimate						**$12,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$240,000		
Design	Design fees, Town fees for design, contract admin	13%	$1,560,000		
Construction	Town fees, base costs and project contingency	85%	$10,200,000		
TOTAL			$12,000,000		

C

Regional Municipality of Niagara

Part C

PORT WELLER WASTEWATER SYSTEM

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C. PORT WELLER WASTEWATER TREATMENT PLANT

C.1 Existing System Infrastructure

The Port Weller wastewater system services the eastern part of St. Catharines, the eastern part of Thorold North, Thorold South, Glendale, and the Niagara District Airport. The system services an existing population of 79,010 and 28,697 employees. Note that this population and employment total is based on the Region's 2021 allocation of Traffic Area Zones planning data and has been processed through the allocation methodology presented in Volume 2 to refine the data to include only serviced populations. As such, the population and employment total may not directly match the system totals using the Region's unprocessed planning data.

The system is serviced by the Port Weller Wastewater Treatment Plant located at 27 Lombardy Avenue, St. Catharines. The Port Weller Wastewater Treatment Plant incorporates conventional activated sludge treatment with screening, grit removal, alum and polymer addition, phosphorus removal and secondary clarification.

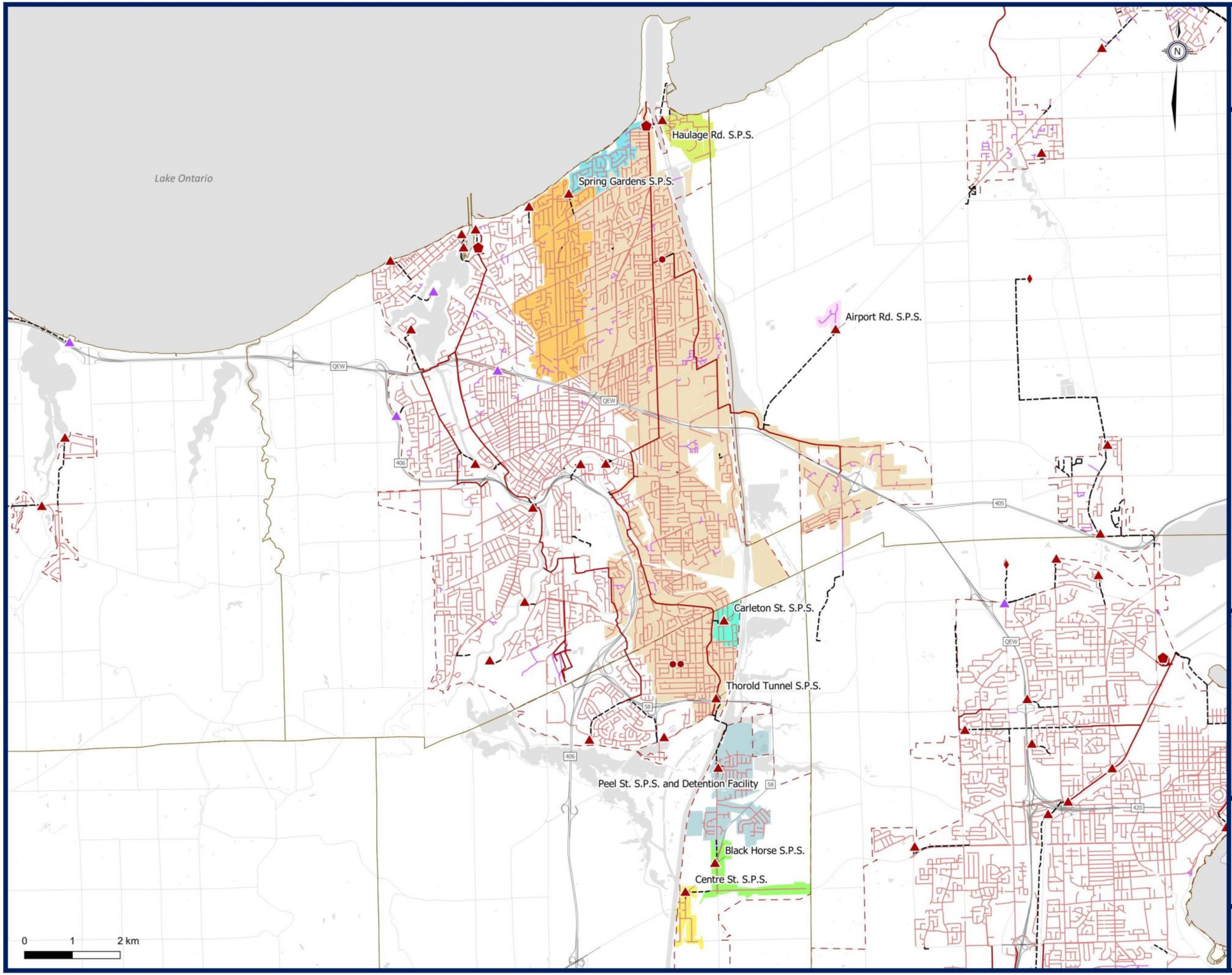
Port Weller Wastewater Treatment Plant has a rated capacity of 56.2 MLD, a peak dry weather flow capacity of 112.4 MLD, and a peak wet weather flow capacity of 136.2 MLD .

System flows are conveyed to the treatment plant via a network of local and Regionally owned sewer, and Regionally owned pump stations and forcemains.

Figure 4.C.1 presents an overview of the wastewater system, and **Figure 4.C.2** shows a schematic of the wastewater system.

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



Existing Wastewater Infrastructure

- Wastewater Treatment Plant (WWTP)
- Combined Sewage Detention Facility
- Biosolids Storage Facility
- Odour Control Facility
- Leachate Pumping Station

Sanitary Pumping Stations (SPS)

- Regional
- Municipal
- Private

Wastewater Network

- Force Mains
- Local Sewers
- Regional Mains
- Private Sewers

Wastewater Catchments

- Airport Road
- Lombardy
- Black Horse
- Peel Street
- Carleton
- Spring Gardens
- Center Street
- Port Weller WWTP
- Haulage Road

Other Features

- Municipal Boundary
- Waterbodies
- Urban Area Boundary

Figure 4.C.1
Port Weller WWTP System
Existing Wastewater Infrastructure

BluePlan ENGINEERING

March 2023
620126-WW-001
WKID: 26917

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

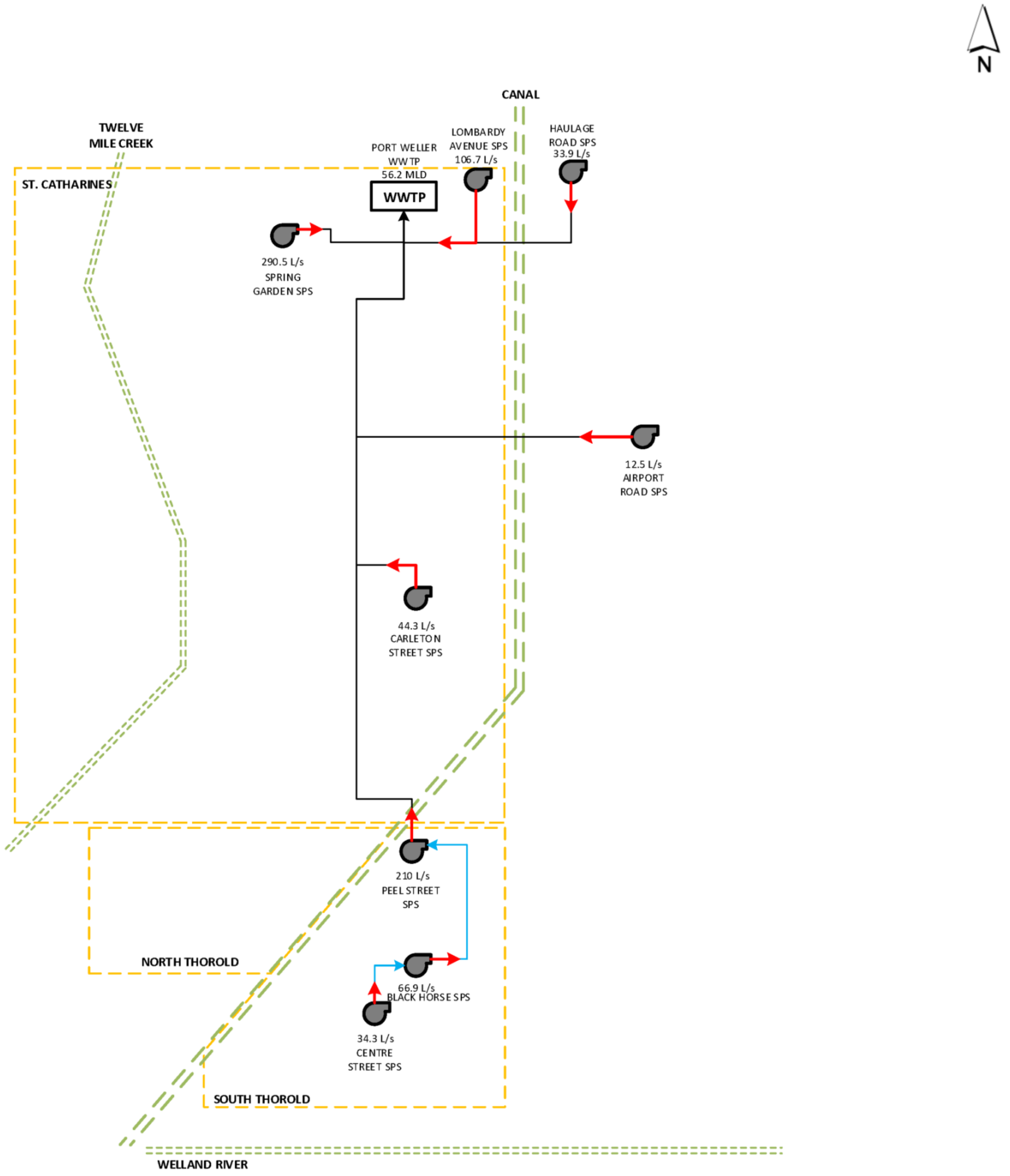


Figure 4.C.2
Port Weller WWTP

Existing Wastewater Infrastructure Schematic

GM BluePlan ENGINEERING

December 2022
621016-W-000
WKID: 26917

C.1.1 Facility Overview

Table 4.C.1 to **Table 4.C.2** present a summary of the environmental compliance approval (ECA) for the Port Weller wastewater treatment plant (WWTP) usage, operation, and effluent concentration objectives.

Table 4.C.1 Wastewater Treatment Plant Overview

Plant Name	Port Weller Wastewater Treatment Plant
ECA #	6014-9QMLZL Issued December 9, 2014
Address	27 Lombardy Avenue, St. Catharines
Discharge Water	Welland Canal
Rated Capacity: Average Daily Flow	56.2 MLD
Rated Capacity: Peak Flow Rate (Dry Weather)	112.4 MLD
Rated Capacity: Peak Flow Rate (Wet Weather)	136.2 MLD
Key Processes	• Conventional activated sludge treatment with screening • Grit removal • Alum and polymer addition • Phosphorus removal • Secondary clarification

Table 4.C.2 Wastewater Treatment Plant Effluent Objectives

Effluent Parameter	Objective Concentration
$CBOD_5$	15.0 mg/L
TSS	15.0 mg/L
Total Phosphorus	1.0 mg/L
E. Coli	200 organisms/100 mL
Total Chlorine Residual	0.5 mg/L

Table 4.C.3 lists each sewage pumping station’s (SPS) listed ECA firm capacity as well as the station’s existing operational firm capacity (the current operating capacity of the pumps station based on performance testing and/or supervisory control and data acquisition (SCADA) trending). As identified in **Volume 4**, the operational firm capacity was used as the basis of assessment for the 2021 MSPU. In some cases where the operational firm capacity was larger than the ECA firm capacity; the registered ECA capacity was used.

Table 4.C.3 Pumping Station and Forcemain Overview

Station Name	Location	Catchment Details		Pump Station Details			Forcemain Details		
		Area Exclusive of Upstream Catchments (ha)	Area Inclusive of Upstream Catchments (ha)	Number of Pumps	ECA Firm Capacity (L/s)	Operational Firm Capacity (L/s)	Single or Twinned Forcemain	Forcemain Diameter (mm)	Length (m)
└→**Lombardy Ave SPS**	27 Lombardy Avenue, St. Catharines	87.1	87.1	3	110.0	106.7	Single	200	12
└→**Haulage Road SPS**	Haulage Road, St. Catharines	84.1	84.1	2	46.0[1]	33.9	Single[2]	150	279
└→**Spring Gardens SPS**	Spring Garden Boulevard,	428.4	428.4	3	295.0	290.5	Single	400	414
└→**Airport Road SPS**	Airport Road, Niagara-on-the-Lake	21.7	21.7	2	12.5	12.5	Single	100	2,654
└→**Carlton Street SPS**	94 ½ Carleton Street, Thorold	42.1	42.1	2	150.0	44.3	Single	300	315
└→**Peel Street SPS**	Allanburg Road, Thorold	244.7	362.1	3	280.0	210.0	Single	350	1,780
└→**Black Horse SPS**	2525 Highway 58, Thorold	75.4	117.5	2	70.0	66.9	Single	250	519
└→**Centre Street SPS**	2408 Centre Street, Thorold	42.1	42.1	2	40.0	34.3	Single	150	528

[1] Recent upgrades to Haulage Road SPS anticipated to re-establish Operational Firm capacity inline with the ECA Capacity. Growth analysis based on 46 L/s capacity.

[2] Haulage Road SPS has a twinned 450 mm forcemain which is not in service. For capacity purposes, the active forcemain 150 mm was assessed.

C.2 Basis for Analysis

C.2.1 Flow Criteria, System Performance, and Sizing Methodology

The Niagara Region Traffic Area Zone planning data was used to estimate growth related flow generation within the wastewater system and to spatially allocate growth flows within each individual system. **Table 4.C.4** presents a summary of the flow criteria, performance, and sizing methodology that was utilized. Refer to **Volume 4 - Introduction** for additional information.

The Region's per capita wastewater flows criteria were updated based on a historic review of the previous 3-year period for local billing meter and flow monitoring records. Given that more granular data was available to complete this analysis compared to previous master plan updates, the population and employment per capita rates were differentiated. The data showed a slight reduction in the population criteria and slight increase in the employment criteria, which more closely reflect existing flow generation trends compared to the Region's previous per capita rate. Further detail regarding the per capita flow generation is presented in **Volume 4 – Introduction.**

The Region's extraneous flow allowance criteria was also reviewed against historic flow monitoring and pump station performance records where available. The review of historic wet weather flows found that typically 2-year design storm peak flows within existing built systems exceeded the Region's existing extraneous flow design allowance of 0.286 L/s/ha; however, that a 2-year design storm peak flow below 0.286 L/s/ha was achievable as demonstrated in multiple catchment areas. Based on the analysis and an industry review, for the purpose of future planning, the extraneous flow design allowance for existing areas was increased to 0.4 L/s/ha but was maintained at 0.286 L/s/ha for new greenfield development areas to better reflect the existing high wet weather flows, while minimizing the magnitude of system upgrades with wet weather flow management as a critical priority. In areas where available historic flow monitoring and modelling results identify existing peak 5 year design flows below the 0.4 L/s/ha criteria, the lower 5 year design flows should be utilized. Further details regarding the extraneous flow design allowance are presented in **Volume 4 – Introduction.**

Table 4.C.4 Flow Criteria, Scenarios, System Performance, and Sizing Methodology

	Component	Criteria	
Flow Criteria	Existing System Flows	Starting Point Methodology • Based on local billing meter records and flow monitoring data to establish existing dry and wet weather flows • Growth flows are added to the existing system baseline using design criteria	
	Flow Generation	Residential	255 L/c/d
		Employment	310 L/e/d
	Peaking Factor	Peak Dry Weather Flow	Harmon's Peaking Factor
	Extraneous Flow Design Allowance	• 0.4 L/s/ha for existing areas • 0.286 L/s/ha for new developments	
WWTP	System Performance and Triggers	• MECP Procedure F-5-1 • Trigger upgrade study at 80% capacity • Trigger upgrade construction at 90% capacity	
	Upgrade Sizing	• Average daily flow plus growth based on population design flows	

Pump Station	System Performance and Triggers Sizing	• Refer to Section C.2.1.1.
		• Two flow scenarios considered
		    • **Design Allowance**: Peak wet weather flow using the peaked dry weather flow plus the extraneous flow design allowance
		    • **5-Year Storm**: Modelled peak wet weather flow using the 5-year design storm
		• Peak flow capacity to meet design peak wet weather flow using the extraneous flow design allowance
		• Wet well and system storage considerations under 5-year storm to minimize basement flooding and overflow risks	

Forcemain	System Performance and Triggers	• Flag velocities less than 0.6 m/s • Flag velocities greater than 2 m/s • Upgrade when velocities exceed 2.5 m/s and considering condition and age	
	Upgrade Sizing	• Design velocity target between 1 m/s and 2 m/s • Forcemain twinning to increase capacity where feasible	

	Component	Criteria
Trunk	System Performance and Triggers	• Design allowance peak wet weather flows, using the extraneous flow design allowance, to be managed within pipe • Freeboard (depth between hydraulic grade line and surface) greater than 1.8 m below surface in 5-year design storm • Flag pipes velocities less than 0.6 m/s • Flag pipes velocities greater than 3.0 m/s
	Upgrade Sizing	• Sized for full flow under post-2051 design peak wet weather flow • Assess 5-year design storm performance to minimize basement flooding risks and overflows

C.2.1.1 SPS Performance Evaluation and Upgrade Framework

Although it is the Region's design philosophy to size SPS inline with the Region's extraneous flow design allowance, the 2021 MSPU undertook a hybrid evaluation approach to acknowledge that SPS are a major contributor to local wastewater system performance and that many legacy system's exiting wet weather flows exceed the extraneous flow design allowance. The SPS hybrid performance evaluation and upgrade framework are summarized in **Table 4.C.5** and strives to balance the magnitude of capacity upgrades, potential cascading downstream upgrades, and managing the potential risk of local sewer surcharging and system overflows.

Under the hybrid performance evaluation and upgrade framework, the SPS capacity was sized to meet the lesser of peak wet weather flow (PWWF) using the extraneous flow design allowance, referred to as "Design Allowance PWWF" or the estimated 5-year storm PWWF. Further, consideration for the SPS actual performance under the estimated 5-year design storm peak wet weather flow was evaluated to determine if the available system storage including the wet well, storage tanks, and in system capacity was sufficient to manage excess flows while maintaining the system hydraulic grade line (HGL) below the basement flooding level of 1.8 m below grade and/or below the local overflow level.

In instances where the 5-year storm PWWF flow exceeded the available system storage, additional system solutions such as wet weather management, system storage, and/or additional SPS capacity upgrades were incorporated into the servicing solution. The most efficient solution to manage capacity and flow reduction was determined through the assessment of calculated flows from the 2051 design allowance PWWF and modelled 5-year storm PWWF against the operational firm capacity of the station and system storage.

Each SPS with a preferred solution of a capacity upgrade was individually reviewed in detail to determine how capacity upgrades should best be achieved:

- Pump replacement
- Pump upgrades
- Pump additions
- Station replacement
- Existing wet well sizing changes
- FM sizing and capacity.

Due to data quality and availability, a prioritization of upgrade needs, and flow monitoring (data collection) was assigned to each case for the Region implementation plan, discussed later in **Section C.8**.

Table 4.C.5 SPS Assessment Framework

Case	2051 Design PWWF	2051 5 Year Storm PWWF	2051 5-Year Storm Storage Need	Preferred Solution	Upgrade Priority	Flow Monitoring Priority
Case 1	> Firm Capacity	> Firm Capacity	> Available Storage	Upgrade pumps to future design allowance flow with potential storage upgrades or wet weather management	High	Medium
Case 2	< Firm Capacity	> Firm Capacity	> Available Storage	Upgrade storage and/or wet weather management	High	High
Case 3	> Firm Capacity	> Firm Capacity	< Available Storage	Potential upgrade to design allowance flow and/or wet weather management	Medium	High
Case 4	< Firm Capacity	> Firm Capacity	< Available Storage	Potential wet weather management	Low	Medium
Case 5	> Firm Capacity	< Firm Capacity	< Available Storage	No upgrade, use actual peak flows	N/A	Low
Case 6	< Firm Capacity	< Firm Capacity	< Available Storage	No upgrade	N/A	Low

C.2.2 Growth Population Projections and Allocations

Table 4.C.6 outlines the existing and projected serviced population and employment by catchment.

Table 4.C.6 Port Weller Wastewater Treatment Plant Existing and Projected Serviced Population by Catchment

Sewage Pumping Station (SPS)	Existing Population & Employment			2051 Population & Employment			Post 2051 Population & Employment			2021-2051 Growth		
	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population Growth	Employment Growth	Total Growth
Port Weller WWTP	59,510	22,660	82,169	72,584	28,732	101,316	76,661	33,224	109,885	13,074	6,072	19,146
└→Lombardy Ave SPS	2,100	153	2,253	2,263	179	2,442	2,368	188	2,556	163	27	189
└→Haulage Road SPS	1,811	1,279	3,090	1,935	2,371	4,307	1,986	2,417	4,403	125	1,093	1,217
└→Spring Gardens SPS	10,985	2,736	13,721	12,210	3,112	15,322	12,729	3,214	15,943	1,226	376	1,601
└→Airport Road SPS	3	6	9	3	9	12	3	9	12	0	3	2
└→Carlton Street SPS	985	678	1,664	1,348	684	2,031	1,391	706	2,097	363	5	368
└→Peel Street SPS	3,080	836	3,916	5,757	1,561	7,318	9,129	2,142	11,271	2,677	725	3,402
└→Black Horse SPS	147	64	211	1,052	824	1,876	3,709	1,227	4,936	904	761	1,665
└→Centre Street SPS	389	286	674	584	674	1,259	2,146	1,514	3,660	196	389	584
TOTAL	**79,010**	**28,697**	**107,707**	**97,736**	**38,147**	**135,883**	**110,123**	**44,641**	**154,764**	**18,727**	**9,450**	**28,176**

Note: Population numbers may not sum due to rounding.

C.3 System Performance

The South Niagara Falls Wastewater Solutions Schedule ‘C’ Class Environmental Assessment was completed in 2022 and its strategy governs recommendation related to the south Thorold and south Niagara Falls systems. The South Niagara Falls WWTP strategy is comprised of a new wastewater treatment plant in South Niagara Falls, deep tunneled trunk sewers to convey the existing system South Side High Lift SPs flows, shallow trunk sewers to collect Thorold South flows and the reconfiguration of Peel Street SPS and Black Horse SPS to pump to the shallow trunk sewers and convey flows to the new plant.

- The existing system performance in the Port Weller WWTP system is presented with the current conditions and configuration of the system, including Thorold South service areas of Peel Street SPS, Black Horse SPS and Centre Street SPS. The existing configuration has Centre Street SPS pumping to Black Horse SPS, pumping to Peel Street SPS, which ultimately pumps the flows to a Region trunk and coveys the flows by gravity to the Port Weller WWTP.
- The future system performance in the Port Weller WWTP system is presented with the South Niagara Falls WWTP strategy implemented. The future scenarios for 2051 and post-2051 assume the commissioning of the South Niagara Falls WWTP by 2027. Therefore the 2051 scenario shows the removal of the Thorold South flows to the Port Weller WWTP and trunk sewers. The strategy reroutes Peel Street SPS via a new forcemain to a new Black Horse SPS, and the Black Horse SPS pumps all Thorold South flows via a new forcemain to a shallow gravity trunk which conveys flows by gravity to the new South Niagara Falls WWTP.

C.3.1 Wastewater Treatment Plant

The starting point flows for the Port Weller WWTP was calculated using historic SCADA flow data. Ten years of data (2011 to 2020) was reviewed to provide historical context and assess overall long-term trends; however, the most recent five years of data was used to determine the average daily flow. **Table 4.C.7** shows the historical system flows obtained from wastewater treatment plant production data.

Table 4.C.7 Historic Port Weller Wastewater Treatment Plant Flows

Year	Average Daily Flow		Peak Daily Flow	
	(MLD)	(L/s)	(MLD)	(L/s)
2011	43.2	500.2	149.9	1734.6
2012	33.8	390.9	129.5	1498.8
2013	37.4	432.6	139.8	1618.2
2014	35.2	407.8	140.6	1627.1
2015	30.2	350.1	128.8	1491.1
5 Year Average	*36.0*	*416.3*	*137.7*	*1593.9*
5 Year Peak	*43.2*	*500.2*	*149.9*	*1734.6*
2016	29.7	343.9	102.0	1181.1
2017	32.1	371.4	88.6	1025.3
2018	36.9	426.9	138.2	1599.5
2019	39.2	453.8	132.7	1535.8
2020	33.8	390.6	131.6	1523.6
5-Year Average	**34.3**	**397.3**	**118.6**	**1373.1**
5-Year Peak	**39.2**	**453.8**	**138.2**	**1599.5**
10-Year Average	**35.1**	**406.8**	**128.2**	**1483.5**
10-Year Peak	**43.2**	**500.2**	**149.9**	**1734.6**

The 10-year trend analysis showed that flows to the Port Weller WWTP continue to reflect high flows in wetter years. The 5-year average flow has decreased 5% from the 2016 MSP starting point.

The starting point flow used for the Port Weller WWTP was 34.3 MLD.

Figure 4.C.3 shows the projected future flows at the Port Weller WWTP. The plant has surplus capacity and will not reach 80% capacity within the 2051-time horizon.

The reduced flows shown in 2027 reflect the implementation of the South Niagara Falls strategy and the removal of the Thorold South flows comprising of Peel Street SPS, Black Horse SPS and Centre Street SPS, and the respective growth in South Thorold redirected to the South Niagara Falls WWTP.

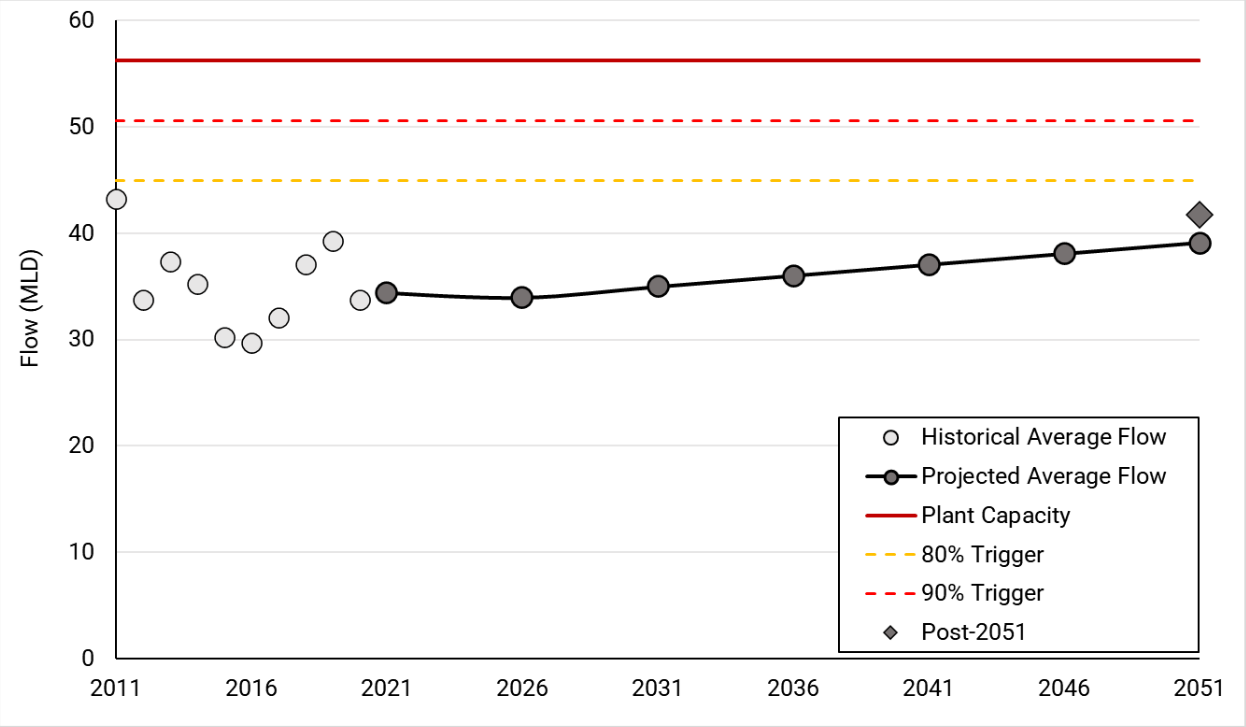


Figure 4.C.3 Projected Future Average Daily Flows at Port Weller Wastewater Treatment Plant

C.3.2 Sewage Pumping Station

Table 4.C.8 highlights the sewage pumping station operational firm capacities and the existing and projected flows. The existing average and peak dry weather flows were estimated using the wastewater system model, which was updated using the best available billing, flow monitoring, and SCADA data from 2018 to 2020. The 2021 flows show the configuration of the existing Port Weller system; the future flow scenarios for 2051 and post-2051 show flows with the South Niagara Falls strategy implements, with South Thorold reconfigured to convey flows to the South Niagara Falls WWTP.

Table 4.C.8 System Sewage Pumping Station Performance

Station Name & Existing Configuration	Station Capacity	2021 Flows				Station Name & Future Configuration	2051 Flows			Post-2051 Flows		
	Operational Firm Capacity	Average Dry Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow		Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow
	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)		(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)
└→Lombardy Ave SPS	106.7	42.7	43.7	78.6	110.9	└→Lombardy Ave SPS	46.1	81.0	113.3	47.5	82.3	114.7
└→Haulage Road SPS	46.0	20.4	21.3	54.9	46.03	└→Haulage Road SPS	37.4	77.3	107.0	38.4	78.4	108.1
└→Spring Gardens SPS	290.5	54.2	152.9	324.3	339.6	└→Spring Gardens SPS	171.1	342.4	357.8	177.3	348.6	364.0
└→Airport Road SPS	12.5	0.2	0.2	8.9	12.4	└→Airport Road SPS	0.3	9.0	12.4	0.3	9.0	12.4
└→Carlton Street SPS	44.3	2.3	3.1	19.9	145.6	└→Carlton Street SPS	7.5	24.3	150.5	8.3	25.1	150.8
└→Peel Street SPS	210.0	16.8	21.6	166.5	301.4	South Niagara Falls Strategy						
						↧ Peel Street SPS	57.3	158.5	307.1	91.2	257.8	359.4
└→Black Horse SPS	66.9	4.3	9.2	56.2	33.3	└→Black Horse SPS	66.3	260.2	407.6	162.6	356.4	517.5
└→Centre Street SPS	34.3	1.5	1.8	18.6	19.2	↑__Centre Street SPS	9.6	26.4	26.9	34.8	58.2	58.8

The following SPS have existing and future deficiencies under both design allowance PWWF and 5-year storm, requiring upgrades to support existing and future flows.

- Haulage Road SPS
- Spring Gardens SPS

The following SPS have future deficiencies under design allowance PWWF and 5-year storm, requiring upgrades to support future flows.

- Black Horse SPS

The following SPS have sufficient capacity to support 2051 flows using the design allowance PWWF, however, the projected 5-year storm PWWF exceeds the operational firm capacity as such potential system or facility upgrades may be required.

- Lombardy SPS
- Airport Road SPS
- Carlton Street SPS

The following SPS have existing and future deficiencies under the design allowance PWWF; however, the existing and projected 5-year storm PWWF is within the station's capacity, as such, the stations capacity is sufficient to support future flows.

- Peel Street SPS

The following stations have surplus capacity to support future flows.

- Centre Street SPS

C.3.3 Forcemain

Table 4.C.9 highlights the existing and projected forcemain performance. Velocities less than 0.6 m/s were flagged in yellow and velocities exceeding 2.5 m/s were flagged in red. Note, if a pumping deficit was identified in **Table 4.C.8**, then projected forcemain velocities were based on the higher of the station's ECA firm capacity or the governing peak wet weather flow scenario, otherwise if no pumping deficit was identified, the operational firm capacity was used for future capacity assessment.

Table 4.C.9 Forcemain Performance

Station Name & Existing Configuration	Forcemain Diameter (mm)	Operational Firm Capacity		Station Name & Future Configuration	2051		Post-2051	
		Pumped Flow (L/s)	Velocity (m/s)		Pumping Needs (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)
└→Lombardy Ave SPS	200	106.7	3.4	└→Lombardy Ave SPS	106.7[1]	3.4	106.7[1]	3.4
└→Haulage Road SPS	150	33.9	1.9	└→Haulage Road SPS	68.6[3]	3.9	69.6[3]	3.9
└→Spring Gardens SPS	400	290.5	2.3	└→Spring Gardens SPS	342.4[3]	2.7	348.6[3]	2.8
└→Airport Road SPS	100	12.5	1.6	└→Airport Road SPS	12.5[1]	1.6	12.5[1]	1.6
└→Carlton Street SPS	300	44.3	0.6	└→Carlton Street SPS	44.3[1]	0.6	44.3[1]	0.6
┌→Peel Street SPS	350	210.0	2.2	┌→Peel Street SPS	South Niagara Falls Strategy			
					210.0[1]	2.2	210.0[1]	2.2
└→Black Horse SPS	250	66.9	1.4	└→Black Horse SPS	272.6[3]	5.6	382.5[3]	7.8
└→Centre Street SPS	150	34.3	1.9	└→Centre Street SPS	34.3[1]	1.9	34.3[1]	1.9

[1] Operational firm capacity

[2] ECA capacity

[3] Minimum of future design allowance PWWF or 5-year storm PWWF

The following forcemains had a projected forcemain capacity deficit in the 2051 growth scenario:

- Lombardy SPS
- Haulage Road SPS
- Spring Garden SPS

The following forcemains require changes to support the South Niagara Falls strategy:

- Peel Street SPS will require a new forcemain to covey flows to the Black Horse SPS.
- Black Horse SPS will require a new forcemain to convey flows to the South Niagara Falls gravity trunk sewers.

The remaining stations' forcemains have sufficient capacity to meet future flows.

C.3.4 Trunk Sewer

Figure 4.C.4 and **Figure 4.C.5** highlight the trunk performance in the existing and 2051 projected design allowance peak wet weather flow scenarios, respectively.

- There are no Region trunk sewers with existing or future pipe capacity deficits from the design allowance peak wet weather flows.
- Note that the Port Dalhousie WWTP - Port Weller WWTP system has several combined sewer overflows (CSO), that help regulate the hydraulic grade line (HGL) within the trunk system to reduce basement flooding risks.
- There are some sewers surcharging above the basement flooding freeboard from the existing and future 5-year storm peak wet weather flows.
    - Port Weller trunk sewer shows surcharging in Region trunks and local sewers due high wet weather inflows in the existing and future scenarios.
    - Future diversion of the Peel Street SPS is anticipated to help reduce surcharging levels in the downstream trunk sewer
    - Localized sewers surcharging is observed throughout the local system.

C.3.5 Overview

Under the design allowance peak flows no overflows are anticipated; however, many of the CSOs become active from 5-year storm peak wet weather flows; however, many of which become active from 5-year storm peak wet weather flows. The adverse risks of wet weather inflows are currently partially managed through CSOs; however, the Region and local area municipalities (LAM) are working together to reduce wet weather inflows to the system to reduce system overflows.

Detailed assessment of system CSO will be addressed jointly by the Region and LAM through future Pollution Prevention Control Plan Studies; which will outline the proposed wet weather flow management approach to manage CSO volumes.

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

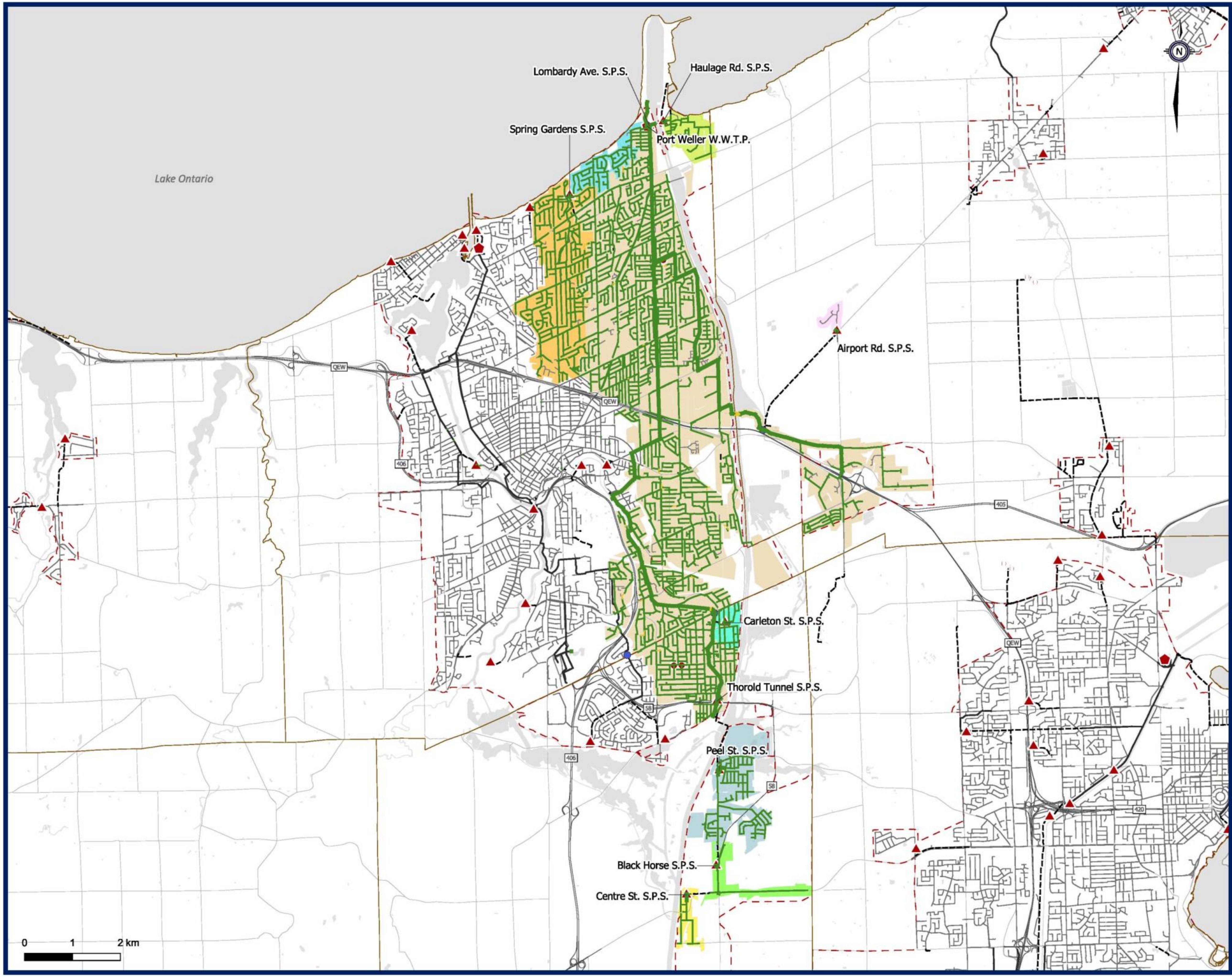


Figure 4.C.4
Existing Design Peak Wet Weather Flows
Port Weller WWTP

BluePlan ENGINEERING

May 2023
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Projection EPSG: 26917

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

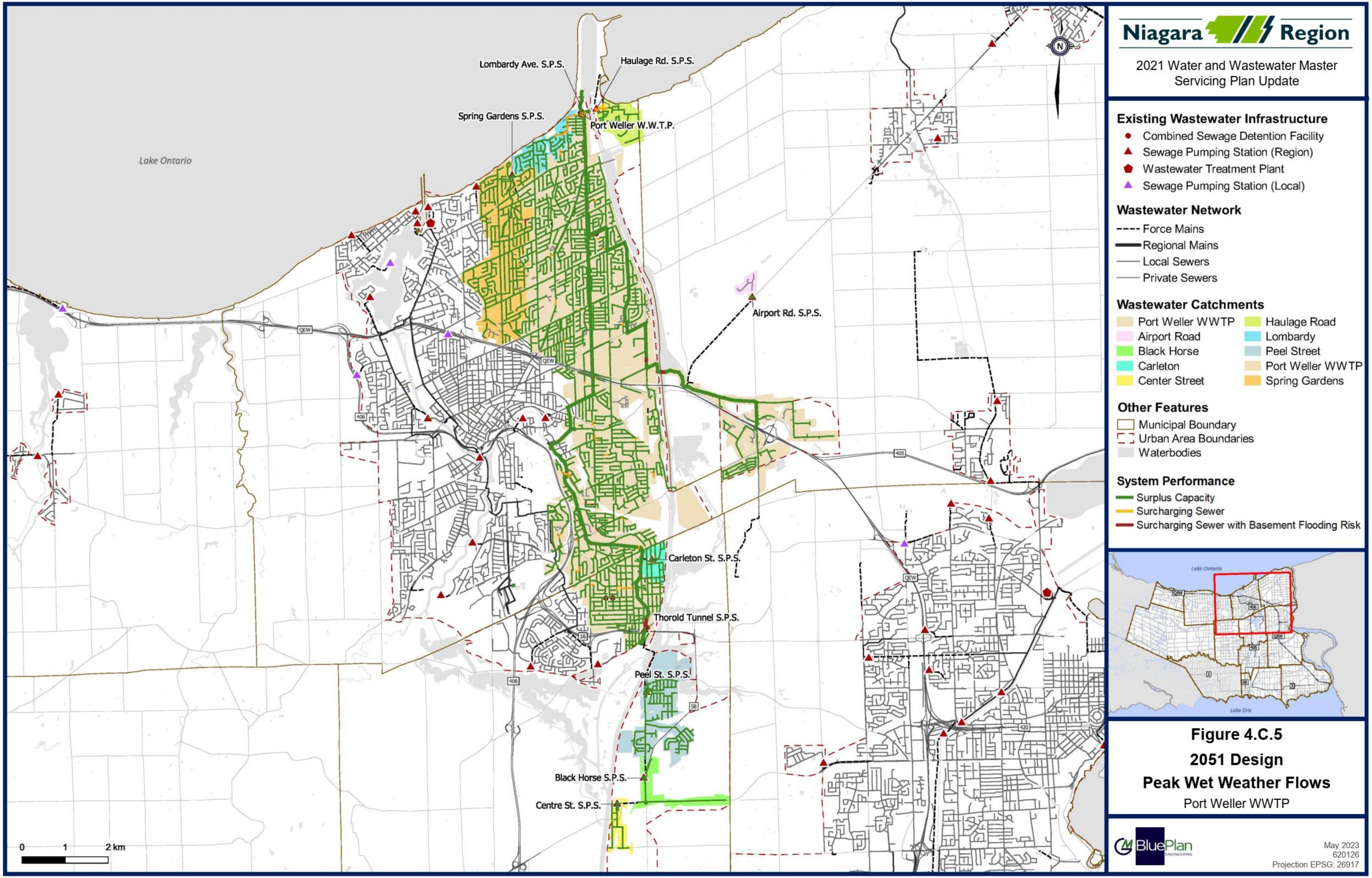

Figure 4.C.5

2051 Design

Peak Wet Weather Flows

Port Weller WWTP

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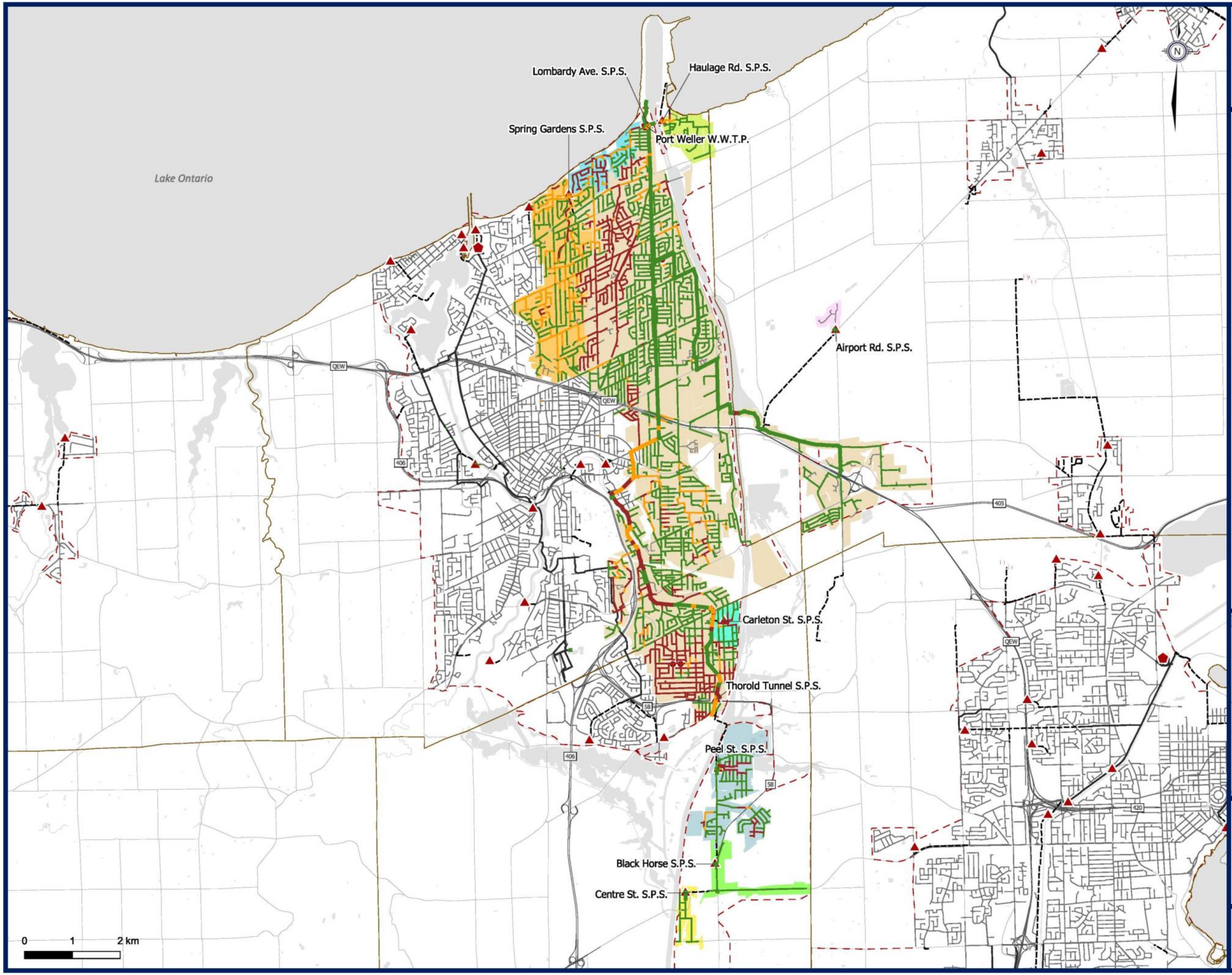
Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



Existing Wastewater Infrastructure

- ● Combined Sewage Detention Facility
- Leachate Pumping Station
- ● Odour Control Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant

Wastewater Network

- Force Main
- Private
- Regional
- Local

Wastewater Catchments

- Port Weller WWTP
- Haulage Road
- Airport Road
- Lombardy
- Black Horse
- Peel Street
- Carleton
- Port Weller WWTP
- Center Street
- Spring Gardens

Other Features

- Municipal Boundary
- Urban Area Boundaries
- Waterbodies

System Performance

- Surplus Capacity
- Surcharging Sewer
- Surcharging Sewer with Basement Flooding Risk

Figure 4.C.6

Existing 5-Year Storm Peak Wet Weather Flows

Port Weller WWTP

GM BluePlan ENGINEERING

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Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

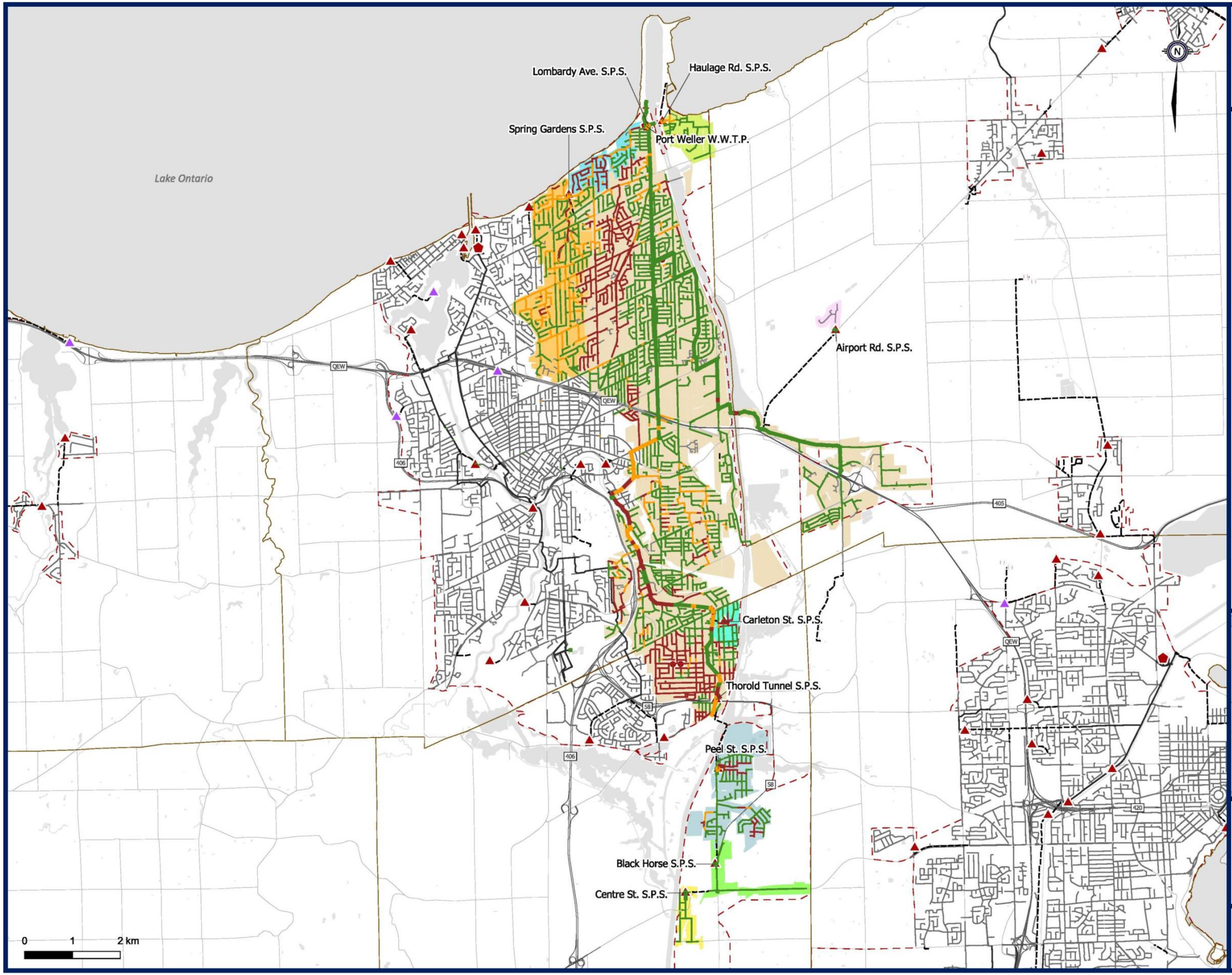

Figure 4.C.7

2051 5-year Storm Peak Wet Weather Flows

Port Weller WWTP

BluePlan ENGINEERING

May 2023
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Projection EPSG: 26917

C.4 System Opportunities and Constraints

Figure 4.C.8 highlights the existing opportunities and constraints.

C.4.1 Port Weller Wastewater Treatment Plant

- The Port Weller Wastewater Treatment Plant has sufficient capacity to support growth to year 2051 and beyond.
- Removing South Thorold from the Port Weller system through the implementation of the South Niagara Falls Strategy will provide the Port Weller WWTP additional capacity to address existing operational restrictions and to support growth.

C.4.2 St. Catharines

- Most of the system drains via gravity directly to the wastewater treatment plant.
- Residential and employment growth primarily consists of intensification in existing combined sewer areas. However, there are significant growth areas consisting of infill and greenfield areas in the Haulage Road SPS and Port Weller WWTP catchments.
- There are existing and growth-related wet weather capacity deficits in the Haulage Road and Spring Gardens SPS catchments.
- The Lombardy SPS forcemain experiences high velocities under the current operating regime.
- Removing South Thorold from the Port Weller system through the implementation of the South Niagara Falls Strategy will provide the Port Weller trunk sewer additional capacity to address existing capacity restrictions and to support growth.
- Significant combined sewer areas resulting in high wet weather flows and system overflows, which will need to be managed to allow for growth across all St. Catharines catchments.

C.4.3 Thorold

- Most of the system consists of separated sewers with moderate wet weather flows in most catchments and high wet weather flow in the Carlton SPS catchment.
- Significant residential and employment growth areas consisting of infill and greenfield in South Thorold.
- South Thorold to be re-directed to the new South Niagara Falls Wastewater Treatment Plant.

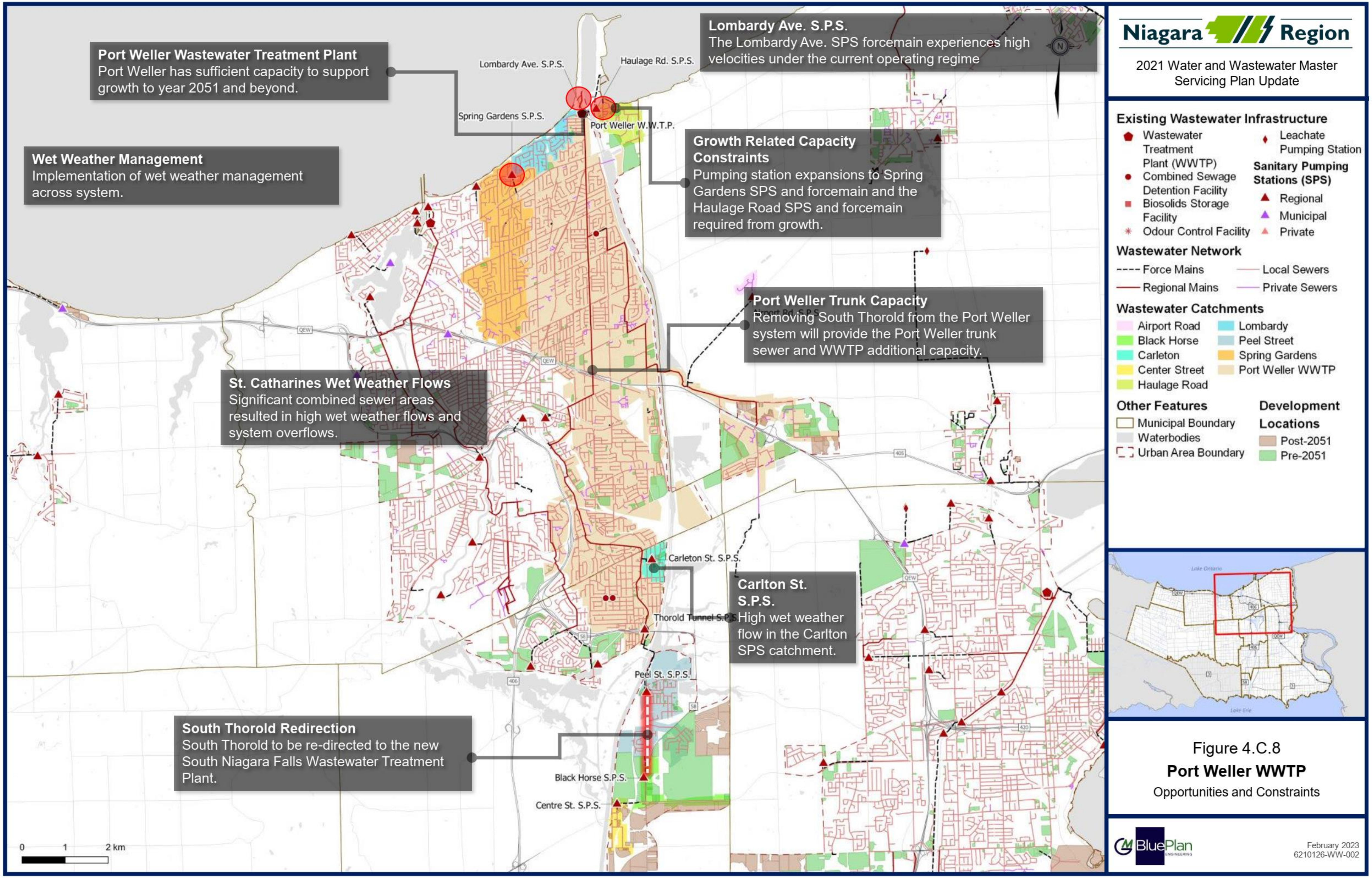
C.4.4 System Optimization Opportunities

- Significant opportunity to provide capacity for growth through implementation of wet weather flow management within the St. Catharines system.

- The potential transfer of flow under wet weather events between the Port Dalhousie and Port Weller systems is not well understood. Enhanced data collection through flow monitoring and invert elevation surveys of key points would be required to improve the system understanding.
- Additional flow monitoring and system data collection, in partnership with LAM, is needed to improve system understanding, support proposed wet weather flow reductions, and identify opportunities for system optimization and overflow removals.

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



Port Weller Wastewater Treatment Plant
Port Weller has sufficient capacity to support growth to year 2051 and beyond.

Lombardy Ave. S.P.S.
The Lombardy Ave. SPS forcemain experiences high velocities under the current operating regime

Wet Weather Management
Implementation of wet weather management across system.

Growth Related Capacity Constraints
Pumping station expansions to Spring Gardens SPS and forcemain and the Haulage Road SPS and forcemain required from growth.

Port Weller Trunk Capacity
Removing South Thorold from the Port Weller system will provide the Port Weller trunk sewer and WWTP additional capacity.

St. Catharines Wet Weather Flows
Significant combined sewer areas resulted in high wet weather flows and system overflows.

Carlton St. S.P.S.
High wet weather flow in the Carlton SPS catchment.

South Thorold Redirection
South Thorold to be re-directed to the new South Niagara Falls Wastewater Treatment Plant.

Figure 4.C.8
Port Weller WWTP
Opportunities and Constraints

BluePlan ENGINEERING

February 2023
6210126-WW-002

C.5 Assessment of Alternatives

Generally, the previously recommended strategies from the 2016 MSP program were carried forward which included the redirection of Thorold South to the new South Niagara Falls WWTP, and wet weather management strategies in key areas.

While the strategies remained the same, the following details including alignment, sizing, or wet weather areas have been updated to reflect the latest system understanding and reflect updated criteria changed through this iteration of the 2021 MSPU.

- Providing capacity within Region-owned pumping stations and trunk sewers to convey peak wet weather flows up to the lesser of the 5-year design storm or extraneous flow design allowance criteria of 0.4 L/s/ha for existing areas and 0.286 L/s/ha for growth areas, needs to be verified based on the updated flow criteria and actual flows.
- Provide upstream flow management to address high peak flows in the system where peak wet weather flows exceed the extraneous flow design allowance criteria of 0.4 L/s/ha resulting in basement flooding and overflow risks. Upstream flow management can include but is not limited to these options, in the preferred order of implementation:
    - Inflow and infiltration reduction in public right of way
    - Inflow and infiltration reduction from private properties
    - Enhanced system storage
    - Peak flow control using system controls or engineered solutions
- As shown in **Section C.3.2**, pump station capacity assessments were completed by reviewing the projected design allowance peak flows and 5-year storm flows against the operational firm capacity of each station.
    - Where the peak storm flows were less than design flows and the operational firm capacity of the station, the storm flows were used as actual flows, and therefore would not have triggered an upgrade.
    - Where the projected peak design allowance flows and 5-year storm flows exceeded the operational firm capacity of the station, a pump upgrade was recommended. Additional storage considerations and wet weather management were also considered.

To address existing and growth-related capacity needs, the following servicing concepts were evaluated:

- Do nothing
- Station capacity upgrade for pumping or storage
- Wet weather management
- Hybrid solution

C.6 Preferred Servicing Strategy

The following is a summary of the Port Weller WWTP system as recommended through the 2016 Master Servicing Plan Update and carried forward through this update:

- The Port Weller Wastewater Treatment Plant has sufficient capacity to support growth to year 2051 and beyond.
- The projected growth will require pumping station expansions to Spring Gardens SPS and forcemain and the Haulage Road SPS and forcemain.
- A key strategy for the Port Weller system is to provide wet weather management across the system. This will require Regional solutions as well as local municipality solutions.
- The preferred servicing for the Thorold South projects including the Peel SPS, Black Horse SPS and Centre Street SPS are governed by the South Niagara Falls Wastewater Solutions Schedule 'C' Class Environmental Assessment.
    - The strategy consists of the redirection of the Thorold South pump stations to pump to a trunk sewer connecting Thorold South to the South Niagara Falls system instead of to the Port Weller WWTP, which will provide the Port Weller trunk sewer and WWTP additional capacity to address existing capacity restrictions and to support growth.
    - The reconfiguration of Thorold South to the trunk sewer consists of
        - A new forcemain from Peel Street SPS to a new Black Horse SPS, and some upgrade work the Peel Street SPS to facilitate the new forcemain.
        - A new, upgraded Black Horse SPS and forcemain to the new trunk sewer.
        - Centre Street SPS will maintain the current configuration pumping into the Black Horse SPS catchment.
- Strategies that were added since the 2016 MSP were the addition of Haulage Road SPS and forcemain upgrade

Figure 4.C.10 and **Figure 4.C.11** show the preferred servicing strategy for the Port Weller system, consisting of:

C.6.1 Treatment Plant Works

- No capacity upgrades are required for the Port Weller WWTP.

The Region has a number of Region-wide programs focused on maintaining and enhancing the treatment capacity at the Region's existing WWTP. The programs applicable to the PNOTL WWTP include:

- WWTP Process Upgrades (WW-TP-005) which funds projects to improve treatment processes to re-establish the ECA capacity at plants.

C.6.2 Pumping Stations

- Increase Spring Gardens SPS capacity from 291 L/s to 349 L/s.
- Increase Haulage Road SPS capacity from 45 L/s to 80 L/s.

Further to the pump station upgrades, the Region-wide allowance to address odour control needs that are the result of growth-related system upgrades has been included.

- WWTP Process Upgrades (WW-TP-006) which funds in-system and plant upgrades to control odour.

C.6.3 Forcemains

- Upgrade existing 400 mm Spring Gardens SPS forcemain with new single 500 mm in St. Catharines.
- Upgrade existing 150 mm Haulage Road SPS forcemain with new single 250 mm in St. Catharines.

C.6.4 Trunk Sewers

- No trunk sewer projects are recommended in the Port Weller WWTP system.

C.6.5 Decommissioning of Existing Facilities

- No decommissioning projects are recommended in the Port Weller WWTP system.

C.6.6 Wet Weather Flow Management Program

A significant element of the Niagara Region wastewater servicing strategy is the wet weather management program. The program is intended to address existing capacity constraints, and to provide for growth-related capacity without expanding/upgrading existing trunk infrastructure, or by minimizing the required expansion/upgrades.

The wet weather management program currently identifies overall preliminary priority, staging of location and target amount of inflow and infiltration reduction across all systems. This program provides for a proactive and targeted approach to addressing wet weather impacts. These wet weather management programs will need to be a joint initiative between the Region and local municipalities.

For the Port Weller system, the following priority areas are identified:

- St. Catharines area, Lombardy Ave SPS, Haulage Road SPS, Spring Gardens SPS, and Port Weller WWTP catchments.
- NOTL area, Airport Road SPS
- Thorold area, consisting of the Carlton Street SPS, the Port Weller WWTP catchment, and Thorold South (including Peel Street).

C.6.7 Additional Studies and Investigations

Flow Monitoring Program: Additional flow monitoring data collection will improve the confidence of the system performance results from the model. Best practices for improving understanding of wastewater systems include:

- Monitoring upstream from pump stations to capture peak wet weather flows
- Increasing the density of monitoring in catchments identified for wet weather flow management, where the flows from the 5-year design storm exceed the design flows.

Sewer Network Survey: Consideration for the LAM to complete sewer invert elevation surveys of key points where the Port Dalhousie and Port Weller systems connect

C.6.8 Future System Performance

Figure 4.C.9 presents the future system performance, based on the preferred servicing strategy configuration and capacities; but excludes the potential benefits of the local wet weather flow management program.

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

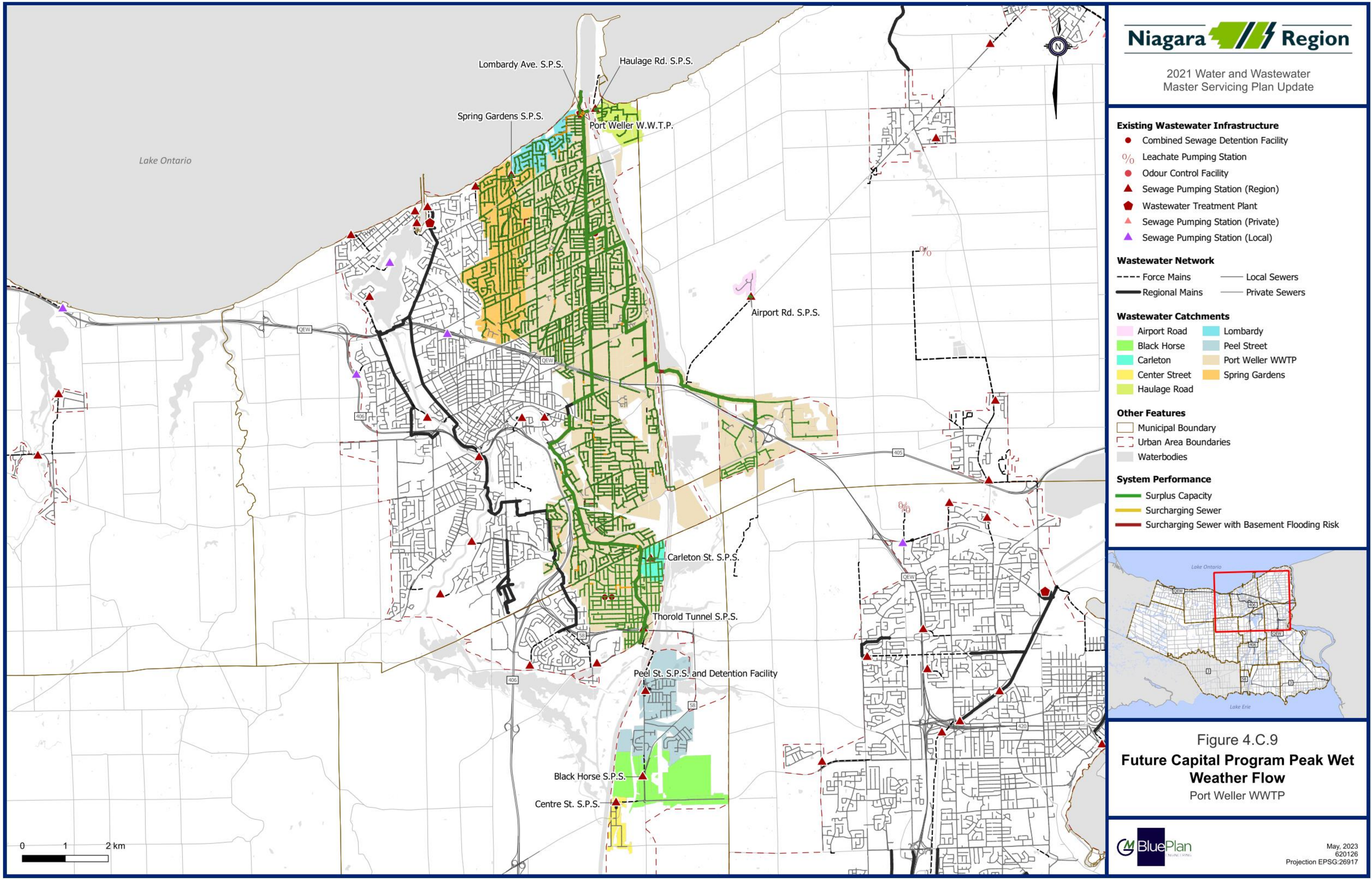


Figure 4.C.9

Future Capital Program Peak Wet Weather Flow

Port Weller WWTP

GM BluePlan ENGINEERING

May, 2023
620126
Projection EPSG:26917

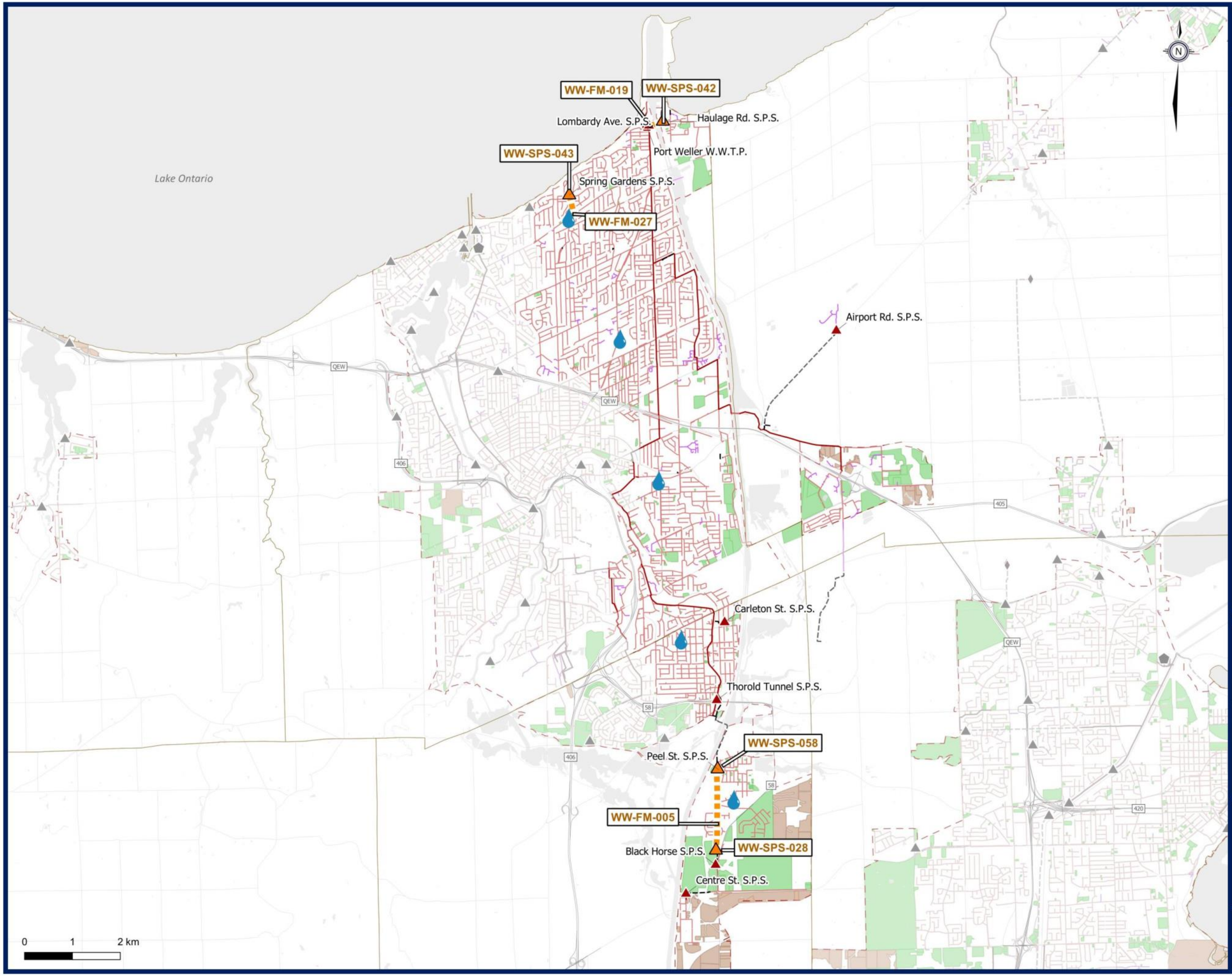
C.7 Capital Program

Figure 4.C.10 and **Figure 4.C.11** present the preferred servicing strategy map and schematic for the Port Weller WWTP system. The capital program and project implementation and considerations for the south Thorold projects in the South Niagara Falls WWTP strategy are shown in the Niagara Falls system **Volume 4 – Appendix F.**

Table 4.C.10 summarizes the recommended project costing timing and Class EA requirements. Individual detailed costing sheets are presented in **Section C.8.6.**

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



Capital Program

- Treatment Plant
- Pumping Station
- Wet Weather Reduction (WW-II-017)
- Forcemains
- Sewers

Wastewater Facilities

- Wastewater Treatment Plant
- Biosolids Storage Facility
- Leachate Pumping Station
- Odour Control Facility

Wastewater Network

- Force Mains
- Regional Mains
- Local Sewers
- Private Sewers

Pumping Stations

- Niagara Region
- Municipal
- Private

Other Features

- Municipal Boundary
- Waterbodies
- Urban Area Boundary

Development Locations

- Post-2051
- Pre-2051

***Note that additional growth in existing built areas is anticipated**

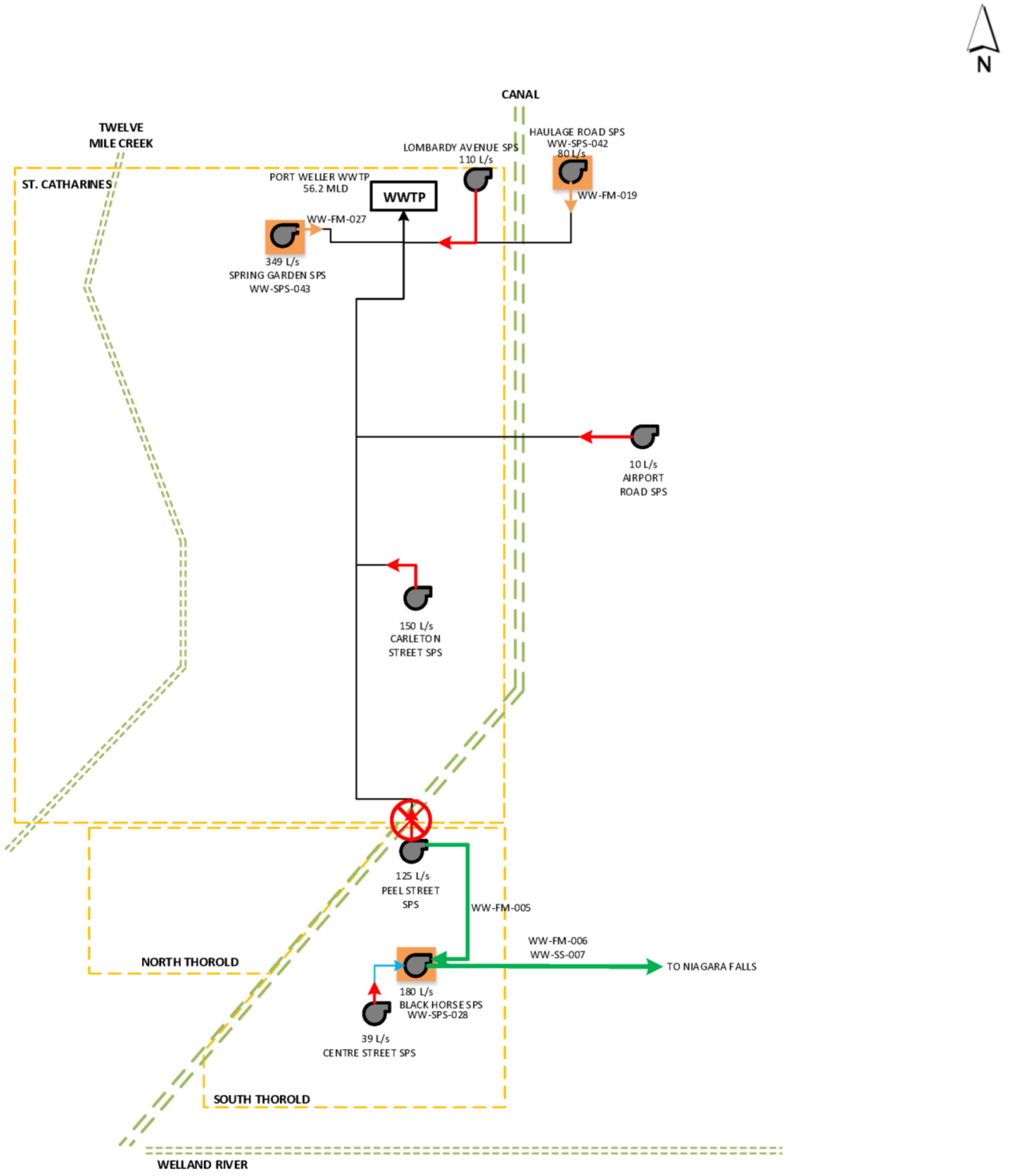
***Project alignments are preliminary and will be refined through subsequent projects (EA and/or detailed design)**

Figure 4.C.10

Port Weller WWTP System

Preferred Wastewater Servicing Strategy

December 2022
620126-WW-006
WKID: 26917



Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

WWTP RATED CAPACITY	Wastewater Treatment Plant
FIRM CAPACITY	Sewage Pumping Station
→	Forcemain
→	Connection from SPS to SPS
→	Connection from SPS to WWTP
🟧	Facility Upgrade
🟩	New Facility
—	Upgrade Forcemain or Sewer
—	New Forcemain or Sewer
⊗	Decommission Project

Figure 4.C.11
Port Weller WWTP
Future Wastewater Infrastructure Schematic

BluePlan

December 2022
621016-W-000
WKID: 26917

Table 4.C.10 Summary of Port Weller Wastewater Treatment Plant Capital Program

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost ($)
WW-FM-019	Haulage Road Forcemain Upgrade	Upgrade existing 150 mm Haulage Road SPS forcemain with new single 250 mm	250 mm	2037-2041	St. Catharines	A+	Dependent on outcome of wet weather flow study	Forcemain	$4,500,000
WW-FM-027	Spring Gardens Forcemain Replacement	Upgrade existing 400 mm Spring Gardens SPS forcemain with new single 500 mm in St Catharines	500 mm	2022-2026	St. Catharines	B	Separate EA Required	Forcemain	$3,058,000
WW-SPS-042	Haulage Road SPS Pump Replacement -Port Weller	Increase station capacity from 45 L/s to 80 L/s by replacing both pumps.	80 L/s	2037-2041	St. Catharines	A+	Dependent on outcome of wet weather flow study	Pumping	$2,415,000
WW-SPS-043	Spring Gardens SPS Pump Replacement	"Increase station capacity from 291 L/s to 349 L/s by replacing existing three pumps.	349 L/s	2022-2026	St. Catharines	A+	Satisfied	Pumping	$6,519,000
WW-II-017(1)	Region-Wide Wet Weather Reduction	Wet weather reduction program in all systems to be executed from 2022-2051	N/A	2022-2051	Region-Wide		Dependent on outcome of wet weather flow study	Wet Weather Reduction	$225,000,000
WW-ST-001(1)	Region-Wide Flow Monitoring and Data Collection	Funding to support flow monitoring and data collection initiatives	N/A	2022-2051	Region-Wide			Wet Weather Reduction	$12,000,000
WW-TP-005(1)	Region-Wide WWTP Process Upgrades	Process upgrades to re-establish ECA capacity	N/A	2022-2051	Region-Wide			Treatment	$50,000,000
WW-TP-006(1)	Region-Wide WWTP Process Upgrades	Upgrades for odour control across the Region at forcemains, pump stations, and other locations.	N/A	2022-2051	Region-Wide			Treatment	$40,000,000
								Total	**$16,492,000**

(1) Project cost not included in subtotal as it is a Region-wide project

C.8 Project Implementation and Considerations

C.8.1 10-Year Program Sequencing

The recommended year in service for the capital projects is presented in **Section C.6.7**. Special project implementation and considerations for the preferred servicing strategy consist of:

- Timing of the Spring Gardens SPS and forcemain upgrades will be constructed in the 2022-2026 time horizon, primarily driven by the condition of the Spring Gardens forcemain.
- Due to the recent upgrades of the Haulage Road SPS; future upgrades to the Haulage Road SPS and Forcemain were deferred to post 2031 timeframe with a focus on wet weather flow management within the catchment to gain additional capacity and potential defer the need for future upgrades.

It is understood that the timing for the recommended projects may be subject to change due to a variety of external factors such as overall balancing of the Region's capital budget, changes to growth projections, and other unforeseen circumstances. As such, **Table 4.C.11** presents the preferred priority of the projects within the first 10-years of the capital program.

Table 4.C.11 Preferred Project Order

Master Plan ID	Name	2021 MSPU Year in Service	Order
WW-FM-027	Spring Gardens Forcemain Replacement	2022-2026	1
WW-SPS-043	Spring Gardens SPS Pump Replacement	2022-2026	1

C.8.2 EA Requirements and Studies

The following summarizes the status of EA requirements for recommended capital projects which will require Schedule B or C EAs.

- EA has been satisfied through previous projects:
    - South Niagara Falls Wastewater Solutions Schedule 'C' Class Environmental Assessment
- Currently ongoing separate EA studies:
    - None.
- EA studies to be completed through separate studies:
    - **WW-FM-027** (Spring Gardens forcemain replacement) Schedule B

C.8.3 Region-Wide Projects and Collaboration with Local Area Municipalities

Acknowledging that the overall wastewater systems are jointly owned and operated by the Region and LAM, the continued operation and expansion of the wastewater systems to support existing users and accommodate projected growth relies upon the cooperation of the upper and lower tier municipalities. Major updates and adjustments to planning projections should be continued to be communicated as this may affect project details such as trigger timelines and design capacities, which is discussed further in **Section C.8.5**

One initiative that will be predominately driven by the LAMs is wet weather management. While wet weather management should be completed in all municipalities, this 2021 MSPU assumes that the catchments where the peak wet weather flows exceed the peak design flows and contribute to increased risk of basement flooding or overflows will put a specific focus on wet weather management. The Region is committed to continuing the joint CSO funding program through which LAMs can apply for funding support for inflow and infiltration reduction programs and projects such as those identified through the PPCP.

Additional flow monitoring and system data collection, in partnership with LAM, is needed to improve system understanding, support proposed wet weather flow reductions, and identify opportunities for system optimization and overflow removals.

C.8.4 Sustainability Projects

It is important to recognize that the 2021 MSPU servicing strategies identify new infrastructure to service the additional growth out to year 2051 but these strategies are built by extending infrastructure from the existing systems and leveraging the existing Region infrastructure in place. It is essential that the existing infrastructure is maintained in good condition and performance to support servicing growth.

The Region continually establishes and implements a sustainability program that addresses priority projects to ensure the existing infrastructure is in a state-of-good-repair and continues to perform and meet the intended level of services. Region-wide programs including but not limited to replacement programs for pipes and manholes, boilers, meters, generators, SCADA upgrades, sludge management programs, laboratory and sampling equipment upgrades, process electrical, process instrumentation. Pump station upgrades through the sustainability capital plan re-establish the SPS ECA capacity.

Independent of the 2021 MSPU, the Region has completed a sustainability program analysis to identify the projects on a yearly basis, with focus on a 10-year program, to address the sustainability needs. This Sustainability Capital Plan is first developed to demonstrate the total investment needs and may identify a level of investment and implementation exceeding Region resources. The next steps for the Sustainability Capital Plan will be the development of the Financial Plan for existing Water and Wastewater assets which is anticipated to be completed in 2024. It should be noted that the Sustainability Capital Plan represents investment required over and above the growth-related 2021 MSPU program.

Port Weller system specific projects include:

- Port Weller WWTP upgrades including works for the chemical system, secondary treatment process, and laneway.
- Carlton Street SPS forcemain upgrade

C.8.5 Project Implementation Flow Chart

The recommended design capacities within the growth capital program are based on the best available information at the time of analysis, including existing system flows, facility capacities, and projected growth. It is understood that this data is not static and often changes over the years between the regular updates of the Region’s Master Plan and between those updates. Design assumptions should be revisited before initiation of projects to reconfirm the appropriate design capacities, along with identification of any associated or dependent projects which can be combined or staged to optimize implementation efficiency and cost, and/or system operation.

To support the Region’s process in implementing all recommended 2021 MSPU capital projects, the following flow chart has been developed for the wastewater system. This flow chart document is intended to be a reference resource for the Region and should be treated as a guideline to support existing internal Region processes in project implementation.

The wastewater implementation flow chart is shown in **Figure 4.C.12**.

Niagara Region

WASTEWATER PROJECT IMPLEMENTATION

The intent of this document is to support the Region in confirming the scope of work for wastewater infrastructure projects.

CONFIRM PROJECT SCOPE

To define Terms of Reference

☐ **What triggered this project?**
- Known development growth
- Forecasted growth
- Sustainability needs

☐ **Are there related or dependent projects that should be identified for streamlining opportunities or for project phasing?**
- Are there upstream projects with increasing capacity?
- Are there projects within the same alignment or project area that could be combined? (e.g., growth projects, SPS, forcemain, sewer, corridor planning, sustainability projects, water, stormwater, etc.)
- If there are related projects, could the project timing be adjusted to combine or stage projects more efficiently?

☐ **What is the project EA Schedule and status?**

☐ **Are there historic or ongoing operational issues in the project area?**
- Confirm with Regional and LAM operations and maintenance groups
- i.e. historic overflows, low flow/odour issues, clogging issues, work order history, etc.

☐ **Are there any data gaps that should be incorporated into the Terms of Reference?**
- Refer to the Required Data section below for details
- How much does the project timeline and budget need to change to allow for the data collection?

☐ **Have the planning projections been updated to the best available information?**
- Consultation with Region and LAM planning groups to confirm planning projection
- Are projected needs for the project in place? Is actual growth in line with projected growth?)

☐ **Should the project be deferred until identified related works are completed?**

REQUIRED DATA

To support terms of reference and detailed design

☐ **Recently completed EA or servicing study**
(for growth triggered projects)

☐ **Historic flow records**
- Within the last 3 years
- Ideally one full year of flow monitoring data that covers 80% of the total contributing area
- Can be included in project scope if feasible

☐ **Existing pump, flow, and pressure data to identify/verify existing system issues**

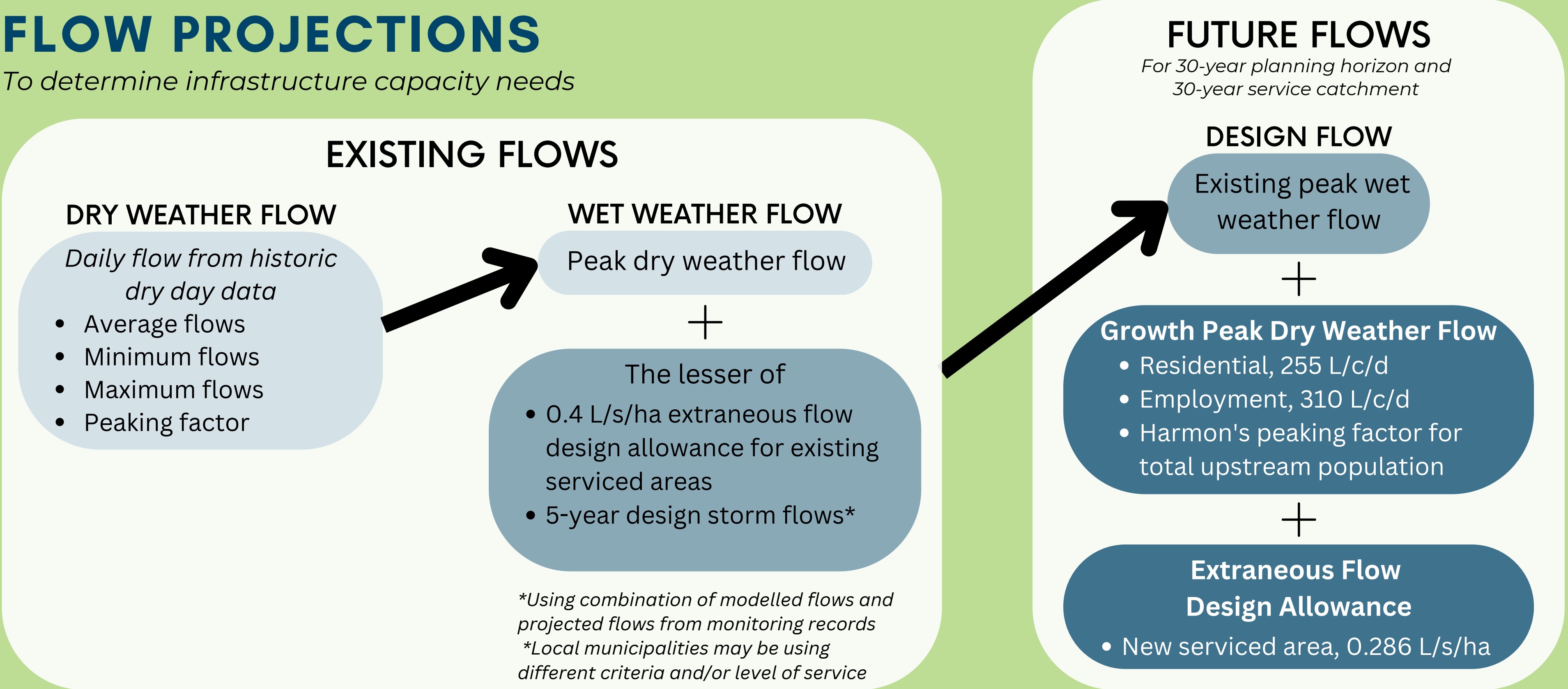
☐ **Asset inventory and condition assessment**
- All asset classes within the infrastructure type (sewer, forcemain, storage, pumping, or treatment facility)
- Within the last 5 years
- Can be part of project scope if the data is not available and would not significantly alter project scope - to assess need for related works (i.e. electrical, HVAC, structural upgrades at an SPS)

☐ **Service area growth potential to confirm projected population and demands**
- Consultation with Region and LAM planning groups within the past year
- Growth information for 30-year horizon and beyond (maximum service catchment)
  - Population, jobs, land use, area
  - Current inventory of development areas with associated development status

! IF THE REQUIRED DATA IS NOT AVAILABLE AND IF IT HAS THE POTENTIAL TO SIGNIFICANTLY ALTER SCOPE OF THE DESIGN, IT IS STRONGLY RECOMMENDED THAT THE APPROPRIATE DATA COLLECTION AND FIELD INVESTIGATION BE COMPLETED PRIOR TO PROCEEDING WITH DESIGN. ALTERNATIVELY, WHERE FEASIBLE, DATA COLLECTION SHOULD BE INCLUDED IN THE PROJECT SCOPE AND INTEGRATED INTO THE DESIGN PROCESS.

FLOW PROJECTIONS

To determine infrastructure capacity needs



EXISTING FLOWS

DRY WEATHER FLOW

Daily flow from historic dry day data
- Average flows
- Minimum flows
- Maximum flows
- Peaking factor

WET WEATHER FLOW

Peak dry weather flow

+

The lesser of
- 0.4 L/s/ha extraneous flow design allowance for existing serviced areas
- 5-year design storm flows*

*Using combination of modelled flows and projected flows from monitoring records
*Local municipalities may be using different criteria and/or level of service

FUTURE FLOWS

For 30-year planning horizon and 30-year service catchment

DESIGN FLOW

Existing peak wet weather flow

+

Growth Peak Dry Weather Flow
- Residential, 255 L/c/d
- Employment, 310 L/c/d
- Harmon's peaking factor for total upstream population

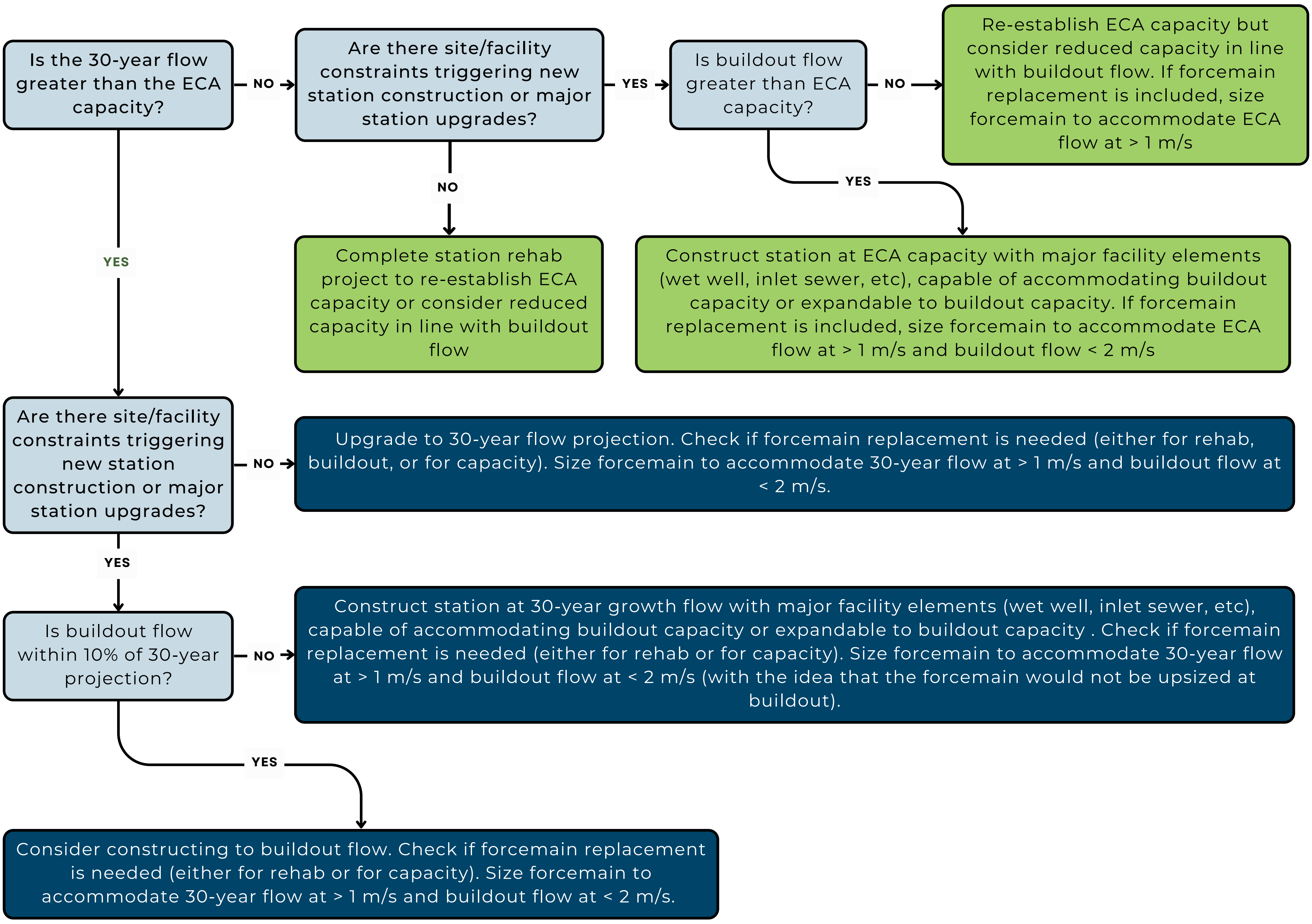
+

Extraneous Flow Design Allowance
- New serviced area, 0.286 L/s/ha

The design criteria presented in this document are based on the 2021 Master Servicing Plan Update Study

BluePlan ENGINEERING

SEWAGE PUMPING STATIONS



Is the 30-year flow greater than the ECA capacity?

NO

Are there site/facility constraints triggering new station construction or major station upgrades?

YES

Is buildout flow greater than ECA capacity?

NO

Re-establish ECA capacity but consider reduced capacity in line with buildout flow. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s

NO

Complete station rehab project to re-establish ECA capacity or consider reduced capacity in line with buildout flow

YES

Construct station at ECA capacity with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s and buildout flow < 2 m/s

YES

Are there site/facility constraints triggering new station construction or major station upgrades?

NO

Upgrade to 30-year flow projection. Check if forcemain replacement is needed (either for rehab, buildout, or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

YES

Is buildout flow within 10% of 30-year projection?

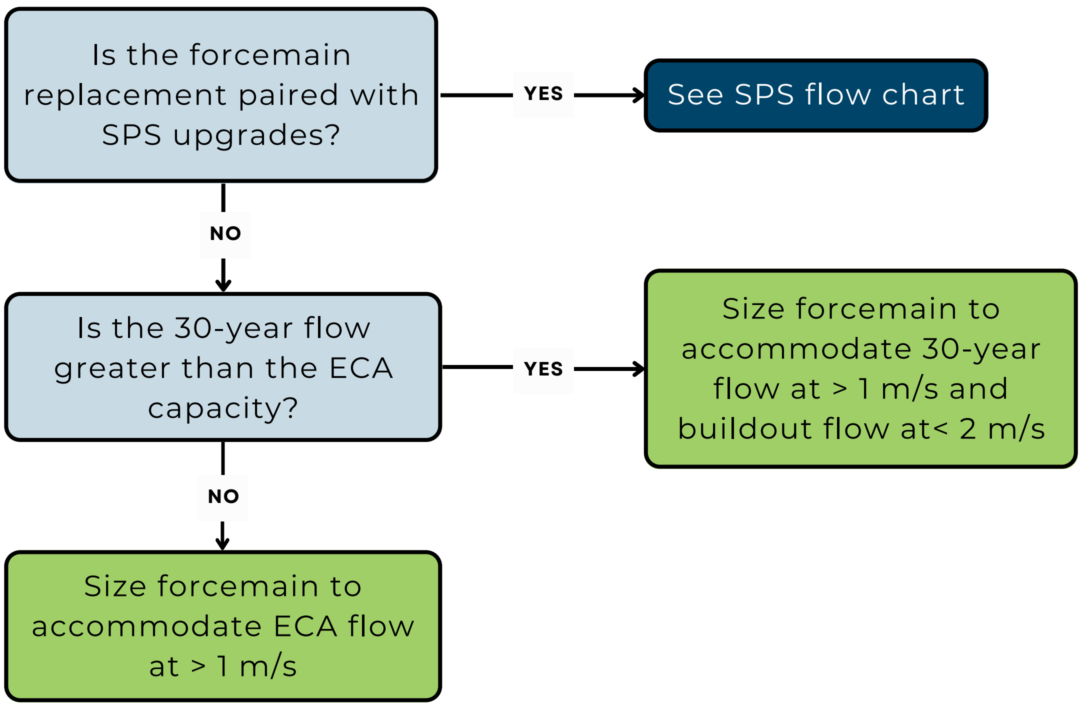
NO

Construct station at 30-year growth flow with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity . Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s (with the idea that the forcemain would not be upsized at buildout).

YES

Consider constructing to buildout flow. Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

FORCEMAINS



Is the forcemain replacement paired with SPS upgrades?

YES

See SPS flow chart

NO

Is the 30-year flow greater than the ECA capacity?

YES

Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at< 2 m/s

NO

Size forcemain to accommodate ECA flow at > 1 m/s

C.8.6 Detailed Project Costing Sheets

The detailed project costing sheets for the recommended 2021 MSPU capital projects within the Port Weller WWTP system are presented below.

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-FM-019**
PROJECT NAME:	**Haulage Road Forcemain Upgrade**
PROJECT DESCRIPTION:	Upgrade existing 150 mm Haulage Road SPS forcemain with new single 250 mm

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-FM-019**

Pump Station	**WW-SPS-042**	
ECA	46	0.94
Proposed	80	1.63
Buildout	78	1.60
Number of Pumps	2	1.63

PROPOSED DIAMETER:	250 mm	
TOTAL LENGTH:	285 m	
Tunnelled		0%
Open Cut	285 m	100%

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Forcemain

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	285 m	$965	$274,941	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$1,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	20%					$54,988	
Minor Creek Crossings			ea.	0	$31,000	$0	
Major Creek Crossings			ea.	1	$200,000	$200,000	
Road Crossings			ea.	1	$83,000	$83,000	Rail
Major Road Crossings (Highway)			ea.	0	$200,000	$0	
Utility Crossings			ea.	0	$83,000	$0	
Additional Construction Costs	10%		ea.			$61,293	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$67,422	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$742,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$7,400	
Geotechnical Sub-Total Cost						**$7,400**	
Property Requirements	1.0%					$ 7,400	
Property Requirements Sub-Total						**$7,400**	
Consultant Engineering/Design	15%					$ 111,300	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$111,300**	
In House Labour/Engineering/Wages/CA	4.0%					$ 50,000	
In-house Labour/Wages Sub-Total						**$50,000**	
Project Contingency	10%					$92,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$92,000**	
Non-Refundable HST	1.76%					$16,900	
Non-Refundable HST Sub-Total						**$16,900**	
Total (2022 Dollars)						**$1,027,000**	Rounded to nearest $1,000
Other Estimate						**$4,500,000**	Detailed design estimate
Chosen Estimate						**$4,500,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$90,000		
Design	Design fees, Town fees for design, contract admin	13%	$585,000		
Construction	Town fees, base costs and project contingency	85%	$3,825,000		
TOTAL			**$4,500,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-FM-027**
PROJECT NAME: **Spring Gardens Forcemain Replacement**
PROJECT DESCRIPTION: Upgrade existing 400 mm Spring Gardens SPS forcemain with new single 500 mm in St Catharines

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-FM-027**

Pump Station	**WW-SPS-043**	
ECA	295	1.50
Proposed	349	1.78
Buildout	349	1.78
Number of Pumps	3	0.89

PROPOSED DIAMETER:	500 mm	
TOTAL LENGTH:	623 m	
Tunnelled		0%
Open Cut	623 m	100%

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Forcemain

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	623 m	$1,216	$757,530	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$6,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	30%					$227,259	
Minor Creek Crossings			ea.	0	$230,000	$0	
Major Creek Crossings			ea.	0	$1,049,000	$0	
Road Crossings			ea.	1	$482,000	$482,000	
Major Road Crossings (Highway)			ea.	0	$1,049,000	$0	
Utility Crossings			ea.	0	$482,000	$0	
Updated Soils Regulation Uplift	2%					$15,151	
Additional Construction Costs	20%		ea.			$296,388	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$177,833	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$1,956,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$39,100	
Geotechnical Sub-Total Cost						**$39,100**	
Property Requirements	2.0%					$ 39,100	
Property Requirements Sub-Total						**$39,100**	
Consultant Engineering/Design	15%					$ 293,400	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$293,400**	
In House Labour/Engineering/Wages/CA	4.0%					$ 78,240	
In-house Labour/Wages Sub-Total						**$78,240**	
Project Contingency	25%					$601,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$601,000**	
Non-Refundable HST	1.76%					$51,500	
Non-Refundable HST Sub-Total						**$51,500**	
Total (2022 Dollars)						**$3,058,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$3,058,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$61,160		
Design	Design fees, Town fees for design, contract admin	13%	$397,540		
Construction	Town fees, base costs and project contingency	85%	$2,599,300		
TOTAL			**$3,058,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PL
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-II-017**
PROJECT NAME:	**Region Wide Wet weather Reduction**
PROJECT DESCRIPTION:	Wet weather reduction program in all systems to be executed from 2022-2051

Old ID		**Focus Areas**	Amount
_WW-II-001	Anger Ave WWTP	Lakeshore Road, Catharine Street, Dominion Road, Rose Avenue SPS, Anger Ave WWTP Catchments	
_WW-II-002	Crystal Beach WWTP	Nigh Road SPS and Crystal Beach WWTP Catchments	
_WW-II-003	Stevensville Douglastown	Stevensville, Douglastown catchments	
_WW-II-004	Welland WWTP	Feeder Road, Seaway Heights, Ontario Road SPS, Dain City, and Welland WWTP Catchments	
_WW-II-005	Baker - Grimsby	Woodsview, Biggar Lagoon, Old Orchard SPS Catchments	
_WW-II-006	Baker - Lincoln Beamsville	Ontario Street SPS Catchment	
_WW-II-007	Baker - Lincoln Vineland	Wet weather reduction in Jordan Valley***	
_WW-II-008	Port Dalhousie	Eastchester, Lakeside, Argyle, Renown SPS and Port Dalhousie WWTP Catchments	
_WW-II-009	Port Weller/Port Dalhousie	Wet weather reduction in North Thorold	
_WW-II-010	Port Weller	Haulage Road, Carlton Street SPS, and Port Weller WWTP Catchments	
_WW-II-011	Seaway WWTP	Union, Clarke Street, Arena, Elm Street, City Hall, Sugarloaf, Rosemount North and South SPS Catchments	
_WW-II-012	Niagara Falls WWTP	Central, Muddy Run, Seneca, Meadowvale, Drummond, Kalar Road SPS Catchments	
_WW-II-013	South Niagara Falls WWTP	South Side High Lift and South Side Low Lift SPS Catchments	
_WW-II-014	NOTL	Wet weather reduction in Northeast Niagara-on-the-Lake	
_WW-II-015	NOTL	Wet weather reduction in Virgil - NOTL	
_WW-II-016	Baker - West Lincoln	Wet weather reduction in West Lincoln - Baker	

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-042**

PROJECT NAME: **Haulage Road SPS Pump Replacement**

PROJECT DESCRIPTION: Increase station capacity from 45 L/s to 80 L/s by replacing both pumps.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-042**

	L/s	
ECA	46.0	
Operational	45.0	based on 2021

PROPOSED CAPACITY		80 L/s	Firm Capacity
Design PWWF	**Existing**	55 L/s	46 L/s
	2051	77 L/s	107 L/s
	Buildout	78 L/s	108 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	45	80
2	45	80

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	80 L/s	$27,983	$1,000,000	$505k per pump, replace existing 2 pumps
Related Upgrades	30%					$300,000	
Bypass Pumping Allowance	6%					$71,500	
Additional Construction Costs	15%		ea.			$205,725	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$157,723	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$1,735,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 260,300	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$260,300**	
In House Labour/Engineering/Wages/CA	4.0%					$ 69,400	
In-house Labour/Wages Sub-Total						**$69,400**	
Project Contingency	15%					$310,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$310,000**	
Non-Refundable HST	1.76%					$40,600	
Non-Refundable HST Sub-Total						**$40,600**	
Total (2022 Dollars)						**$2,415,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$2,415,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$48,300		
Design	Design fees, Town fees for design, contract admin	13%	$313,950		
Construction	Town fees, base costs and project contingency	85%	$2,052,750		
TOTAL			**$2,415,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-043**

PROJECT NAME: **Spring Gardens SPS Pump Replacement**

PROJECT DESCRIPTION: Increase station capacity from 291 L/s to 349 L/s by replacing existing three pumps.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-043**

	L/s
ECA	295.0
Operational	290.5

PROPOSED CAPACITY		349 L/s	Firm Capacity
Design PWWF	**Existing**	324 L/s	340 L/s
	2051	342 L/s	358 L/s
	Buildout	349 L/s	364 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	145	174
2	145	174
3	145	174

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	58 L/s	$27,983	$2,700,000	$900k per pump, replace 3 existing pumps
Related Upgrades	30%					$810,000	
Bypass Pumping Allowance	6%					$193,050	
Additional Construction Costs	15%		ea.			$555,458	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$425,851	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$4,684,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 702,600	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$702,600**	
In House Labour/Engineering/Wages/CA	4.0%					$ 187,360	
In-house Labour/Wages Sub-Total						**$187,360**	
Project Contingency	15%					$836,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$836,000**	
Non-Refundable HST	1.76%					$109,500	
Non-Refundable HST Sub-Total						**$109,500**	
Total (2022 Dollars)						**$6,519,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$6,519,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$130,380		
Design	Design fees, Town fees for design, contract admin	13%	$847,470		
Construction	Town fees, base costs and project contingency	85%	$5,541,150		
TOTAL			**$6,519,000**		

PROJECT NO.: WW-TP-005
PROJECT NAME: Region-wide WWTP Process Upgrades
PROJECT DESCRIPTION: Process upgrades to re-establish ECA capacity

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-TP-005

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$50,000,000**	Placeholder Costs
Chosen Estimate						**$50,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$1,000,000		
Design	Design fees, Town fees for design, contract admin	13%	$6,500,000		
Construction	Town fees, base costs and project contingency	85%	$42,500,000		
TOTAL			**$50,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-TP-005**
PROJECT NAME:	**Region-wide WWTP Process Upgrades**
PROJECT DESCRIPTION:	Upgrades for odour control across the Region at forcemains, pump stations, and other locations.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$40,000,000**	Placeholder Costs
Chosen Estimate						**$40,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$800,000		
Design	Design fees, Town fees for design, contract admin	13%	$5,200,000		
Construction	Town fees, base costs and project contingency	85%	$34,000,000		
TOTAL			**$40,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-ST-001**
PROJECT NAME: **Region Wide Flow Monitoring and Data Collection**
PROJECT DESCRIPTION: Funding to support flow monitoring and data collection initiatives

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-ST-001**

PROPOSED CAPACITY	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction							
Additional Construction Costs	10%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ -	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$0**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	10%					$4,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$4,000**	
Non-Refundable HST	1.76%					$100	
Non-Refundable HST Sub-Total						**$100**	
Total (2022 Dollars)						**$44,000**	Rounded to nearest $1,000
Other Estimate						**$12,000,000**	Assumes 400k/year for 30 y
Chosen Estimate						**$12,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$240,000		
Design	Design fees, Town fees for design, contract admin	13%	$1,560,000		
Construction	Town fees, base costs and project contingency	85%	$10,200,000		
TOTAL			$12,000,000		

D

Regional Municipality of Niagara

Part D

NIAGARA-ON-THE-LAKE WASTEWATER SYSTEM

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D. NIAGARA-ON-THE-LAKE WASTEWATER TREATMENT PLANT

D.1 Existing System Infrastructure

The Niagara-on-the-Lake wastewater system services the Old Town and Virgil areas of the Town of Niagara-on-the-Lake. The system services an existing population of 10,058 and 4,152 employees. Note that this population and employment total is based on the Region's 2021 allocation of Traffic Area Zones planning data and has been processed through the allocation methodology presented in **Volume 2** to refine the data to include only serviced populations. As such, the population and employment total may not directly match the system totals using the Region's unprocessed planning data.

The system is serviced by the Niagara-on-the-Lake Wastewater Treatment Plant, located on 1550 Lakeshore Road, Niagara-on-the-Lake. The Niagara-on-the-Lake Wastewater Treatment Plant is a conventional treatment facility with a current rated capacity of 8.0 MLD and a peak flow capacity of 34.7 MLD.

System flows are conveyed to the treatment plant via a network of local and Regionally owned sewer, and Regionally owned pump stations and forcemains.

Figure 4.D.1 presents an overview of the wastewater system, and **Figure 4.D.2** shows a schematic of the wastewater system.

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

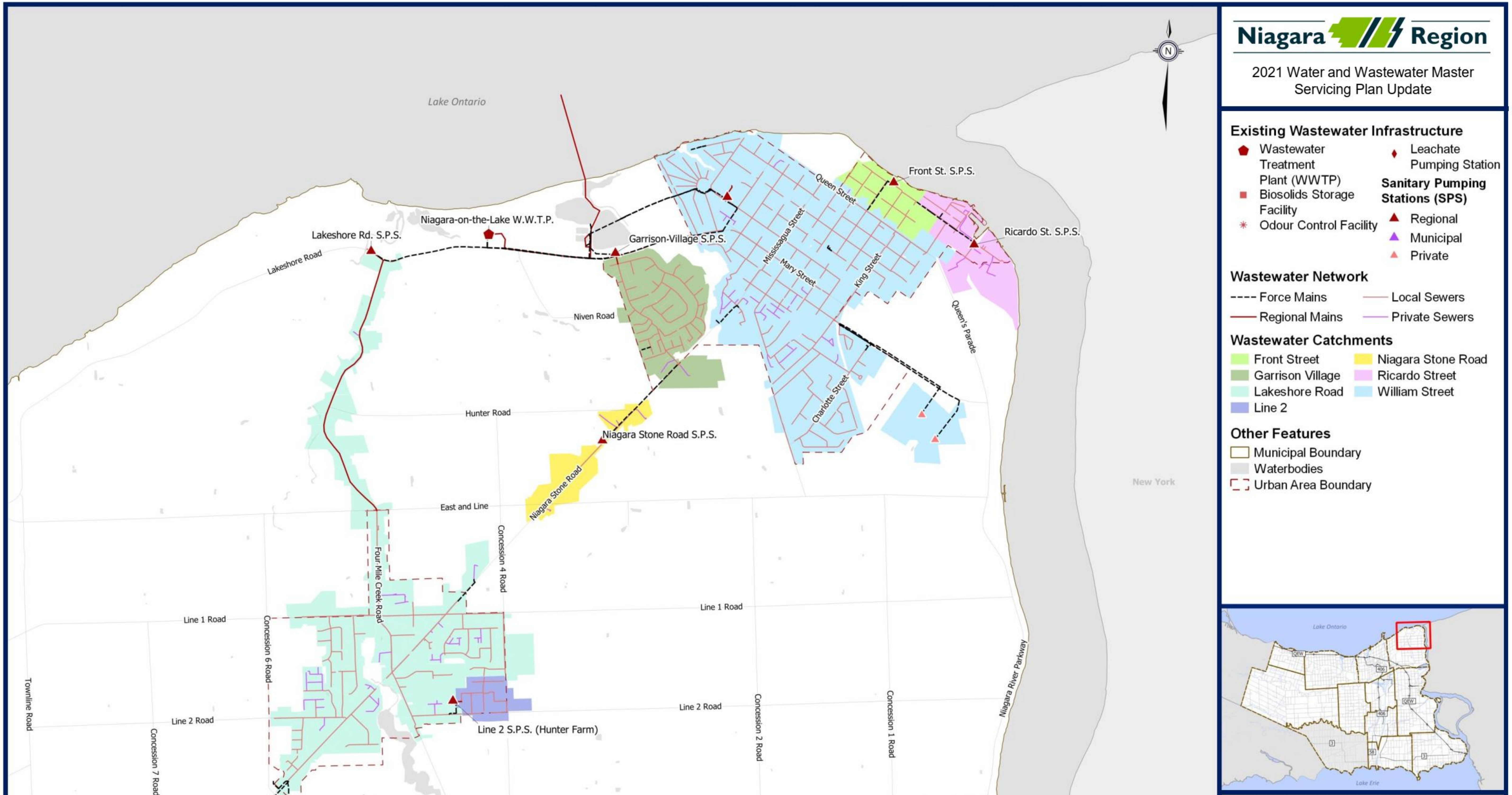
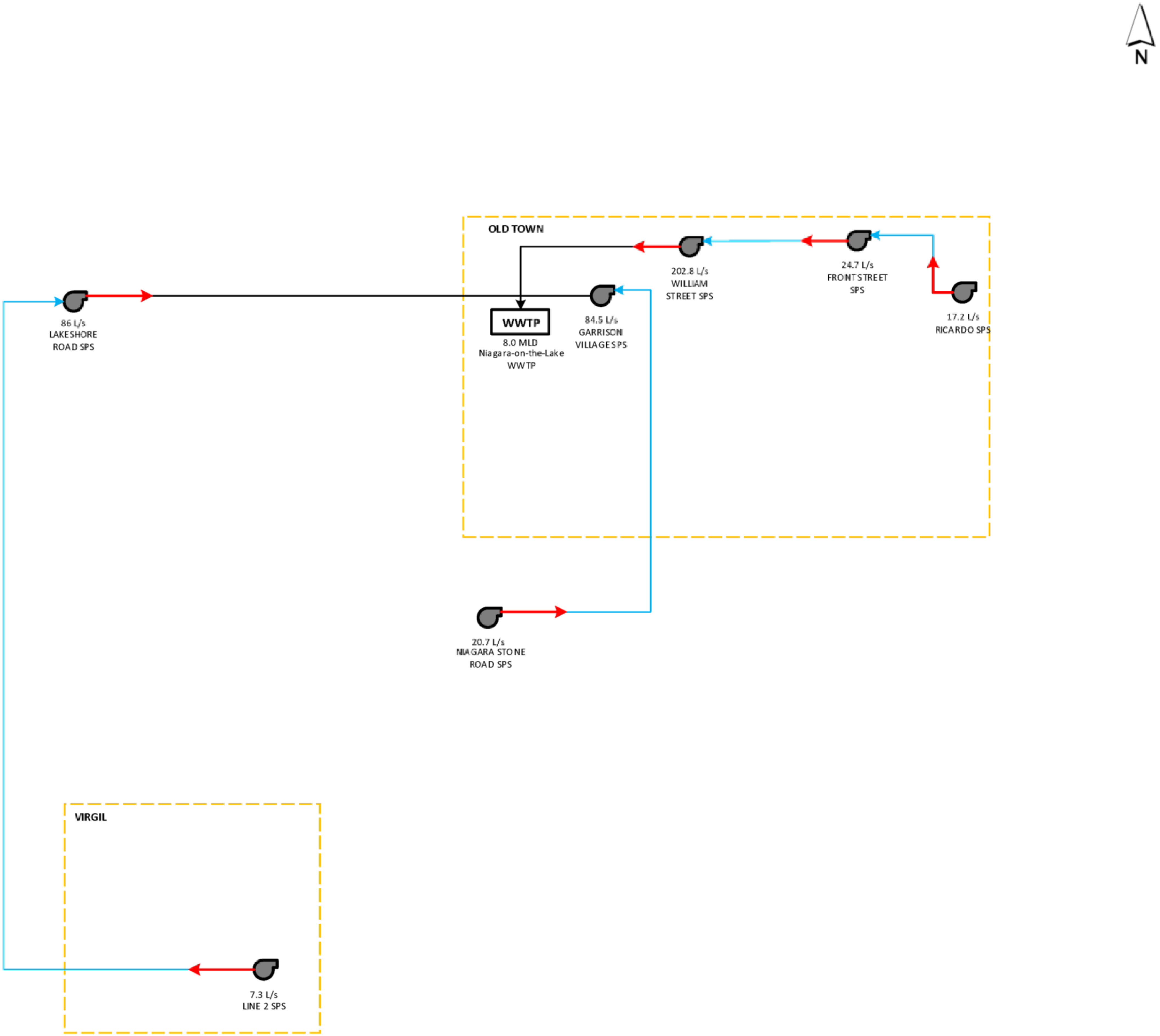


Figure 4.D.1
NOTL WWTP System
Existing Wastewater Infrastructure

BluePlan ENGINEERING

March 2023
620126-WW-001
WKID: 26917



2021 Water and Wastewater Master Servicing Plan Update

WWTP RATED CAPACITY	Wastewater Treatment Plant
FIRM CAPACITY	Sewage Pumping Station
→	Forcemain
→	Connection from SPS to SPS
→	Connection from SPS to WWTP

Figure 4.D.2
Niagara-on-the-Lake WWTP
Existing Wastewater Infrastructure Schematic

December 2022
621016-W-000
WKID: 26917

D.1.1 Facility Overview

Table 4.D.1 to **Table 4.D.2** present a summary of the environmental compliance approval (ECA) for the Niagara-on-the-Lake wastewater treatment plant (WWTP) usage, operation, and effluent concentration objectives.

Table 4.D.1 Wastewater Treatment Plant Overview

Plant Name	NOTL Wastewater Treatment Plant
ECA #	8314-9MHHJQ Issued September 10, 2014
Address	1550 Lakeshore Road, Niagara-on-the-Lake
Discharge Water	Lake Ontario
Rated Capacity: Average Daily Flow	8.0 MLD
Rated Capacity: Peak Flow Rate (Dry Weather)	Not Available
Rated Capacity: Peak Flow Rate (Wet Weather)	34.7 MLD
Key Processes	• Mechanical bar screens with air bubble diffuser system • Grit classifier with cyclone separators • Aeration • Final clarification • Disinfection • Sludge thickening • Anaerobic digestion

Table 4.D.2 Wastewater Treatment Plant Effluent Objectives

Effluent Parameter	Objective Concentration
$CBOD_5$	15.0 mg/L
TSS	15.0 mg/L
Total Phosphorus	0.5 mg/L
Total Ammonia Nitrogen	
April, May, and October	*5 mg/L*
June – September	*2 mg/L*
November – March	*10 mg/L*
E. Coli	100 organisms/100 mL
Total Chlorine Residual	0.01 mg/L

Table 4.D.3 lists each sewage pumping station's (SPS) ECA firm capacity as well as the station's existing operational firm capacity (the current operating capacity of the pumps station based on performance testing and/or supervisory control and data acquisition (SCADA) trending). As identified in Volume 4, the operational firm capacity was used as the basis of assessment for the MSPU. In some cases where the operational firm capacity was larger than the ECA firm capacity; the registered ECA capacity was used.

Table 4.D.3 Pumping Station and Forcemain Overview

Station Name	Location	Catchment Details		Pump Station Details			Forcemain Details		
		Area Exclusive of Upstream Catchments (ha)	Area Inclusive of Upstream Catchments (ha)	Number of Pumps	ECA Firm Capacity (L/s)	Operational Firm Capacity (L/s)	Single or Twinned Forcemain	Forcemain Diameter (mm)	Length (m)
└→**Garrison Village SPS**	1788 Lakeshore Road, Niagara-on-the-Lake	72.8	101.0	2	62.0	84.5	Single	250	355
| └→**Niagara Stone Road SPS**	1974 Niagara Stone Road, Niagara-on-the-Lake	28.2	28.2	2	24.0	20.7	Single	147	902
└→**Lakeshore Road SPS**	1340 Lakeshore Road, Niagara-on-the-Lake	258.9	276.1	2	90.0	86.0	Single	300	2,078
| └→**Line 2 SPS**	Hunter Farm Subdivision, Line 2 Road, Virgil	17.1	17.1	2	8.1	7.3	Single	100	175
└→**William Street SPS**	433 William Street, Niagara-on-the-Lake	354.1	420.9	3	250.0	202.8	Single	356	846
└→**Front Street SPS**	Front Street, Niagara-on-the-Lake	25.1	66.9	2	41.5	24.7	Single	200	360
└→**Ricardo Street SPS**	Ricardo Street, Niagara-on-the-Lake	41.7	41.7	2	17.6	17.2	Single	150	624

D.2 Basis for Analysis

D.2.1 Flow Criteria, System Performance, and Sizing Methodology

The Niagara Region Traffic Area Zone planning data was used to estimate growth related flow generation within the wastewater system and to spatially allocate growth flows within each individual system. **Table 4.D.4** presents a summary of the flow criteria, performance, and sizing methodology that was utilized. Refer to **Volume 4 - Introduction** for additional information.

The Region's per capita wastewater flows criteria were updated based on a historic review of the previous 3-year period for local billing meter and flow monitoring records. Given that more granular data was available to complete this analysis compared to previous master plan updates, the population and employment per capita rates were differentiated. The data showed a slight reduction in the population criteria and slight increase in the employment criteria, which more closely reflect existing flow generation trends compared to the Region's previous per capita rate. Further detail regarding the per capita flow generation is presented in **Volume 4 – Introduction.**

The Region's extraneous flow allowance criteria was also reviewed against historic flow monitoring and pump station performance records where available. The review of historic wet weather flows found that typically 2-year design storm peak flows within existing built systems exceeded the Region's existing extraneous flow design allowance of 0.286 L/s/ha; however, that a 2-year design storm peak flow below 0.286 L/s/ha was achievable as demonstrated in multiple catchment areas. Based on the analysis and an industry review, for the purposed of future planning the extraneous flow design allowance for existing areas was increased to 0.4 L/s/ha but was maintained at 0.286 L/s/ha for new greenfield development areas to better reflect the existing high wet weather flows, while minimizing the magnitude of system upgrades with wet weather flow management as a critical priority. In areas where available historic flow monitoring and modelling results identify existing peak 5 year design flows below the 0.4 L/s/ha criteria, the lower 5 year design flows should be utilized. Further details regarding the extraneous flow design allowance are presented in **Volume 4 – Introduction**

Table 4.D.4 Flow Criteria, Scenarios, System Performance, and Sizing Methodology

	Component	Criteria	
Flow Criteria	Existing System Flows	Starting Point Methodology • Based on local billing meter records and flow monitoring data to establish existing dry and wet weather flows • Growth flows are added to the existing system baseline using design criteria	
	Flow Generation	Residential	255 L/c/d
		Employment	310 L/e/d

	Component	Criteria	
	Peaking Factor	Peak Dry Weather Flow	Harmon's Peaking Factor
	Extraneous Flow Design Allowance	• 0.4 L/s/ha for existing areas • 0.286 L/s/ha for new developments	
WWTP	System Performance and Triggers	• MECP Procedure F-5-1 • Trigger upgrade study at 80% capacity • Trigger upgrade construction at 90% capacity	
	Upgrade Sizing	• Average daily flow plus growth based on population design flows	

Pump Station	System Performance and Triggers Sizing	• Refer to **Section D.2.1.1**
		• Two flow scenarios considered
		    • **Design Allowance**: Peak wet weather flow using the peaked dry weather flow plus the extraneous flow design allowance
		    • **5-Year Storm**: Modelled peak wet weather flow using the 5-year design storm
		• Peak flow capacity to meet design peak wet weather flow using the extraneous flow design allowance
		• Wet well and system storage considerations under 5-year storm to minimize basement flooding and overflow risks	

Forcemain	System Performance and Triggers	• Flag velocities less than 0.6 m/s • Flag velocities greater than 2 m/s • Upgrade when velocities exceed 2.5 m/s and considering condition and age	
	Upgrade Sizing	• Design velocity target between 1 m/s and 2 m/s • Forcemain twinning to increase capacity where feasible	
Trunk	System Performance and Triggers	• Design allowance peak wet weather flows, using the extraneous flow design allowance, to be managed within pipe • Freeboard (depth between hydraulic grade line and surface) greater than 1.8 m below surface in 5-year design storm • Flag pipes velocities less than 0.6 m/s • Flag pipes velocities greater than 3.0 m/s	
	Upgrade Sizing	• Sized for full flow under post-2051 design peak wet weather flow • Assess 5-year design storm performance to minimize basement flooding risks and overflows	

D.2.1.1 SPS Performance Evaluation and Upgrade Framework

Although it is the Region's design philosophy to size SPS inline with the Region's extraneous flow design allowance, the MSPU undertook a hybrid evaluation approach in an effort to acknowledge that SPS are a major contributor to local wastewater system performance and that many legacy system's exiting wet weather flows exceed the extraneous flow design allowance. The SPS hybrid performance evaluation and upgrade framework are summarized in **Table 4.D.5** and strives to balance the magnitude of capacity upgrades, potential cascading downstream upgrades, and managing the potential risk of local sewer surcharging and system overflows.

Under the hybrid performance evaluation and upgrade framework, the SPS capacity was sized to meet the lesser of peak wet weather flow (PWWF) using the extraneous flow design allowance, referred to as "Design Allowance PWWF" or the estimated 5-year storm PWWF. Further, consideration for the SPS actual performance under the estimated 5-year design storm peak wet weather flow was evaluated to determine if the available system storage including the wet well, storage tanks, and in system capacity was sufficient to manage excess flows while maintaining the system hydraulic grade line (HGL) below the basement flooding level of 1.8 m below grade and/or below the local overflow level.

In instances where the 5-year storm PWWF flow exceeded the available system storage, additional system solutions such as wet weather management, system storage, and/or additional SPS capacity upgrades were incorporated into the servicing solution. The most efficient solution to manage capacity and flow reduction was determined through the assessment of calculated flows from the 2051 design allowance PWWF and modelled 5-year storm PWWF against the operational firm capacity of the station and system storage.

Each SPS with a preferred solution of a capacity upgrade was individually reviewed in detail to determine how capacity upgrades should best be achieved:

- Pump replacement
- Pump upgrades
- Pump additions
- Station replacement
- Existing wet well sizing changes
- FM sizing and capacity.

Due to data quality and availability, a prioritization of upgrade needs, and flow monitoring (data collection) was assigned to each case for the Region implementation plan, discussed later in **Section D.8**.

Table 4.D.5 SPS Assessment Framework

Case	2051 Design PWWF	2051 5 Year Storm PWWF	2051 5-Year Storm Storage Need	Preferred Solution	Upgrade Priority	Flow Monitoring Priority
Case 1	> Firm Capacity	> Firm Capacity	> Available Storage	Upgrade pumps to future design allowance flow with potential storage upgrades or wet weather management	High	Medium
Case 2	< Firm Capacity	> Firm Capacity	> Available Storage	Upgrade storage and/or wet weather management	High	High
Case 3	> Firm Capacity	> Firm Capacity	< Available Storage	Potential upgrade to design allowance flow and/or wet weather management	Medium	High
Case 4	< Firm Capacity	> Firm Capacity	< Available Storage	Potential wet weather management	Low	Medium
Case 5	> Firm Capacity	< Firm Capacity	< Available Storage	No upgrade, use actual peak flows	N/A	Low
Case 6	< Firm Capacity	< Firm Capacity	< Available Storage	No upgrade	N/A	Low

D.2.2 Growth Population Projections and Allocations

Table 4.D.6 outlines the existing and projected serviced population and employment by catchment.

Table 4.D.6 NOTL Wastewater Treatment Plant Existing and Projected Serviced Population by Catchment

Sewage Pumping Station (SPS)	Existing Population & Employment			2051 Population & Employment			Post 2051 Population & Employment			2021-2051 Growth		
	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population Growth	Employment Growth	Total Growth
└→**Garrison Village SPS**	1,268	288	1,555	1,270	341	1,611	1,380	370	1,751	3	53	56
│ └→**Niagara Stone Road SPS**	128	58	187	141	90	231	158	101	259	13	32	45
└→**Lakeshore Road SPS**	3,642	878	4,520	4,635	1,652	6,287	4,949	1,732	6,682	993	774	1,768
│ └→**Line 2 SPS**	376	113	489	407	158	565	506	163	670	31	45	76
└→**William Street SPS**	4,202	2,018	6,221	4,778	2,373	7,151	5,065	2,440	7,505	576	355	930
└→**Front Street SPS**	231	415	646	233	534	767	234	543	776	2	119	121
└→**Ricardo Street SPS**	211	381	592	214	490	705	216	498	714	4	109	113
TOTAL	**10,058**	**4,152**	**14,210**	**11,678**	**5,639**	**17,318**	**12,509**	**5,848**	**18,356**	**1,621**	**1,487**	**3,108**

Note: Population numbers may not sum due to rounding.

D.3 System Performance

D.3.1 Wastewater Treatment Plant

The starting point flow for the Crystal Beach WWTP was calculated using historic SCADA flow data. Ten years of data (2011 to 2020) was reviewed to provide historical context and assess overall long-term trends; however, the most recent five years of data was used to determine the average daily flow. **Table 4.D.7** shows the historical system flows obtained from wastewater treatment plant production data. Data from 2011-2019 were from the NOTL Lagoon and the 2020 data were from the new NOTL WWTP.

Table 4.D.7 Historic NOTL Wastewater Treatment Plant Flows

Year	Average Daily Flow		Peak Daily Flow	
	(MLD)	(L/s)	(MLD)	(L/s)
2011	5.0	57.6	16.1	186.4
2012	4.1	47.0	8.7	100.5
2013	4.9	56.5	8.6	99.2
2014	4.3	49.3	10.2	117.5
2015	4.0	46.8	0.0	0.0
5 Year Average	**4.4**	**51.4**	**8.7**	**100.7**
5 Year Peak	**5.0**	**57.6**	**16.1**	**186.4**
2016	3.9	45.7	8.0	92.9
2017	4.6	52.8	8.2	94.6
2018	4.7	54.2	8.1	93.6
2019	5.2	60.6	7.8	89.9
2020	5.0	58.3	18.1	209.7
5-Year Average	**4.7**	**54.3**	**10.0**	**116.1**
5-Year Peak	**5.2**	**60.6**	**18.1**	**209.7**
10-Year Average	**4.6**	**52.9**	**9.4**	**108.4**
10-Year Peak	**5.2**	**60.6**	**18.1**	**209.7**

(1) 2020 new NOTL WWTP data

The 10-year trend analysis showed that flows to the NOTL WWTP continue to reflect high flows in wetter years. The 5-year average flow has increased 6% from the 2016 MSP starting point.

The starting point flow used for the NOTL WWTP was 4.7 MLD.

Figure 4.D.3 shows the projected future flows at the NOTL WWTP. The plant has surplus capacity and will not reach 80% capacity within the 2051-time horizon.

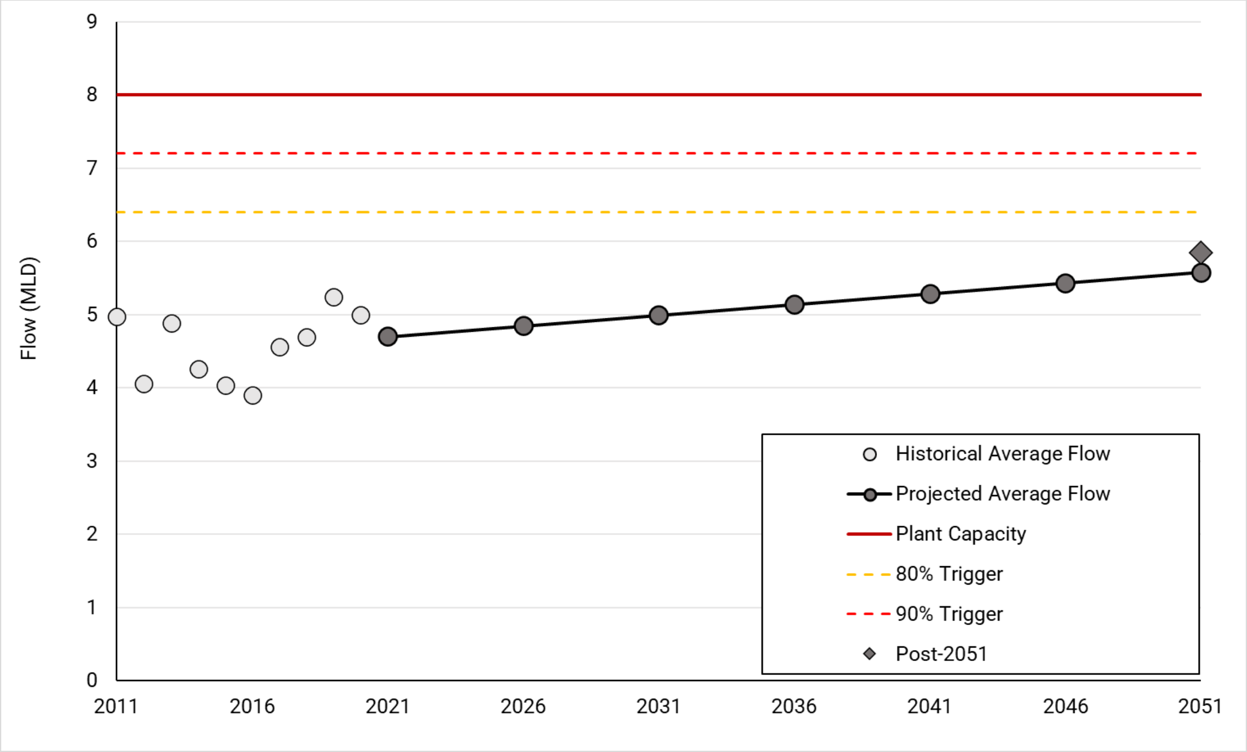


Figure 4.D.3 Projected Sewage Generation at NOTL Wastewater Treatment Plant

D.3.2 Sewage Pumping Station

Table 4.D.8 highlights the sewage pumping station operational firm capacities and the existing and projected flows. The existing average and peak dry weather flows were estimated using the wastewater system model, which was updated using the best available billing, flow monitoring, and SCADA data from 2018 to 2020.

Table 4.D.8 System Sewage Pumping Station Performance

Sewage Pumping System	Station Capacity	2021 Flows				2051 Flows			Post-2051 Flows		
	Operational Firm Capacity	Average Dry Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow
	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)
└→Garrison Village SPS	**84.5**	12.9	14.8	55.2	38.6	16.2	56.7	40.2	18.3	58.8	42.2
| └→Niagara Stone Road SPS	**20.7**	2.3	2.9	14.2	11.2	3.5	14.8	11.8	3.9	15.2	12.2
└→Lakeshore Road SPS	**86.0**	17.1	22.6	133.0	167.7	44.1	162.7	197.3	49.0	167.6	202.3
| └→Line 2 SPS	**7.3**	0.6	0.9	7.8	10.5	2.0	8.8	11.6	3.3	10.1	12.8
└→William Street SPS	**202.8**	67.5	76.5	244.8	158.4	90.8	262.7	176.3	94.7	266.6	180.2
└→Front Street SPS	**24.7**	13.3	25.0	51.7	83.2	28.4	55.2	86.7	28.7	55.4	86.9
└→Ricardo Street SPS	**17.2**	6.2	7.2	23.9	14.5	8.9	25.6	16.2	9.1	25.8	16.3

The following SPS have existing and future deficiencies under both design allowance PWWF and 5-year storm, requiring upgrades to support existing and future flows.

- Lakeshore Road SPS
- Line 2 SPS
- Front Street SPS

The following SPS have existing and future deficiencies under the design allowance PWWF; however, the existing and projected 5-year storm PWWF is withing the station’s capacity, as such, the stations capacity is sufficient to support future flows.

- William Street SPS
- Ricardo Street SPS

The following stations have surplus capacity to support future flows.

- Garrison Village SPS
- Niagara Stone Road SPS

D.3.3 Forcemain

Table 4.D.9 highlights the existing and projected forcemain performance. Velocities less than 0.6 m/s were flagged in yellow and velocities exceeding 2.5 m/s were flagged in red. Note, if a pumping deficit was identified in **Table 4.D.8,** then projected forcemain velocities were based on the higher of the station's ECA firm capacity or the governing peak wet weather flow scenario, otherwise if no pumping deficit was identified, the operational firm capacity was used for future capacity assessment.

Table 4.D.9 Forcemain Performance

Station Name	Forcemain Diameter (mm)	Operational Firm Capacity		2051		Post-2051	
		Pumped Flow (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)
└→Garrison Village SPS	**250**	84.5	1.7	84.5[1]	1.7	84.5[1]	1.7
| └→Niagara Stone Road SPS	**147**	20.7	1.2	20.7[1]	1.2	20.7[1]	1.2
└→Lakeshore Road SPS	**300**	63.3	0.9	162.7[3]	2.3	167.6[3]	2.4
| └→Line 2 SPS	**100**	7.3	0.9	8.8[3]	1.1	10.1[3]	1.3
└→William Street SPS	**356**	202.8	2.0	202.8[1]	2.0	202.8[1]	2.0
└→Front Street SPS	**200**	24.7	0.8	55.2[3]	1.8	55.4[3]	1.8
└→Ricardo Street SPS	**150**	17.2	1.0	17.2[1]	1.0	17.2[1]	1.0

[1] Operational firm capacity

[2] ECA capacity

[3] Minimum of future design allowance PWWF or 5-year storm PWWF

There are no forcemains with low velocities in the current operating regime.

All forcemains have sufficient capacity to meet future flows.

D.3.4 Trunk Sewer

Figure 4.D.4 and **Figure 4.D.5** highlight the trunk performance in the existing and 2051 projected design allowance peak wet weather flow scenarios, respectively.

- There are no Region trunk sewers with existing or future pipe capacity deficits from the design allowance peak wet weather flows Note that the NOTL WWTP systems have several combined sewer overflows (CSO), that help regulate the hydraulic grade line (HGL) within the trunk system to reduce basement flooding risks.
- Local sewer deficiencies will be identified through the Town's planned Pollution Prevention and Control Plan (PPCP) and addressed by the Town.

D.3.5 Overflows

Under the design allowance peak flows no overflows are anticipated; however, many of the CSOs become active from 5-year storm peak wet weather flows; however, many of which become active from 5-year storm peak wet weather flows. The adverse risks of wet weather inflows are currently partially managed through CSOs; however, the Region and local area municipalities (LAM) are working together to reduce wet weather inflows to the system to reduce system overflows.

Detailed assessment of system CSO will be addressed jointly by the Region and LAM through future Pollution Prevention Control Plan Studies; which will outline the proposed wet weather flow management approach to manage CSO volumes.

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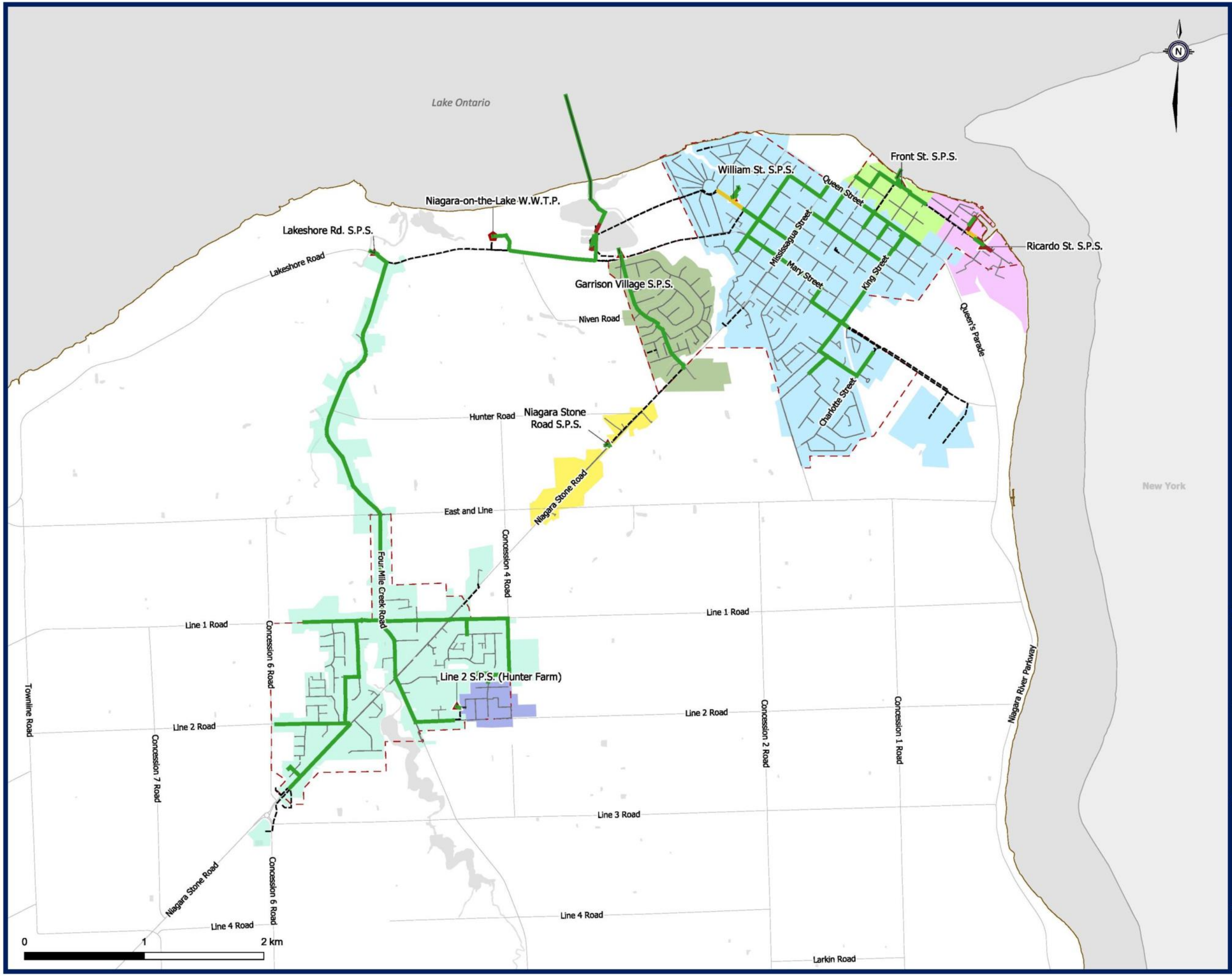

Existing Wastewater Infrastructure

Facilities - All Others

- ● Combined Sewage Detention Facility
- ● Flow Diversion Facility
- ● Flume
- ♦ Leachate Pumping Station
- ● Sewage Detention Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant

Wastewater Network

- ---- Force Mains
- ── Local Sewers
- ━━ Regional Mains
- ── Private Sewers

Wastewater Catchments

- 🟩 Front Street
- 🟨 Niagara Stone Road
- 🟩 Garrison Village
- 🟪 Ricardo Street
- 🟩 Lakeshore Road
- 🟦 William Street
- 🟦 Line 2

Other Features

- ☐ Municipal Boundary
- ⬚ Urban Area Boundary
- ▨ Waterbodies

System Performance

- ━ Surplus Capacity
- ━ Surcharging Sewer
- ━ Surcharging Sewer with Basement Flooding Risk

Figure 4.D.4
Existing Design
Peak Wet Weather Flows

Niagara-on-the-Lake WWTP

BluePlan ENGINEERING

May 2023
620126
Projection EPSG: 26917

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

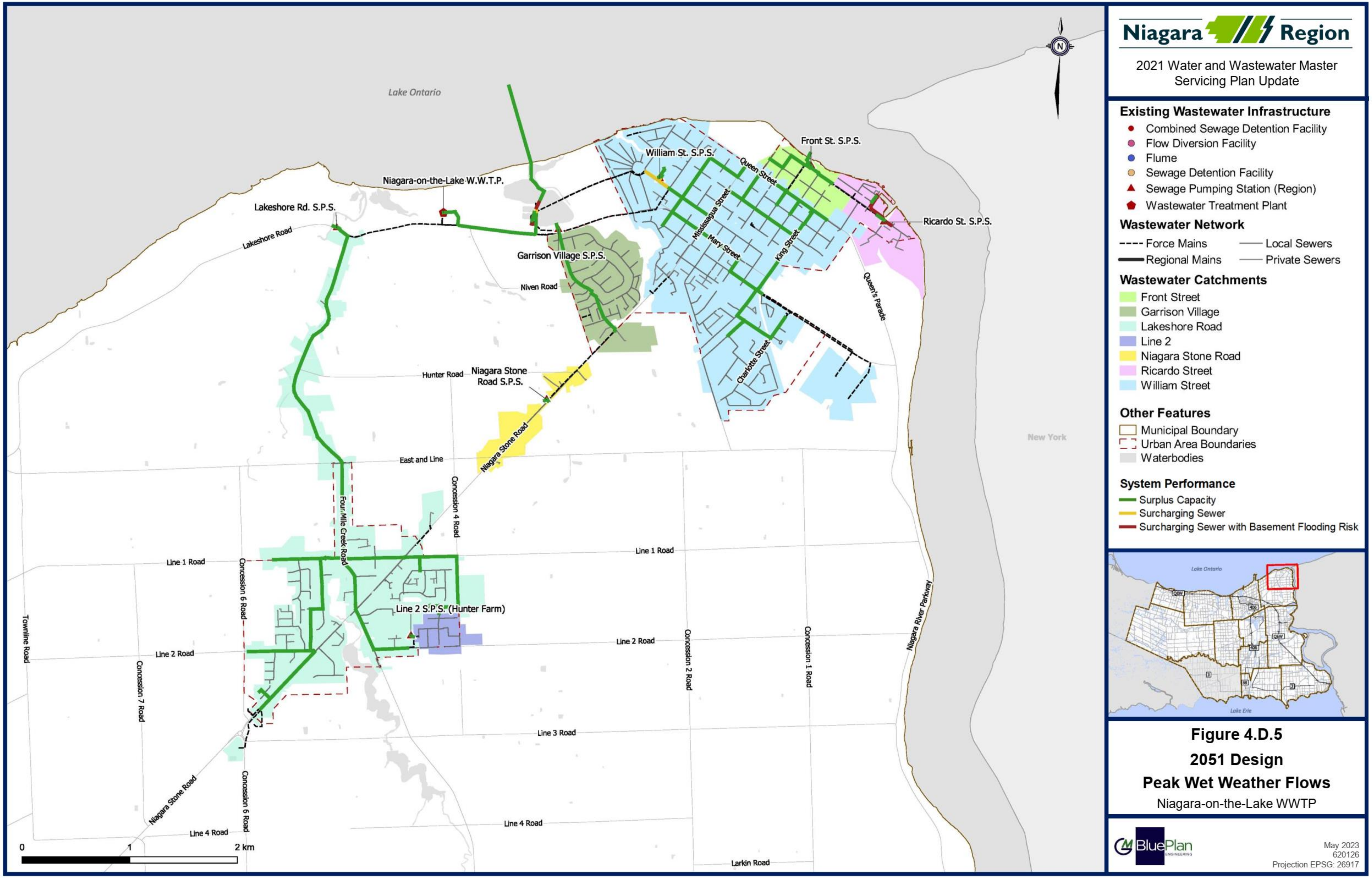

Figure 4.D.5

2051 Design

Peak Wet Weather Flows

Niagara-on-the-Lake WWTP

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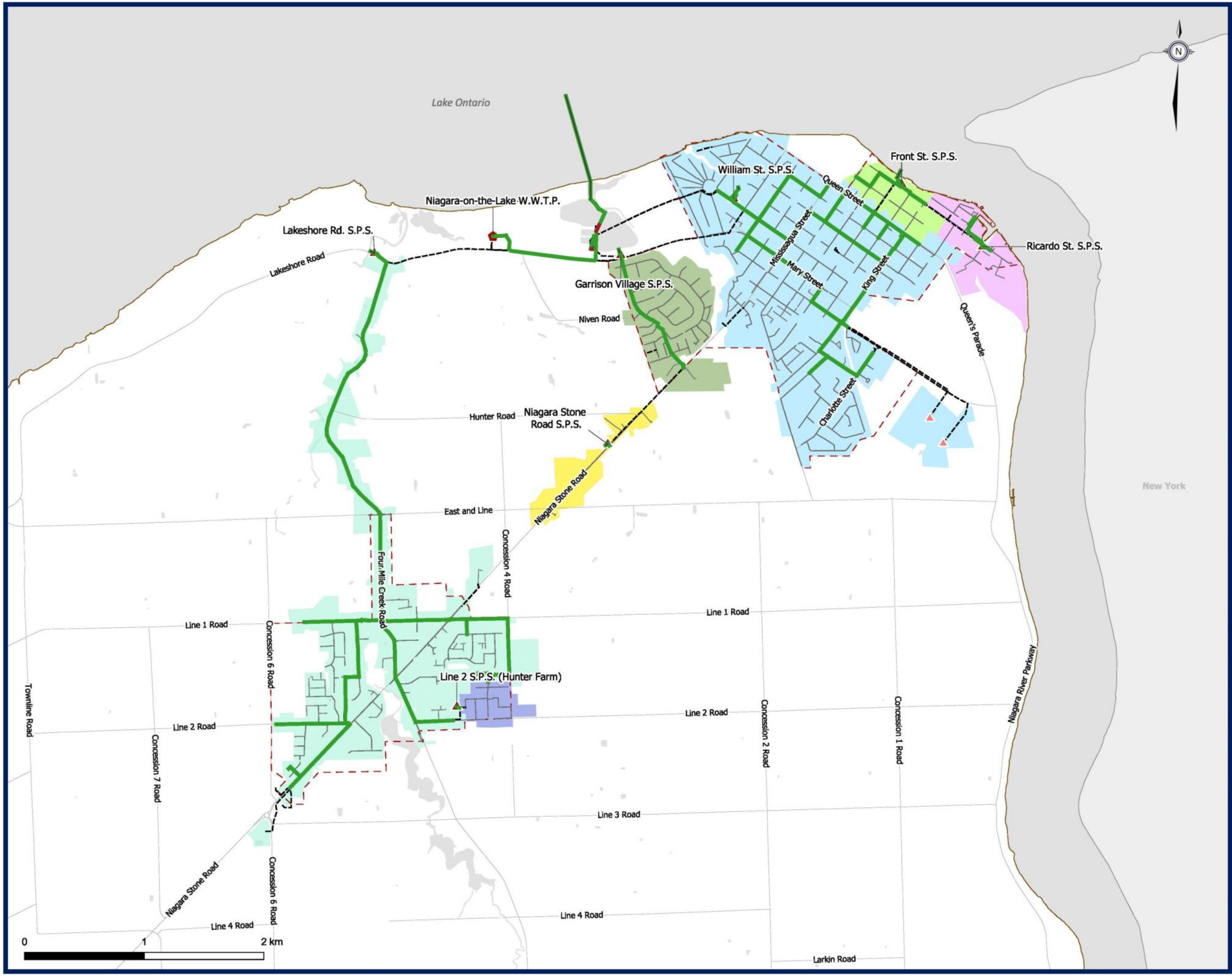

Figure 4.D.6

Existing 5-Year Storm Peak Wet Weather Flows

Niagara-on-the-Lake WWTP

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Projection EPSG: 26917

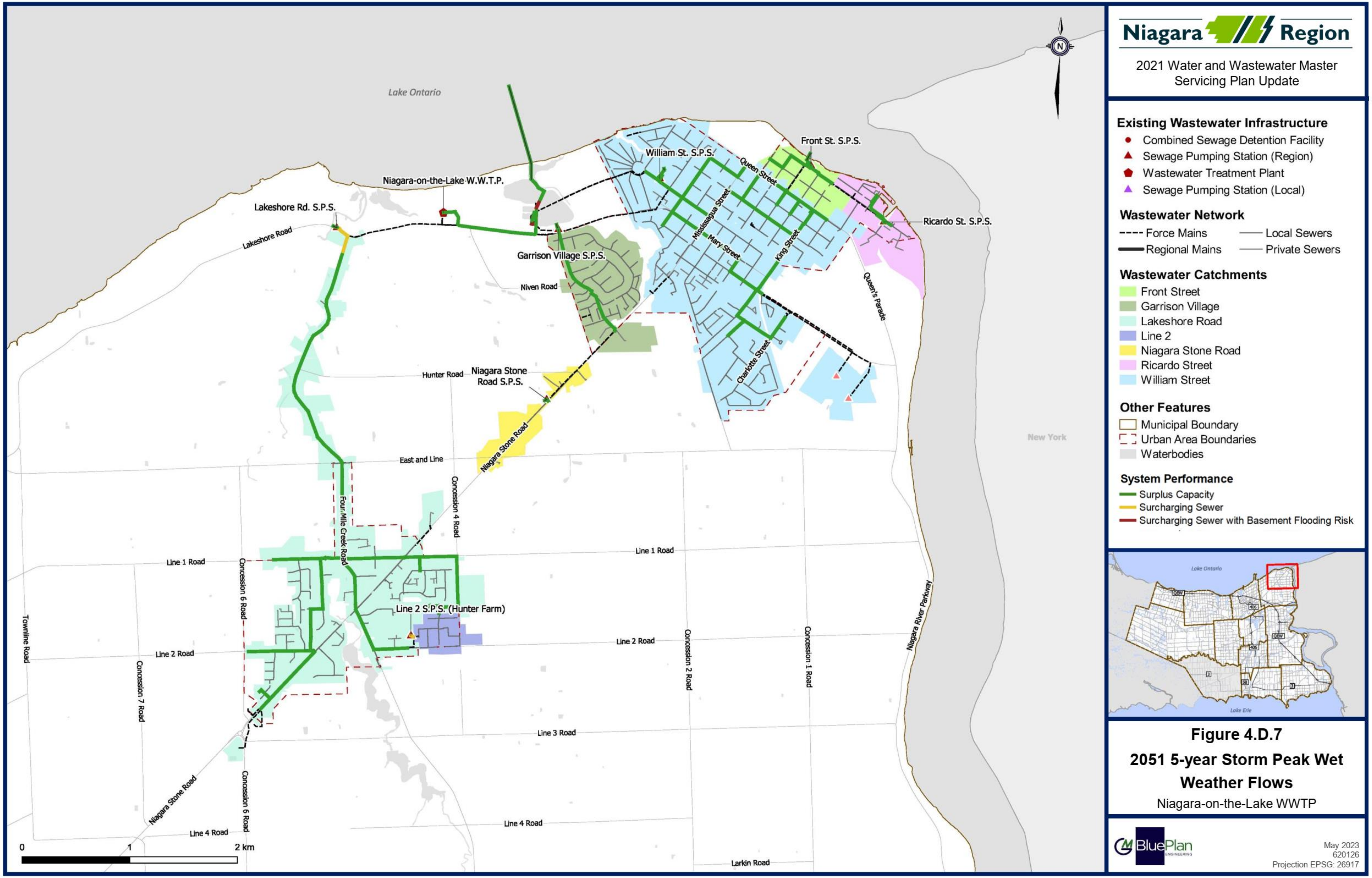

Figure 4.D.7

2051 5-year Storm Peak Wet Weather Flows

Niagara-on-the-Lake WWTP

D.4 System Opportunities and Constraints

Figure 4.D.8 Highlights the existing opportunities and constraints.

D.4.1 NOTL Wastewater Treatment Plant

- The current rated average daily flow capacity of the plant is 8.0 MLD, with an existing flow of 4.7 MLD and a projected 2051 average daily flow of 5.6 MLD, which is below 80% of the wastewater treatment plant rated capacity. As such, the plant has surplus capacity and will not reach 80% capacity within the 2051-time horizon. The post-2051 flows are not expected to exceed the 80% capacity.

D.4.2 Niagara-On-The-Lake

- Moderate residential and employment growth consisting of infill developments within the existing urban boundary.
- Existing and growth-related wet weather flow issues in the Front Street SPS, Lakeshore Road SPS, and Line 2 SPS catchments.
- The existing Region-owned sewer network has capacity to support growth to 2051.
- The Town has initiated a Pollution Prevention and Control Plan (PPCP) Study to improve system understanding including flow monitoring and a model update. The PPCP will further inform the Town’s priorities for inflow and infiltration removal and other strategies to reduce combined sewer overflows.

D.4.3 System Optimization Opportunities

- In-series pumping stations generates cascading impacts.
- The existing system configuration limits opportunities to optimize the system including system diversions to reduce sewage pumping station upgrades and/or eliminate existing sewage pumping stations.

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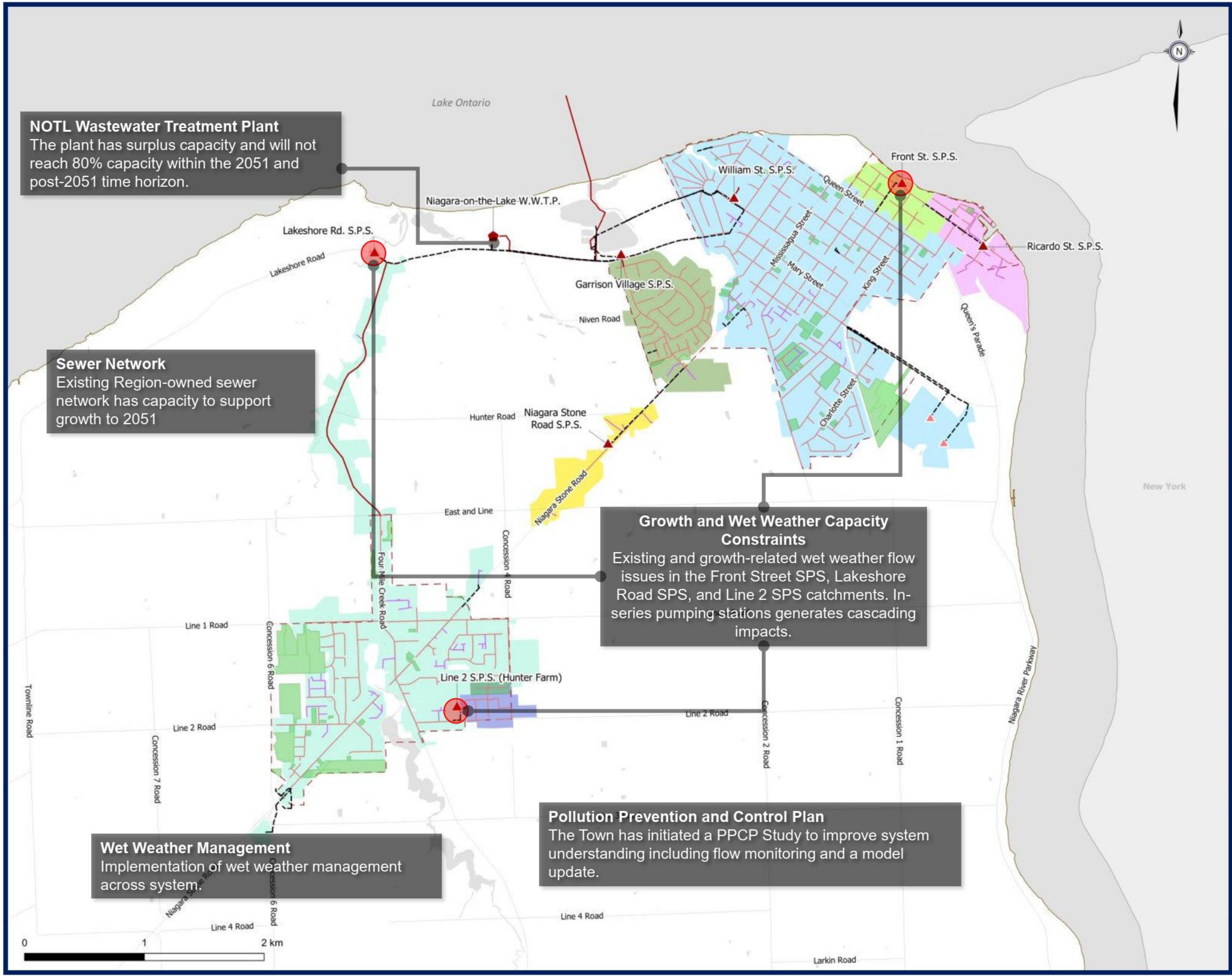


NOTL Wastewater Treatment Plant
The plant has surplus capacity and will not reach 80% capacity within the 2051 and post-2051 time horizon.

Sewer Network
Existing Region-owned sewer network has capacity to support growth to 2051

Growth and Wet Weather Capacity Constraints
Existing and growth-related wet weather flow issues in the Front Street SPS, Lakeshore Road SPS, and Line 2 SPS catchments. In-series pumping stations generates cascading impacts.

Wet Weather Management
Implementation of wet weather management across system.

Pollution Prevention and Control Plan
The Town has initiated a PPCP Study to improve system understanding including flow monitoring and a model update.

Existing Wastewater Infrastructure
- ⬟ Wastewater Treatment Plant (WWTP)
- ● Combined Sewage Detention Facility
- ■ Biosolids Storage Facility
- ✳ Odour Control Facility
- ♦ Leachate Pumping Station

Sanitary Pumping Stations (SPS)
- ▲ Regional
- ▲ Municipal
- ▲ Private

Wastewater Network
- ---- Force Mains
- — Regional Mains
- — Local Sewers
- — Private Sewers

Wastewater Catchments
- 🟩 Front Street
- 🟩 Garrison Village
- 🟩 Lakeshore Road
- 🟦 Line 2
- 🟨 Niagara Stone Road
- 🟪 Ricardo Street
- 🟦 William Street

Other Features
- ☐ Municipal Boundary
- ■ Waterbodies
- ⬚ Urban Area Boundary

Development Locations
- ■ Post-2051
- 🟩 Pre-2051

Figure 4.D.8
Niagara-on-the-Lake WWTP
Opportunities and Constraints

BluePlan

February 2023
6210126-WW-002

D.5 Assessment of Alternatives

Generally, the previously recommended strategies from the 2016 MSP program were carried forward which included capacity upgrades at Lakeshore Road SPS, Niagara Stone Road SPS, Line 2 SPS, and wet weather management strategies in key areas.

While the strategies remained the same, the following details including alignment, sizing, or wet weather areas have been updated to reflect the latest system understanding and reflect updated criteria changed through this iteration of the 2021 MSPU.

- Providing capacity within Region-owned pumping stations and trunk sewers to convey peak wet weather flows up to the lesser of the 5-year design storm or extraneous flow design allowance criteria of 0.4 L/s/ha for existing areas and 0.286 L/s/ha for growth areas, needs to be verified based on the updated flow criteria and actual flows.
- Provide upstream flow management to address high peak flows in the system where peak wet weather flows exceed the extraneous flow design allowance criteria of 0.4 L/s/ha resulting in basement flooding and overflow risks. Upstream flow management can include but is not limited to these options, in the preferred order of implementation:
  - Inflow and infiltration reduction in public right of way
  - Inflow and infiltration reduction from private properties
  - Enhanced system storage
  - Peak flow control using system controls or engineered solutions
- As shown in **Section D.3.2**, pump station capacity assessments were completed by reviewing the projected design allowance peak flows and 5-year storm flows against the operational firm capacity of each station.
  - Where the peak storm flows were less than design flows and the operational firm capacity of the station, the storm flows were used as actual flows, and therefore would not have triggered an upgrade.
  - Where the projected peak design allowance flows and 5-year storm flows exceeded the operational firm capacity of the station, a pump upgrade was recommended. Additional storage considerations and wet weather management were also considered.

To address existing and growth-related capacity needs, the following servicing concepts were evaluated:

- Do nothing
- Station capacity upgrade for pumping or storage
- Wet weather management
- Hybrid solution

D.6 Preferred Servicing Strategy

The following is a summary of NOTL WWTP system as recommended through the 2016 Master Servicing Plan Update and carried forward through this update:

- The recommended solution for the NOTL Treatment Plant system is to provide wet weather management across the system. This will require Regional solutions as well as local municipality solutions.
- Upgrades to the following SPS were identified to support growth in the area.
    - Lakeshore Road SPS
    - Line 2 SPS
    - Front Street SPS
- Strategies that have changed since the 2016 MSP
    - The following SPS upgrades are no longer required:
        - Garrison Village SPS
        - Niagara Stone Road SPS

Figure 4.D.10 and **Figure 4.D.11** show the preferred servicing strategy, consisting of:

D.6.1 Treatment Plant Works

- No capacity upgrades are required.

The Region has several Region-wide programs focused on maintaining and enhancing the treatment capacity at the Region's existing WWTP. The programs applicable to the NOTL WWTP include:

- WWTP Process Upgrades (WW-TP-005) which funds projects to improve treatment processes to re-establish the ECA capacity at plants.

D.6.2 Pumping Stations

- Increase Line 2 SPS capacity from 7 L/s to re-establish 8 L/s ECA capacity as planned in the 2022 design
- Increase Front Street SPS capacity from 25 L/s to 56 L/s.
- Increase Lakeshore SPS capacity from 90 L/s to 168 L/s.

Further to the pump station upgrades, the Region-wide allowance to address odour control needs that are the result of growth-related system upgrades has been included.

- WWTP Process Upgrades (WW-TP-006) which funds in-system and plant upgrades to control odour.

D.6.3 Forcemains

- No forcemains require upgrades.

D.6.4 Decommissioning of Existing Facilities

- No decommissioning projects are recommended in the NOTL system.

D.6.5 Wet Weather Flow Management Program

A significant element of the Niagara Region wastewater servicing strategy is the wet weather management program. The program is intended to address existing capacity constraints, and to provide for growth-related capacity without expanding/upgrading existing trunk infrastructure, or by minimizing the required expansion/upgrades.

The wet weather management program currently identifies overall preliminary priority, staging of location and target amount of inflow and infiltration reduction across all systems. This program provides for a proactive and targeted approach to addressing wet weather impacts. These wet weather management programs will need to be a joint initiative between the Region and local municipalities.

For the NOTL system, the following priority areas are identified:

- Front Street SPS
- William Street SPS
- Lakeshore Road SPS

The Town's Planned PPCP will further identify catchments and strategies for inflow and infiltration reduction and other wet weather management solutions.

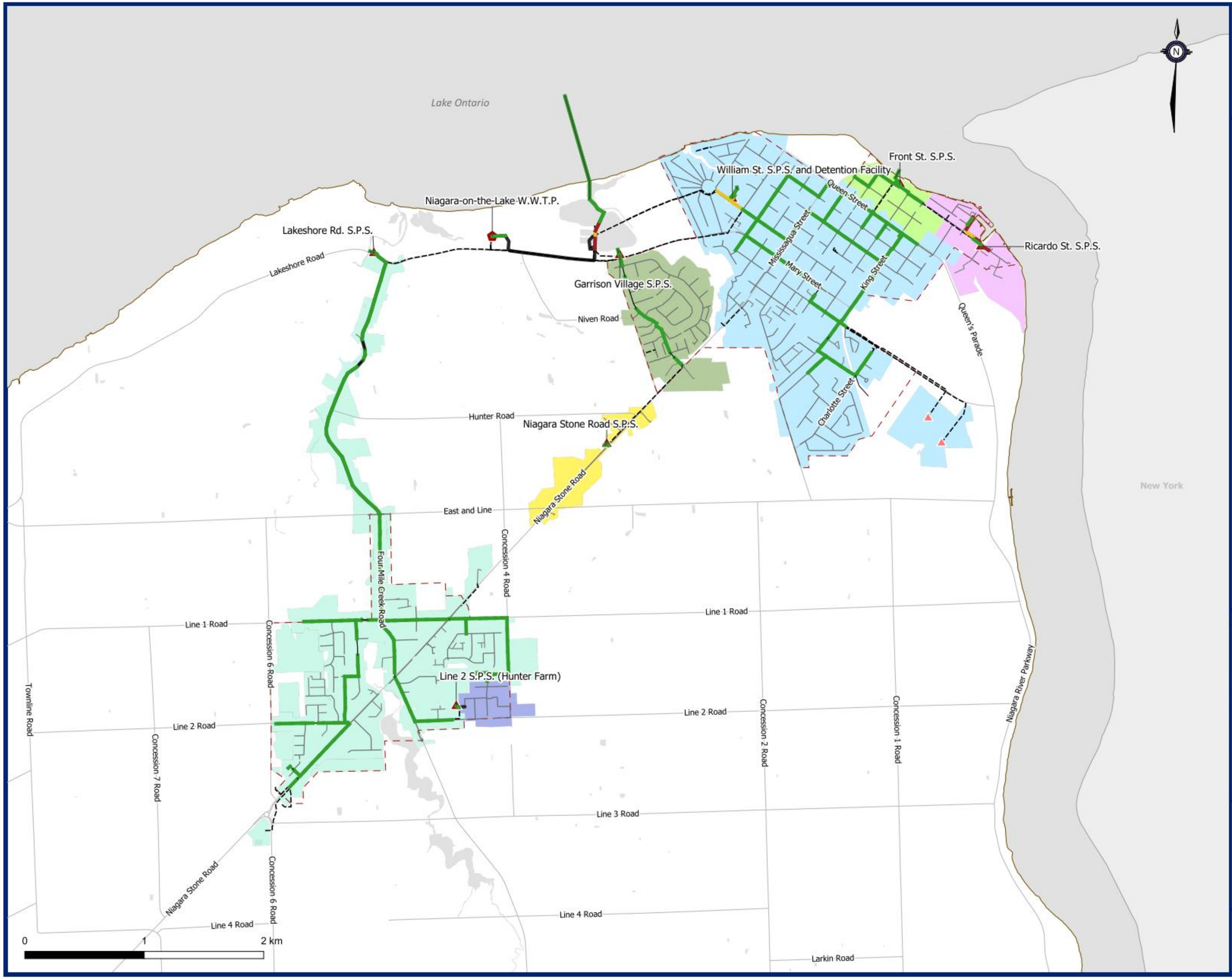
D.6.6 Additional Studies and Investigations

Flow Monitoring Program: Additional flow monitoring data collection will improve the confidence of the system performance results from the model. Best practices for improving understanding of wastewater systems include:

- Monitoring upstream from pump stations to capture peak wet weather flows
- Increasing the density of monitoring in catchments identified for wet weather flow management, where the flows from the 5-year design storm exceed the design flows.

D.6.7 Future System Performance

Figure 4.D.9 presents the future system performance, based on the preferred servicing strategy configuration and capacities; but excludes the potential benefits of the local wet weather flow management program.



Niagara Region

2021 Water and Wastewater
Master Servicing Plan Update

Existing Wastewater Infrastructure
- ● Combined Sewage Detention Facility
- % Leachate Pumping Station
- ● Odour Control Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Private)
- ▲ Sewage Pumping Station (Local)

Wastewater Network
- - - - Force Mains
- ━ Regional Mains
- — Local Sewers
- — Private Sewers

Wastewater Catchments
- 🟩 Front Street
- 🟩 Garrison Village
- 🟩 Lakeshore Road
- 🟦 Line 2
- 🟨 Niagara Stone Road
- 🟪 Ricardo Street
- 🟦 William Street

Other Features
- ☐ Municipal Boundary
- ☐ Urban Area Boundaries
- ▨ Waterbodies

System Performance
- ━ Surplus Capacity
- ━ Surcharging Sewer
- ━ Surcharging Sewer with Basement Flooding Risk

Figure 4.D.9

Future Capital Program Peak Wet Weather Flow

Niagara-on-the-Lake WWTP

BluePlan ENGINEERING

May, 2023
620126
Projection EPSG:26917

Document Path: W:\Hamilton\620000\620126 Niagara 2021 MSP Update\5 Work in Progress\5. GIS and Databases\4. Wastewater\System Performance\2051 CP RDII_working.qgz

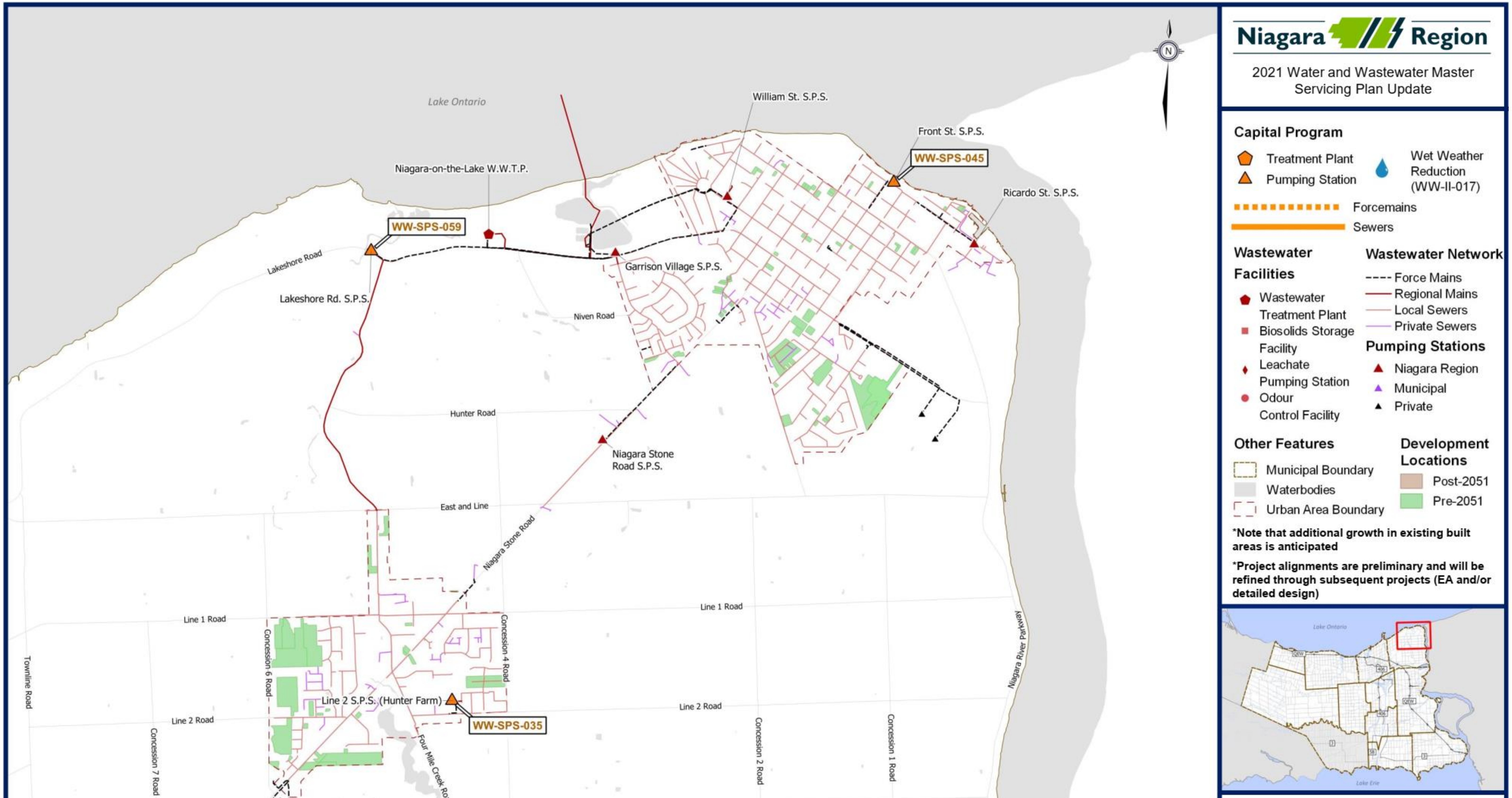
D.7 Capital Program

Figure 4.D.10 and **Figure 4.D.11** present the preferred servicing strategy map and schematic

Table 4.D.10 summarizes the recommended project costing timing and Class EA requirements. Individual detailed costing sheets are presented in **Section D.8.6.**

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



*Note that additional growth in existing built areas is anticipated

*Project alignments are preliminary and will be refined through subsequent projects (EA and/or detailed design)

Figure 4.D.10
NOTL WWTP System

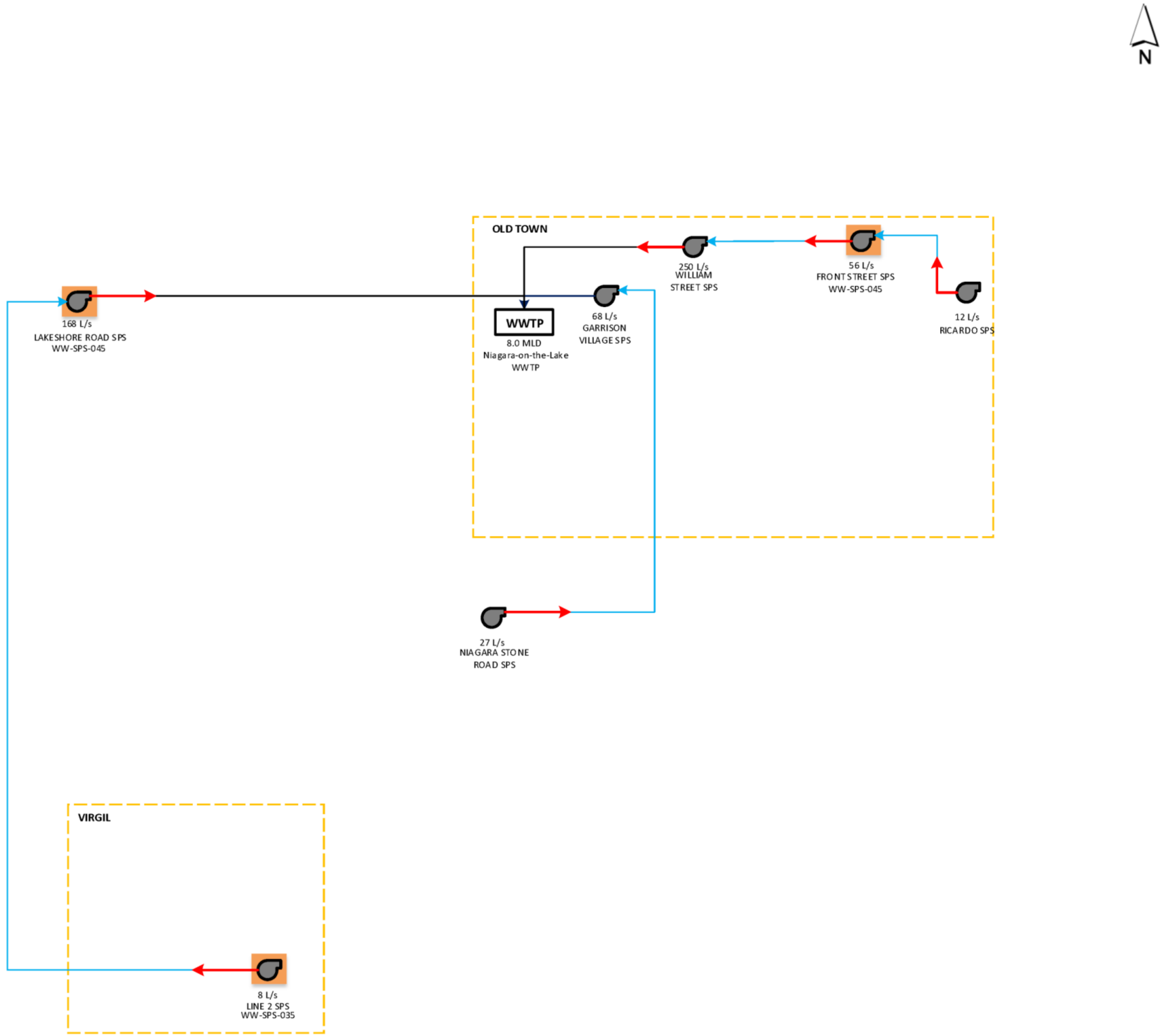
Preferred Wastewater Servicing Strategy

BluePlan ENGINEERING

December 2022
620126-WW-006
WKID: 26917

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



WWTP RATED CAPACITY	Wastewater Treatment Plant
FIRM CAPACITY	Sewage Pumping Station
→	Forcemain
→	Connection from SPS to SPS
→	Connection from SPS to WWTP
🟧	Facility Upgrade
🟩	New Facility
—	Upgrade Forcemain or Sewer
—	New Forcemain or Sewer
⊗	Decommission Project

Figure 4.D.11
Niagara-on-the-Lake WWTP

Future Wastewater Infrastructure Schematic

December 2022
621016-W-000
WKID: 26917

Table 4.D.10 Summary of NOTL Wastewater Treatment Plant Capital Program

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost ($)
WW-SPS-035	Line 2 SPS Pump Replacement	Increase station capacity from 7 L/s to re-establish 8 L/s ECA capacity by replacing the existing two pumps, as per 2022 design.	8 L/s	2022-2026	Niagara-on-the-Lake	A+	Satisfied	Pumping	$1,213,000
WW-SPS-045	Front Street SPS Pump Replacement	Increase station capacity from 25 L/s to 56 L/s by replacing existing two pumps. Use implementation plan prior to upgrade: Flow monitoring, validate wet weather flows, re-evaluate required upgrades	56 L/s	2032-2036	Niagara-on-the-Lake	A+	Satisfied	Pumping	$2,778,000
WW-SPS-059	Lakeshore Road SPS Pump Replacement	Increase station capacity from 90 L/s to 168 L/s by replacing existing two pumps, Includes wet well upgrades	168 L/s	2037-2041	Niagara-on-the-Lake	A+	Satisfied	Pumping	$4,055,000
WW-II-017(1)	Region-Wide Wet weather Reduction	Wet weather reduction program in all systems to be executed from 2022-2051	N/A	2022-2051	Region-Wide		Dependent on outcome of wet weather flow study	Wet Weather Reduction	$225,000,000
WW-ST-001(1)	Region-Wide Flow Monitoring and Data Collection	Funding to support flow monitoring and data collection initiatives	N/A	2022-2051	Region-Wide			Wet Weather Reduction	$12,000,000
WW-TP-005(1)	Region-Wide WWTP Process Upgrades	Process upgrades to re-establish ECA capacity	N/A	2022-2051	Region-Wide			Treatment	$50,000,000
WW-TP-006(1)	Region-Wide WWTP Process Upgrades	Upgrades for odour control across the Region at forcemains, pump stations, and other locations	N/A	2022-2051	Region-Wide			Treatment	$40,000,000
								Total	$8,046,000

(1) Project cost not included in subtotal as it is a Region-wide project

D.8 Project Implementation and Considerations

D.8.1 10-Year Program Sequencing

The recommended year in service for the capital projects is presented in **Section D.6.3**. Special project implementation and considerations for the preferred servicing strategy consist of:

- Timing of the Line 2 SPS and forcemain upgrades will be constructed in the 2022-2026 time horizon.

It is understood that the timing for the recommended projects may be subject to change due to a variety of external factors such as overall balancing of the Region's capital budget, changes to growth projections, and other unforeseen circumstances. As such, **Table 4.D.11** presents the preferred priority of the projects within the first 10-years of the capital program.

Table 4.D.11 Preferred Project Order

Master Plan ID	Name	2021 MSPU Year in Service	Order
WW-SPS-035	Line 2 SPS Pump Replacement	2023	1

D.8.2 EA Requirements and Studies

The following summarizes the status of EA requirements for recommended capital projects which will require Schedule B or C EAs.

- **EA has been satisfied through previous projects:**
    - None
- **Currently ongoing separate EA studies:**
    - None
- **EAs or studies to be completed through separate studies:**
    - None

D.8.3 Region-Wide Projects and Collaboration with Local Area Municipalities

Acknowledging that the overall wastewater systems are jointly owned and operated by the Region and LAM, the continued operation and expansion of the wastewater systems to support existing users and accommodate projected growth relies upon the cooperation of the upper and lower tier municipalities. Major updates and adjustments to planning projections should be continued to be communicated as this may affect project details such as trigger timelines and design capacities, which is discussed further in **Section D.8.5**.

One initiative that will be predominately driven by the LAMs is wet weather management. While wet weather management should be completed in all municipalities, this 2021 MSPU assumes that the catchments where the peak wet weather flows exceed the peak design flows and contribute to increased risk of basement flooding or overflows will put a specific focus on wet weather management. The Region is committed to continuing the joint CSO funding program through which LAMs can apply for funding support for inflow and infiltration reduction programs and projects such as those identified through the PPCP.

Additional flow monitoring and system data collection, in partnership with LAM, is needed to improve system understanding, support proposed wet weather flow reductions, and identify opportunities for system optimization and overflow removals.

D.8.4 Sustainability Projects

It is important to recognize that the 2021 MSPU servicing strategies identify new infrastructure to service the additional growth out to year 2051 but these strategies are built by extending infrastructure from the existing systems and leveraging the existing Region infrastructure in place. It is essential that the existing infrastructure is maintained in good condition and performance to support servicing growth.

The Region continually establishes and implements a sustainability program that addresses priority projects to ensure the existing infrastructure is in a state-of-good-repair and continues to perform and meet the intended level of services. Region-wide programs including but not limited to replacement programs for pipes and manholes, boilers, meters, generators, SCADA upgrades, sludge management programs, laboratory and sampling equipment upgrades, process electrical, process instrumentation. Pump station upgrades through the sustainability capital plan re-establish the SPS ECA capacity.

Independent of the 2021 MSPU, the Region has completed a sustainability program analysis to identify the projects on a yearly basis, with focus on a 10 year program, to address the sustainability needs. This Sustainability Capital Plan is first developed to demonstrate the total investment needs and may identify a level of investment and implementation exceeding Region resources. The next steps for the Sustainability Capital Plan will be the development of the Financial Plan for existing Water and Wastewater assets which is anticipated to be completed in 2024. It should be noted that the Sustainability Capital Plan represents investment required over and above the growth-related 2021 MSPU program.

NOTL system specific projects include:

- Four Mile Creek Sewer Rehabilitation

D.8.5 Project Implementation Flow Chart

The recommended design capacities within the growth capital program are based on the best available information at the time of analysis, including existing system flows, facility capacities, and projected growth. It is understood that this data is not static and often changes over the years between the regular updates of the Region's Master Plan and between those updates. Design assumptions should be revisited before initiation of all projects to reconfirm the appropriate design capacities, along with identification of any associated or dependent projects which can be combined or staged to optimize implementation efficiency and cost, and/or system operation.

To support the Region's process in implementing all recommended 2021 MSPU capital projects, the following flow chart has been developed for the wastewater system. This flow chart document is intended to be a reference resource for the Region and should be treated as a guideline to support existing internal Region processes in project implementation.

The wastewater implementation flow chart is shown in **Figure 4.D.12.**

WASTEWATER PROJECT IMPLEMENTATION

The intent of this document is to support the Region in confirming the scope of work for wastewater infrastructure projects.

CONFIRM PROJECT SCOPE

To define Terms of Reference

☐ **What triggered this project?**
- Known development growth
- Forecasted growth
- Sustainability needs

☐ **Are there related or dependent projects that should be identified for streamlining opportunities or for project phasing?**
- Are there upstream projects with increasing capacity?
- Are there projects within the same alignment or project area that could be combined? (e.g., growth projects, SPS, forcemain, sewer, corridor planning, sustainability projects, water, stormwater, etc.)
- If there are related projects, could the project timing be adjusted to combine or stage projects more efficiently?

☐ **What is the project EA Schedule and status?**

☐ **Are there historic or ongoing operational issues in the project area?**
- Confirm with Regional and LAM operations and maintenance groups
- i.e. historic overflows, low flow/odour issues, clogging issues, work order history, etc.

☐ **Are there any data gaps that should be incorporated into the Terms of Reference?**
- Refer to the Required Data section below for details
- How much does the project timeline and budget need to change to allow for the data collection?

☐ **Have the planning projections been updated to the best available information?**
- Consultation with Region and LAM planning groups to confirm planning projection
- Are projected needs for the project in place? Is actual growth in line with projected growth?)

☐ **Should the project be deferred until identified related works are completed?**

REQUIRED DATA

To support terms of reference and detailed design

☐ **Recently completed EA or servicing study**
(for growth triggered projects)

☐ **Historic flow records**
- Within the last 3 years
- Ideally one full year of flow monitoring data that covers 80% of the total contributing area
- Can be included in project scope if feasible

☐ **Existing pump, flow, and pressure data to identify/verify existing system issues**

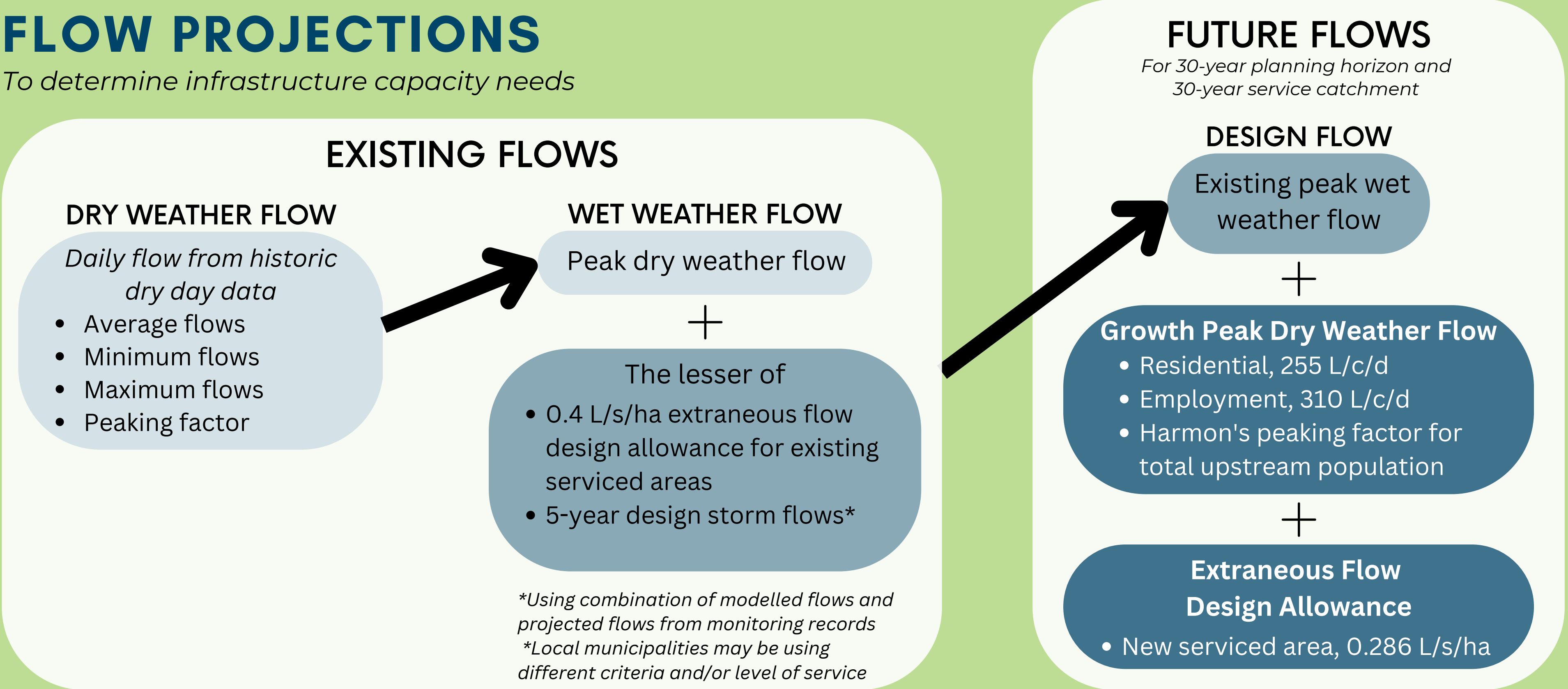
☐ **Asset inventory and condition assessment**
- All asset classes within the infrastructure type (sewer, forcemain, storage, pumping, or treatment facility)
- Within the last 5 years
- Can be part of project scope if the data is not available and would not significantly alter project scope - to assess need for related works (i.e. electrical, HVAC, structural upgrades at an SPS)

☐ **Service area growth potential to confirm projected population and demands**
- Consultation with Region and LAM planning groups within the past year
- Growth information for 30-year horizon and beyond (maximum service catchment)
  - Population, jobs, land use, area
  - Current inventory of development areas with associated development status

IF THE REQUIRED DATA IS NOT AVAILABLE AND IF IT HAS THE POTENTIAL TO SIGNIFICANTLY ALTER SCOPE OF THE DESIGN, IT IS STRONGLY RECOMMENDED THAT THE APPROPRIATE DATA COLLECTION AND FIELD INVESTIGATION BE COMPLETED PRIOR TO PROCEEDING WITH DESIGN. ALTERNATIVELY, WHERE FEASIBLE, DATA COLLECTION SHOULD BE INCLUDED IN THE PROJECT SCOPE AND INTEGRATED INTO THE DESIGN PROCESS.

FLOW PROJECTIONS

To determine infrastructure capacity needs



EXISTING FLOWS

DRY WEATHER FLOW

Daily flow from historic dry day data
- Average flows
- Minimum flows
- Maximum flows
- Peaking factor

WET WEATHER FLOW

Peak dry weather flow

+

The lesser of
- 0.4 L/s/ha extraneous flow design allowance for existing serviced areas
- 5-year design storm flows*

*Using combination of modelled flows and projected flows from monitoring records
*Local municipalities may be using different criteria and/or level of service

FUTURE FLOWS

For 30-year planning horizon and 30-year service catchment

DESIGN FLOW

Existing peak wet weather flow

+

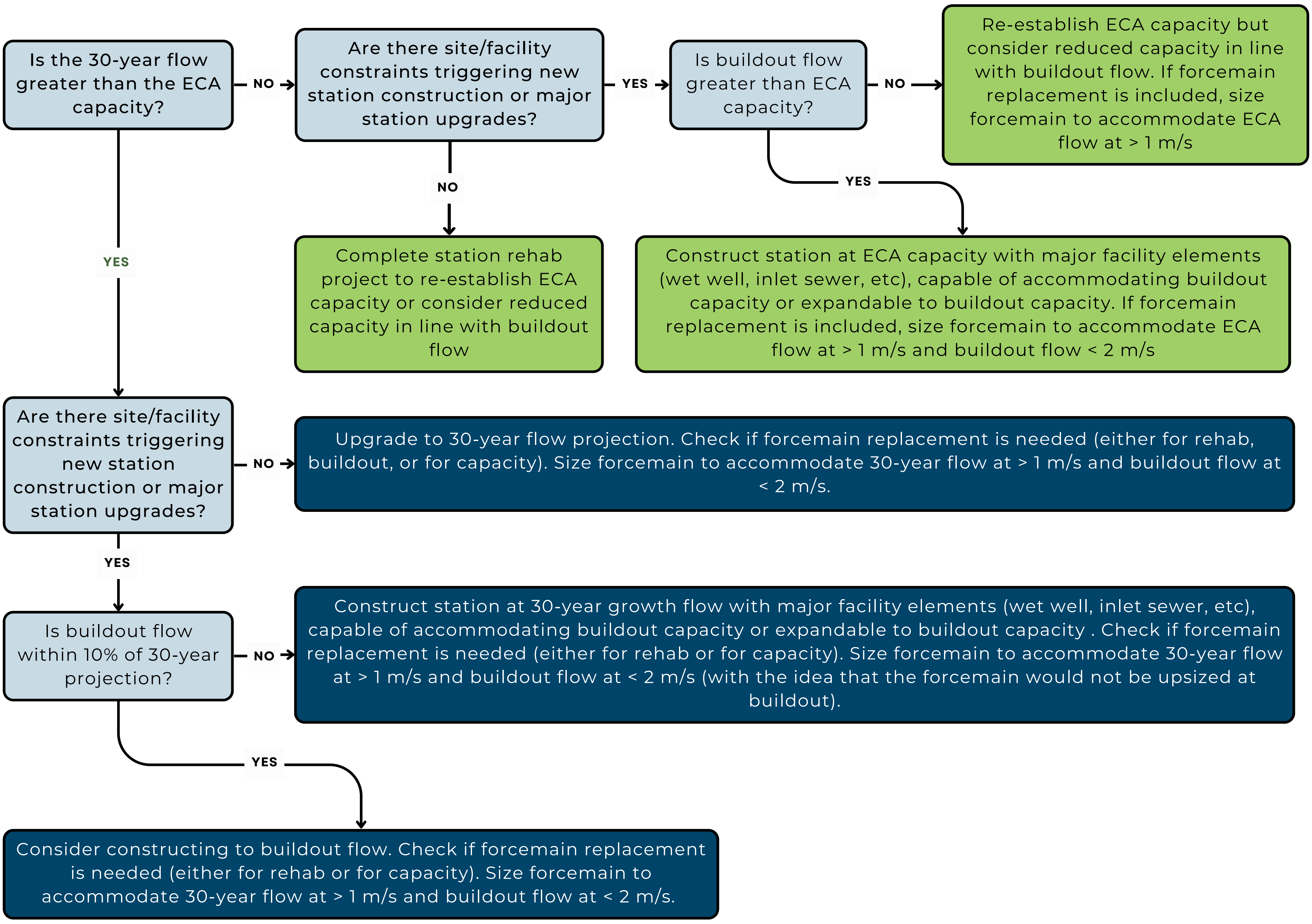
Growth Peak Dry Weather Flow
- Residential, 255 L/c/d
- Employment, 310 L/c/d
- Harmon's peaking factor for total upstream population

+

Extraneous Flow Design Allowance
- New serviced area, 0.286 L/s/ha

The design criteria presented in this document are based on the 2021 Master Servicing Plan Update Study

SEWAGE PUMPING STATIONS



Is the 30-year flow greater than the ECA capacity?

NO

Are there site/facility constraints triggering new station construction or major station upgrades?

YES

Is buildout flow greater than ECA capacity?

NO

Re-establish ECA capacity but consider reduced capacity in line with buildout flow. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s

YES

NO

Complete station rehab project to re-establish ECA capacity or consider reduced capacity in line with buildout flow

Construct station at ECA capacity with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s and buildout flow < 2 m/s

YES

Are there site/facility constraints triggering new station construction or major station upgrades?

NO

Upgrade to 30-year flow projection. Check if forcemain replacement is needed (either for rehab, buildout, or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

YES

Is buildout flow within 10% of 30-year projection?

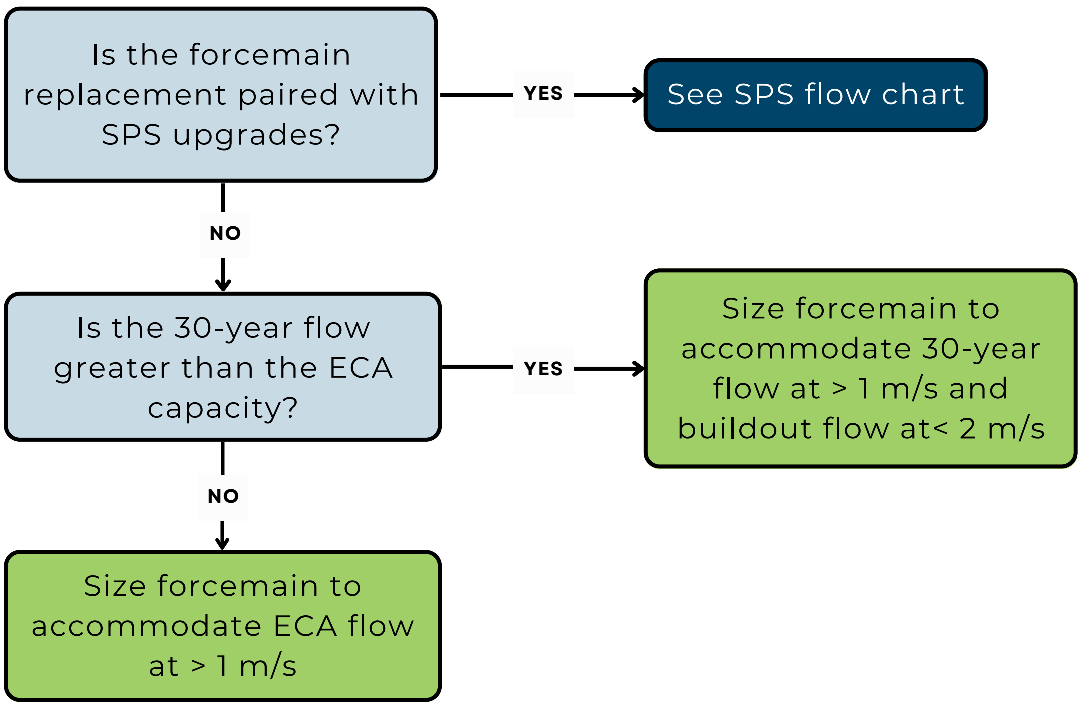
NO

Construct station at 30-year growth flow with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity . Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s (with the idea that the forcemain would not be upsized at buildout).

YES

Consider constructing to buildout flow. Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

FORCEMAINS



Is the forcemain replacement paired with SPS upgrades?

YES

See SPS flow chart

NO

Is the 30-year flow greater than the ECA capacity?

YES

Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at< 2 m/s

NO

Size forcemain to accommodate ECA flow at > 1 m/s

D.8.6 Detailed Project Costing Sheets

The detailed project costing sheets for the recommended 2021 MSPU capital projects within the Niagara-on-the-Lake WWTP system are presented below.

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PL
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-II-017**

PROJECT NAME: **Region Wide Wet weather Reduction**

PROJECT DESCRIPTION: Wet weather reduction program in all systems to be executed from 2022-2051

Old ID		**Focus Areas**	Amount
_WW-II-001	Anger Ave WWTP	Lakeshore Road, Catharine Street, Dominion Road, Rose Avenue SPS, Anger Ave WWTP Catchments	
_WW-II-002	Crystal Beach WWTP	Nigh Road SPS and Crystal Beach WWTP Catchments	
_WW-II-003	Stevensville Douglastown	Stevensville, Douglastown catchments	
_WW-II-004	Welland WWTP	Feeder Road, Seaway Heights, Ontario Road SPS, Dain City, and Welland WWTP Catchments	
_WW-II-005	Baker - Grimsby	Woodsview, Biggar Lagoon, Old Orchard SPS Catchments	
_WW-II-006	Baker - Lincoln Beamsville	Ontario Street SPS Catchment	
_WW-II-007	Baker - Lincoln Vineland	Wet weather reduction in Jordan Valley***	
_WW-II-008	Port Dalhousie	Eastchester, Lakeside, Argyle, Renown SPS and Port Dalhousie WWTP Catchments	
_WW-II-009	Port Weller/Port Dalhousie	Wet weather reduction in North Thorold	
_WW-II-010	Port Weller	Haulage Road, Carlton Street SPS, and Port Weller WWTP Catchments	
_WW-II-011	Seaway WWTP	Union, Clarke Street, Arena, Elm Street, City Hall, Sugarloaf, Rosemount North and South SPS Catchments	
_WW-II-012	Niagara Falls WWTP	Central, Muddy Run, Seneca, Meadowvale, Drummond, Kalar Road SPS Catchments	
_WW-II-013	South Niagara Falls WWTP	South Side High Lift and South Side Low Lift SPS Catchments	
_WW-II-014	NOTL	Wet weather reduction in Northeast Niagara-on-the-Lake	
_WW-II-015	NOTL	Wet weather reduction in Virgil - NOTL	
_WW-II-016	Baker - West Lincoln	Wet weather reduction in West Lincoln - Baker	

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-035**

PROJECT NAME: **Line 2 SPS Pump Replacement**

PROJECT DESCRIPTION: Increase station capacity from 7 L/s to re-establish 8 L/s ECA capacity by replacing the existing two pumps, as per

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-035**

	L/s
ECA	8.1
Operational	7.3

PROPOSED CAPACITY		8 L/s	Firm capacity
Design PWWF	**Existing**	8 L/s	10 L/s
	2051	9 L/s	12 L/s
	Buildout	10 L/s	13 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	7	8.0
2	7	8.0

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s			$500,000	$250k per pump, replace the 2 existing pumps
Related Upgrades	30%					$150,000	
Bypass Pumping Allowance	6%					$35,750	
Additional Construction Costs	15%		ea.			$102,863	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$78,861	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$867,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 130,100	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$130,100**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	15%					$156,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$156,000**	
Non-Refundable HST	1.76%					$20,300	
Non-Refundable HST Sub-Total						**$20,300**	
Total (2022 Dollars)						**$1,213,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$1,213,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$24,260		
Design	Design fees, Town fees for design, contract admin	13%	$157,690		
Construction	Town fees, base costs and project contingency	85%	$1,031,050		
TOTAL			**$1,213,000**		

PROJECT NO.: **WW-SPS-045**

PROJECT NAME: **Front Street SPS Pump Replacement**

PROJECT DESCRIPTION: Increase station capacity from 25 L/s to 56 L/s by replacing existing two pumps.
Use implementation plan prior to upgrade: Flow monitoring, validate wet weather flows, re-evaluate required upgrades

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-045**

	L/s
ECA	41.5
Operational	24.7

PROPOSED CAPACITY	56 L/s	Firm capacity
Design PWWF Existing	52 L/s	83 L/s
2051	55 L/s	87 L/s
Buildout	56 L/s	87 L/s
	RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	25	55.6
2	25	55.6

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s			$1,000,000	$500k per pump, replace existing two pumps
Related Upgrades	30%					$300,000	
Bypass Pumping Allowance	7%					$91,000	
Additional Construction Costs	20%		ea.			$278,200	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$166,920	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$1,836,000**	
Geotechnical / Hydrogeological / Materials	2.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 275,400	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$275,400**	
In House Labour/Engineering/Wages/CA	4.0%					$ 73,440	
In-house Labour/Wages Sub-Total						**$73,440**	
Project Contingency	25%					$546,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$546,000**	
Non-Refundable HST	1.76%					$46,800	
Non-Refundable HST Sub-Total						**$46,800**	
Total (2022 Dollars)						**$2,778,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$2,778,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$55,560		
Design	Design fees, Town fees for design, contract admin	13%	$361,140		
Construction	Town fees, base costs and project contingency	85%	$2,361,300		
TOTAL			**$2,778,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-059**

PROJECT NAME: **Lakeshore Road SPS Pump Replacement**

PROJECT DESCRIPTION: Increase station capacity from 90 L/s to 168 L/s by replacing existing two pumps, Includes wet well

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-059**

	L/s
ECA	90.0
Operational	87.0

PROPOSED CAPACITY	168 L/s	Firm Capacity
Design PWWF Existing	133 L/s	167 L/s
2051	163 L/s	197 L/s
Buildout	168 L/s	202 L/s
	RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)*
1	90.0	168.2
2	87.0	168.2

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	78 L/s	$27,983	$2,182,675	
Related Upgrades	30%						
Bypass Pumping Allowance	6%					$120,047	
Additional Construction Costs	15%		ea.			$345,408	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$264,813	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$2,913,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 437,000	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$437,000**	
In House Labour/Engineering/Wages/CA	4.0%					$ 116,520	
In-house Labour/Wages Sub-Total						**$116,520**	
Project Contingency	15%					$520,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$520,000**	
Non-Refundable HST	1.76%					$68,100	
Non-Refundable HST Sub-Total						**$68,100**	
Total (2022 Dollars)						**$4,055,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$4,055,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$81,100		
Design	Design fees, Town fees for design, contract admin	13%	$527,150		
Construction	Town fees, base costs and project contingency	85%	$3,446,750		
TOTAL			**$4,055,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-TP-005**
PROJECT NAME: **Region-wide WWTP Process Upgrades**
PROJECT DESCRIPTION: Process upgrades to re-establish ECA capacity

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$50,000,000**	Placeholder Costs
Chosen Estimate						**$50,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$1,000,000		
Design	Design fees, Town fees for design, contract admin	13%	$6,500,000		
Construction	Town fees, base costs and project contingency	85%	$42,500,000		
TOTAL			**$50,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-TP-005**
PROJECT NAME: **Region-wide WWTP Process Upgrades**
PROJECT DESCRIPTION: Upgrades for odour control across the Region at forcemains, pump stations, and other locations.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$40,000,000**	Placeholder Costs
Chosen Estimate						**$40,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$800,000		
Design	Design fees, Town fees for design, contract admin	13%	$5,200,000		
Construction	Town fees, base costs and project contingency	85%	$34,000,000		
TOTAL			**$40,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-ST-001**
PROJECT NAME: **Region Wide Flow Monitoring and Data Collection**
PROJECT DESCRIPTION: Funding to support flow monitoring and data collection initiatives

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-ST-001**

PROPOSED CAPACITY	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction							
Additional Construction Costs	10%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ -	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$0**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	10%					$4,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$4,000**	
Non-Refundable HST	1.76%					$100	
Non-Refundable HST Sub-Total						**$100**	
Total (2022 Dollars)						**$44,000**	Rounded to nearest $1,000
Other Estimate						**$12,000,000**	Assumes 400k/year for 30 y
Chosen Estimate						**$12,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$240,000		
Design	Design fees, Town fees for design, contract admin	13%	$1,560,000		
Construction	Town fees, base costs and project contingency	85%	$10,200,000		
TOTAL			$12,000,000		

E

Regional Municipality of Niagara

Part E

QUEENSTON WASTEWATER SYSTEM

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E. QUEENSTON WASTEWATER TREATMENT PLANT

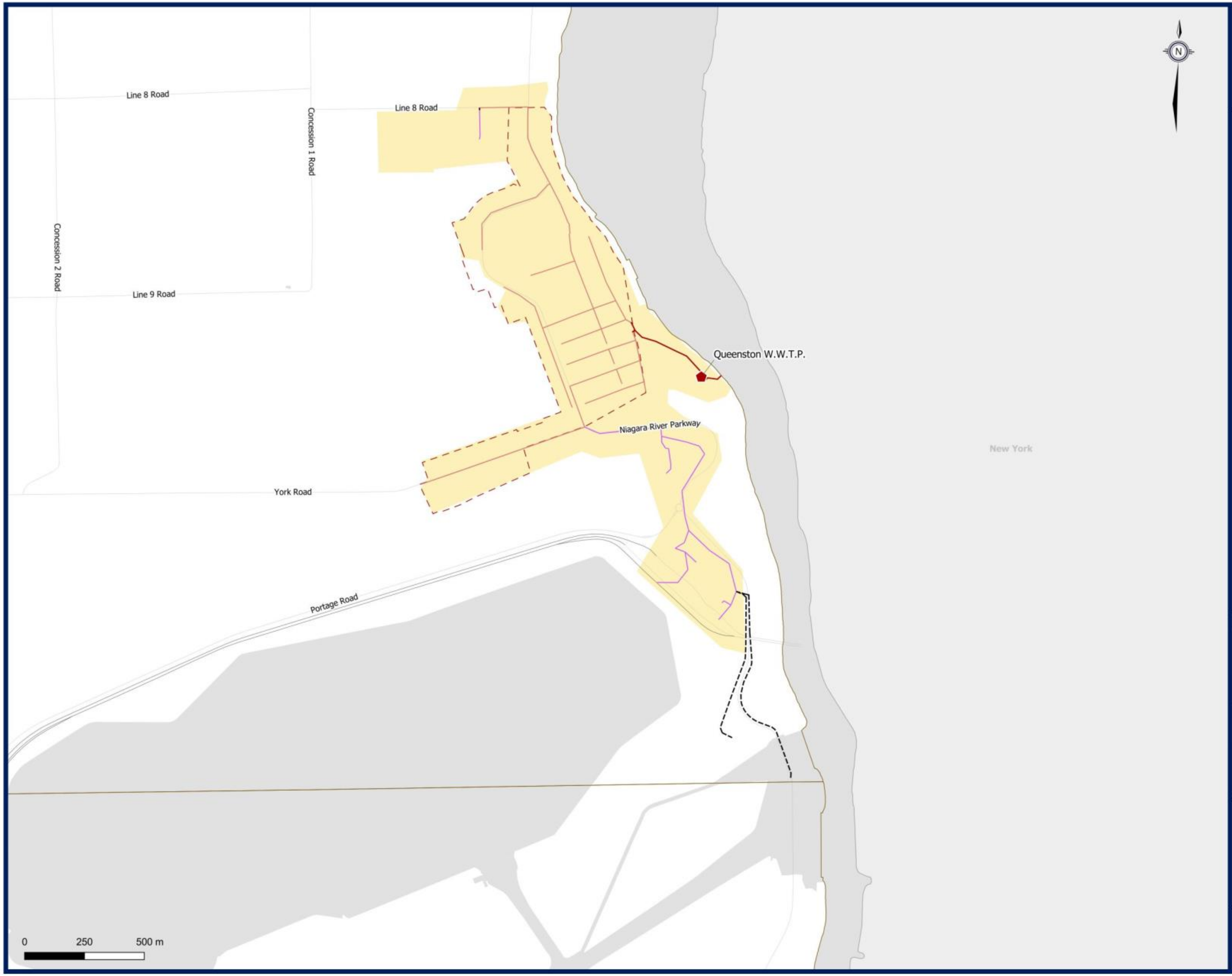
E.1 Existing System Infrastructure

The Queenston wastewater system services the Community of Queenston in Niagara-on-the-Lake. The system services an existing population of 660 and 462 employees. Note that the population and employment total was based on the Region's 2021 allocation of Traffic Area Zones planning data and has been processed through the allocation methodology presented in **Volume 2** to refine the data to include only serviced populations. As such, the population and employment total may not directly match the system totals using the Region's unprocessed planning data.

The system is serviced by the Queenston Wastewater Treatment Plant, located on 30 Front Street, Niagara-on-the-Lake. The Queenston Wastewater Treatment Plant is a conventional treatment plant with a current rated average daily flow capacity of 0.5 MLD, and a peak design flow rate of 1.7 MLD.

System flows are conveyed to the treatment plant via a network of local sewers.

Figure 4.E.1 presents an overview of the wastewater system, and **Figure 4.E.2** shows a schematic of the wastewater system.



Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

Existing Wastewater Infrastructure

- ⬟ Wastewater Treatment Plant (WWTP)
- ■ Biosolids Storage Facility
- ✳ Odour Control Facility
- ♦ Leachate Pumping Station

Sanitary Pumping Stations (SPS)

- ▲ Regional
- ▲ Municipal
- ▲ Private

Wastewater Network

- ---- Force Mains
- —— Regional Mains
- —— Local Sewers
- —— Private Sewers

Wastewater Catchments

- 🟨 Queenston WWTP

Other Features

- ☐ Municipal Boundary
- ▨ Waterbodies
- ⌜⌟ Urban Area Boundary

Figure 4.E.1

Queenston WWTP System

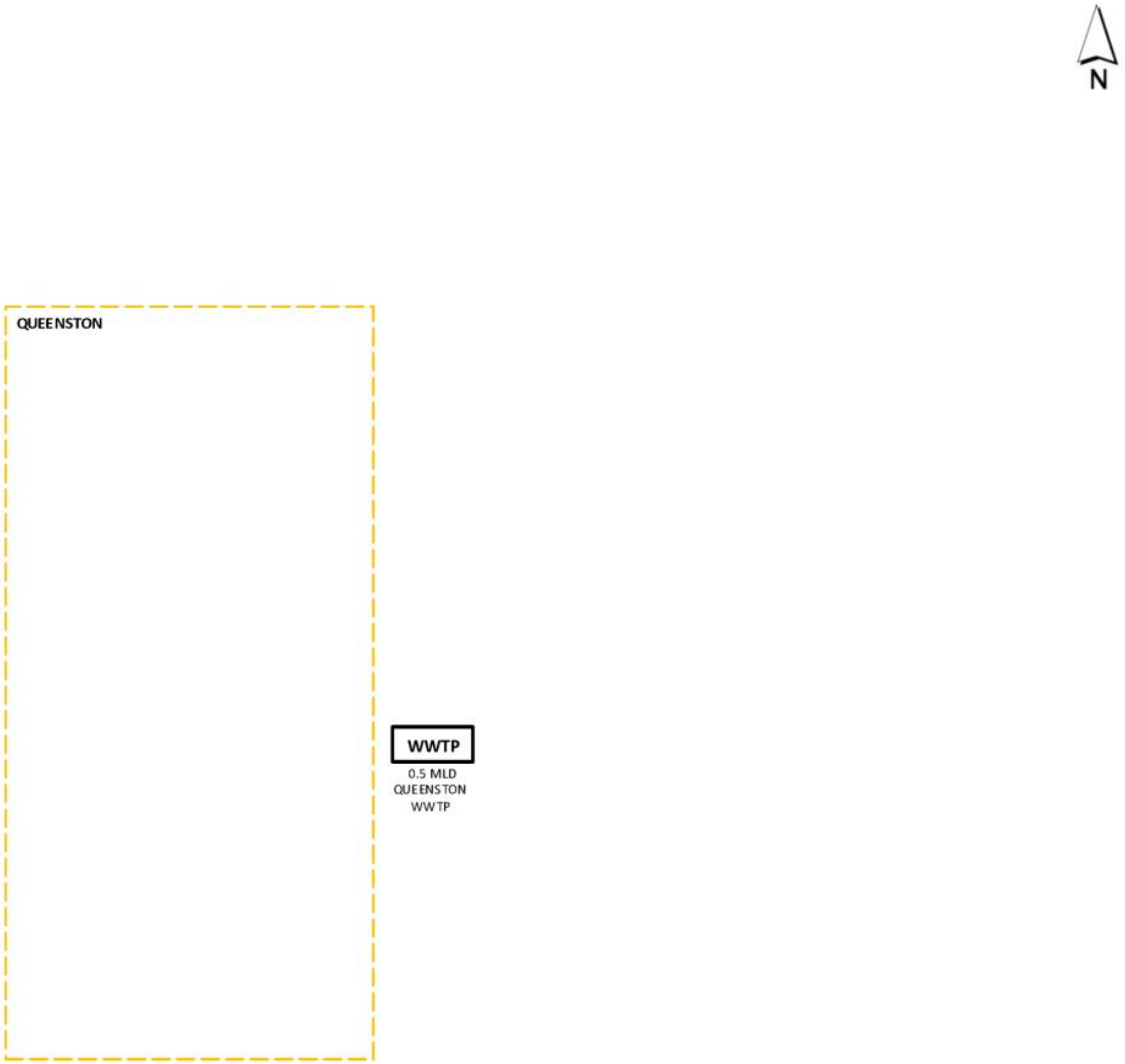
Existing Wastewater Infrastructure

GM BluePlan ENGINEERING

March 2023
620126-WW-001
WKID: 26917

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



WWTP RATED CAPACITY	Wastewater Treatment Plant
FIRM CAPACITY	Sewage Pumping Station
→	Forcemain
→	Connection from SPS to SPS
→	Connection from SPS to WWTP

Figure 4.E.2

Queenston WWTP

Existing Wastewater Infrastructure Schematic

GM BluePlan ENGINEERING

December 2022
621016-W-000
WKID: 26917

E.1.1 Facility Overview

Table 4.E.1 to **Table 4.E.2** present a summary of the environmental compliance approval (ECA) for the Queenston wastewater treatment plant (WWTP) usage, operation, and effluent concentration objectives.

Table 4.E.1 Wastewater Treatment Plant Overview

Plant Name	Queenston Wastewater Treatment Plant
ECA #	0371-93YM2L
Address	30 Front Street, Niagara-on-the-Lake
Discharge Water	Niagara River
Rated Capacity: Average Daily Flow	0.5 MLD
Rated Capacity: Peak Flow Rate (Dry Weather)	Not available
Rated Capacity: Peak Flow Rate (Wet Weather)	1.7 MLD
Key Processes	• Total Phosphorus Treatment • Biological Reactors • Return Activated Sludge/Waste Activated Sludge Pumping Station • Treated Effluent Outfall • Biosolids Storage and Disposal

Table 4.E.2 Wastewater Treatment Plant Effluent Objectives

Effluent Parameter	Objective Concentration
$CBOD_5$	15.0 mg/L
TSS	15.0 mg/L
Total Phosphorus	1.0 mg/L
E. Coli	200 organisms/100 mL
Total Chlorine Residual	0.5 mg/L

E.2 Basis for Analysis

E.2.1 Flow Criteria, System Performance, and Sizing Methodology

The Niagara Region Traffic Area Zone planning data was used to estimate growth related flow generation within the wastewater system and to spatially allocate growth demands within each individual system**. Table 4.E.3** presents a summary of the flow criteria, performance, and sizing methodology that was utilized. Refer to **Volume 4 - Introduction** for additional information.

The Region's per capita wastewater flows criteria were updated based on a historic review of the previous 3-year period for local billing meter and flow monitoring records. Given that more granular data was available to complete this analysis compared to previous master plan updates, the population and employment per capita rates were differentiated. The data showed a slight reduction in the population criteria and slight increase in the employment criteria, which more closely reflect existing flow generation trends compared to the Region's previous per capita rate. Further detail regarding the per capita flow generation is presented in **Volume 4 – Introduction.**

The Region's extraneous flow allowance criteria was also reviewed against historic flow monitoring and pump station performance records where available. The review of historic wet weather flows found that typically 2-year design storm peak flows within existing built systems exceeded the Region's existing extraneous flow design allowance of 0.286 L/s/ha; however, that a 2-year design storm peak flow below 0.286 L/s/ha was achievable as demonstrated in multiple catchment areas. Based on the analysis and an industry review, for the purposed of future planning the extraneous flow design allowance for existing areas was increased to 0.4 L/s/ha but was maintained at 0.286 L/s/ha for new greenfield development areas to better reflect the existing high wet weather flows, while minimizing the magnitude of system upgrades with wet weather flow management as a critical priority. In areas where available historic flow monitoring and modelling results identify existing peak 5 year design flows below the 0.4 L/s/ha criteria, the lower 5 year design flows should be utilized. Further details regarding the extraneous flow design allowance are presented in **Volume 4 – Introduction.**

Table 4.E.3 Flow Criteria, Scenarios, System Performance, and Sizing Methodology

	Component	Criteria	
Flow Criteria	Existing System Flows	Starting Point Methodology • Based on local billing meter records and flow monitoring data to establish existing dry and wet weather flows • Growth flows are added to the existing system baseline using design criteria	
	Flow Generation	Residential	255 L/c/d
		Employment	310 L/e/d
	Peaking Factor	Peak Dry Weather Flow	Harmon’s Peaking Factor
	Extraneous Flow Design Allowance	• 0.4 L/s/ha for existing areas • 0.286 L/s/ha for new developments	
WWTP	System Performance and Triggers	• MECP Procedure F-5-1 • Trigger upgrade study at 80% capacity • Trigger upgrade construction at 90% capacity	
	Upgrade Sizing	• Average daily flow plus growth based on population design flows	

Pump Station	System Performance and Triggers Sizing	• Two flow scenarios considered
		    • **Design Allowance**: Peak wet weather flow using the peaked dry weather flow plus the extraneous flow design allowance
		    • **5-Year Storm**: Modelled peak wet weather flow using the 5-year design storm
		• Peak flow capacity to meet design peak wet weather flow using the extraneous flow design allowance
		• Wet well and system storage considerations under 5-year storm to minimize basement flooding and overflow risks	

Forcemain	System Performance and Triggers	• Flag velocities less than 0.6 m/s • Flag velocities greater than 2 m/s • Upgrade when velocities exceed 2.5 m/s and considering condition and age	
	Upgrade Sizing	• Design velocity target between 1 m/s and 2 m/s • Forcemain twinning to increase capacity where feasible	
Trunk	System Performance and Triggers	• Design allowance peak wet weather flows, using the extraneous flow design allowance, to be managed within pipe • Freeboard (depth between hydraulic grade line and surface) greater than 1.8 m below surface in 5-year design storm • Flag pipes velocities less than 0.6 m/s	

	Component	Criteria
		• Flag pipes velocities greater than 3.0 m/s
	Upgrade Sizing	• Sized for full flow under post-2051 design peak wet weather flow • Assess 5-year design storm performance to minimize basement flooding risks and overflows

E.2.2 Growth Population Projections and Allocations

Table 4.E.4 outlines the existing and projected serviced population and employment by catchment.

Table 4.E.4 Queenston Wastewater Treatment Plant Existing and Projected Serviced Population by Catchment

Sewage Pumping Station (SPS)	Existing Population & Employment			2051 Population & Employment			Post-2051 Population & Employment			2021-2051 Growth		
	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population Growth	Employment Growth	Total Growth
Queenston WWTP	660	462	1,122	675	548	1,223	743	563	1,306	15	86	101
Total	660	462	1,122	675	548	1,223	743	563	1,306	15	86	101

Note: Population numbers may not sum due to rounding.

E.3 System Performance

E.3.1 Wastewater Treatment Plant

The starting point flow for the Queenston WWTP was calculated using historic SCADA flow data. Ten years of data (2011 to 2020) was reviewed to provide historical context and assess overall long-term trends; however, the most recent five years of data was used to determine the average daily flow. **Table 4.E.5** shows the historical system flows obtained from wastewater treatment plant production data.

Table 4.E.5 Historic Queenston Wastewater Treatment Plant Flows

Year	Average Daily Flow		Peak Daily Flow	
	(MLD)	(L/s)	(MLD)	(L/s)
2011	0.29	3.4	2.27	26.3
2012	0.25	2.9	1.56	18.1
2013	0.28	3.3	2.07	24.0
2014	0.23	2.6	1.25	14.5
2015	0.2	2.8	N/A	N/A
5 Year Average	0.26	3.0	1.8	20.7
5 Year Peak	0.29	3.4	2.3	26.3
2016	0.23	2.63	0.96	11.15
2017	0.23	2.71	1.75	20.23
2018	0.20	2.29	1.53	17.73
2019	0.21	2.46	1.06	12.25
2020	0.14	1.56	0.51	5.95
5-Year Average	0.20	2.33	1.16	13.46
5-Year Peak	0.23	2.71	1.75	20.23
10-Year Average	0.23	2.66	1.44	16.67
10-Year Peak	0.29	3.39	2.27	26.27

The 10-year trend analysis showed that flows to the Queenston WWTP decreasing. The 5-year average flow has decreased by approximately 20% from the 2016 MSP starting point. However, it is noted that due to the area's small population and high tourism-based economy the flow reductions may be a temporary effect of COVID.

The starting point flow used for the Queenston WWTP was 0.2 MLD.

While flows to the Queenston WWTP have been decreasing, there continue to be servicing agreements in place with local commercial users that reserve capacity at the plant for their operations. Within the Queenston WWTP catchment there are four (4) agencies with servicing agreement that provide a set allocation of 226 m^3 of the Queenston WWTP available 500 m^3/day average daily flow capacity.

It is NOTL and the Region's current understanding that the servicing limits identified in the agreement represent the peak allowable daily discharge. Based on the analysis completed for the ongoing Queenston WWTP EA, approximately 76% of the total allocation is being utilized. There is potential that the remaining 55m^3 allocation will be fully utilized; however, it is unclear if the Region's employment growth projections of 86 jobs by 2051 (equivalent to 26 m^3 of flow) and of 101 total jobs (equivalent to 31 m^3) is inclusive of 55 m^3 of remaining allocation. **Figure 4.E.3** shows the projected future flows at the Queenston WWTP and additional flows that the maximum potential use of the servicing agreements could result in.

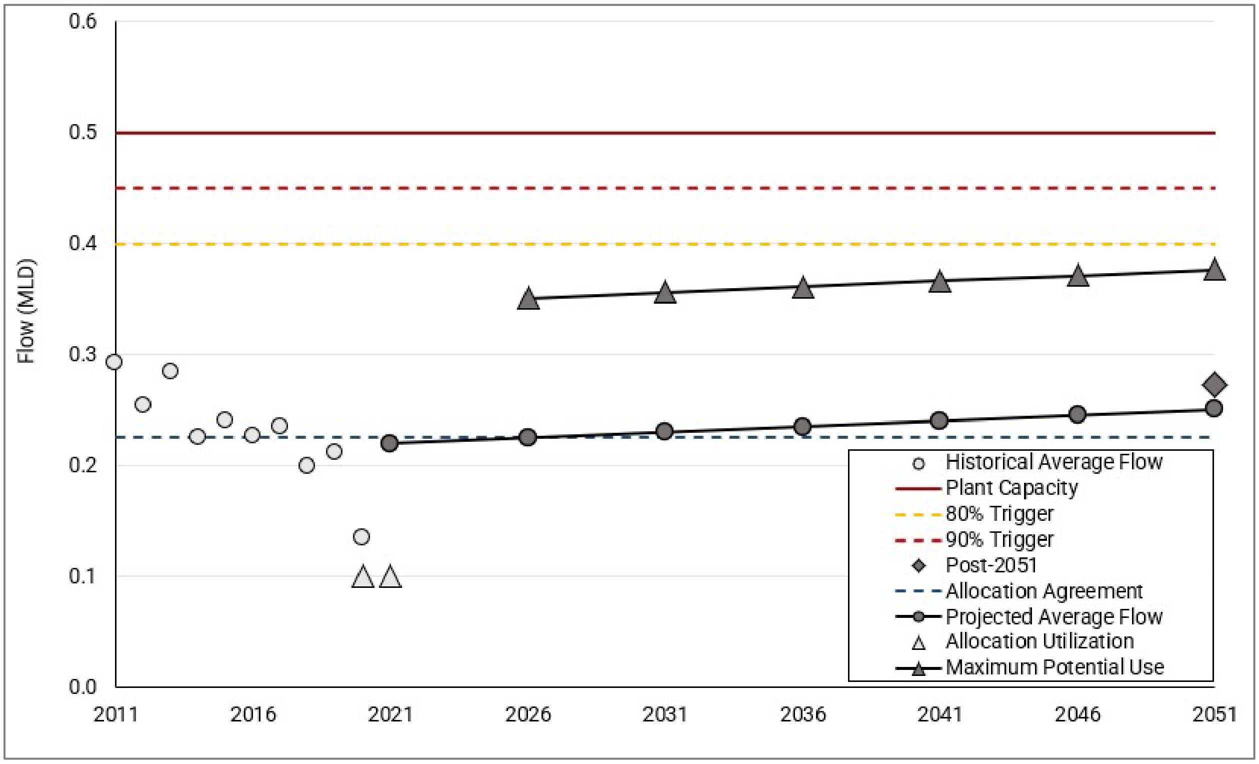


Figure 4.E.3 Projected Sewage Generation at Queenston Wastewater Treatment Plant

E.4 System Opportunities and Constraints

Figure 4.E.4 highlights the existing opportunities and constraints.

E.4.1 Queenston Wastewater Treatment Plant

- The current rated average daily flow capacity of the plant is 0.5 MLD, with an existing flow of 0.2 MLD and a projected 2051 average daily flow of 0.25 MLD, which is below 80% of the wastewater treatment plant rated capacity.
- Queenston WWTP has commercial allocation agreements with businesses that total 0.226 MLD. Currently only 0.1 MLD of the allocation agreements is being utilized however, if the total allocation were to be used in the future, with the growth flow projections, the projected maximum potential use for the 2051 average daily flow would be 0.38 MLD, which is below 80% of the wastewater treatment plant rated capacity.
- As such, the wastewater treatment plant has surplus capacity to accommodate growth beyond 2051.

E.4.2 Niagara-on-the-Lake

- Limited residential and employment growth consisting of infill development within existing urban boundary.

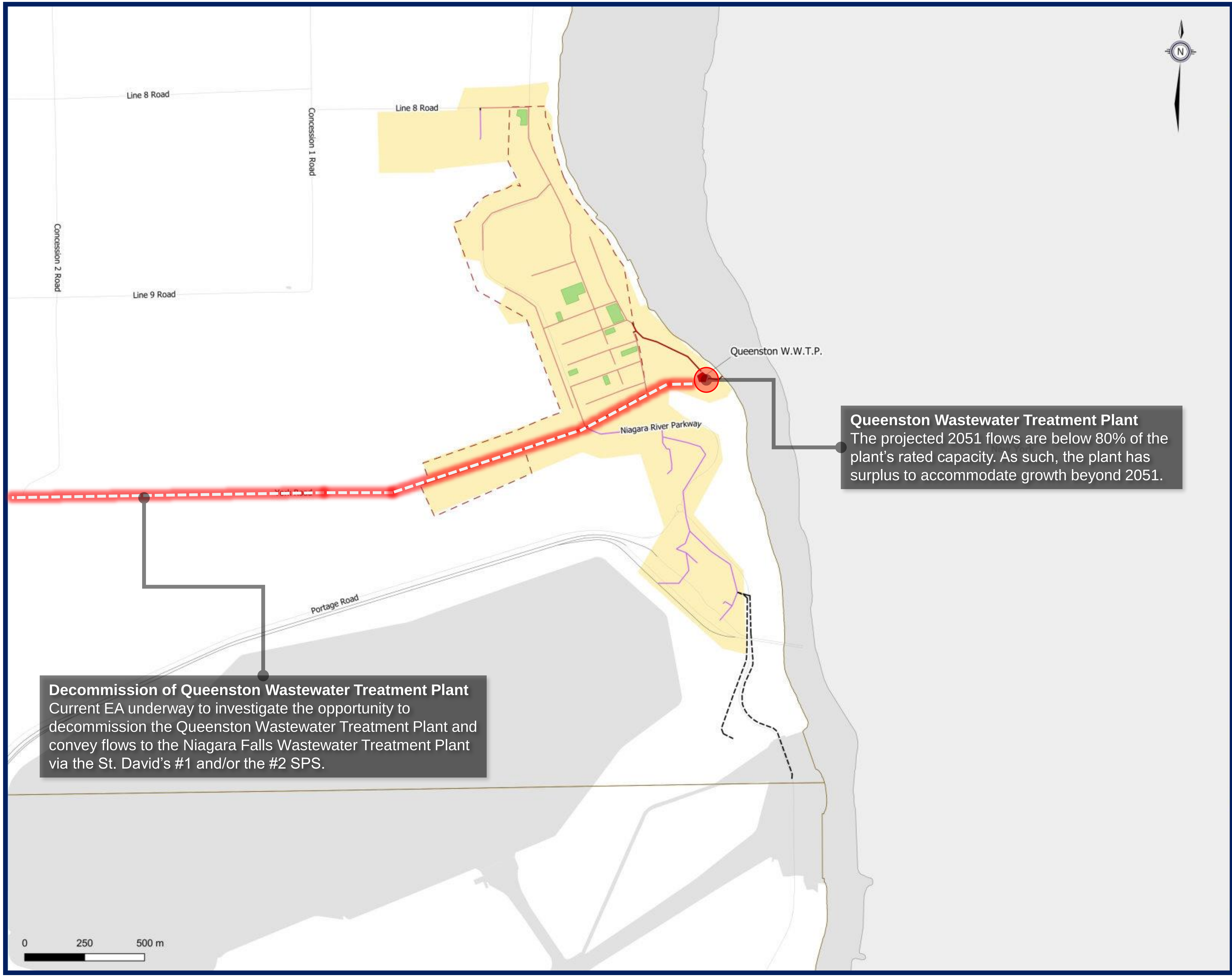
- No Regional conveyance infrastructure.

E.4.3 System Optimization Opportunities

- Opportunity to decommission Queenston Wastewater Treatment Plant and convey flows to the Niagara Falls Wastewater Treatment Plant via the St. David’s #1 and/or the #2 SPS. There is currently an EA underway investigating these options further.

Niagara Region

2021 Water and Wastewater Master
Servicing Plan Update



Queenston Wastewater Treatment Plant
The projected 2051 flows are below 80% of the plant's rated capacity. As such, the plant has surplus to accommodate growth beyond 2051.

Decommission of Queenston Wastewater Treatment Plant
Current EA underway to investigate the opportunity to decommission the Queenston Wastewater Treatment Plant and convey flows to the Niagara Falls Wastewater Treatment Plant via the St. David's #1 and/or the #2 SPS.

Existing Wastewater Infrastructure

- ⬟ Wastewater Treatment Plant (WWTP)
- ● Combined Sewage Detention Facility
- ■ Biosolids Storage Facility
- ✳ Odour Control Facility
- ♦ Leachate Pumping Station

Sanitary Pumping Stations (SPS)

- ▲ Regional
- ▲ Municipal
- ▲ Private

Wastewater Network

- ---- Force Mains
- — Regional Mains
- — Local Sewers
- — Private Sewers

Wastewater Catchments

- ▨ Queenston WWTP

Other Features

- ☐ Municipal Boundary
- ▨ Waterbodies
- ⌜ ⌟ Urban Area Boundary

Development Locations

- ▨ Post-2051
- 🟩 Pre-2051

Figure 4.E.4

Queenston WWTP

Opportunities and Constraints

GM BluePlan

February 2023
6210126-WW-002

E.5 Assessment of Alternatives

The Queenston – St. David's Wastewater Servicing Strategy Environmental Assessment (EA) is currently ongoing (target completion in 2023). Through the Queenston – St. David's EA several options will be considered with the objective of developing the optimized long-term servicing strategy for the Queenston and St. David's wastewater system. For the purposes of the MSPU, placeholder projects have been included in the capital program which represent a reasonable middle ground for the potential options that will be considered through the EA. This strategy is subject to change through the EA and the preferred strategy determined through the Queenston – St. David's Wastewater Servicing Strategy EA will supersede the recommendations of the MSPU with respect to the Queenston strategy. The placeholder projects included in the MSPU are based on the strategy of decommissioning the Queenston WWTP and redirecting flows to the Niagara Falls WWTP via the St. David's #1 SPS and St. David's #2 SPS, and included within the MSPU are as follows:

- New Queenston Sewage Pumping Station and forcemain
- Decommission the Queenston WWTP

E.6 Preferred Servicing Strategy

- The following is a summary of Queenston WWTP system as recommended through the 2016 Master Servicing Plan Update. The proposed works or a more suitable recommended option from the ongoing Queenston – St. David's Wastewater Servicing Strategy EA are to prevail over the 2021 MSPU recommendations for the Queenston wastewater system, when the Queenston EA study results are approved and filed in 2023.The Queenston wastewater system is a small system in Niagara-on-the-Lake. There is not much growth projected and the system has capacity to support its needs. However, from a lifecycle perspective, it can be inefficient to operate small independent systems.
- The South Niagara Falls wastewater strategy presents opportunities for adjacent systems. On this basis, it is recommended to include the redirection of the Queenston flows to Niagara Falls and decommissioning the Queenston WWTP. The work relating to the St. David's #1 and #2 SPS are included in the Niagara Falls system **Volume 4 – Appendix F**.

Figure 4.E.5 and **Figure 4.E.6** show the preferred servicing strategy, consisting of:

E.6.1 Treatment Plant Works

- Decommission the existing Queenston WWTP and replace with new SPS.

E.6.2 Pumping Stations

- New Queenston SPS with firm capacity of 62 L/s on the Queenston WWTP site.

E.6.3 Forcemains

- New 250 mm Queenston Forcemain into Niagara Falls system.

E.6.4 Decommissioning of Existing Facilities

- Decommission the existing Queenston WWTP and replace with new SPS.

E.6.5 Wet Weather Flow Management Program

- The Queenston WWTP catchment has some wet weather flows; however, based on available capacity at the plant and local system, the area is a lower priority for NOTL.

E.6.6 Additional Studies and Investigations

The local area municipalities (LAMs) are expected to continue with the inflow and infiltration reduction studies and action programs to address sources of inflow and infiltration.

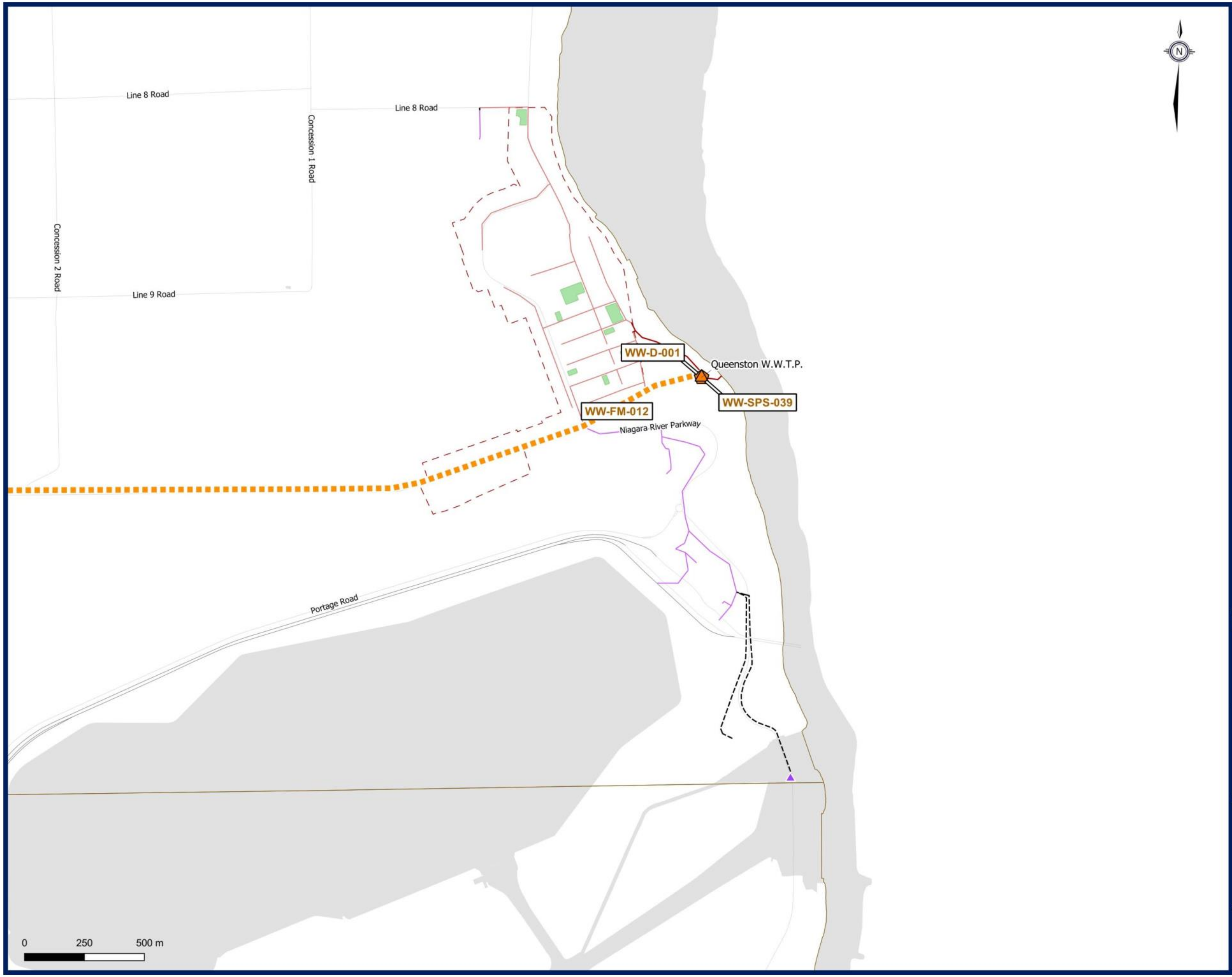
E.7 Capital Program

Figure 4.E.5 and **Figure 4.E.6** present the preferred servicing strategy map and schematic

Table 4.E.6 summarizes the recommended project costing timing and Class EA requirements. Individual detailed costing sheets are presented in **Section E.8.6.**

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



Capital Program

- Treatment Plant
- Pumping Station
- Wet Weather Reduction (WW-II-017)
- Forcemains
- Sewers

Wastewater Facilities

- Wastewater Treatment Plant
- Biosolids Storage Facility
- Leachate Pumping Station
- Odour Control Facility

Wastewater Network

- Force Mains
- Regional Mains
- Local Sewers
- Private Sewers

Pumping Stations

- Niagara Region
- Municipal
- Private

Other Features

- Municipal Boundary
- Waterbodies
- Urban Area Boundary

Development Locations

- Post-2051
- Pre-2051

***Note that additional growth in existing built areas is anticipated**

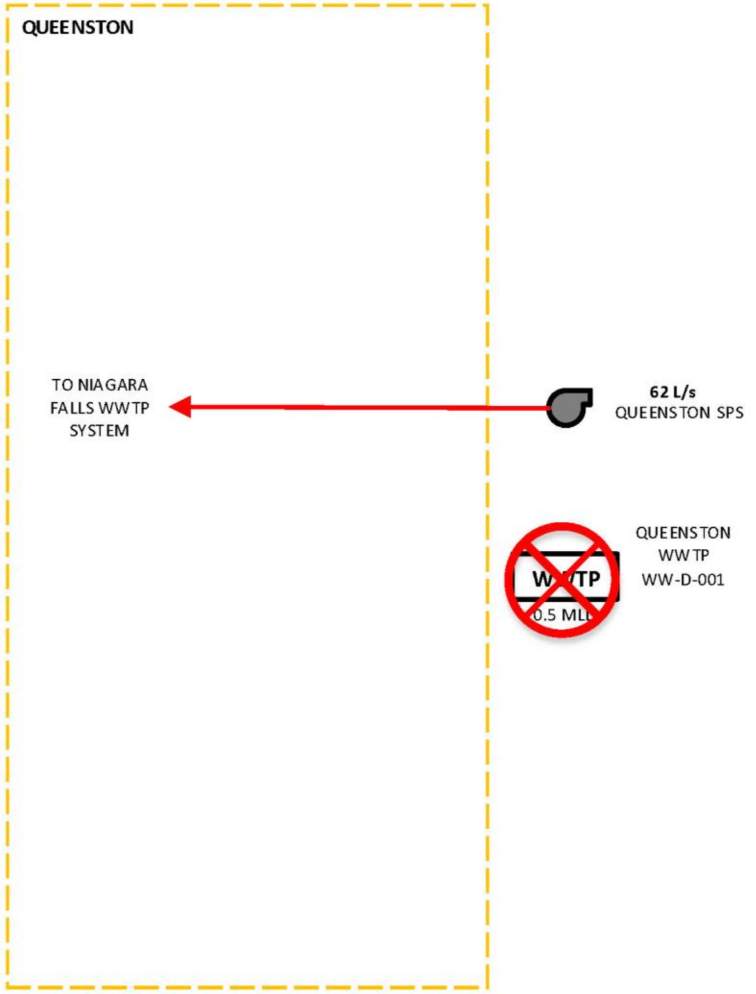
***Project alignments are preliminary and will be refined through subsequent projects (EA and/or detailed design)**

Figure 4.E.5
Queenston WWTP System

Preferred Wastewater Servicing Strategy

GM BluePlan ENGINEERING

December 2022
620126-WW-006
WKID: 26917



Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

WWTP RATED CAPACITY	Wastewater Treatment Plant
FIRM CAPACITY	Sewage Pumping Station
⟶	Forcemain
⟶	Connection from SPS to SPS
⟶	Connection from SPS to WWTP
🟧	Facility Upgrade
🟩	New Facility
—	Upgrade Forcemain or Sewer
—	New Forcemain or Sewer
⊗	Decommission Project

Figure 4.E.6
Queenston WWTP

Future Wastewater Infrastructure Schematic

BluePlan

December 2022
621016-W-000
WKID: 26917

Table 4.E.6 Summary of Queenston Wastewater Treatment Plant Capital Program

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost ($)
WW-D-001	Decommissioning of Queenston WWTP	Decommissioning of Queenston WWTP, to be replaced by new SPS and forcemain to St. David's #1	N/A	2027-2031	Niagara-on-the-Lake	B	To be Satisfied Under Consolidated Queenston Schedule B EA - Separate Study	Treatment	$2,256,000
WW-SPS-039	New Queenston SPS	New Queenston SPS with firm capacity of 62 L/s	62 L/s	2027-2031	Niagara-on-the-Lake	B	To be Satisfied Under Consolidated Queenston Schedule B EA - Separate Study	Pumping	$2,996,000
WW-FM-012	New Queenston Forcemain	New 250 mm Queenston Forcemain into Niagara Falls system	250 mm	2027-2031	Niagara-on-the-Lake	B	To be Satisfied Under Consolidated Queenston Schedule B EA - Separate Study	Forcemain	$12,427,000
WW-II-017(1)	Region-Wide Wet weather Reduction	Wet weather reduction program in all systems to be executed from 2022-2051	N/A	2022-2051	Region-Wide		Dependent on outcome of wet weather flow study	Wet Weather Reduction	$225,000,000
WW-ST-001(1)	Region-Wide Flow Monitoring and Data Collection	Funding to support flow monitoring and data collection initiatives	N/A	2022-2051	Region-Wide			Wet Weather Reduction	$12,000,000
WW-TP-005(1)	Region-Wide WWTP Process Upgrades	Process upgrades to re-establish ECA capacity	N/A	2022-2051	Region-Wide			Treatment	$50,000,000
WW-TP-006(1)	Region-Wide WWTP Process Upgrades	Upgrades for odour control across the Region at forcemains, pump stations, and other locations.	N/A	2022-2051	Region-Wide			Treatment	$40,000,000
								Total Queenston	**$17,679,000**

(1) Project cost not included in subtotal as it is a Region-wide project

E.8 Project Implementation and Considerations

E.8.1 10-Year Program Sequencing

The recommended year in service for the capital projects is presented in **Section E.6.6**. Special project implementation and considerations for the preferred servicing strategy consist of:

- The St. David's #1 and #2 SPS and forcemains in the Niagara Falls system would require upgrades prior to the construction of the new Queenston SPS and forcemain.

It is understood that the timing for the recommended projects may be subject to change due to a variety of external factors such as overall balancing of the Region's capital budget, changes to growth projections, and other unforeseen circumstances. As such, **Table 4.E.7** presents the preferred priority of the projects within the first 10-years of the capital program.

Table 4.E.7 Preferred Project Order

Master Plan ID	Name	2022 MSPU Year in Service	Order
WW-FM-012	New Queenston Forcemain	2027-2031	1
WW-SPS-039	New Queenston SPS	2027-2031	1

E.8.2 EA Requirements and Studies

The following summarizes the status of EA requirements for recommended capital projects which will require Schedule B or C EAs.

- **EA has been satisfied through previous projects:**
  - None.
- **Currently ongoing separate EA studies:**
  - WW-FM-012, WW-SPS-039, WW-D-001 (Queenston – St. David's Wastewater Servicing Strategy) Schedule B EA.
- **EA studies to be completed through separate studies:**
  - None.

E.8.3 Region-Wide Projects and Collaboration with Local Area Municipalities

Acknowledging that the overall wastewater systems are jointly owned and operated by the Region and LAM, the continued operation and expansion of the wastewater systems to support existing users and accommodate projected growth relies upon the cooperation of the upper and lower tier municipalities. Major updates and adjustments to planning projections should be continued to be communicated as this may affect project details such as trigger timelines and design capacities, which is discussed further in **Section E.8.5**.

One initiative that will be predominately driven by the LAMs is wet weather management. While wet weather management should be completed in all municipalities, this 2021 MSPU assumes that the catchments where the peak wet weather flows exceed the peak design flows and contribute to increased risk of basement flooding or overflows will put a specific focus on wet weather management. The Region is committed to continuing the joint CSO funding program through which LAMs can apply for funding support for inflow and infiltration reduction programs and projects such as those identified through the PPCP.

Additional flow monitoring and system data collection, in partnership with LAM, is needed to improve system understanding, support proposed wet weather flow reductions, and identify opportunities for system optimization and overflow removals.

E.8.4 Sustainability Projects

It is important to recognize that the 2021 MSPU servicing strategies identify new infrastructure to service the additional growth out to year 2051 but these strategies are built by extending infrastructure from the existing systems and leveraging the existing Region infrastructure in place. It is essential that the existing infrastructure is maintained in good condition and performance to support servicing growth.

The Region continually establishes and implements a sustainability program that addresses priority projects to ensure the existing infrastructure is in a state-of-good-repair and continues to perform and meet the intended level of services. Region-wide programs including but not limited to replacement programs for pipes and manholes, boilers, meters, generators, SCADA upgrades, sludge management programs, laboratory and sampling equipment upgrades, process electrical, process instrumentation. Pump station upgrades through the sustainability capital plan re-establish the SPS ECA capacity.

Independent of the 2021 MSPU, the Region has completed a sustainability program analysis to identify the projects on a yearly basis, with focus on a 10-year program, to address the sustainability needs. This Sustainability Capital Plan is first developed to demonstrate the total investment needs and may identify a level of investment and implementation exceeding Region resources. The next steps for the Sustainability Capital Plan will be the development of the Financial Plan for existing Water and Wastewater assets which is anticipated to be completed in 2024. It should be noted that the Sustainability Capital Plan represents investment required over and above the growth-related 2021 MSPU program.

There were no Queenston system specific identified.

E.8.5 Project Implementation Flow Chart

The recommended design capacities within the growth capital program are based on the best available information at the time of analysis, including existing system flows, facility capacities, and projected growth. It is understood that this data is not static and often changes over the years between the regular updates of the Region's Master Plan and between those updates. Design assumptions should be revisited before initiation of all projects to reconfirm the appropriate design capacities, along with identification of any associated or dependent projects which can be combined or staged to optimize implementation efficiency and cost, and/or system operation.

To support the Region's process in implementing all recommended MSPU capital projects, the following flow chart has been developed for the wastewater system. This flow chart document is intended to be a reference resource for the Region and should be treated as a guideline to support existing internal Region processes in project implementation.

The wastewater implementation flow chart is shown in **Figure 4.E.7.**

Niagara Region

WASTEWATER PROJECT IMPLEMENTATION

The intent of this document is to support the Region in confirming the scope of work for wastewater infrastructure projects.

CONFIRM PROJECT SCOPE

To define Terms of Reference

☐ **What triggered this project?**
- Known development growth
- Forecasted growth
- Sustainability needs

☐ **Are there related or dependent projects that should be identified for streamlining opportunities or for project phasing?**
- Are there upstream projects with increasing capacity?
- Are there projects within the same alignment or project area that could be combined? (e.g., growth projects, SPS, forcemain, sewer, corridor planning, sustainability projects, water, stormwater, etc.)
- If there are related projects, could the project timing be adjusted to combine or stage projects more efficiently?

☐ **What is the project EA Schedule and status?**

☐ **Are there historic or ongoing operational issues in the project area?**
- Confirm with Regional and LAM operations and maintenance groups
- i.e. historic overflows, low flow/odour issues, clogging issues, work order history, etc.

☐ **Are there any data gaps that should be incorporated into the Terms of Reference?**
- Refer to the Required Data section below for details
- How much does the project timeline and budget need to change to allow for the data collection?

☐ **Have the planning projections been updated to the best available information?**
- Consultation with Region and LAM planning groups to confirm planning projection
- Are projected needs for the project in place? Is actual growth in line with projected growth?)

☐ **Should the project be deferred until identified related works are completed?**

REQUIRED DATA

To support terms of reference and detailed design

☐ **Recently completed EA or servicing study**
(for growth triggered projects)

☐ **Historic flow records**
- Within the last 3 years
- Ideally one full year of flow monitoring data that covers 80% of the total contributing area
- Can be included in project scope if feasible

☐ **Existing pump, flow, and pressure data to identify/verify existing system issues**

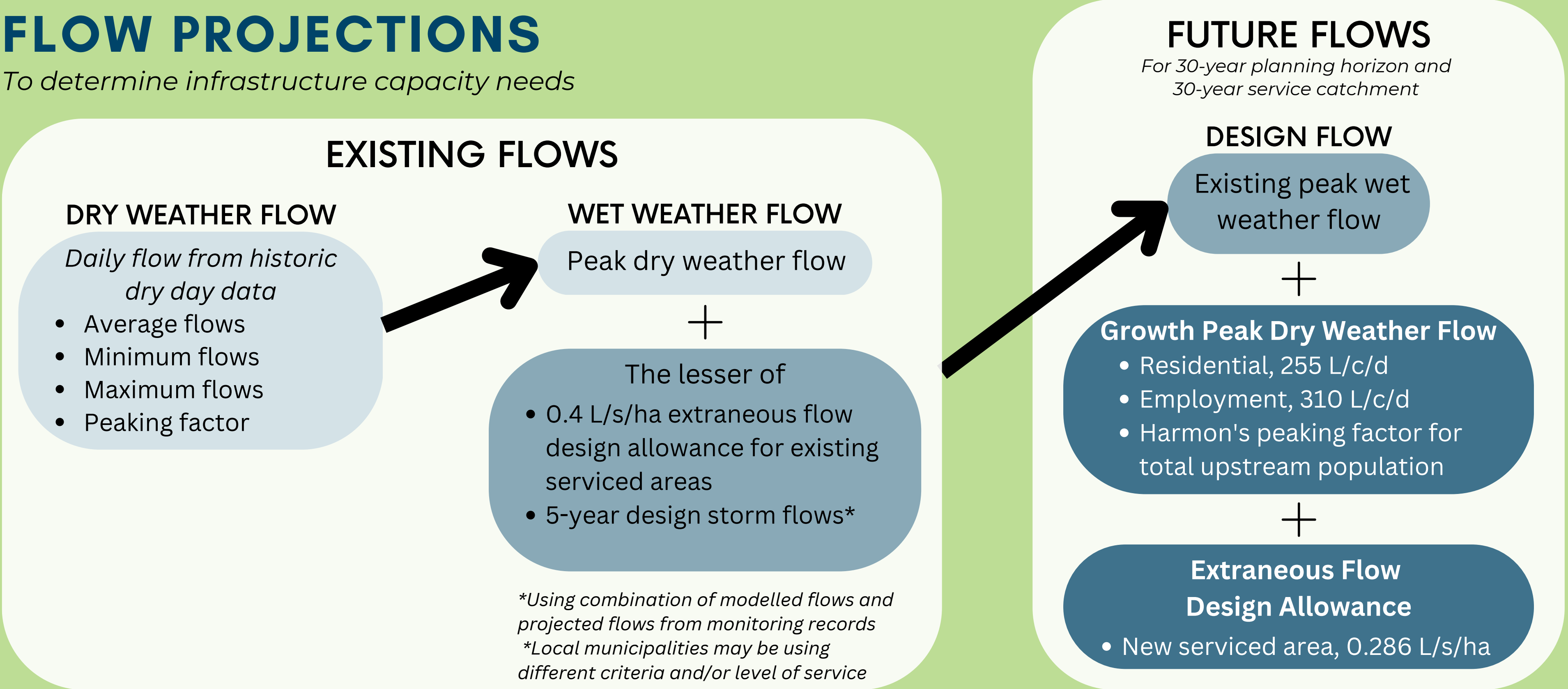
☐ **Asset inventory and condition assessment**
- All asset classes within the infrastructure type (sewer, forcemain, storage, pumping, or treatment facility)
- Within the last 5 years
- Can be part of project scope if the data is not available and would not significantly alter project scope - to assess need for related works (i.e. electrical, HVAC, structural upgrades at an SPS)

☐ **Service area growth potential to confirm projected population and demands**
- Consultation with Region and LAM planning groups within the past year
- Growth information for 30-year horizon and beyond (maximum service catchment)
  - Population, jobs, land use, area
  - Current inventory of development areas with associated development status

IF THE REQUIRED DATA IS NOT AVAILABLE AND IF IT HAS THE POTENTIAL TO SIGNIFICANTLY ALTER SCOPE OF THE DESIGN, IT IS STRONGLY RECOMMENDED THAT THE APPROPRIATE DATA COLLECTION AND FIELD INVESTIGATION BE COMPLETED PRIOR TO PROCEEDING WITH DESIGN. ALTERNATIVELY, WHERE FEASIBLE, DATA COLLECTION SHOULD BE INCLUDED IN THE PROJECT SCOPE AND INTEGRATED INTO THE DESIGN PROCESS.

FLOW PROJECTIONS

To determine infrastructure capacity needs



EXISTING FLOWS

DRY WEATHER FLOW

Daily flow from historic dry day data
- Average flows
- Minimum flows
- Maximum flows
- Peaking factor

WET WEATHER FLOW

Peak dry weather flow

+

The lesser of
- 0.4 L/s/ha extraneous flow design allowance for existing serviced areas
- 5-year design storm flows*

*Using combination of modelled flows and projected flows from monitoring records
*Local municipalities may be using different criteria and/or level of service

FUTURE FLOWS

For 30-year planning horizon and 30-year service catchment

DESIGN FLOW

Existing peak wet weather flow

+

Growth Peak Dry Weather Flow
- Residential, 255 L/c/d
- Employment, 310 L/c/d
- Harmon's peaking factor for total upstream population

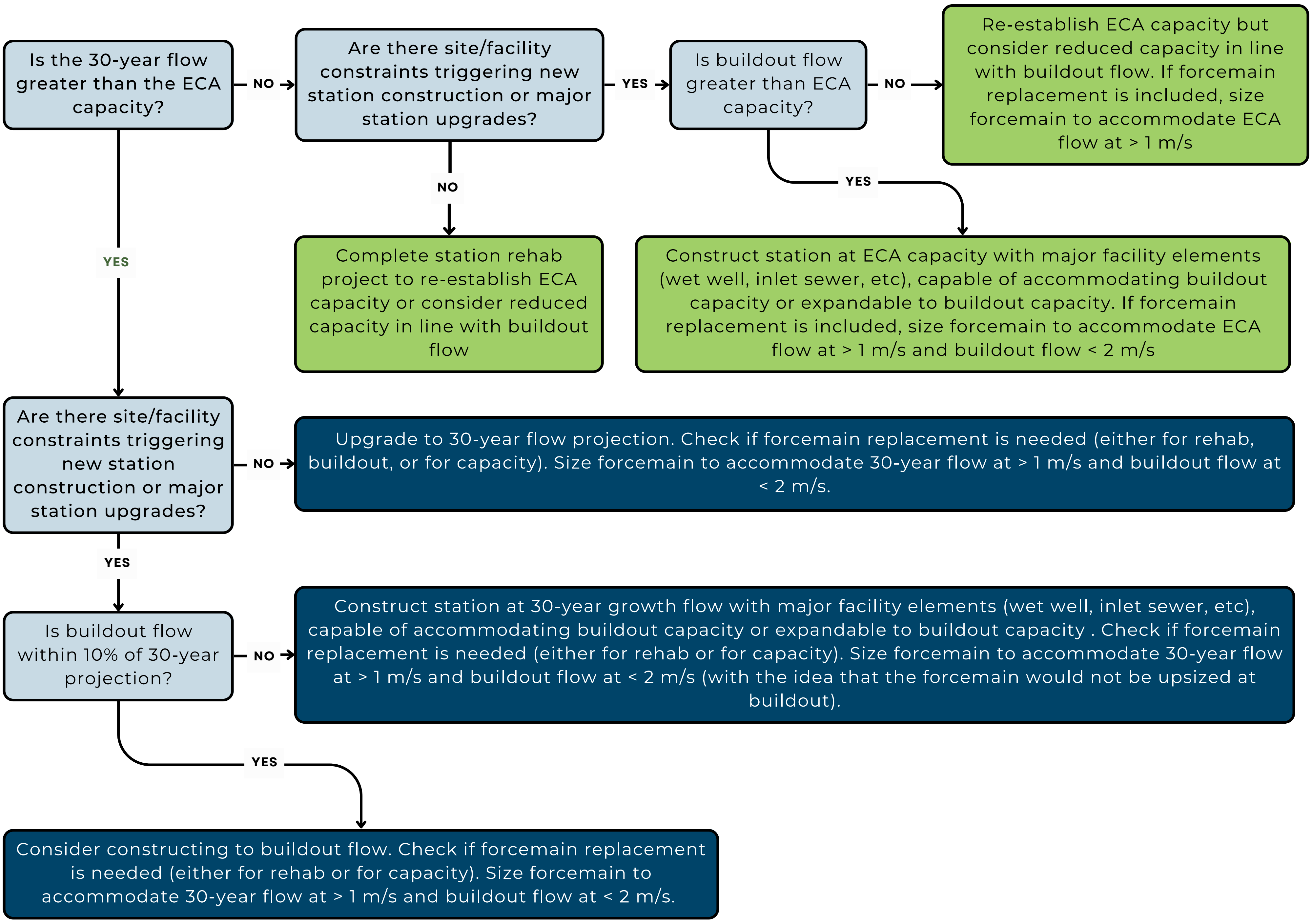
+

Extraneous Flow Design Allowance
- New serviced area, 0.286 L/s/ha

The design criteria presented in this document are based on the 2021 Master Servicing Plan Update Study

BluePlan ENGINEERING

SEWAGE PUMPING STATIONS



Is the 30-year flow greater than the ECA capacity?

Are there site/facility constraints triggering new station construction or major station upgrades?

Is buildout flow greater than ECA capacity?

Re-establish ECA capacity but consider reduced capacity in line with buildout flow. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s

Complete station rehab project to re-establish ECA capacity or consider reduced capacity in line with buildout flow

Construct station at ECA capacity with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s and buildout flow < 2 m/s

Are there site/facility constraints triggering new station construction or major station upgrades?

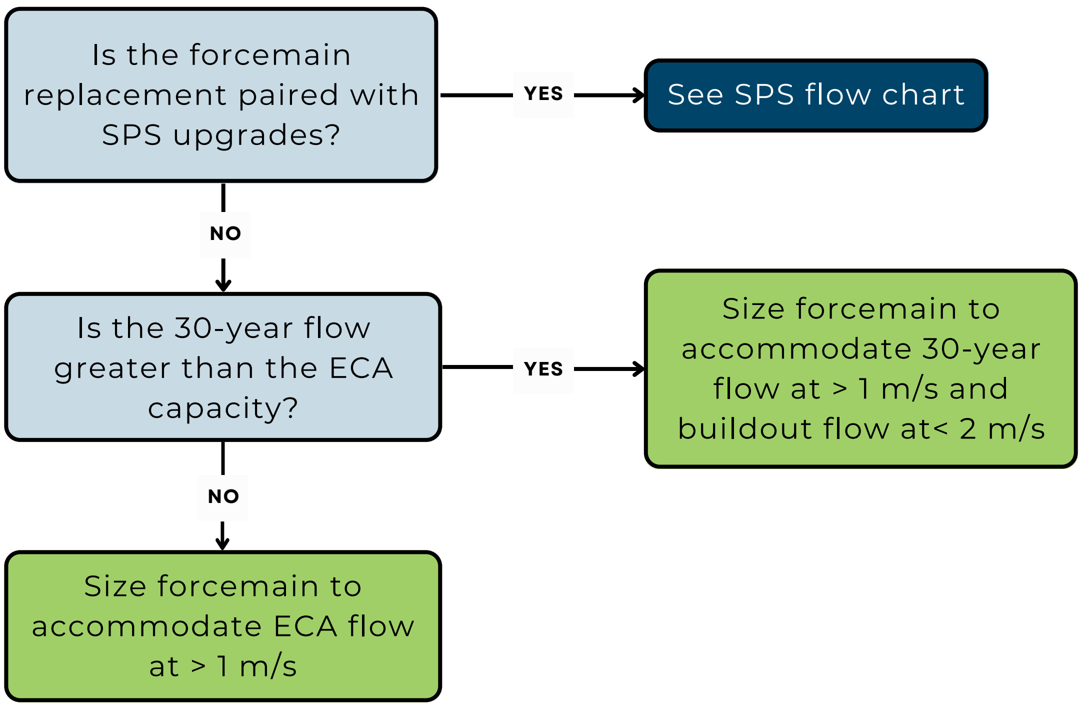
Upgrade to 30-year flow projection. Check if forcemain replacement is needed (either for rehab, buildout, or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

Is buildout flow within 10% of 30-year projection?

Construct station at 30-year growth flow with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity . Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s (with the idea that the forcemain would not be upsized at buildout).

Consider constructing to buildout flow. Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

FORCEMAINS



Is the forcemain replacement paired with SPS upgrades?

See SPS flow chart

Is the 30-year flow greater than the ECA capacity?

Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at< 2 m/s

Size forcemain to accommodate ECA flow at > 1 m/s

E.8.6 Detailed Project Costing Sheets

The detailed project costing sheets for the recommended 2021 MSPU capital projects within the Queenston WWTP system are presented below.

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-FM-012**
PROJECT NAME:	**New Queenston Forcemain**
PROJECT DESCRIPTION:	New 250 mm Queenston Forcemain into Niagara Falls system

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-FM-012**

Pump Station	**WW-SPS-039**	
ECA	0	0.00
Proposed	61	1.25
Buildout	61	1.25
Number of Pumps	2	1.25

PROPOSED DIAMETER:	250 mm	
TOTAL LENGTH:	5060 m	
Tunnelled		0%
Open Cut	5060 m	100%

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Forcemain

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	5060 m	$965	$4,881,404	
Pipe Construction - Tunneling			m	0 m	$1,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	20%					$976,281	
Minor Creek Crossings			ea.	1	$31,000	$31,000	
Major Creek Crossings			ea.	0	$200,000	$0	
Road Crossings			ea.	1	$83,000	$83,000	Rail
Major Road Crossings (Highway)			ea.	0	$200,000	$0	
Utility Crossings			ea.	0	$83,000	$0	
Updated Soils Regulation Uplift	2%					$97,628	
Additional Construction Costs	20%		ea.			$1,213,863	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$728,318	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$8,011,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$160,200	
Geotechnical Sub-Total Cost						**$160,200**	
Property Requirements	2.0%					$ 160,200	
Property Requirements Sub-Total						**$160,200**	
Consultant Engineering/Design	15%					$ 1,201,700	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$1,201,700**	
In House Labour/Engineering/Wages/CA	3.0%					$ 240,330	
In-house Labour/Wages Sub-Total						**$240,330**	
Project Contingency	25%					$2,443,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$2,443,000**	
Non-Refundable HST	1.76%					$210,800	
Non-Refundable HST Sub-Total						**$210,800**	
Total (2016 Dollars)						**$12,427,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$12,427,000**	**2016 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$248,540		
Design	Design fees, Town fees for design, contract admin	13%	$1,615,510		
Construction	Town fees, base costs and project contingency	85%	$10,562,950		
TOTAL			**$12,427,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PL
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-II-017**

PROJECT NAME: **Region Wide Wet weather Reduction**

PROJECT DESCRIPTION: Wet weather reduction program in all systems to be executed from 2022-2051

Old ID		**Focus Areas**	Amount
_WW-II-001	Anger Ave WWTP	Lakeshore Road, Catharine Street, Dominion Road, Rose Avenue SPS, Anger Ave WWTP Catchments	
_WW-II-002	Crystal Beach WWTP	Nigh Road SPS and Crystal Beach WWTP Catchments	
_WW-II-003	Stevensville Douglastown	Stevensville, Douglastown catchments	
_WW-II-004	Welland WWTP	Feeder Road, Seaway Heights, Ontario Road SPS, Dain City, and Welland WWTP Catchments	
_WW-II-005	Baker - Grimsby	Woodsview, Biggar Lagoon, Old Orchard SPS Catchments	
_WW-II-006	Baker - Lincoln Beamsville	Ontario Street SPS Catchment	
_WW-II-007	Baker - Lincoln Vineland	Wet weather reduction in Jordan Valley***	
_WW-II-008	Port Dalhousie	Eastchester, Lakeside, Argyle, Renown SPS and Port Dalhousie WWTP Catchments	
_WW-II-009	Port Weller/Port Dalhousie	Wet weather reduction in North Thorold	
_WW-II-010	Port Weller	Haulage Road, Carlton Street SPS, and Port Weller WWTP Catchments	
_WW-II-011	Seaway WWTP	Union, Clarke Street, Arena, Elm Street, City Hall, Sugarloaf, Rosemount North and South SPS Catchments	
_WW-II-012	Niagara Falls WWTP	Central, Muddy Run, Seneca, Meadowvale, Drummond, Kalar Road SPS Catchments	
_WW-II-013	South Niagara Falls WWTP	South Side High Lift and South Side Low Lift SPS Catchments	
_WW-II-014	NOTL	Wet weather reduction in Northeast Niagara-on-the-Lake	
_WW-II-015	NOTL	Wet weather reduction in Virgil - NOTL	
_WW-II-016	Baker - West Lincoln	Wet weather reduction in West Lincoln - Baker	

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-039**

PROJECT NAME: **New Queenston SPS**

PROJECT DESCRIPTION: New Queenston SPS with firm capacity of 62 L/s

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-039**

	L/s
ECA	0.0
Operational	0.0

PROPOSED CAPACITY		61 L/s	Firm Capacity
Design PWWF	**Existing**	59 L/s	NA
	2051	60 L/s	NA
	Buildout	61 L/s	NA
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	0	61.1
2	0	61.1

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	61 L/s	$36,000	$2,200,167	New pumping station
Related Upgrades	30%						
Bypass Pumping Allowance	6%					$121,009	
Additional Construction Costs	15%		ea.			$348,176	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$266,935	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$2,936,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$29,400	
Geotechnical Sub-Total Cost						**$29,400**	
Property Requirements	5.0%					$ 146,800	
Property Requirements Sub-Total						**$146,800**	
Consultant Engineering/Design	15%					$ 440,400	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$440,400**	
In House Labour/Engineering/Wages/CA	4.0%					$ 117,440	
In-house Labour/Wages Sub-Total						**$117,440**	
Project Contingency	15%					$551,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$551,000**	
Non-Refundable HST	1.76%					$72,200	
Non-Refundable HST Sub-Total						**$72,200**	
Total (2022 Dollars)						**$4,293,000**	Rounded to nearest $1,000
Other Estimate						**$2,996,000**	Override to match DC numbers; Planning allocation update post-DC
Chosen Estimate						**$2,996,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$59,920		
Design	Design fees, Town fees for design, contract admin	13%	$389,480		
Construction	Town fees, base costs and project contingency	85%	$2,546,600		
TOTAL			$2,996,000		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-TP-005**
PROJECT NAME: **Region-wide WWTP Process Upgrades**
PROJECT DESCRIPTION: Process upgrades to re-establish ECA capacity

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$50,000,000**	Placeholder Costs
Chosen Estimate						**$50,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$1,000,000		
Design	Design fees, Town fees for design, contract admin	13%	$6,500,000		
Construction	Town fees, base costs and project contingency	85%	$42,500,000		
TOTAL			**$50,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-TP-005**
PROJECT NAME:	**Region-wide WWTP Process Upgrades**
PROJECT DESCRIPTION:	Upgrades for odour control across the Region at forcemains, pump stations, and other locations.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$40,000,000**	Placeholder Costs
Chosen Estimate						**$40,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$800,000		
Design	Design fees, Town fees for design, contract admin	13%	$5,200,000		
Construction	Town fees, base costs and project contingency	85%	$34,000,000		
TOTAL			**$40,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-D-001**
PROJECT NAME: **Decommissioning of Queenston WWTP**
PROJECT DESCRIPTION: Decommissioning of Queenston WWTP, to be replaced by new SPS and forcemain to St. David's #1

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-D-001**

PROPOSED CAPACITY	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction						$1,400,000	
Additional Construction Costs	10%		ea.			$140,000	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$154,000	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$1,694,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 254,100	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$254,100**	
In House Labour/Engineering/Wages/CA	4.0%					$ 67,760	
In-house Labour/Wages Sub-Total						**$67,760**	
Project Contingency	10%					$202,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$202,000**	
Non-Refundable HST	1.76%					$37,800	
Non-Refundable HST Sub-Total						**$37,800**	
Total (2022 Dollars)						**$2,256,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$2,256,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$45,120		
Design	Design fees, Town fees for design, contract admin	13%	$293,280		
Construction	Town fees, base costs and project contingency	85%	$1,917,600		
TOTAL			**$2,256,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-ST-001**
PROJECT NAME: **Region Wide Flow Monitoring and Data Collection**
PROJECT DESCRIPTION: Funding to support flow monitoring and data collection initiatives

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-ST-001**

PROPOSED CAPACITY	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction							
Additional Construction Costs	10%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ -	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$0**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	10%					$4,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$4,000**	
Non-Refundable HST	1.76%					$100	
Non-Refundable HST Sub-Total						**$100**	
Total (2022 Dollars)						**$44,000**	Rounded to nearest $1,000
Other Estimate						**$12,000,000**	Assumes 400k/year for 30 y
Chosen Estimate						**$12,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$240,000		
Design	Design fees, Town fees for design, contract admin	13%	$1,560,000		
Construction	Town fees, base costs and project contingency	85%	$10,200,000		
TOTAL			$12,000,000		

F

Regional Municipality of Niagara

Part F

NIAGARA FALLS WASTEWATER SYSTEM

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F. NIAGARA FALLS WASTEWATER TREATMENT PLANT

F.1 Existing System Infrastructure

The Niagara Falls wastewater system services the City of Niagara Falls, and the Town of Niagara-on-the-Lake. The system services an existing population of 96,720 and 37,857 employees. Note that this population and employment total is based on the Region's 2021 allocation of Traffic Area Zones planning data and has been processed through the allocation methodology presented in **Volume 2** to refine the data to include only serviced populations. As such, the population and employment total may not directly match the system totals using the Region's unprocessed planning data.

The system is serviced by the Niagara Falls Wastewater Treatment Plant, located on 3450 Stanley Avenue, Niagara Falls. The Niagara Falls Wastewater Treatment Plant is a rotating biological contacting plant with a current rated capacity of 68.3 MLD, a peak dry weather flow capacity of 136.4 MLD and a peak wet weather flow capacity of 205.0 MLD.

System flows are conveyed to the treatment plant via a network of local and Regionally owned sewer, and Regionally owned pump stations and forcemains.

Figure 4.F.1 presents an overview of the wastewater system, and **Figure 4.F.2** shows a schematic of the wastewater system.

Niagara Region

2021 Water and Wastewater Master
Servicing Plan Update

Existing Wastewater Infrastructure

- ⬟ Wastewater Treatment Plant (WWTP)
- ■ Biosolids Storage Facility
- ✳ Odour Control Facility
- ♦ Leachate Pumping Station

Sanitary Pumping Stations (SPS)

- ▲ Regional
- ▲ Municipal
- ▲ Private

Wastewater Network

- ---- Force Mains
- —— Regional Mains
- —— Local Sewers
- —— Private Sewers

Wastewater Catchments

- 🟪 Bender Hill
- 🟧 Calaguiro
- 🟩 Central
- 🟨 Dorchester Road
- 🟫 Drummond Road
- 🟧 Garner
- 🟩 Grassy Brook
- 🟥 Kalar Road
- 🟦 Lundy's Lane
- 🟧 Meadowvale
- 🟩 Mewburn
- 🟨 Muddy Run
- 🟪 Neighbourhood
- 🟩 Oakwood
- 🟩 Rolling Acres
- 🟧 Royal Manor
- 🟧 Seneca Street
- 🟪 South Side High Lift
- 🟩 South Side Low Lift
- 🟨 St. Davids #1
- 🟦 St. Davids #2
- 🟦 Niagara Falls WWTP

Other Features

- ☐ Municipal Boundary
- ⬚ Urban Area Boundary
- ■ Waterbodies

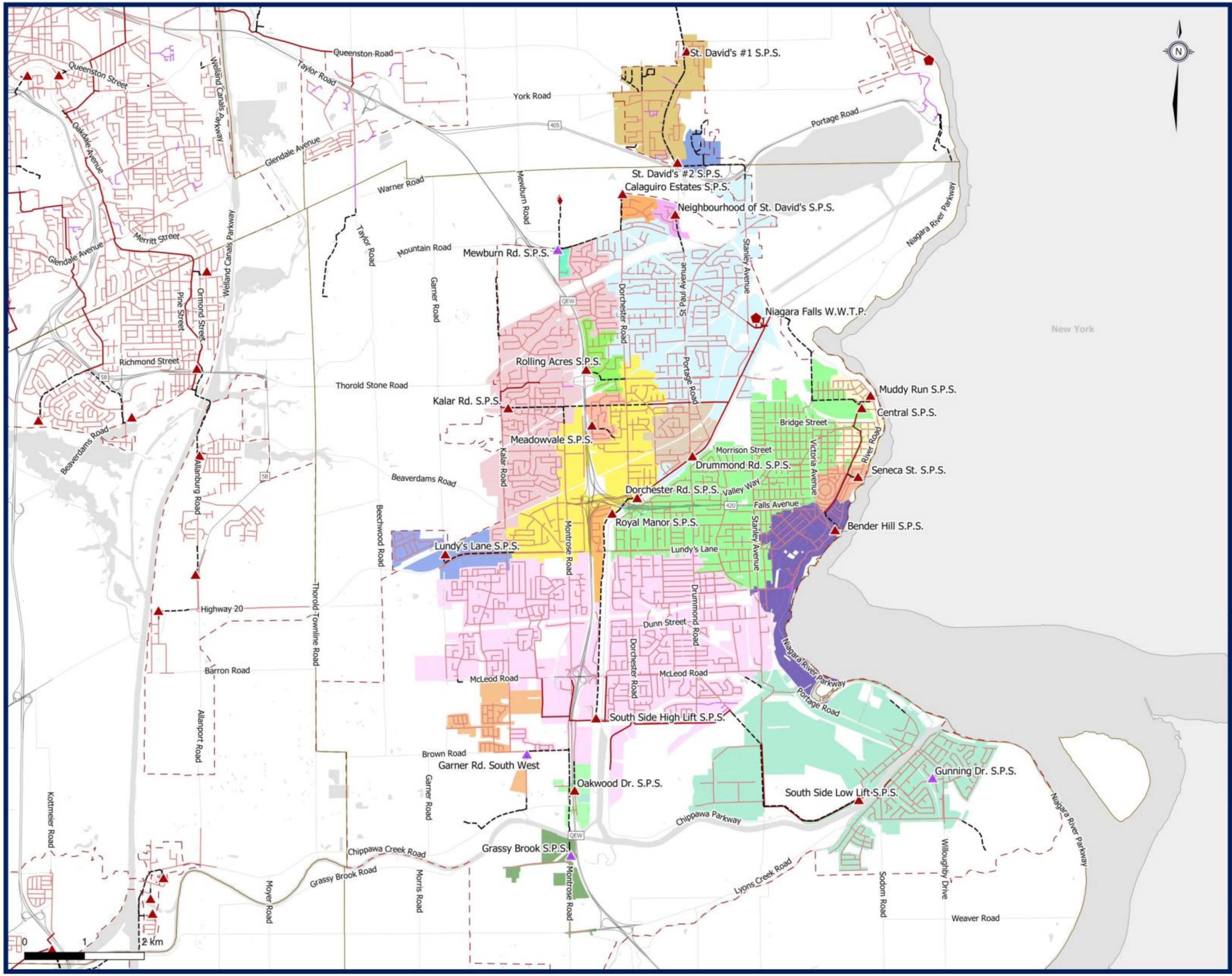
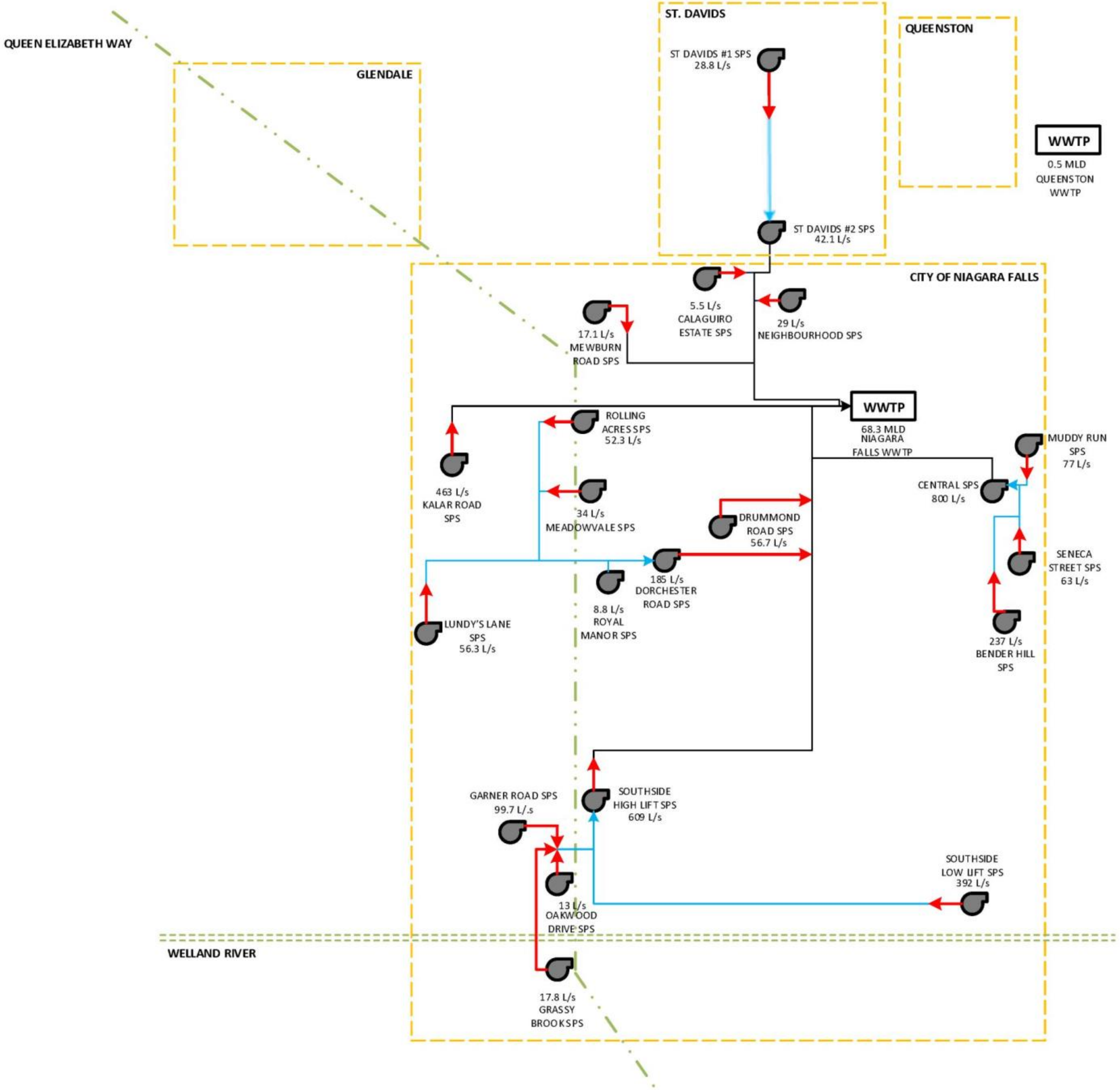


Figure 3.F.1
Niagara Falls WWTP System

Existing Wastewater Infrastructure

BluePlan ENGINEERING

March 2023
620126-WW-001
WKID: 26917



Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

WWTP RATED CAPACITY — Wastewater Treatment Plant

FIRM CAPACITY — Sewage Pumping Station

→ Forcemain

→ Connection from SPS to SPS

→ Connection from SPS to WWTP

Figure 4.F.2
Niagara Falls WWTP

Existing Wastewater Infrastructure Schematic

December 2022
621016-W-000
WKID: 26917

F.1.1 Facility Overview

Table 4.F.1 to **Table 4.F.2** present a summary of the environmental compliance approval (ECA) for the Niagara Falls wastewater treatment plant (WWTP) usage, operation, and effluent concentration objectives.

Table 4.F.1 Wastewater Treatment Plant Overview

Plant Name	**Niagara Falls Wastewater Treatment Plant**
ECA	#7962-7ZLKR6 Issued February 3, 2010
Address	3450 Stanley Avenue, Niagara Falls City
Discharge Water	Niagara River
Rated Capacity: Average Daily Flow	68.3 MLD
Rated Capacity: Peak Flow Rate (Dry Weather)	136.4 MLD
Rated Capacity: Peak Flow Rate (Wet Weather)	205.0 MLD
Key Processes	• Rotating Biological Contactors • Ferric chloride addition for phosphorous removal

Table 4.F.2 Wastewater Treatment Plant Effluent Objectives

Effluent Parameter	**Objective Concentration**
$CBOD_5$	15.0 mg/L
TSS	15.0 mg/L
Total Phosphorus	0.5 mg/L
E. Coli	200 organisms/100 mL
Total Chlorine Residual	0.5 mg/L

Table 4.F.3 lists each sewage pumping station's (SPS) listed ECA firm capacity as well as the station's existing operational firm capacity (the current operating capacity of the pumps station based on performance testing and/or supervisory control and data acquisition (SCADA) trending). As identified in Volume 4, the operational firm capacity was used as the basis of assessment for the 2021 MSPU. In some cases where the operational firm capacity was larger than the ECA firm capacity; the registered ECA capacity was used.

Table 4.F.3 Pumping Station and Forcemain Overview

Station Name	Location	Catchment Details		Pump Station Details			Forcemain Details		
		Area Exclusive of Upstream Catchments (ha)	Area Inclusive of Upstream Catchments (ha)	Number of Pumps	ECA Firm Capacity (L/s)	Operational Firm Capacity (L/s)	Single or Twinned Forcemain	Forcemain Diameter (mm)	Length (m)
└→Calaguiro SPS	Calaguiro Subdivision, Niagara Falls	22.7	22.7	2	7.0	5.5	Single	100	601
└→Central SPS	4300 Buttrey Street, Niagara Falls	675.2	977.9	5	1000.0	800.0	Single	900	2,776
|—└→Bender Hill SPS	Bender Street, Niagara Falls	197.6	197.6	4	330.0	237.0	Single	600	439
|—└→Muddy Run SPS	4222 May Avenue, Niagara Falls	63.0	63.0	2	100.0	77.0	Single	250	252
|—└→Seneca Street SPS	Seneca Street, Niagara Falls	42.1	42.1	2	67.7	63.0	Single	200	188
└→Dorchester Road SPS	Dorchester Road, Niagara Falls	360.3	577.1	3	235.0	185.0	Single	350	48
|—└→Lundy's Lane SPS	8971 Lundy’s Lane, Niagara Falls	97.1	97.1	3	98.4	56.3	Single	250	1,349
|—└→Meadowvale SPS	4491 Sussex Drive, Niagara Falls	35.9	35.9	2	38.9	34.0	Single	200	460
|—└→Rolling Acres SPS	Rolling Acres Drive, Niagara Falls	51.1	51.1	2	60.0	52.3	Single	300	728
|—└→Royal Manor SPS	7006 Windsor Crescent, Niagara Falls	32.7	32.7	2	10.5	8.8	Single	100	5
└→Drummond Road SPS	Drummond Road, Niagara Falls	85.3	85.3	2	46.0	56.7	Twin	150	12
└→Kalar Road SPS	4254 Kalar Road, Niagara Falls	500.1	500.1	4	510.0	463.0	Single[1]	600	2,448
└→Mewburn SPS	Mewburn Road, Niagara Falls	8.9	8.9	2	23.3	17.1	Single	192	685
└→Neighbourhood SPS	St. Paul Avenue, Niagara Falls	19.7	19.7	2	40.0	29.0	Single	200	626
└→St. Davids #2 SPS	383 Four Mile Creek Road, Niagara Falls	34.8	235.8	2	43.6	42.9	Single	250	1,425
|—└→St. Davids #1 SPS	383 Four Mile Creek Road, Niagara Falls	201.0	201.0	2	40.9	28.8	Single	200	2,032

Station Name	Location	Catchment Details		Pump Station Details			Forcemain Details		
		Area Exclusive of Upstream Catchments (ha)	Area Inclusive of Upstream Catchments (ha)	Number of Pumps	ECA Firm Capacity (L/s)	Operational Firm Capacity (L/s)	Single or Twinned Forcemain	Forcemain Diameter (mm)	Length (m)
└→South Side High Lift SPS	7606 Oakwood Drive, Niagara Falls	1175.1	2077.7	5	760.0	609.0	Single	667	3,983
└→South Side Low Lift SPS	4414 Chippawa Parkway	719.5	719.5	4	576.0	392.1	Single	534	3,517
└→Garner SPS	Garner Southwest, Niagara Falls	98.0	98.0	2	190.0	99.7	Single	350	756
└→Oakwood SPS	8555 Oakwood Drive, Niagara Falls	32.0	32.0	2	16.7	13.0	Single	150	506
└→Grassy Brook SPS	9240 Montrose Road, Niagara Falls	53.0	53.0	2	20.9	17.8	Single	147	1,838

[1] Kalar Road SPS has an additional 350 mm diameter forcemain (as emergency standby), approximately 1,269 m long, along the existing hydro right-of-way, and south along Montrose Road, discharging to a 600 mm diameter sanitary sewer. The 600 mm diameter forcemain presented in the table is operated as a single forcemain.

F.2 Basis for Analysis

F.2.1 Flow Criteria, System Performance, and Sizing Methodology

The Niagara Region Traffic Area Zone planning data was used to estimate growth related flow generation within the wastewater system and to spatially allocate growth demands within each individual system. **Table 4.F.4** presents a summary of the flow criteria, performance, and sizing methodology that was utilized. Refer to **Volume 4 - Introduction** for additional information.

The Region's per capita wastewater flows criteria were updated based on a historic review of the previous 3-year period for local billing meter and flow monitoring records. Given that more granular data was available to complete this analysis compared to previous master plan updates, the population and employment per capita rates were differentiated. The data showed a slight reduction in the population criteria and slight increase in the employment criteria, which more closely reflect existing flow generation trends compared to the Region's previous per capita rate. Further detail regarding the per capita flow generation is presented in **Volume 4 – Introduction.**

The Region's extraneous flow allowance criteria was also reviewed against historic flow monitoring and pump station performance records where available. The review of historic wet weather flows found that typically 2-year design storm peak flows within existing built systems exceeded the Region's existing extraneous flow design allowance of 0.286 L/s/ha; however, that a 2-year design storm peak flow below 0.286 L/s/ha was achievable as demonstrated in multiple catchment areas. Based on the analysis and an industry review, for the purpose of future planning, the extraneous flow design allowance for existing areas was increased to 0.4 L/s/ha but was maintained at 0.286 L/s/ha for new greenfield development areas to better reflect the existing high wet weather flows, while minimizing the magnitude of system upgrades with wet weather flow management as a critical priority. In areas where available historic flow monitoring and modelling results identify existing peak 5 year design flows below the 0.4 L/s/ha criteria, the lower 5 year design flows should be utilized. Further details regarding the extraneous flow design allowance are presented in **Volume 4 – Introduction**

Table 4.F.4 Flow Criteria, Scenarios, System Performance, and Sizing Methodology

	Component	Criteria	
Flow Criteria	Existing System Flows	Starting Point Methodology • Based on local billing meter records and flow monitoring data to establish existing dry and wet weather flows • Growth flows are added to the existing system baseline using design criteria	
	Flow Generation	Residential	255 L/c/d
		Employment	310 L/e/d

	Component	Criteria	
	Peaking Factor	Peak Dry Weather Flow	Harmon's Peaking Factor
	Extraneous Flow Design Allowance	• 0.4 L/s/ha for existing areas • 0.286 L/s/ha for new developments	
WWTP	System Performance and Triggers	• MECP Procedure F-5-1 • Trigger upgrade study at 80% capacity • Trigger upgrade construction at 90% capacity	
	Upgrade Sizing	• Average daily flow plus growth based on population design flows	

Pump Station	System Performance and Triggers Sizing	• Refer to **Section F.2.1.1.**
		• Two flow scenarios considered
		    • **Design Allowance**: Peak wet weather flow using the peaked dry weather flow plus the extraneous flow design allowance
		    • **5-Year Storm**: Modelled peak wet weather flow using the 5-year design storm
		• Peak flow capacity to meet design peak wet weather flow using the extraneous flow design allowance
		• Wet well and system storage considerations under 5-year storm to minimize basement flooding and overflow risks	

Forcemain	System Performance and Triggers	• Flag velocities less than 0.6 m/s • Flag velocities greater than 2 m/s • Upgrade when velocities exceed 2.5 m/s and considering condition and age	
	Upgrade Sizing	• Design velocity target between 1 m/s and 2 m/s • Forcemain twinning to increase capacity where feasible	
Trunk	System Performance and Triggers	• Design allowance peak wet weather flows, using the extraneous flow design allowance, to be managed within pipe • Freeboard (depth between hydraulic grade line and surface) greater than 1.8 m below surface in 5-year design storm • Flag pipes velocities less than 0.6 m/s • Flag pipes velocities greater than 3.0 m/s	
	Upgrade Sizing	• Sized for full flow under post-2051 design peak wet weather flow • Assess 5-year design storm performance to minimize basement flooding risks and overflows	

F.2.1.1 SPS Performance Evaluation and Upgrade Framework

Although it is the Region's design philosophy to size SPS inline with the Region's extraneous flow design allowance, the 2021 MSPU undertook a hybrid evaluation approach in an effort to acknowledge that SPS are a major contributor to local wastewater system performance and that many legacy system's exiting wet weather flows exceed the extraneous flow design allowance. The SPS hybrid performance evaluation and upgrade framework are summarized in **Table 4.F.5** and strives to balance the magnitude of capacity upgrades, potential cascading downstream upgrades, and managing the potential risk of local sewer surcharging and system overflows.

Under the hybrid performance evaluation and upgrade framework, the SPS capacity was sized to meet the lesser of peak wet weather flow (PWWF) using the extraneous flow design allowance, referred to as "Design Allowance PWWF" or the estimated 5-year storm PWWF. Further, consideration for the SPS actual performance under the estimated 5-year design storm peak wet weather flow was evaluated to determine if the available system storage including the wet well, storage tanks, and in system capacity was sufficient to manage excess flows while maintaining the system hydraulic grade line (HGL) below the basement flooding level of 1.8 m below grade and/or below the local overflow level.

In instances where the 5-year storm PWWF flow exceeded the available system storage, additional system solutions such as wet weather management, system storage, and/or additional SPS capacity upgrades were incorporated into the servicing solution. The most efficient solution to manage capacity and flow reduction was determined through the assessment of calculated flows from the 2051 design allowance PWWF and modelled 5-year storm PWWF against the operational firm capacity of the station and system storage.

Each SPS with a preferred solution of a capacity upgrade was individually reviewed in detail to determine how capacity upgrades should best be achieved:

- Pump replacement
- Pump upgrades
- Pump additions
- Station replacement
- Existing wet well sizing changes
- FM sizing and capacity.

Due to data quality and availability, a prioritization of upgrade needs, and flow monitoring (data collection) was assigned to each case for the Region implementation plan, discussed later in **Section F.8**.

Table 4.F.5 SPS Assessment Framework

Case	2051 Design PWWF	2051 5 Year Storm PWWF	2051 5-Year Storm Storage Need	Preferred Solution	Upgrade Priority	Flow Monitoring Priority
Case 1	> Firm Capacity	> Firm Capacity	> Available Storage	Upgrade pumps to future design allowance flow with potential storage upgrades or wet weather management	High	Medium
Case 2	< Firm Capacity	> Firm Capacity	> Available Storage	Upgrade storage and/or wet weather management	High	High
Case 3	> Firm Capacity	> Firm Capacity	< Available Storage	Potential upgrade to design allowance flow and/or wet weather management	Medium	High
Case 4	< Firm Capacity	> Firm Capacity	< Available Storage	Potential wet weather management	Low	Medium
Case 5	> Firm Capacity	< Firm Capacity	< Available Storage	No upgrade, use actual peak flows	N/A	Low
Case 6	< Firm Capacity	< Firm Capacity	< Available Storage	No upgrade	N/A	Low

F.2.2 Growth Population Projections and Allocations

Table 4.F.6 outlines the existing and projected serviced population and employment by catchment.

Table 4.F.6 Niagara Falls Wastewater Treatment Plant Existing and Projected Serviced Population by Catchment

Sewage Pumping Station (SPS)	Existing Population & Employment			2051 Population & Employment			Post 2051 Population & Employment			2021-2051 Growth		
	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population Growth	Employment Growth	Total Growth
Niagara Falls WWTP	11,920	3,649	15,568	12,817	5,148	17,965	13,193	5,325	18,518	898	1,500	2,397
└→Calaguiro SPS	215	115	329	192	153	345	241	153	394	-23	39	16
└→Central SPS	14,730	9,222	23,953	22,091	12,437	34,528	22,190	12,653	34,843	7,361	3,214	10,576
└→Bender Hill SPS	726	4,791	5,517	1,073	8,039	9,112	1,426	8,039	9,466	347	3,248	3,595
└→Muddy Run SPS	1,444	1,144	2,589	5,119	1,597	6,716	5,119	1,604	6,723	3,675	453	4,128
└→Seneca Street SPS	1,425	276	1,701	1,570	310	1,881	1,570	310	1,881	145	34	180
└→Dorchester Road SPS	5,152	2,645	7,797	4,855	3,531	8,386	5,903	3,546	9,448	-296	885	589
└→Lundy's Lane SPS	1,487	210	1,697	2,667	462	3,129	2,945	462	3,407	1,181	252	1,433
└→Meadowvale SPS	1,065	221	1,287	1,154	231	1,385	1,154	231	1,385	89	9	98
└→Rolling Acres SPS	1,006	176	1,182	956	191	1,148	1,030	191	1,221	-50	15	-35
└→Royal Manor SPS	306	138	444	272	160	432	272	160	432	-34	22	-12
└→Drummond Road SPS	1,592	750	2,342	2,170	859	3,029	2,170	859	3,029	578	109	687
└→Kalar Road SPS	13,098	1,725	14,824	16,202	2,046	18,247	17,550	2,046	19,595	3,104	320	3,424
└→Mewburn SPS	125	9	134	5	195	200	243	195	438	-120	186	66

Sewage Pumping Station (SPS)	Existing Population & Employment			2051 Population & Employment			Post 2051 Population & Employment			2021-2051 Growth		
	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population Growth	Employment Growth	Total Growth
└→Neighbourhood SPS	406	217	623	334	290	624	491	290	781	-73	73	0
└→St. Davids #2 SPS	6	3	9	6	4	10	6	4	10	0	20	20
└→St. Davids #1 SPS	2,778	604	3,382	4,503	656	5,159	4,503	831	5,335	1,725	52	1,777
SOUTH NIAGARA FALLS WWTP	165	198	363	7,451	3,481	10,932	8,563	6,571	15,135	7,286	3,283	10,569
└→South Side High Lift SPS	29,185	8,709	37,894	35,737	11,036	46,773	36,268	11,293	47,561	6,552	2,327	8,879
└→South Side Low Lift SPS	7,200	1,540	8,740	13,884	1,736	15,620	28,782	1,875	30,657	6,684	196	6,880
└→Garner SPS	2,629	343	2,972	4,934	520	5,454	5,005	596	5,601	2,305	177	2,482
└→Oakwood SPS	39	356	396	-30	438	408	40	438	479	-69	82	13
└→Grassy Brook SPS	21	815	836	4,982	5,020	10,002	5,414	5,020	10,435	4,961	4,205	9,166
Total	96,720	37,857	134,577	142,945	58,541	201,486	164,079	62,696	226,775	46,225	20,703	66,928

Note: Population numbers may not sum due to rounding.

F.3 System Performance

The South Niagara Falls Wastewater Solutions Schedule ‘C’ Class Environmental Assessment was completed in 2022 and its strategy governs the recommendations for the south Niagara Falls system. The South Niagara Falls strategy is comprised of a new wastewater treatment plant in South Niagara Falls, deep tunneled trunk sewers to convey the existing system South Side High Lift SPs flows, shallow trunk sewers to collect Thorold South flows and the reconfiguration of Peel Street SPS and Black Horse SPS to pump to the shallow trunk sewers and convey flows to the new plant.

Additionally, the Region is undertaking the Queenston – St. David’s Wastewater Servicing Strategy EA that is reviewing potential of the redirection of the Queenston flows to Niagara Falls.

- The existing system performance in the Niagara Falls WWTP system is presented with the current conditions and configuration of the system.
- The future system performance in the Niagara Falls WWTP system is presented with the South Niagara Falls strategy implemented. The future scenarios for 2051 and post-2051 assume the commissioning of the South Niagara Falls WWTP by 2027.
    - The 2051 scenario shows the removal of the Thorold South flows to the Port Weller WWTP and trunk sewers. The strategy reroutes Peel Street SPS via a new forcemain to a new Black Horse SPS, and the Black Horse SPS pumps all Thorold South flows via a new forcemain to a shallow gravity trunk which conveys flows by gravity to the new South Niagara Falls WWTP.
    - The South Niagara Falls wastewater strategy presents opportunities for adjacent systems. On this basis, it is recommended to include the redirection of the Queenston flows to Niagara Falls via the St David’s #1 SPS and St. David’s #2 SPS and decommissioning the Queenston WWTP. The future system performance of the St. David’s pumping stations includes 60 L/s of flow representing the Queenston SPS.

F.3.1 Wastewater Treatment Plant

The starting point flows for the Niagara Falls WWTP was calculated using historic SCADA flow data. Ten years of data (2011 to 2020) was reviewed to provide historical context and assess overall long-term trends; however, the most recent five years of data was used to determine the average daily flow. **Table 4.F.7** shows the historical system flows obtained from wastewater treatment plant production data.

Table 4.F.7 Historic Niagara Falls Wastewater Treatment Plant Flows

Year	Average Daily Flow		Peak Daily Flow	
	(MLD)	(L/s)	(MLD)	(L/s)
2011	45.45	526.0	134.14	1552.5
2012	39.58	458.1	138.65	1604.7
2013	43.90	508.1	136.88	1584.2
2014	36.84	426.3	134.11	1552.2
2015	41.9	485.4	125.7	1455.0
5 Year Average	41.5	480.8	133.9	1549.7
5 Year Peak	45.4	526.0	138.7	1604.7
2016	36.7	425.1	96.1	1112.5
2017	44.7	517.2	141.6	1639.0
2018	41.5	480.2	148.3	1715.9
2019	41.4	478.7	134.8	1559.8
2020	35.2	407.9	137.9	1596.1
5-Year Average	39.9	461.8	131.7	1524.7
5-Year Peak	44.7	517.2	148.3	1715.9
10-Year Average	40.7	471.3	132.8	1537.2
10-Year Peak	45.4	526.0	148.3	1715.9

The 10-year trend analysis showed that flows to the Niagara Falls WWTP continue to reflect high flows in wetter years. The 5-year average flow has decreased 4% from the 2016 MSP starting point.

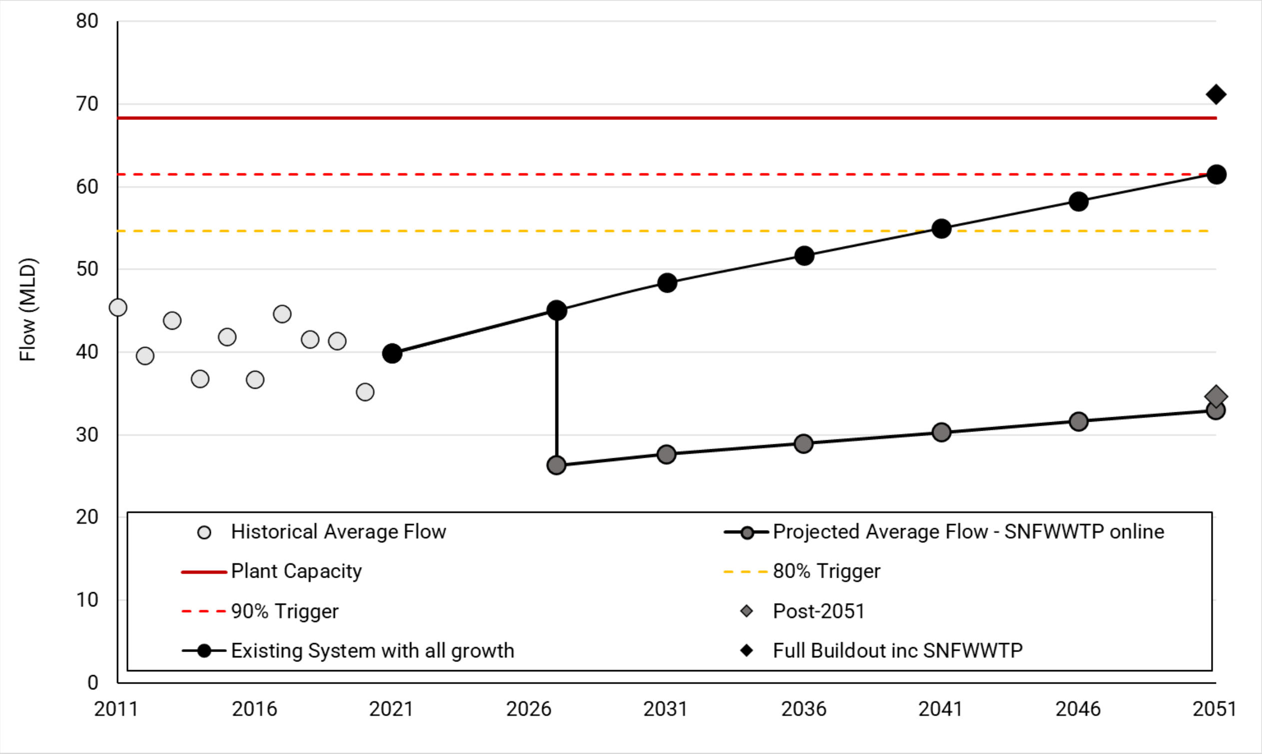
The starting point flow used for the Niagara Falls WWTP was 39.9 MLD.

Figure 4.F.3 shows the projected future flows at the Niagara Falls WWTP.

Without the implementation of the South Niagara Falls strategy the current rated average daily flow capacity of the Niagara Falls WWTP is 68.3 MLD, with an existing flow of 39.9 MLD and a projected 2051 average daily flow of 61.6 MLD, which exceeds 90% of the wastewater treatment plant rated capacity. The projected post-2051 flow is 71.2 MLD, which exceeds the wastewater treatment plant rated capacity.

The South Niagara Falls Wastewater Treatment Plant is shown as online in 2027 in **Figure 4.F.3**. The strategy reduces the 2051 flows to the Niagara Falls WWTP to 33.0 MLD and the post-2051 flow to 34.6 MLD. As such, the plant has surplus capacity and will not reach 80% capacity within the 2051-time horizon.

Figure 4.F.3 Projected Future Average Daily Flows at Niagara Falls Wastewater Treatment Plant



Phase 1 of the South Niagara Falls Wastewater Treatment Plant will have a capacity of 30 MLD in 2027. The projected 2051 average daily flow of 27.3 MLD exceeds 90% of the wastewater treatment plant rated capacity and will trigger the implementation of Phase 2 which will add an additional 30 MLD of capacity. **Figure 4.F.4** shows the long-term forecast for the South Niagara Falls WWTP.

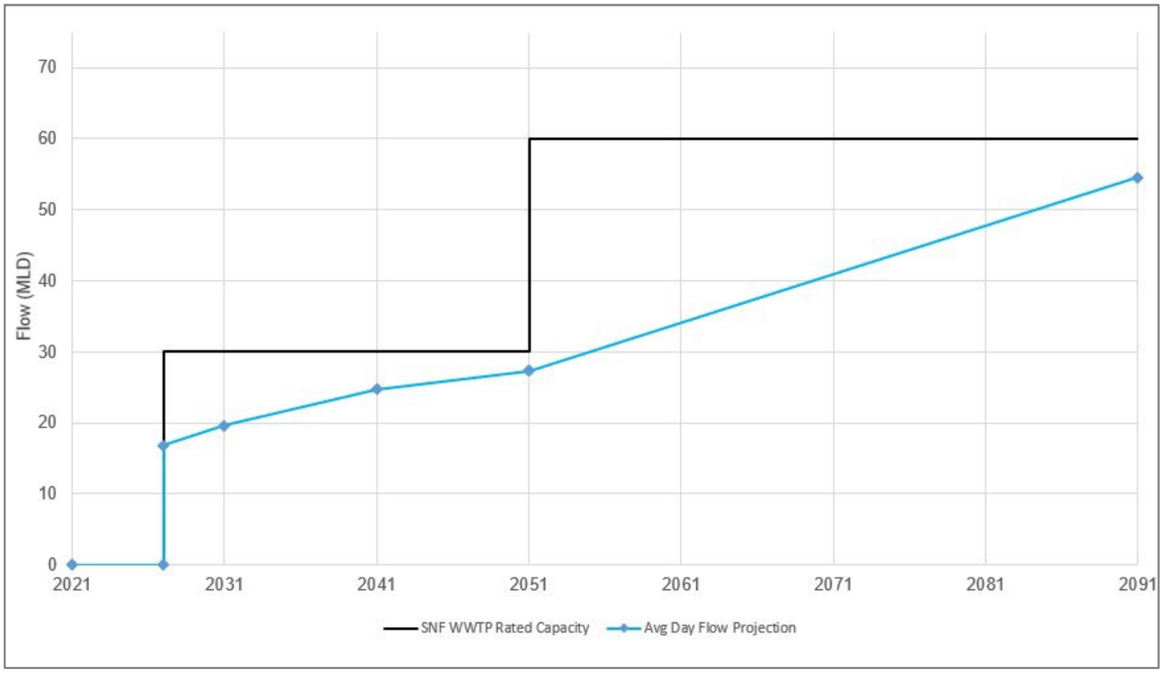


Figure 4.F.4 Projected Future Average Daily Flows at South Niagara Falls Wastewater Treatment Plant

F.3.2 Sewage Pumping Station

Table 4.F.8 highlights the sewage pumping station operational firm capacities and the existing and projected flows. The existing average and peak dry weather flows were estimated using the wastewater system model, which was updated using the best available billing, flow monitoring, and SCADA data from 2018 to 2020. Note that the 2051 and post-2051 flows for St. David's #1 and #2 SPS include a 60 L/s flow representing the Queenston SPS.

Table 4.F.8 System Sewage Pumping Station Performance

Station Name	Station Capacity	2021 Flows				2051 Flows			Post-2051 Flows		
	Operational Firm Capacity	Average Dry Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow
	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)
└→**Calaguiro SPS**	5.5	2.2	3.0	12.1	8.8	3.4	12.5	9.1	4.0	13.1	9.7
└→**Central SPS**	800.0	185.2	346.3	737.5	5,759.6	504.7	900.5	5,922.6	509.5	905.3	5,927.4
| └→**Bender Hill SPS**	237.0	98.9	127.0	206.1	450.3	169.8	249.0	493.3	172.8	252.1	496.3
| └→**Muddy Run SPS**	77.0	8.3	9.9	35.1	70.3	51.3	76.6	111.7	51.4	76.6	111.8
| └→**Seneca Street SPS**	63.0	6.8	8.6	25.4	108.5	10.9	27.7	110.8	10.9	27.7	110.8
└→**Dorchester Road SPS**	185.0	53.2	73.4	304.2	445.2	98.0	329.2	470.2	110.8	342.1	483.0
| └→**Lundy's Lane SPS**	56.3	7.6	10.8	49.7	149.8	27.1	66.3	166.4	29.8	69.1	169.1
| └→**Meadowvale SPS**	34.0	3.2	4.8	19.1	49.7	6.0	20.4	51.0	6.0	20.4	51.0
| └→**Rolling Acres SPS**	52.3	3.4	5.3	25.7	76.4	4.9	25.3	76.0	5.8	26.3	77.0
| └→**Royal Manor SPS**	8.8	1.2	2.2	15.3	21.4	2.1	15.2	21.3	2.1	15.2	21.3
└→**Drummond Road SPS**	56.7	5.1	7.4	41.5	168.6	15.6	49.7	176.8	15.6	49.7	176.8
└→**Kalar Road SPS**	463.0	83.5	91.7	291.7	670.9	126.7	350.8	730.0	138.3	362.5	741.6
└→**Mewburn SPS**	17.1	0.6	0.9	4.5	7.2	2.3	8.5	11.2	5.1	11.3	14.0
└→**Neighbourhood SPS**	29.0	1.2	2.3	10.2	5.5	2.5	10.4	5.7	4.5	12.3	7.7
└→**St. David's #2 SPS**[1]	42.9	8.8	8.9	112.7	99	44.1	188.6	174.9	57.9	202.4	188.8
└→**St. David's #1 SPS**[1]	28.8	8.2	8.2	97.6	86	42.2	172.0	160.4	44.6	174.4	162.8
└→**South Side High Lift SPS**[2]	609.0	175.2	271.5	1,102.6	1,531.8	486.3	1,390.8	1,820.0	582.8	1,532.8	1,962.0
| └→**South Side Low Lift SPS**	392.1	42.5	53.4	341.3	614.8	117.1	430.8	704.4	223.0	582.3	855.8
| └→**Garner SPS**	99.7	6.1	6.3	45.5	46.3	32.4	75.8	76.6	33.9	77.3	78.1
| └→**Oakwood SPS**	13.0	0.9	1.1	13.9	24.5	1.5	15.3	25.9	2.4	16.2	26.8
| └→**Grassy Brook SPS**	17.8	1.4	1.5	22.7	21.5	90.5	149.3	148.1	93.7	152.5	151.3

[1] Queenston SPS flows included

[2] Thorold South flows not included to the South Side High Lift SPS as the flows would be conveyed by gravity directly to the South Niagara Falls Plant.

The following SPS have existing and future deficiencies under both design allowance PWWF and 5-year storm, requiring upgrades to support existing and future flows.

- Calaguiro SPS
- Dorchester Road SPS
- Royal Manor SPS
- St. David’s #1 SPS
- St. David’s #2 SPS
- South Side High Lift SPS
- Oakwood SPS
- Grassy Brook SPS

The following SPS have future deficiencies under design allowance PWWF and 5-year storm, requiring upgrades to support future flows.

- Central SPS
- Bender Hill SPS
- Lundy’s Lane SPS
- South Side Low Lift SPS

The following SPS have sufficient capacity to support 2051 flows using the design allowance PWWF, however, the projected 5-year storm PWWF exceeds the operational firm capacity as such potential system or facility upgrades may be required.

- Muddy Run SPS
- Seneca SPS
- Meadowvale SPS
- Rolling Acres SPS
- Drummond road SPS
- Kalar Road SPS

The following stations have surplus capacity to support future flows.

- Mewburn SPS
- Neighbourhood SPS
- Garner Road SPS

F.3.3 Forcemain

Table 4.F.9 highlights the existing and projected forcemain performance. Velocities less than 0.6 m/s were flagged in yellow and velocities exceeding 2.5 m/s were flagged in red. Note, if a pumping deficit was identified in **Table 4.F.8**, then projected forcemain velocities were based on the higher of the station's ECA firm capacity or the governing peak wet weather flow scenario, otherwise if no pumping deficit was identified, the operational firm capacity was used for future capacity assessment. Note that the 2051 and post-2051 flows for St. David's #1 and #2 SPS include a 60 L/s flow representing the Queenston SPS.

Table 4.F.9 Forcemain Performance

Station Name	Forcemain Diameter (mm)	Operational Firm Capacity		2051		Post-2051	
		Pumped Flow (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)
└→Calaguiro SPS	**100**	5.5	0.7	9.1[3]	1.2	9.7[3]	1.2
└→Central SPS	**900**	800.0	1.3	900.5[3]	1.4	905.3[3]	1.4
└→Bender Hill SPS	**600**	237.0	0.8	249.0[3]	0.9	252.1[3]	0.9
└→Muddy Run SPS	**250**	77.0	1.6	77.0[1]	1.6	77.0[1]	1.6
└→Seneca Street SPS	**200**	63.0	2.0	63.0[1]	2.0	63.0[1]	2.0
└→Dorchester Road SPS	**350**	185.0	1.9	329.2[3]	3.4	342.1[3]	3.6
└→Lundy's Lane SPS	**250**	56.3	1.1	66.3[3]	1.4	69.1[3]	1.4
└→Meadowvale SPS	**200**	34.0	1.1	34.0[1]	1.1	34.0[1]	1.1
└→Rolling Acres SPS	**300**	52.3	0.7	52.3[1]	0.7	52.3[1]	0.7
└→Royal Manor SPS	**100**	8.8	1.1	15.2[3]	1.9	15.2[3]	1.9
└→Drummond Road SPS	**150**	56.7	1.6	56.7[1]	1.6	56.7[1]	1.6
└→Kalar Road SPS	**600**	463.0	1.6	463.0[1]	1.6	463.0[1]	1.6
└→Mewburn SPS	**192**	17.1	0.6	17.1[1]	0.6	17.1[1]	0.6
└→Neighbourhood SPS	**200**	29.0	0.9	29.0[1]	0.9	29.0[1]	0.9
└→St. David's #2 SPS[1]	**250**	42.9	0.9	174.9[3]	3.6	188.8[3]	3.9
└→St. David's #1 SPS[1]	**200**	28.8	0.9	160.4[3]	5.2	162.8[3]	5.2
└→South Side High Lift SPS[2]	**667**	609.0	1.7	1,390.8[3]	4.0	1,532.8[3]	4.4
└→South Side Low Lift SPS	**534**	392.1	1.8	430.8[3]	1.9	582.3[3]	2.6
└→Garner SPS	**350**	99.7	1.0	99.7[1]	1.0	99.7[1]	1.0
└→Oakwood SPS	**150**	13.0	0.7	15.3[3]	0.9	16.2[3]	0.9
└→Grassy Brook SPS	**147**	17.8	1.0	148.1[3]	8.7	151.3[3]	8.9

[1] Operational firm capacity

[2] ECA capacity

[3] Minimum of future design allowance PWWF or 5-year storm PWWF

The existing Mewburn SPS forcemain was flagged for low velocities in the existing and future operating regime.

The following forcemains had a projected forcemain capacity deficit in the 2051 growth scenario:

- Dorchester Road SPS
- Drummond Road SPS
- St. David's #1 SPS
- St. David's #2 SPS
- South Side High Lift SPS
- Grassy Brook SPS

The following forcemains had a projected forcemain capacity deficit in the post- 2051 growth scenario:

- South Side Low Lift SPS

The remaining stations' forcemains have sufficient capacity to meet future flows.

F.3.4 Trunk Sewer

Figure 4.F.5 and **Figure 4.F.6** highlight the trunk performance in the existing and 2051 projected design allowance peak wet weather flow scenarios, respectively.

- There are no Region trunk sewers with existing or future pipe capacity deficits from the design allowance peak wet weather flows.
- There are some sewers surcharging above the basement flooding freeboard from the existing and future 5-year storm peak wet weather flows.
    - Southside High Lift SPS and Kalar Road SPS shows surcharging in Region trunks and local sewers due to SPS capacity and high wet weather inflows in the existing and future scenarios.
    - Central SPS and at the WWTP shows surcharging in Region trunks sewers due to high wet weather inflows in the existing and future scenarios.
    - Some local sewers in the in various SPS catchment.
- Note that the Niagara Falls WWTP system has several combined sewer overflows (CSO), that help regulate the hydraulic grade line (HGL) within the trunk system to reduce basement flooding risks.
- Further we note:
    - Increasing the discharge capacity of the High Lift SPS has the potential to trigger surcharging in the downstream Region Trunk Sewer
    - There is surcharging in the local Stanley Avenue trunk sewer downstream of the St. David's #2 SPS; upgrades to the St. David's #2 SPS have the potential to increase local sewer surcharging.

F.3.5 Overflows

Under the design allowance peak flows no overflows are anticipated; however, many of the CSOs become active from 5-year storm peak wet weather flows. The adverse risks of wet weather inflows are currently partially managed through CSOs; however, the Region and local area municipalities (LAM) are working together to reduce wet weather inflows to the system to reduce system overflows.

Detailed assessment of system CSO will be addressed jointly by the Region and LAM through future Pollution Prevention Control Plan Studies; which will outline the proposed wet weather flow management approach to manage CSO volumes.

Niagara Region

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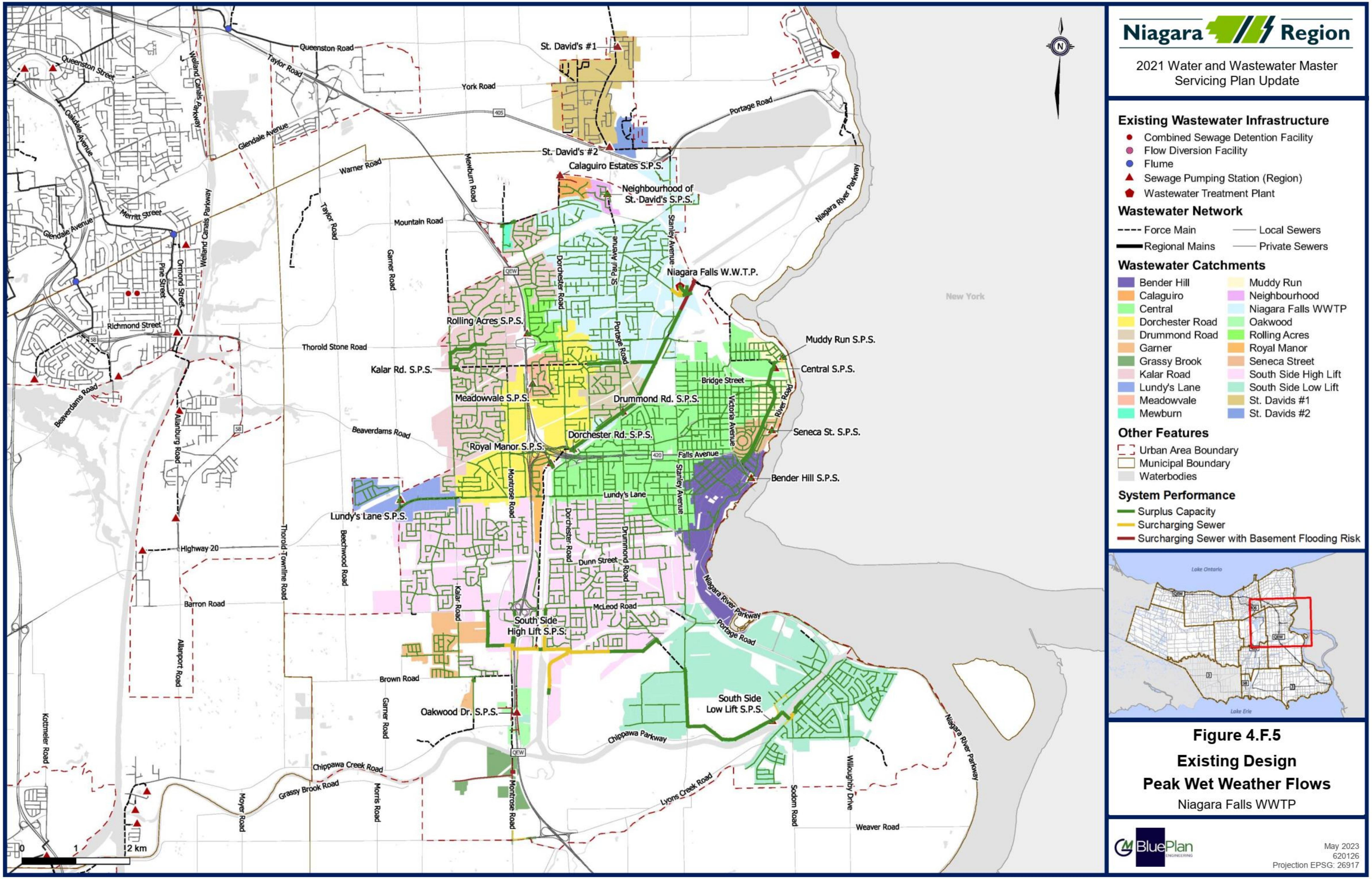

Figure 4.F.5

Existing Design Peak Wet Weather Flows

Niagara Falls WWTP

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2021 Water and Wastewater Master Servicing Plan Update

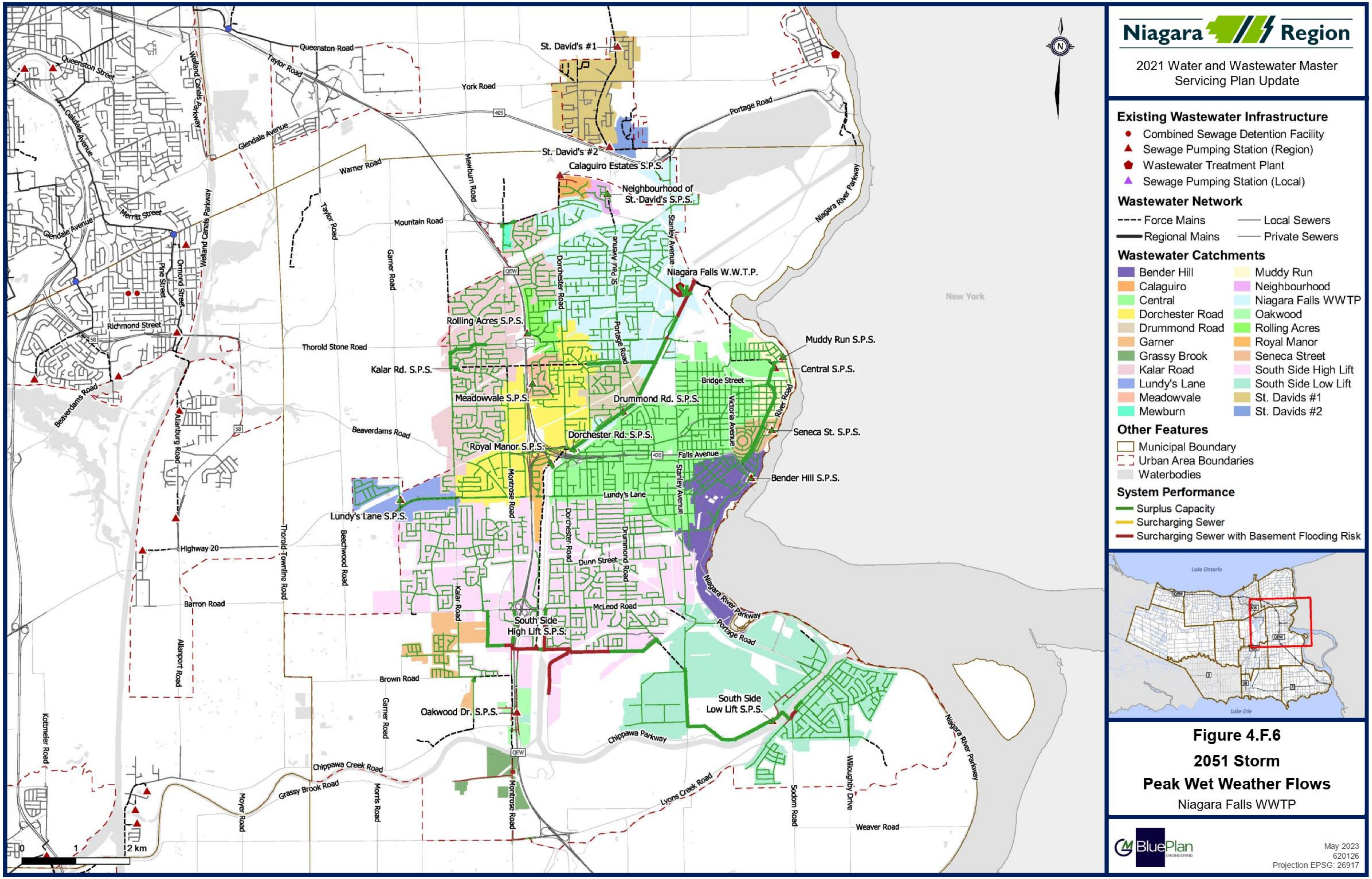

Figure 4.F.6

2051 Storm

Peak Wet Weather Flows

Niagara Falls WWTP

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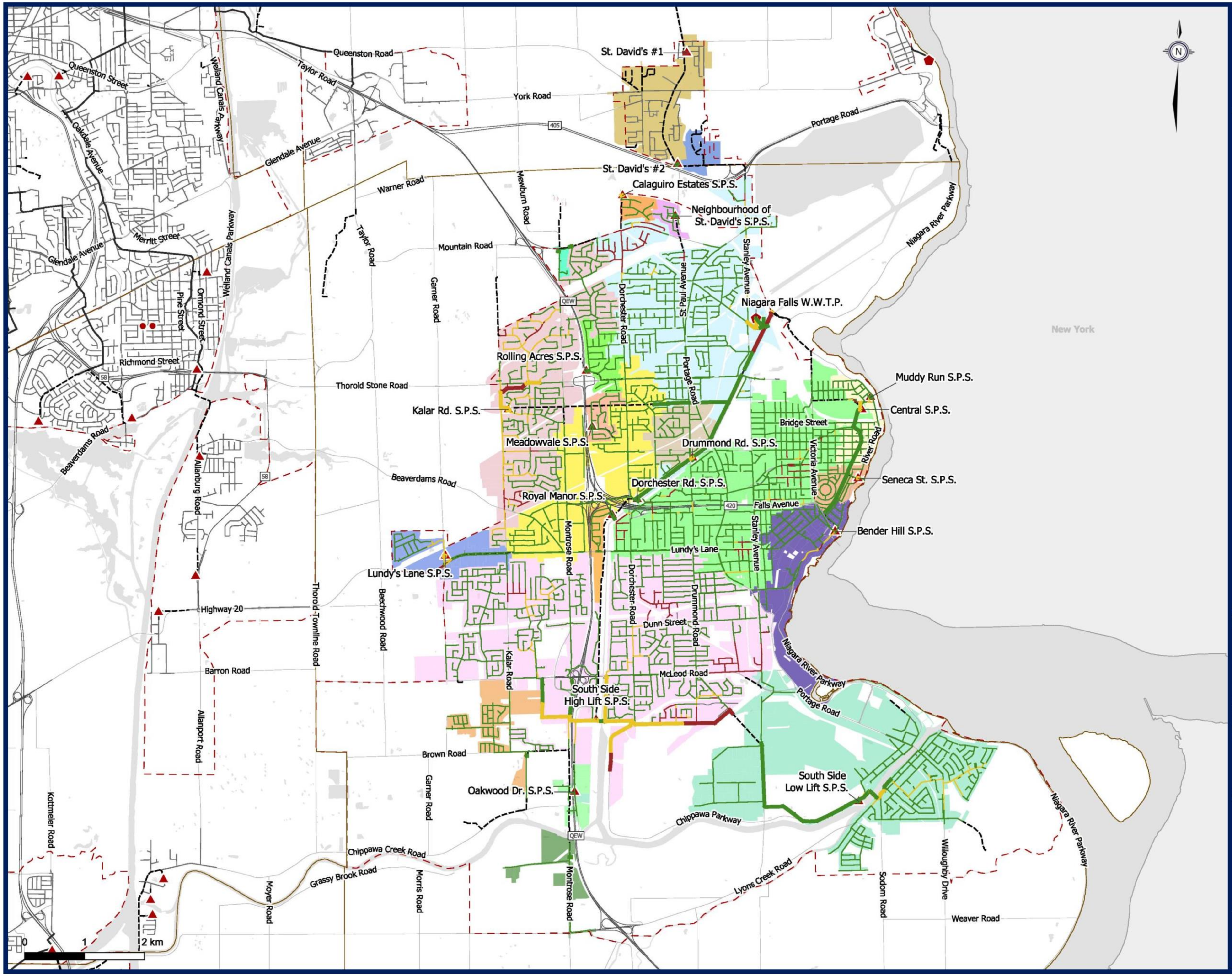

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

Existing Wastewater Infrastructure

- ● Combined Sewage Detention Facility
- Leachate Pumping Station
- ● Odour Control Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant

Wastewater Network

- ---- Force Mains
- —— Local Sewers
- —— Private Sewers

Wastewater Catchments

- Bender Hill
- Calaguiro
- Central
- Dorchester Road
- Drummond Road
- Garner
- Grassy Brook
- Kalar Road
- Lundy's Lane
- Meadowvale
- Mewburn
- Muddy Run
- Neighbourhood
- Niagara Falls WWTP
- Oakwood
- Rolling Acres
- Royal Manor
- Seneca Street
- South Side High Lift
- South Side Low Lift
- St. Davids #1
- St. Davids #2

Other Features

- Municipal Boundary
- Urban Area Boundaries
- Waterbodies

System Performance

- Surplus Capacity
- Surcharging Sewer
- Surcharging Sewer with Basement Flooding Risk

Figure 4.F.7

Existing 5-Year Storm Peak Wet Weather Flows

Niagara Falls WWTP

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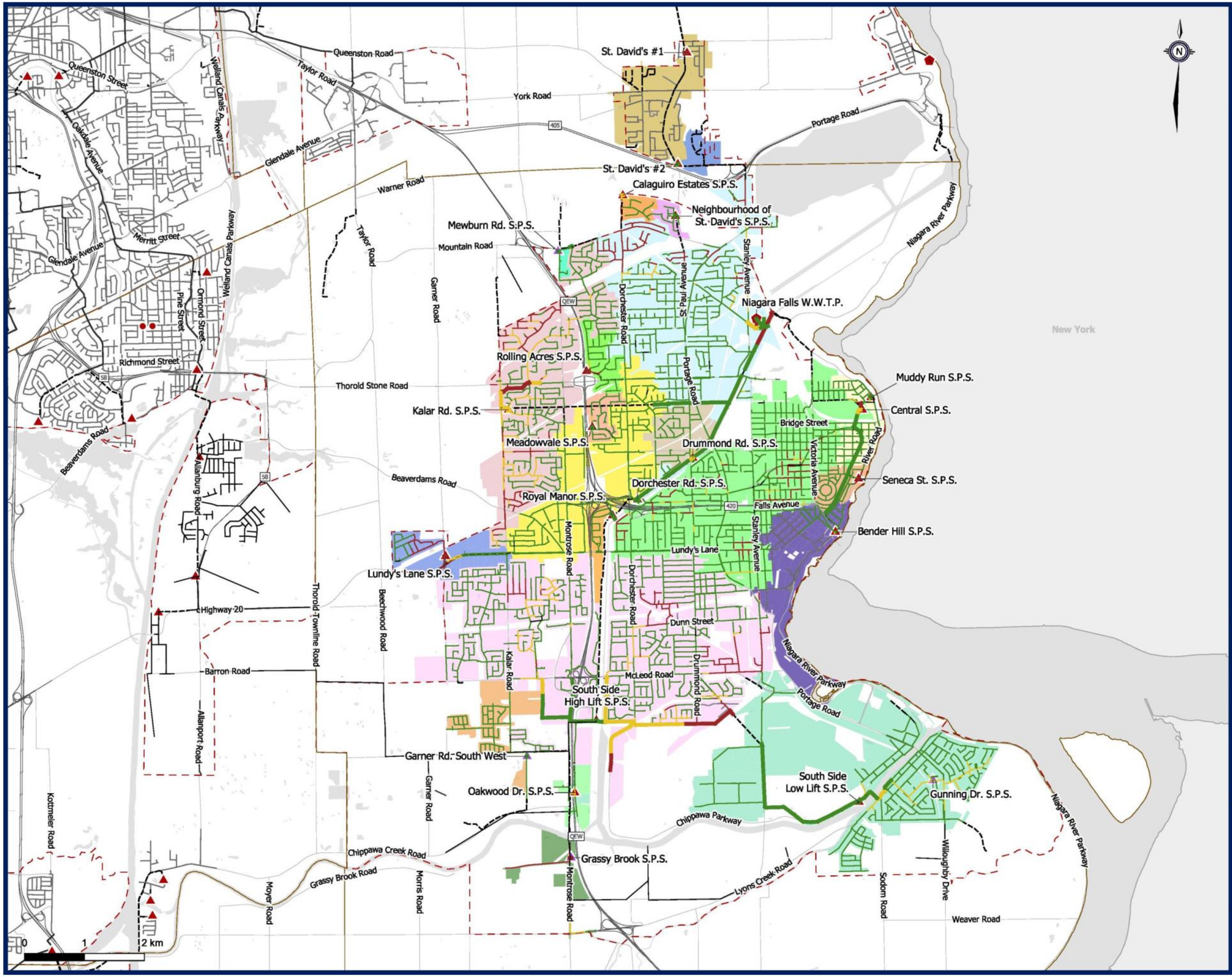
2021 Water and Wastewater Master Servicing Plan Update



Existing Wastewater Infrastructure

- ● Combined Sewage Detention Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Local)

Wastewater Network

- Force Mains
- Regional Mains
- Local Sewers
- Private Sewers

Wastewater Catchments

Bender Hill	Muddy Run
Calaguiro	Neighbourhood
Central	Niagara Falls WWTP
Dorchester Road	Oakwood
Drummond Road	Rolling Acres
Garner	Royal Manor
Grassy Brook	Seneca Street
Kalar Road	South Side High Lift
Lundy's Lane	South Side Low Lift
Meadowvale	St. Davids #1
Mewburn	St. Davids #2

Other Features

- Municipal Boundary
- Urban Area Boundaries
- Waterbodies

System Performance

- Surplus Capacity
- Surcharging Sewer
- Surcharging Sewer with Basement Flooding Risk

Figure 4.F.8

2051 5-year Storm Peak Wet Weather Flows

Niagara Falls WWTP

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F.4 System Opportunities and Constraints

Figure 4.F.9 Highlights the existing opportunities and constraints.

F.4.1 Niagara Falls Wastewater Treatment Plant

- Without the implementation of the South Niagara Falls strategy the current rated average daily flow capacity of the Niagara Falls WWTP is 68.3 MLD, with an existing flow of 39.9 MLD and a projected 2051 average daily flow of 61.6 MLD, which exceeds 90% of the wastewater treatment plant rated capacity. The projected post-2051 flow is 71.2 MLD, which exceeds the wastewater treatment plant rated capacity.
- The South Niagara Falls Wastewater Treatment Plant will reduce the 2051 flows to the Niagara Falls WWTP to 33.0 MLD and the post-2051 flow to 34.6 MLD. As such, the plant has surplus capacity and will not reach 80% capacity within the 2051-time horizon.

F.4.2 NOTL

- There are existing and growth-related wet weather capacity deficits in the St. David’s #1 and #2 SPS and forcemains.
- If the Queenston WWTP is not re-directed to the Niagara Falls WWTP catchment, the upgrades to the St. David’s #1 SPS and St. David’s #2 SPS and supporting forcemains are still required.
- Moderate wet weather flows in the St. David’s #1 SPS catchment. It is expected that the Town’s planned PPCP update will further identify catchments and strategies for inflow and infiltration reduction and other wet weather management solutions.

F.4.3 Niagara Falls

- Generally, there are high wet weather flows observed across the system.
- There are significant combined sewer areas upstream of Central SPS resulting in high wet weather flows and system overflows, which will need to be managed to allow for growth.
- There are existing and growth-related wet weather capacity deficits in the Dorchester Road SPS, Calaguiro SPS, and Royal Manor SPS.
- Based on the levels of growth in some local areas, there are growth-related deficits in the Central SPS, Bender Hill SPS and Lundy’s Lane SPS.
- The existing Mewburn SPS forcemain was flagged for low velocities in the existing and future operating regime.
- Majority of existing sewer network has capacity to meet design allowance wet weather flows; however actual wet weather flows exceed sewer capacity in several areas.

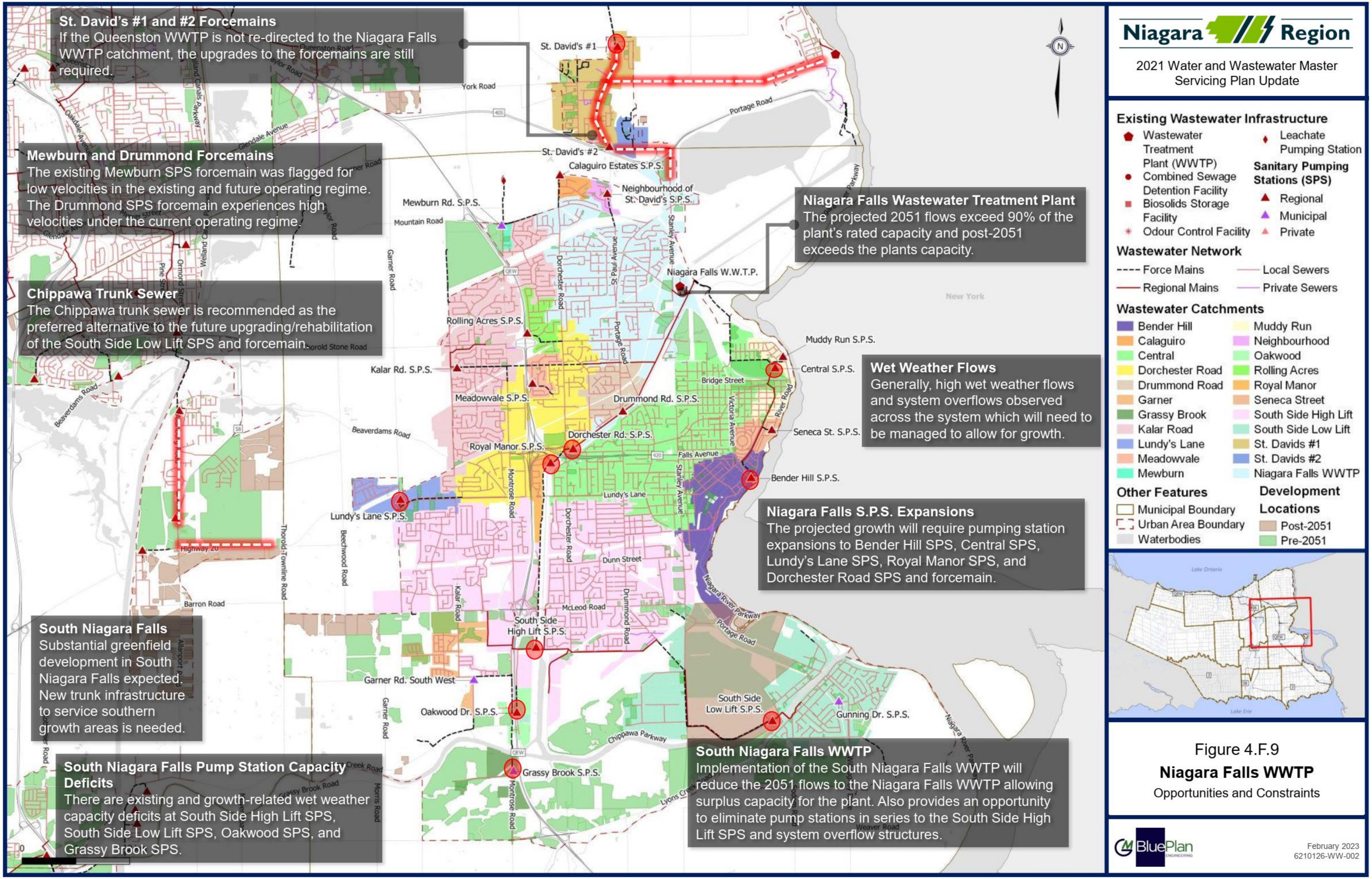
F.4.4 South Niagara Falls

- Substantial greenfield development in South Niagara Falls.
- New trunk infrastructure to service southern growth areas is needed.

- There are existing and growth-related wet weather capacity deficits at South Side high Lift SPS, South Side Low Lift SPS, Oakwood SPS, and Grassy Brook SPS.
- The Region experience challenges performing maintenance or rehabilitation work to the South Side Low Lift SPS and forcemain.
- Generally, there are high wet weather flows observed across the system, which will need to be managed to allow for infill growth in the existing areas.
- The new trunk sewers to service the South Niagara Falls wastewater treatment plant provide an opportunity to eliminate pump stations in series to the South Side High Lift SPS including:
    - South Side High Lift SPS
    - Garner SPs
    - Grassy Brook SPS
- Opportunity to remove system overflow structures (upstream of South Side High Lift SPS) in South Niagara Falls with the implementation of new tunneled trunk sewers.

F.4.5 System Optimization Opportunities

- Significant opportunity to provide capacity for growth through implementation of wet weather flow management within the Niagara Falls and South Niagara Falls systems.
- Re-direction of South Side High Lift SPS to provide future growth capacity in the downstream trunk sewer and WWTP, deferring upgrade needs to the North Niagara Falls system.
- Opportunity to decommission Queenston Wastewater Treatment Plant and convey flows to the Niagara Falls Wastewater Treatment Plant via the St. David’s #1 and/or the #2 SPS. There is currently an EA underway investigating these options further.
- Opportunity to avoid the future upgrading/rehabilitation of the South Side Low Lift SPS and forcemain, by diverting flows through a new large diameter tunneled sewer to the new South Niagara Falls WWTP through Chippawa. Currently the South Side Low Lift SPS and forcemain present maintenance challenges for the Region. In addition to servicing the South Side Low Lift SPS catchment, a tunneled trunk will provide servicing flexibility for lands to the southeast of the new plant.



St. David's #1 and #2 Forcemains
If the Queenston WWTP is not re-directed to the Niagara Falls WWTP catchment, the upgrades to the forcemains are still required.

Mewburn and Drummond Forcemains
The existing Mewburn SPS forcemain was flagged for low velocities in the existing and future operating regime. The Drummond SPS forcemain experiences high velocities under the current operating regime.

Chippawa Trunk Sewer
The Chippawa trunk sewer is recommended as the preferred alternative to the future upgrading/rehabilitation of the South Side Low Lift SPS and forcemain.

Niagara Falls Wastewater Treatment Plant
The projected 2051 flows exceed 90% of the plant's rated capacity and post-2051 exceeds the plants capacity.

Wet Weather Flows
Generally, high wet weather flows and system overflows observed across the system which will need to be managed to allow for growth.

Niagara Falls S.P.S. Expansions
The projected growth will require pumping station expansions to Bender Hill SPS, Central SPS, Lundy's Lane SPS, Royal Manor SPS, and Dorchester Road SPS and forcemain.

South Niagara Falls
Substantial greenfield development in South Niagara Falls expected. New trunk infrastructure to service southern growth areas is needed.

South Niagara Falls Pump Station Capacity Deficits
There are existing and growth-related wet weather capacity deficits at South Side High Lift SPS, South Side Low Lift SPS, Oakwood SPS, and Grassy Brook SPS.

South Niagara Falls WWTP
Implementation of the South Niagara Falls WWTP will reduce the 2051 flows to the Niagara Falls WWTP allowing surplus capacity for the plant. Also provides an opportunity to eliminate pump stations in series to the South Side High Lift SPS and system overflow structures.

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

Existing Wastewater Infrastructure

⬟ Wastewater Treatment Plant (WWTP)
● Combined Sewage Detention Facility
■ Biosolids Storage Facility
✳ Odour Control Facility
♦ Leachate Pumping Station

Sanitary Pumping Stations (SPS)

▲ Regional
▲ Municipal
▲ Private

Wastewater Network

---- Force Mains
— Regional Mains
— Local Sewers
— Private Sewers

Wastewater Catchments

■ Bender Hill	■ Muddy Run
■ Calaguiro	■ Neighbourhood
■ Central	■ Oakwood
■ Dorchester Road	■ Rolling Acres
■ Drummond Road	■ Royal Manor
■ Garner	■ Seneca Street
■ Grassy Brook	■ South Side High Lift
■ Kalar Road	■ South Side Low Lift
■ Lundy's Lane	■ St. Davids #1
■ Meadowvale	■ St. Davids #2
■ Mewburn	■ Niagara Falls WWTP

Other Features

☐ Municipal Boundary
☐ Urban Area Boundary
■ Waterbodies

Development Locations

■ Post-2051
■ Pre-2051

Figure 4.F.9

Niagara Falls WWTP

Opportunities and Constraints

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February 2023
6210126-WW-002

F.5 Assessment of Alternatives

As noted in Section F.3, the evaluation of alternatives for the South Niagara Falls plant location, trunk and forcemain alignment, and new SPS locations were all completed as a part of the South Niagara Falls Wastewater Solutions Schedule 'C' and are carried forward into this 2021 MSPU.

The South Niagara Falls wastewater strategy presents opportunities for adjacent systems. On this basis, it is recommended to include the redirection of the Queenston flows to Niagara Falls via a new SPS and forcemain to the St. David's #1 SPS catchment, upgrades to the St David's #1 and #2 SPS and forcemains and decommissioning the Queenston WWTP. For the purposes of the 2021 MSPU, placeholder projects have been included in the capital program which represent a reasonable middle ground for the potential options that will be considered through the EA. This strategy is subject to change through the EA and the preferred strategy determined through the Queenston – St. David's Wastewater Servicing Strategy EA will supersede the recommendations of the 2021 MSPU with respect to the Queenston strategy. The placeholder projects included in the 2021 MSPU are based on the strategy of decommissioning the Queenston WWTP and redirecting flows to the Niagara Falls WWTP via the St. David's #1 SPS and St. David's #2 SPS.

In addition to the alternatives assessed in the EAs, the projected growth will require pumping station expansions to Bender Hill SPS, Central SPS, Lundy's Lane SPS, Royal Manor SPS, and Dorchester Road SPS and forcemain based on the updated criteria changed through this iteration of the 2021 MSPU.

- Providing capacity within Region-owned pumping stations and trunk sewers to convey peak wet weather flows up to the lesser of the 5-year design storm or extraneous flow design allowance criteria of 0.4 L/s/ha for existing areas and 0.286 L/s/ha for growth areas, needs to be verified based on the updated flow criteria and actual flows.
- Provide upstream flow management to address high peak flows in the system where peak wet weather flows exceed the extraneous flow design allowance criteria of 0.4 L/s/ha resulting in basement flooding and overflow risks. Upstream flow management can include but is not limited to these options, in the preferred order of implementation:
    - Inflow and infiltration reduction in public right of way
    - Inflow and infiltration reduction from private properties
    - Enhanced system storage
    - Peak flow control using system controls or engineered solutions

- As shown in **Section F.3.2**, pump station capacity assessments were completed by reviewing the projected design allowance peak flows and 5-year storm flows against the operational firm capacity of each station.
    - Where the peak storm flows were less than design flows and the operational firm capacity of the station, the storm flows were used as actual flows, and therefore would not have triggered an upgrade.
    - Where the projected peak design allowance flows and 5-year storm flows exceeded the operational firm capacity of the station, a pump upgrade was recommended. Additional storage considerations and wet weather management were also considered.

To address existing and growth-related capacity needs, the following servicing concepts were evaluated:

- Do nothing
- Station capacity upgrade for pumping or storage
- System optimization including trunk sewers to eliminate pumping
- Wet weather management
- Hybrid solution

Further to the above strategies, the following area specific alternatives were reviewed

F.5.1 Chippawa

The South Side Low Lift SPS services an industrial/commercial area, including Marineland, north of the Welland River and the residential Chippawa neighbourhood to the south of the Welland River. The Chippawa area flows are conveyed to the South Side Low Lift via a triple barrel siphon with 200 mm, 400 mm, and 600 mm diameters. The existing system is characterized by high wet weather flows which are managed through several inline storage tanks, a pumped storage facility, combined sewer overflows, inline trunk sewers and flow control structures, and a storage tank at the SPS. The Chippawa area has history of basement flooding issues.

There is significant growth planned in South Niagara Falls to 2051 and beyond:

- Significant greenfield growth areas planned south of Chippawa by 2051
- Infill and greenfield growth areas north of Welland River in the catchment relating to the potential redevelopment of the Marineland property.
- Significant greenfield areas west of Lyon’s Creek, to the east of the new South Niagara Falls WWTP.

The growth, in combination with existing maintenance issues for the South Side Low Lift SPS and forcemain, wet weather flow issues, and opportunities with the new South Niagara Falls WWTP prompted a broader review of the long-term servicing of the area.

Three alternatives for the Chippawa Trunk were considered, presented in the following sections.

F.5.1.1 Chippawa Alternative 1 – Maintain Existing South Side Low Lift SPS

Chippawa Alternative 1, highlighted in Figure 4.F.10, generally maintains the existing South Side Low Lift SPS capacity and configuration. A new trunk servicing the area east of the new South Niagara Falls WWTP will be a shallow trunk sewer sized to convey local flows directly to the South Niagara Falls WWTP with no capacity for the existing South Side Low Lift SPS catchment or re-direction of flows from Chippawa.

This alternative would address servicing growth areas to the east of the South Niagara Falls WWTP, however it would require technically complex maintenance and upgrade to the existing South Side Low Lift SPS and forcemain.

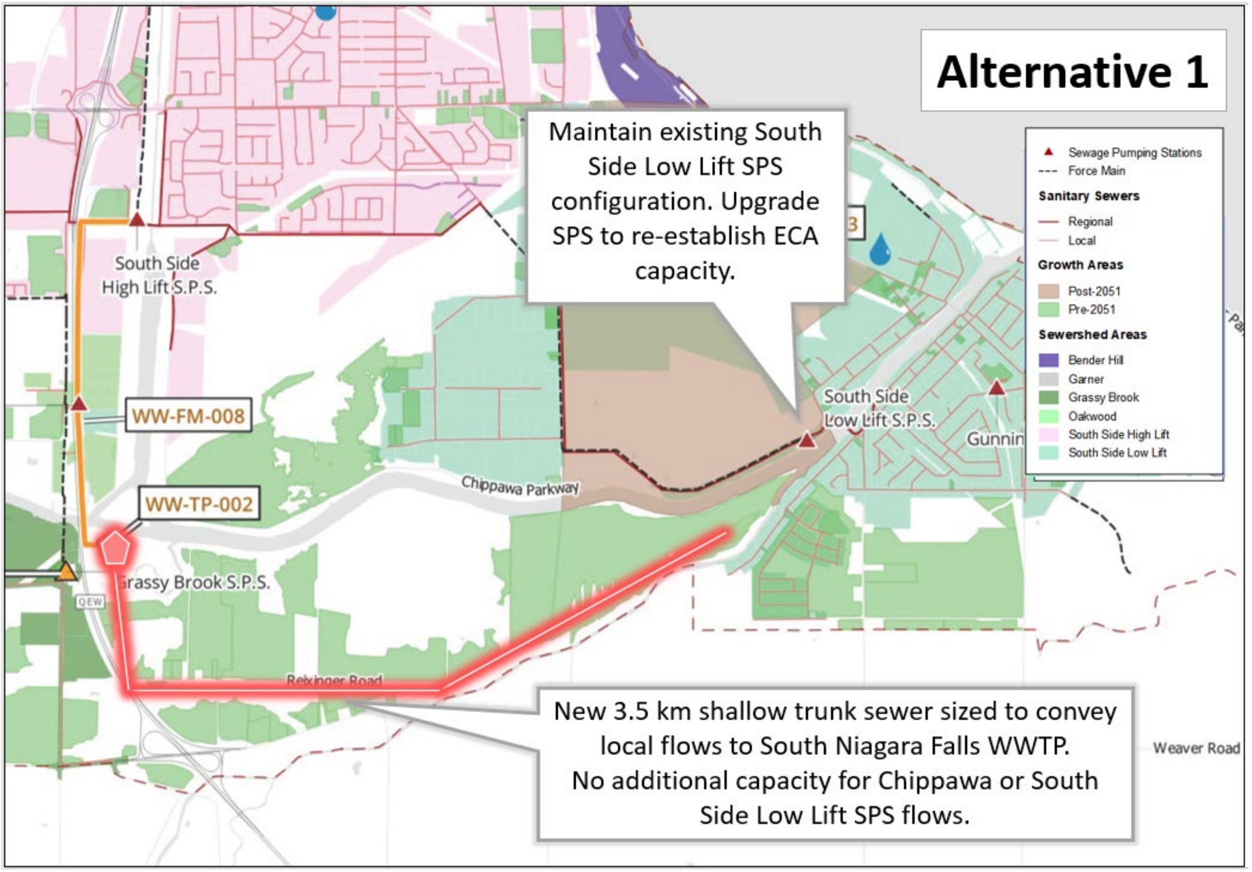
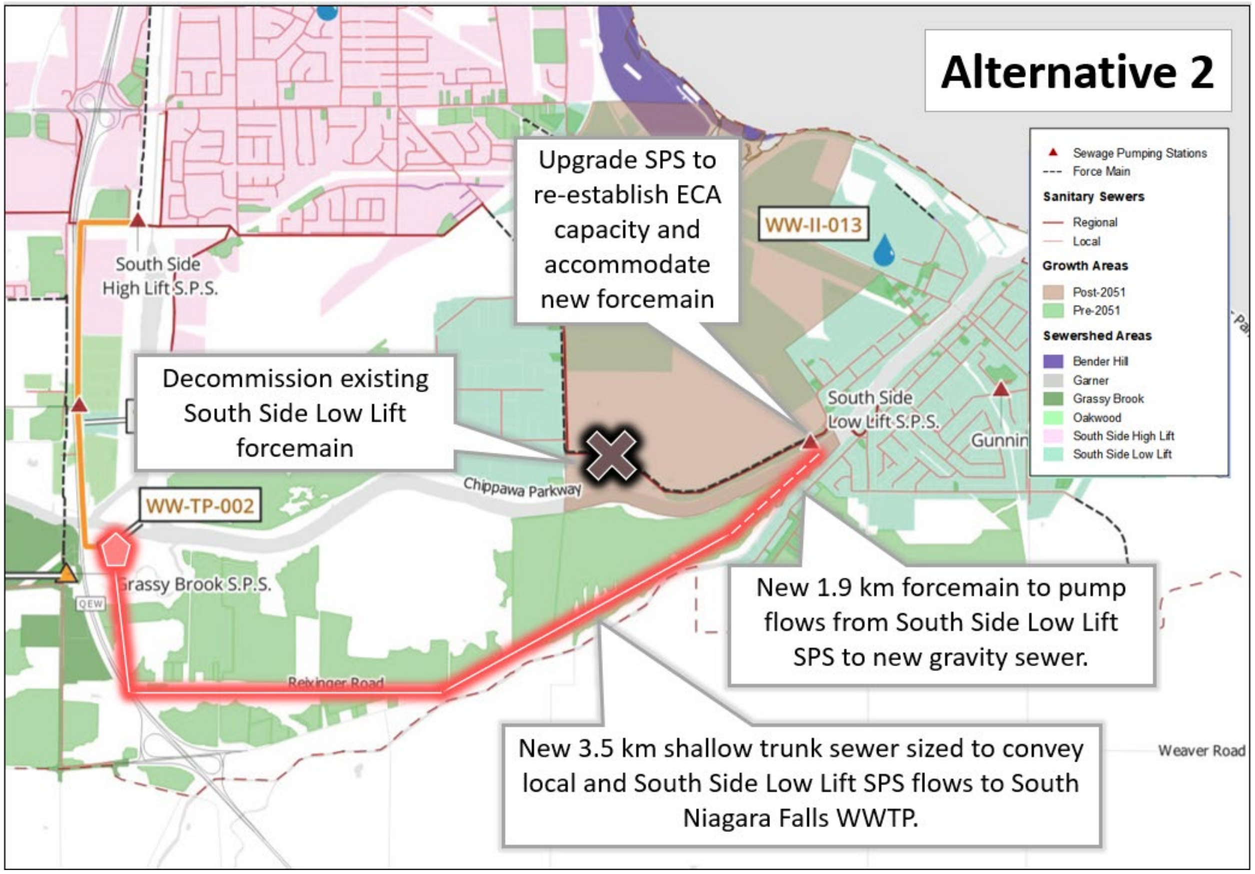


Figure 4.F.10 Chippawa Alternative 1 - Maintain Existing South Side Low Lift SPS

F.5.1.2 Chippawa Alternative 2 - Re-Direct South Side Low Lift SPS to the New Trunk Sewer

Chippawa Alternative 2, highlighted in Figure 4.F.11, the existing South Side Low Lift SPS will be maintained but with flow re-directed to the new trunk sewer via a new forcemain. The new trunk sewer will be a shallow sewer; however, will be sized to accommodate pumped flows from South Side Low Lift SPS via a new forcemain.

This alternative would address servicing growth areas to the east of the South Niagara Falls WWTP and avoids technically complex maintenance to the existing South Side Low Lift SPS forcemain. The station would likely need some upgrades to re-establish the ECA capacity and accommodation the new forcemain configuration. Depending on the alignment, the new forcemain may require crossings of the Welland River and Lyon’s Creek.



Upgrade SPS to re-establish ECA capacity and accommodate new forcemain

Decommission existing South Side Low Lift forcemain

New 1.9 km forcemain to pump flows from South Side Low Lift SPS to new gravity sewer.

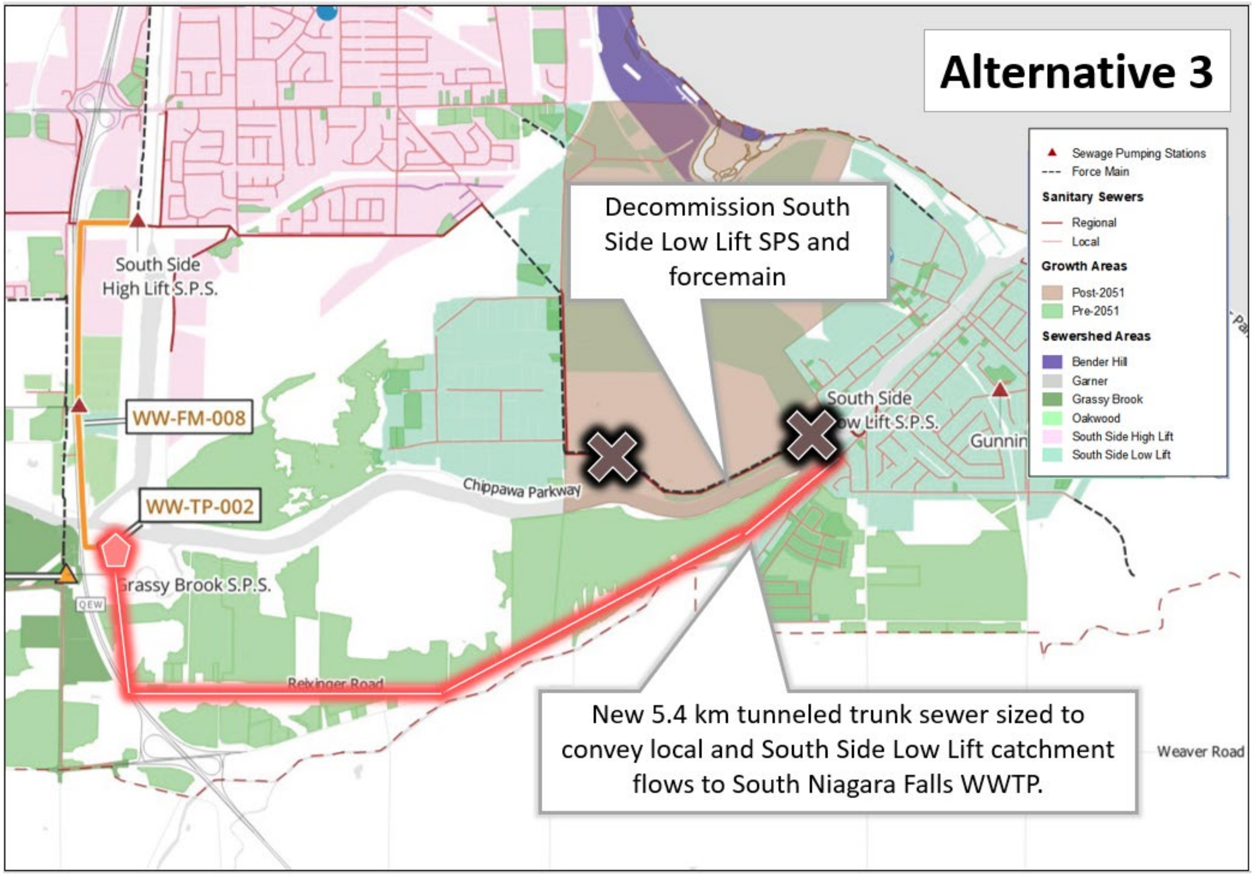
New 3.5 km shallow trunk sewer sized to convey local and South Side Low Lift SPS flows to South Niagara Falls WWTP.

Figure 4.F.11 Chippawa Alternative 2 - Re-Direct South Side Low Lift SPS to the New Trunk Sewer

F.5.1.3 Chippawa Alternative 3 - Decommission the South Side Low Lift SPS

Chippawa Alternative 3, highlighted in Figure 4.F.12, the existing South Side Low Lift SPS will be decommissioned in favour of a 5.4 km deep tunneled gravity trunk sewer conveying flows from the existing South Side Low Lift SPS site to South Niagara Falls WWTP. The sewer will be sized to convey all flows from the service catchment, likely to be a 1.2 m diameter sewer.

This alternative would address servicing growth areas to the east of the South Niagara Falls WWTP and avoids technically complex maintenance and upgrade to the existing South Side Low Lift SPS and forcemain. Depending on the alignment, the new gravity sewer may require crossings of the Welland River and Lyon's Creek to convey flows from the South Side Low Lift SPS site and Chippawa. This alternative provides a robust solution for growth that may occur within the South Side Low Lift SPS catchment area, particularly on the Marineland property. Phasing of the tunneled sewer is possible pending timing and ultimate buildout of the growth areas.



Decommission South Side Low Lift SPS and forcemain

New 5.4 km tunneled trunk sewer sized to convey local and South Side Low Lift catchment flows to South Niagara Falls WWTP.

Figure 4.F.12 Chippawa Alternative 3- Decommission the South Side Low Lift SPS

F.5.1.4 Chippawa Alternatives Evaluation

Table 4.F.10 presents the various alternatives along with their advantages and disadvantages.

Through discussion with Region staff and based on the relative advantages and disadvantages of the alternatives, Alternative 3 – Decommission the South Side Low Lift is the preferred servicing strategy as:

- The baseline strategy does not satisfy future servicing needs of the wastewater system.
- Alternative 3 allows for:
    - A more efficient operation of the overall system by eliminating pumping needs at South Side Low Lift SPS.
    - Providing a new tunneled (deep) trunk sewer from the South Niagara Falls WWTP to the east provides servicing flexibility for greenfield lands to the southeast of the plant and the long-term redevelopment of Marineland.
    - A tunneled trunk option provides the opportunity to avoid a technically challenging upgrade and rehabilitation of the South Side Low Lift SPS and forcemain.
    - Opportunity to decommission the South Side Low Lift SPS and reduce pumping needs overall saving energy, greenhouse gas emissions, and associated costs.
    - A tunneled trunk sewer through Chippawa presents opportunities to eliminate some or all overflows in the Chippawa area, depending on the ultimate trunk alignment.
    - This option assumes wet weather flow management would continue to be aggressively pursued in the Chippawa area.
    - Future sustainability upgrades to the Chippawa siphon can be avoided as they would be replaced with the new trunk sewer.

A Schedule B EA will be required to determine the alignment for the new tunneled trunk sewer and its major waterbody crossings of the Welland River and Lyon’s Creek.

Table 4.F.10 Chippawa Alternatives Evaluation

Category	Alternative 1	Alternative 2	Alternative 3
Description	Maintain existing South Side Low Lift SPS configuration	Re-Direct South Side Low Lift SPS to the New Trunk Sewer	Decommission the South Side Low Lift SPS
Upgrades	• New 3.5 km shallow trunk sewer (525-600 mm) • Upgrades to re-establish South Side Low Lift SPS ECA capacity • Maintenance works on existing South Side Low Lift forcemain • Requires continued inflow and infiltration reduction works in the Chippawa area	• New 3.5 km shallow trunk sewer (975 mm) • New 1.9 km forcemain from South Side Low Lift SPS to new gravity trunk • Upgrades to re-establish South Side Low Lift SPS ECA capacity and accommodated new forcemain • Decommission existing South Side Low Lift forcemain • Requires continued inflow and infiltration reduction works in the Chippawa area	• New 5.4 km deep tunneled trunk sewer (1200 mm) • Decommission existing South Side Low Lift SPS and forcemain • Requires continued inflow and infiltration reduction works in the Chippawa area
Advantages	• Services growth areas to the east of the new South Niagara Falls WWTP	• Services growth areas to the east of the new South Niagara Falls WWTP • Avoids technically challenging maintenance to the existing South Side Low Lift forcemain	• Services growth areas to the east of the new South Niagara Falls WWTP • Upgrades to South Side Low Lift SPS not required • Avoids technically challenging maintenance to the existing South Side Low Lift forcemain • Reduce overall pumping costs, conserving energy, greenhouse gas emissions, and associated costs • Deeper trunk sewer provides enhanced servicing flexibility to growth areas in the South Side Low Lift catchment and for areas to the south and east of the new South Niagara Falls WWTP • Opportunities for phasing based on growth and maintenance timelines • A tunneled trunk sewer through Chippawa presents opportunities to eliminate some or all overflows in the Chippawa area, depending on the ultimate trunk alignment.
Disadvantages	• Requires upgrades re-establish to South Side Low Lift ECA capacity • Requires continued maintenance of the South Side Low Lift forcemain which is technically complex	• Requires upgrades to the South Side Low Lift SPS • Requires up to two major water crossings (Welland River and Lyon’s Creek) for the new South Side Low Lift forcemain to the new gravity trunk	• Requires up to two major water crossings (Welland River and Lyon’s Creek) for the new gravity trunk

F.6 Preferred Servicing Strategy

- Several of the strategies for the Niagara Falls WWTP service area are governed by environmental assessments:
    - South Niagara Falls Wastewater Solutions Schedule ‘C’ Class EA was completed in 2022.
    - Queenston – St. David’s Wastewater Servicing Strategy EA, which is ongoing.

Niagara Falls Strategy

- Without the implementation of the South Niagara Falls strategy the current rated average daily flow capacity of the Niagara Falls WWTP is 68.3 MLD, with an existing flow of 39.9 MLD and a projected 2051 average daily flow of 61.6 MLD, which exceeds 90% of the wastewater treatment plant rated capacity. The projected post-2051 flow is 71.2 MLD, which exceeds the wastewater treatment plant rated capacity. The South Niagara Falls Wastewater Treatment Plant will reduce the 2051 flows to the Niagara Falls WWTP to 33.0 MLD and the post-2051 flow to 34.6 MLD. As such, the plant has surplus capacity and will not reach 80% capacity within the 2051-time horizon.
- The projected growth will require pumping station expansions to Bender Hill SPS, Central SPS, Lundy’s Lane SPS, Royal Manor SPS, and Dorchester Road SPS and forcemain.

South Niagara Falls

- The evaluation of alternatives for the South Niagara Falls plant location, trunk and forcemain alignment, and new SPS locations were all completed as a part of the South Niagara Falls Wastewater Solutions Schedule ‘C’ Class EA, which includes the following projects:
    - New South Niagara Falls WWTP
    - New WWTP Outfall
    - New tunneled trunk sewer from South Side High Lift SPS to new WWTP
    - New shallow trunk sewer to Thorold South
    - New trunk sewer to eliminate CSO overflow upstream of the South Side High Lift SPS
    - Upgraded Black Horse SPS and new upgraded forcemain and alignment
    - New Peel Street SPS forcemain and alignment
    - Decommission South Side High Lift SPS, Grass Brook SPS and Garner Road SPS, all to be replace by gravity connections to the new trunk system
    - Inflow and infiltration reduction in South Niagara Falls and Thorold South
- The Chippawa trunk sewer (new strategy to identified in this Master Plan) is recommended as the preferred alternative to the future upgrading/rehabilitation of the South Side Low Lift SPS and forcemain, which currently present maintenance challenges for the Region. In addition to servicing the South Side Low Lift SPS catchment, a

tunneled trunk will provide servicing flexibility for lands to the southeast of the new plant.
  - The trunk sewer is proposed in two phases:
    - Phase 1 is a tunneled trunk sewer from west of Lyon's Creek to the new South Niagara Falls WWTP
    - Phase 2 is a tunneled trunk sewer from the South side Low Lift SPS to west of Lyon's Creek
  - A Schedule B EA will be required to confirm the alignment of the Chippawa trunk sewer and various water body crossings.

St. David's and Queenston

- The South Niagara Falls wastewater strategy presents opportunities for adjacent systems. On this basis, it is recommended to include the redirection of the Queenston flows to Niagara Falls via a new SPS and forcemain to the St. David's #1 SPS catchment, upgrades to the St David's #1 and #2 SPS and forcemains and decommissioning the Queenston WWTP. The proposed works or a more suitable recommended option from the ongoing Queenston – St. David's Wastewater Servicing Strategy EA are to prevail over the 2021 MSPU recommendations for the Queenston wastewater system, when the Queenston EA study results are approved and filed in 2023.. Details for the Queenston SPS and forcemain projects are included in **Appendix E- Queenston**.
- If the Queenston WWTP is not re-directed to the Niagara Falls WWTP catchment, the upgrades to the St. David's #1 SPS and St. David's #2 SPS and supporting forcemains are still required.

Systemwide

- A key strategy for the Niagara Falls system is to provide wet weather management across the system. This will require Regional solutions as well as local municipality solutions. Further, it is expected that the City's planned Master Plan and Wet Weather Management Study and the Town's planned PPCP will further identify catchments and strategies for inflow and infiltration reduction and other wet weather management solutions.

Figure 4.F.14 and **Figure 4.F.15** show the preferred servicing strategy, consisting of:

F.6.1 Treatment Plant Works

- New South Niagara Falls WWTP Phase 1 with 30 MLD capacity online for 2027.
- New South Niagara Falls WWTP Phase 2 Upgrade from 30 MLD to 60 MLD.
- New South Niagara Falls WWTP Outfall Structure.
- No capacity upgrades are required for the Niagara Falls WWTP.

The Region has several Region-wide programs focused on maintaining and enhancing the treatment capacity at the Region's existing WWTP. The programs applicable to the Niagara Falls WWTP include:

- WWTP Process Upgrades (WW-TP-005) which funds projects to improve treatment processes to re-establish the ECA capacity at plants.

F.6.2 Pumping Stations

Queenston Strategy

- Increase St. David's #1 SPS capacity from 29 L/s to 174 L/s.
- Increase St. David's #2 SPS capacity from 42 L/s to 202 L/s.

Niagara Falls WWTP Strategy

- Bender Hill SPS Full station replacement at new location from 237 L/s to re-establish 330 L/s ECA capacity.
- Increase Central SPS capacity from 800 L/s to re-establish 1000 L/s ECA capacity.
- Increase Lundy's Lane SPS capacity from 56 L/s to re-establish 98 L/s ECA capacity.
- Increase Royal Manor SPS capacity from 9 L/s to 16 L/s
- Increase Dorchester Road SPS capacity from 185 L/s to 345 L/s.

South Niagara Falls WWTP Strategy

- No upgrades recommended.

Further to the pump station upgrades, the Region-wide allowance to address odour control needs that are the result of growth-related system upgrades has been included.

- WWTP Process Upgrades (WW-TP-006) which funds in-system and plant upgrades to control odour.

F.6.3 Forcemains

Queenston Strategy

- Replace existing 200 mm St. David's #1 Forcemain with new single 400 mm forcemain.
- Replace existing 250 mm St. David's #2 SPS forcemain with new single 400 mm forcemain.

Niagara Falls WWTP Strategy

- Replace Existing 350 mm Dorchester SPS Forcemain with new single 500 mm forcemain.

South Niagara Falls WWTP Strategy

- New 400 mm Peel Street SPS Forcemain in Thorold from station to Black Horse SPS.

- New Black Horse Forcemain to New South Niagara Falls Trunk on Barron Road to the Montrose Trunk Sewer.

F.6.4 Trunk Sewers

- New tunneled 1500 mm trunk sewer on Montrose conveying flows from South Side High Lift SPS to the new South Niagara Falls WWTP.
- New Brown Road shallow 600 mm gravity trunk from South Thorold to Garner SPS-South Niagara Falls trunk connection.
- South Niagara Falls Sanitary Sewer Overflow trunk - New 1050 mm sewer to eliminate overflows upstream of South Side High Lift SPS.
- New Chippawa tunneled 1200 mm trunk sewer to convey flows from South Side Low Lift SPS by gravity.

F.6.5 Decommissioning of Existing Facilities

- Decommissioning of South Side High Lift SPS, to be replaced by gravity trunk sewer to SNF WWTP.
- Decommissioning of Garner SPS to be replaced by gravity connection to SNF WWTP.
- Decommissioning of Grassy Brook SPS to be replaced by gravity connection to SNF WWTP.

F.6.6 Wet Weather Flow Management Program

A significant element of the Niagara Region wastewater servicing strategy is the wet weather management program. The program is intended to address existing capacity constraints, and to provide for growth-related capacity without expanding/upgrading existing trunk infrastructure, or by minimizing the required expansion/upgrades.

The wet weather management program currently identifies overall preliminary priority, staging of location and target amount of inflow and infiltration reduction across all systems. This program provides for a proactive and targeted approach to addressing wet weather impacts. These wet weather management programs will need to be a joint initiative between the Region and local municipalities.

For the Niagara Falls system, the following priority areas are identified:

- South Niagara Falls, especially Chippawa in the South Side Low Lift SPS catchment
- St David’s #1 in NOTL
- Central SPS and upstream catchments
- Dorchester SPS and upstream catchments

F.6.7 Additional Studies and Investigations

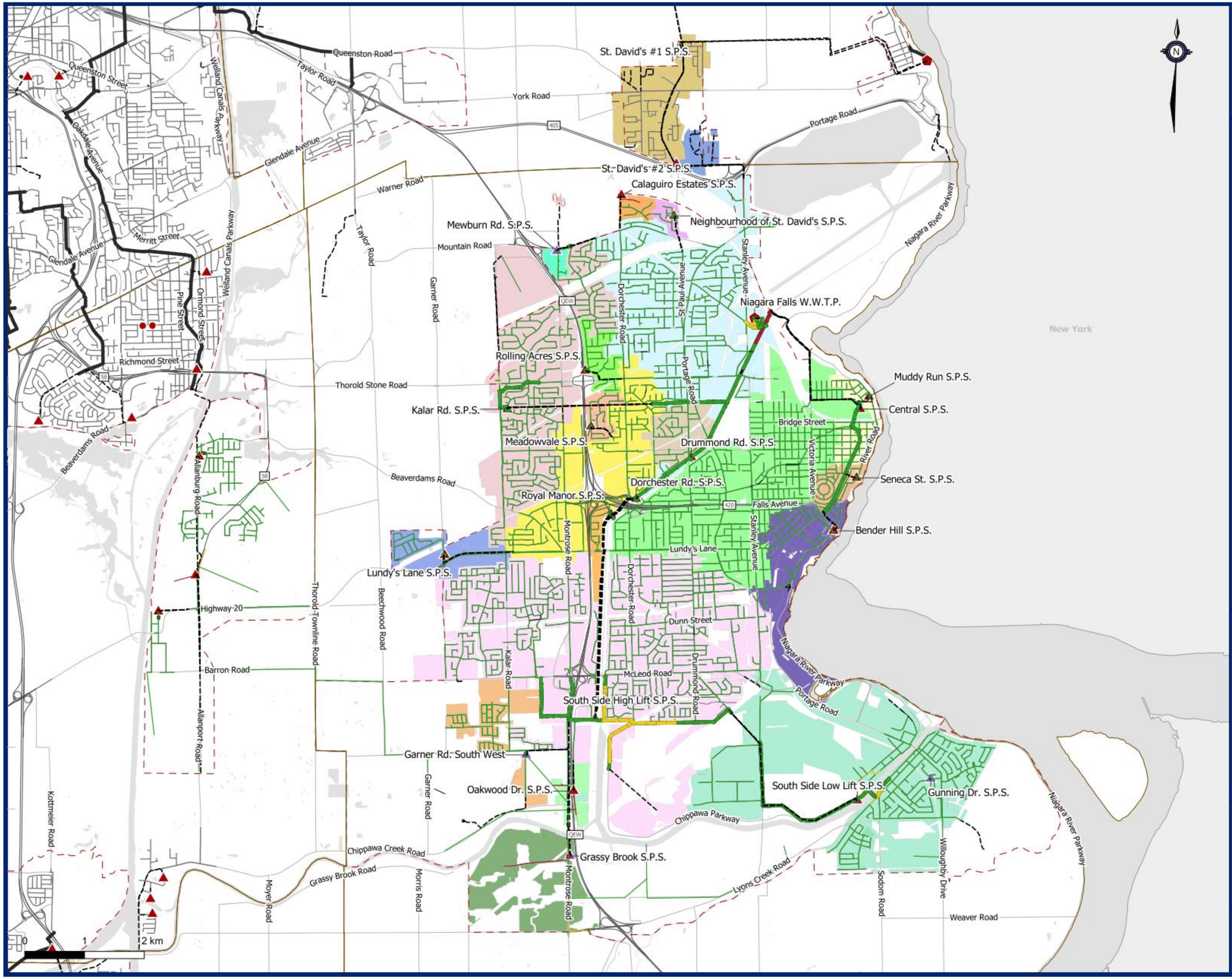
Flow Monitoring Program: Additional flow monitoring data collection will improve the confidence of the system performance results from the model. Best practices for improving understanding of wastewater systems include:

- Monitoring upstream from pump stations to capture peak wet weather flows
- Increasing the density of monitoring in catchments identified for wet weather flow management, where the flows from the 5-year design storm exceed the design flows.

The City is also undertaking a Master Servicing Plan and Wet Weather Management Strategy that will support flow monitoring data collection and improve system understanding locally.

F.6.8 Future System Performance

Figure 4.F.13 presents the future system performance, based on the preferred servicing strategy configuration and capacities; but excludes the potential benefits of the local wet weather flow management program.



Niagara Region

2021 Water and Wastewater
Master Servicing Plan Update

Existing Wastewater Infrastructure
- ● Combined Sewage Detention Facility
- % Leachate Pumping Station
- ● Odour Control Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Private)
- ▲ Sewage Pumping Station (Local)

Wastewater Network
- Force Mains
- Local Sewers
- Regional Mains
- Private Sewers

Wastewater Catchments
- Bender Hill
- Calaguiro
- Central
- Dorchester Road
- Drummond Road
- Garner
- Grassy Brook
- Kalar Road
- Lundy's Lane
- Meadowvale
- Mewburn
- Muddy Run
- Neighbourhood
- Niagara Falls WWTP
- Oakwood
- Rolling Acres
- Royal Manor
- Seneca Street
- South Side High Lift
- South Side Low Lift
- St. Davids #1
- St. Davids #2

Other Features
- Municipal Boundary
- Urban Area Boundaries
- Waterbodies

System Performance
- Surplus Capacity
- Surcharging Sewer
- Surcharging Sewer with Basement Flooding Risk

Figure 4.F.13

Future Capital Program Peak Wet Weather Flow

Niagara Falls WWTP

BluePlan

May, 2023
620126
Projection EPSG:26917

Document Path: W:\Hamilton\620000\620126 Niagara 2021 MSP Update\5 Work in Progress\5. GIS and Databases\4. Wastewater\System

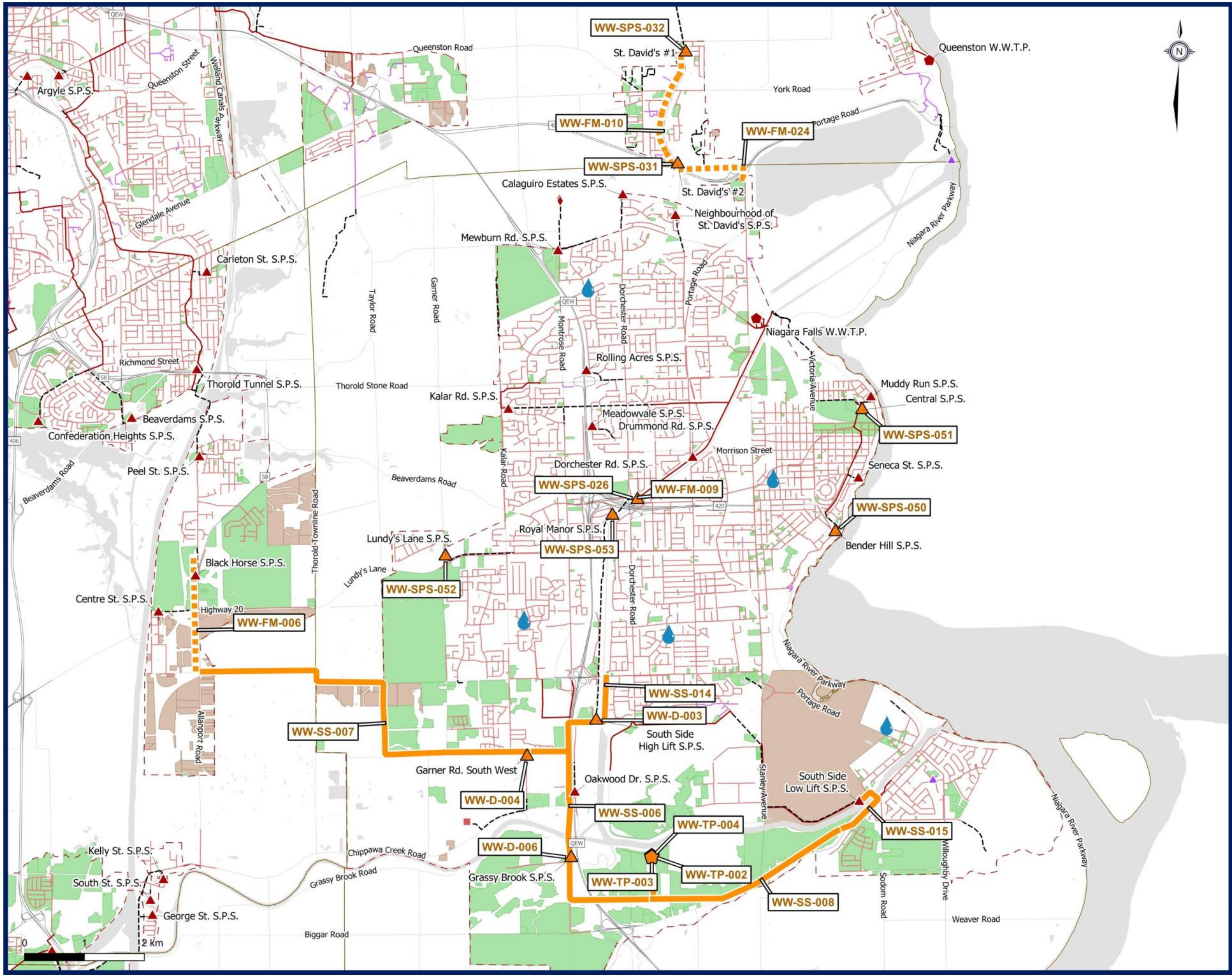
F.7 Capital Program

Figure 4.F.14 and **Figure 4.F.15** present the preferred servicing strategy map and schematic

Table 4.F.11 and **Table 4.F.14** summarize the recommended project costing timing and Class EA requirements for the Niagara Falls and South Niagara Falls systems, respectively. Individual detailed costing sheets are presented in **Section F.8.6.**

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



Capital Program

- ⬟ Treatment Plant
- ▲ Pumping Station
- 💧 Wet Weather Reduction (WW-II-017)
- ▪▪▪▪ Forcemains
- ▬ Sewers

Wastewater Facilities

- ⬟ Wastewater Treatment Plant
- ■ Biosolids Storage Facility
- ♦ Leachate Pumping Station
- ● Odour Control Facility

Wastewater Network

- --- Force Mains
- — Regional Mains
- — Local Sewers
- — Private Sewers

Pumping Stations

- ▲ Niagara Region
- ▲ Municipal
- ▲ Private

Other Features

- ⬚ Municipal Boundary
- ▨ Waterbodies
- ⬚ Urban Area Boundary

Development Locations

- 🟫 Post-2051
- 🟩 Pre-2051

***Note that additional growth in existing built areas is anticipated**

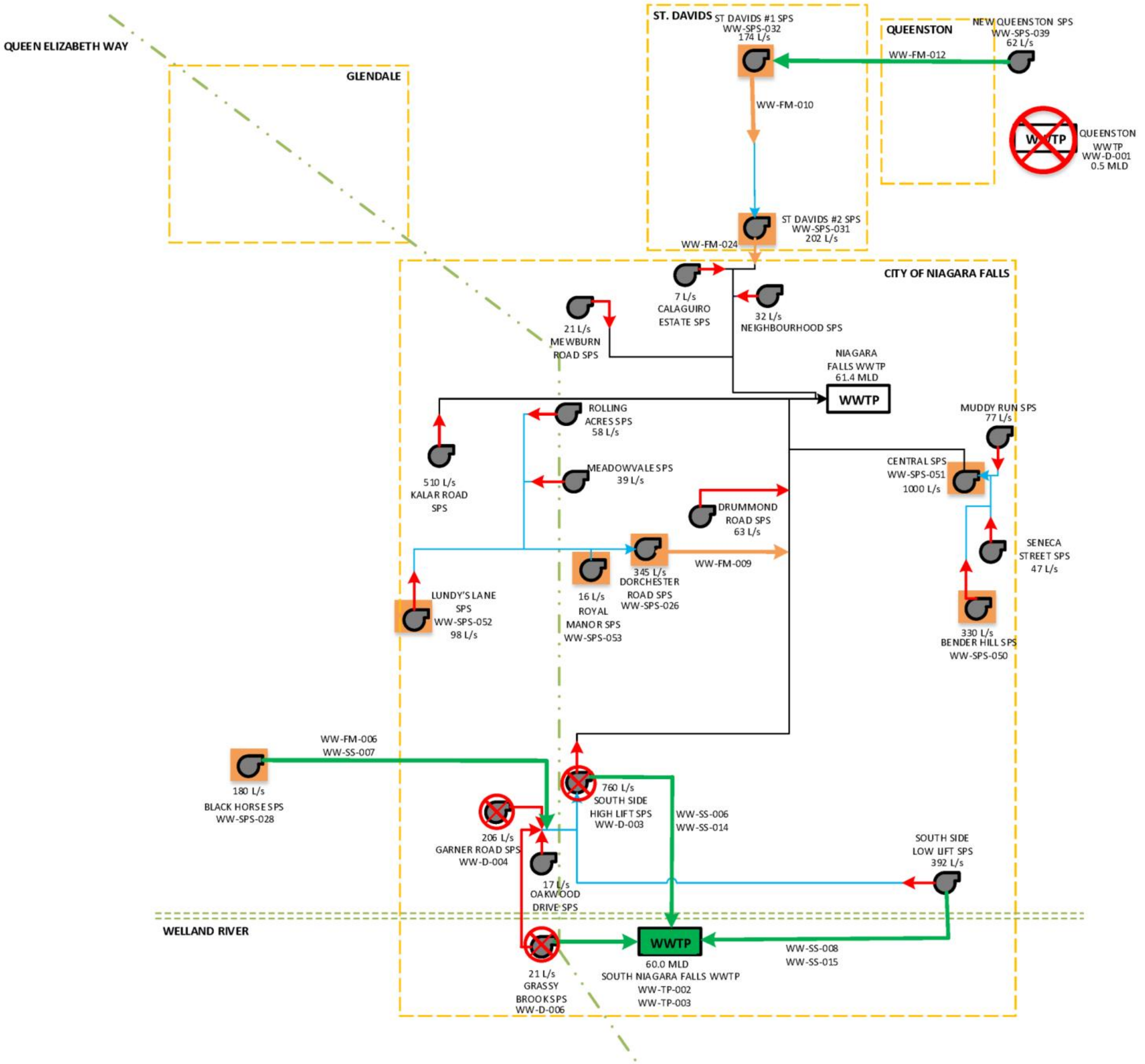
***Project alignments are preliminary and will be refined through subsequent projects (EA and/or detailed design)**

Figure 4.F.14
Niagara Falls WWTP System

Preferred Wastewater Servicing Strategy

BluePlan ENGINEERING

December 2022
620126-WW-006
WKID: 26917



Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

WWTP RATED CAPACITY	Wastewater Treatment Plant
FIRM CAPACITY	Sewage Pumping Station
→	Forcemain
→	Connection from SPS to SPS
→	Connection from SPS to WWTP
🟧	Facility Upgrade
🟩	New Facility
—	Upgrade Forcemain or Sewer
—	New Forcemain or Sewer
⊗	Decommission Project

Figure 4.F.15
Niagara Falls WWTP

Future Wastewater Infrastructure Schematic

BluePlan ENGINEERING

December 2022
621016-W-000
WKID: 26917

Table 4.F.11 Summary of Niagara Falls Wastewater Treatment Plant Capital Program

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost ($)
WW-FM-009	Dorchester Forcemain Upgrade	Replace Existing 350 mm Dorchester SPS Forcemain with new single 500 mm forcemain in Niagara Falls.	500 mm	2027-2031	Niagara Falls	+	Satisfied	Forcemain	$659,000
WW-FM-010	St. David's #1 Forcemain Upgrade	Replace existing 200 mm St. Davids #1 Forcemain with new single 400 mm in Niagara-on-the-Lake.	400 mm	2027-2031	Niagara-on-the-Lake	A+	To be Satisfied Under Consolidated Queenstown Schedule B EA - Separate Study	Forcemain	$5,803,000
WW-FM-024	St. David's #2 Forcemain Upgrade	Replace existing 250 mm St David's #2 SPS forcemain with new single 400 mm in Niagara Falls.	400 mm	2027-2031	Niagara-on-the-Lake	A+	To be Satisfied Under Consolidated Queenstown Schedule B EA - Separate Study	Forcemain	$5,689,000
WW-SPS-026	Dorchester SPS Pump Replacement	Increase station capacity from 185 L/s to 345 L/s by replacing the existing three pumps. Use implementation plan prior to upgrade: Flow monitoring, validate wet weather flows, re-evaluate required upgrades.	345 L/s	2027-2031	Niagara Falls	A+	Satisfied	Pumping	$5,070,000
WW-SPS-031	St. David's #2 SPS Upgrade	Increase station capacity from 42 L/s to 202 L/s with a full station Reconstruction.	202 L/s	2027-2031	Niagara-on-the-Lake	B	To be Satisfied Under Consolidated Queenstown Schedule B EA - Separate Study	Pumping	$6,571,000
WW-SPS-032	St. David's #1 SPS Upgrade	Increase station capacity from 29 L/s to 174 L/s. with a full station reconstruction.	174 L/s	2027-2031	Niagara-on-the-Lake	B	To be Satisfied Under Consolidated Queenstown Schedule B EA - Separate Study	Pumping	$5,740,000
WW-SPS-050	Bender Hill SPS Pump Replacement	Full station replacement at new location from 237 L/s to re-establish 330 L/s ECA capacity.	330 L/s	2022-2026	Niagara Falls	B	Satisfied through completed EA	Pumping	$15,234,000
WW-SPS-051	Central SPS Pump Replacement	Increase station capacity from 800 L/s to re-establish 1000 L/s ECA capacity by replacing the existing five pumps.	1000 L/s	2037-2041	Niagara Falls	A+	Satisfied	Pumping	$10,777,000
WW-SPS-052	Lundy's Lane SPS Pump Replacement	Increase station capacity from 56 L/s to re-establish 98 L/s ECA capacity by replacing the existing three pumps.	98 L/s	2037-2041	Niagara Falls	A+	Satisfied	Pumping	$3,079,000
WW-SPS-053	Royal Manor SPS Pump Replacement	Increase station capacity from 9 L/s to 16 L/s by replacing existing two pumps	16 L/s	2022-2026	Niagara Falls	A+	Satisfied	Pumping	$1,213,000
WW-II-017(1)	Region-Wide Wet weather Reduction	Wet weather reduction program in all systems to be executed from 2022-2051	N/A	2022-2051	Region-Wide		Dependent on outcome of wet weather flow study	Wet Weather Reduction	$225,000,000

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost ($)
WW-ST-001[(1)]	Region-Wide Flow Monitoring and Data Collection	Funding to support flow monitoring and data collection initiatives	N/A	2022-2051	Region-Wide			Wet Weather Reduction	$12,000,000
WW-TP-005[(1)]	Region-Wide WWTP Process Upgrades	Process upgrades to re-establish ECA capacity	N/A	2022-2051	Region-Wide			Treatment	$50,000,000
WW-TP-006[(1)]	Region-Wide WWTP Process Upgrades	Upgrades for odour control across the Region at forcemains, pump stations, and other locations.	N/A	2022-2051	Region-Wide			Treatment	$40,000,000
								Total	**$59,835,000**

(1) Project cost not included in subtotal as it is a Region-wide project

Table 4.F.12 Summary of South Niagara Falls Wastewater Treatment Plant Capital Program

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost ($)
WW-D-003	Decommissioning of South Side High Lift SPS	Decommissioning of SSHL SPS, to be replaced by gravity trunk sewer to SNF WWTP	N/A	2037-2041	Niagara Falls	A+	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Forcemain	$500,000
WW-D-004	Decommissioning of Garner SPS	Decommissioning of Garner SPS to be replaced by gravity connection to SNF WWTP	N/A	2032-2036	Niagara Falls	A+	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Forcemain	$450,000
WW-D-006	Decommissioning of Grassy Brook SPS	Decommissioning of Grassy Brook SPS to be replaced by gravity connection to SNF WWTP	N/A	2032-2036	Niagara Falls	A+	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Sewer	$450,000
WW-FM-005	New Peel Street SPS Forcemain	New 400 mm Peel Street SPS Forcemain in Thorold from station to Black Horse SPS	400 mm	2027-2031	Thorold	B	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Forcemain	$5,062,000
WW-FM-006	New Black Horse Forcemain to Niagara Falls	New Black Horse Forcemain to New South Niagara Falls Trunk on Barron Road to the Montrose Trunk Sewer	400 mm	2027-2031	Thorold	B	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Forcemain	$2,839,000
WW-SPS-028	Black Horse SPS Upgrade	New SPS location with increased capacity from 67 L/s to 180 L/s.	180 L/s	2027-2031	Thorold	B	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Pumping	$5,054,000
WW-SPS-058	Peel Street SPS Upgrade	Station upgrades which may be required to accommodate new forcemain	N/A	2027-2031	Thorold	A+	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Pumping	$500,000
WW-SS-006	New Montrose Trunk Sewer	New tunneled trunk sewer on Montrose conveying flows from South Side High Lift SPS to the new South Niagara Falls WWTP	1500 mm	2027-2031	Niagara Falls	B	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Sewer	$ 88,622,000
WW-SS-007	New Brown Road Trunk Sewer	Shallow gravity trunk from South Thorold to Garner SPS-South Niagara Falls trunk connection	600 mm	2027-2031	Niagara Falls	B	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Sewer	$16,765,000
WW-SS-008	Chippawa Trunk Sewer Phase 1	New tunneled 1200 mm trunk sewer from west of Lyon's Creek to South Niagara Falls WWTP	1200 mm	2032-2036	Niagara Falls	B	Separate EA Required (WW-SS-015)	Sewer	$60,923,000
WW-SS-014	South Niagara Falls SSO Trunk	New sewer to eliminate overflows upstream of South Side High Lift SPS	1050 mm	2022-2026	Niagara Falls	B	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Sewer	$1,554,000
WW-SS-015	Chippawa Trunk Sewer Phase 2	New tunneled 1200 mm trunk sewer from South Side Low Lift to west of Lyon's Creek	1200 mm	2037-2041	Niagara Falls	B	Separate EA Required (WW-SS-008)	Sewer	$27,082,000
WW-TP-002	South Niagara Falls Wastewater Treatment Plant - Phase 1	New South Niagara Falls WWTP Phase 1 with 30 MLD capacity	30 MLD	2022-2026	Niagara Falls	C	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Treatment	$203,557,000
WW-TP-003	South Niagara Falls Wastewater Treatment Plant Phase 2	New South Niagara Falls WWTP Upgrade from 30 MLD to 60 MLD	30 MLD	2037-2041	Niagara Falls	C	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Treatment	$200,000,000

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost ($)
WW-TP-004	South Niagara Falls Wastewater Treatment Plant Outfall	New South Niagara Falls WWTP Outfall Structure	1800 mm	2022-2026	Niagara Falls	C	To be Satisfied Under Consolidated South NF Schedule C EA - Separate Study	Treatment	$4,718,000
								Total	**$618,076,000**

F.8 Project Implementation and Considerations

F.8.1 10-Year Program Sequencing

The recommended year in service for the capital projects is presented in **Section F.7**. Special project implementation and considerations for the preferred servicing strategy consist of:

Niagara Falls WWTP Strategies

- The timing for the Bender Hill SPS is ordered as first, as the project is already in the design phase. The remaining pump upgrades are existing deficiencies in design allowance PWWF and wet weather flows.

Queenston WWTP Strategies

- The Queenston-St David's servicing strategies are independent from other upgrades required in the system. The St. David's #1 and #2 SPS and forcemains in the Niagara Falls system would require upgrades prior to the construction of the new Queenston SPS and forcemain. If the Queenston WWTP EA determines that the new Queenston SPS and forcemain are not the preferred option, the timing required for the St. David's #1 and #2 SPS may change. The work relating to the Queenston SPS, forcemain, and WWTP decommissioning are included in the Queenston system **Volume 4 – Appendix E**.

South Niagara Falls WWTP Strategies

- The South Niagara Falls Wastewater Solutions Schedule 'C' Class Environmental Assessment specified an in-service date
- The implementation plan is as follows:
  - South Niagara Falls WWTP and outfall
  - South Niagara Falls trunk sewer –New Montrose trunk sewer and Sanitary sewer overflow (SSO) trunk to eliminate overflow at South Side High Lift SPS.
  - Thorold South Servicing – works connecting Thorold South to the South Niagara Falls system including Black Horse SPS, Peel Street forcemain, and Brown Road trunk sewer.

It is understood that the timing for the recommended projects may be subject to change due to a variety of external factors such as overall balancing of the Region's capital budget, changes to growth projections, and other unforeseen circumstances. As such,

Table 4.F.13 and **Table 4.F.14** presents the preferred priority of the projects within the first 10-years of the capital program.

Table 4.F.13 Preferred Project Order for Niagara Falls WWTP including Queenston Strategies in NOTL

Master Plan ID	Name	2021 MSPU Year in Service	Order
WW-SPS-050	Bender Hill SPS Pump Replacement	2022-2026	1
WW-SPS-053	Royal Manor SPS Pump Replacement	2022-2026	2
WW-FM-009	Dorchester Forcemain Upgrade	2027-2031	3
WW-SPS-026	Dorchester SPS Pump Replacement	2027-2031	3
WW-FM-024	St. David's #2 Forcemain Upgrade	2027-2031	3
WW-SPS-031	St. David’s #2 SPS Upgrade	2027-2031	3
WW-FM-010	St. David’s #1 Forcemain Upgrade	2027-2031	4
WW-SPS-032	St. David’s #1 SPS Upgrade	2027-2031	4

Table 4.F.14 Preferred Project Order for South Niagara Falls WWTP

Master Plan ID	Name	2021 Year in Service	Order
WW-TP-002	South Niagara Falls Wastewater Treatment Plant - Phase 1	2022-2026	1
WW-TP-004	South Niagara Falls Wastewater Treatment Plant Outfall	2022-2026	1
WW-SS-014	South Niagara Falls SSO Trunk	2022-2026	2
WW-SS-006	New Montrose Trunk Sewer	2027-2031	3
WW-SS-007	New Brown Road Trunk Sewer	2027-2031	3
WW-FM-006	New Black Horse Forcemain	2027-2031	4
WW-SPS-028	Black Horse SPS Upgrade	2027-2031	4
WW-FM-005	New Peel Street SPS Forcemain	2027-2031	5
WW-SPS-058	Peel Street SPS Upgrade	2027-2031	5

F.8.2 EA Requirements and Studies

The following summarizes the status of EA requirements for recommended capital projects which will require Schedule B or C EAs.

- **EA has been satisfied through previous projects:**
    - South Niagara Falls Wastewater Solutions Schedule 'C' Class Environmental Assessment for the project listed in **Table 4.F.14**
- **Currently ongoing separate EA studies:**
    - Completion of the ongoing Queenston – St. David's Wastewater Servicing Strategy EA , which is a Schedule B EA.
- **EA studies to be completed through separate studies:**
    - WW-SS-008 and WW-SS-015 (Chippawa Trunk Sewer Phases 1 and 2) Schedule B

F.8.3 Region-Wide Projects and Collaboration with Local Area Municipalities

Acknowledging that the overall wastewater systems are jointly owned and operated by the Region and LAM, the continued operation and expansion of the wastewater systems to support existing users and accommodate projected growth relies upon the cooperation of the upper and lower tier municipalities. Major updates and adjustments to planning projections should be continued to be communicated as this may affect project details such as trigger timelines and design capacities, which is discussed further in **Section F.8.5**.

One initiative that will be predominately driven by the LAMs is wet weather management. While wet weather management should be completed in all municipalities, this 2021 MSPU assumes that the catchments where the peak wet weather flows exceed the peak design flows and contribute to increased risk of basement flooding or overflows will put a specific focus on wet weather management.

Additional flow monitoring and system data collection, in partnership with LAM, is needed to improve system understanding, support proposed wet weather flow reductions, and identify opportunities for system optimization and overflow removals.

F.8.4 Sustainability Projects

It is important to recognize that the 2021 MSPU servicing strategies identify new infrastructure to service the additional growth out to year 2051 but these strategies are built by extending infrastructure from the existing systems and leveraging the existing Region infrastructure in place. It is essential that the existing infrastructure is maintained in good condition and performance to support servicing growth.

The Region continually establishes and implements a sustainability program that addresses priority projects to ensure the existing infrastructure is in a state-of-good-repair and continues to perform and meet the intended level of services. Region-wide programs including but not limited to replacement programs for pipes and manholes, boilers, meters, generators, SCADA upgrades, sludge management programs, laboratory and sampling equipment upgrades, process electrical, process instrumentation. Pump station upgrades through the sustainability capital plan re-establish the SPS ECA capacity.

Independent of the 2021 MSPU, the Region has completed a sustainability program analysis to identify the projects on a yearly basis, with focus on a 10 year program, to address the sustainability needs. This Sustainability Capital Plan is first developed to demonstrate the total investment needs and may identify a level of investment and implementation exceeding Region resources. The next steps for the Sustainability Capital Plan will be the development of the Financial Plan for existing Water and Wastewater assets which is anticipated to be completed in 2024. It should be noted that the Sustainability Capital Plan represents investment required over and above the growth-related 2021 MSPU program.

Niagara Falls system specific projects include:

- Drummond Road SPS upgrade
- Mewburn SPS upgrade
- Rolling Acres SPS and forcemain upgrade
- Portage Trunk sewer
- South Side Low Lift forcemain rehabilitation/replacement
- Niagara Falls WWTP upgrades including raw sewage SPS works, screening upgrades, primary and secondary treatment upgrades, HVAC, maintenance building and, administration building replacements.
- Centre Street SPS Upgrades (South Thorold)

F.8.5 Project Implementation Flow Chart

The recommended design capacities within the growth capital program are based on the best available information at the time of analysis, including existing system flows, facility capacities, and projected growth. It is understood that this data is not static and often changes over the years between the regular updates of the Region’s Master Plan and between those updates. Design assumptions should be revisited before initiation of all projects to reconfirm the appropriate design capacities, along with identification of any associated or dependent projects which can be combined or staged to optimize implementation efficiency and cost, and/or system operation.

To support the Region's process in implementing all recommended 2021 MSPU capital projects, the following flow chart has been developed for the wastewater system. This flow chart document is intended to be a reference resource for the Region and should be treated as a guideline to support existing internal Region processes in project implementation.

The wastewater implementation flow chart is shown in **Figure 4.F.16.**

Niagara Region

WASTEWATER PROJECT IMPLEMENTATION

The intent of this document is to support the Region in confirming the scope of work for wastewater infrastructure projects.

CONFIRM PROJECT SCOPE

To define Terms of Reference

☐ **What triggered this project?**
- Known development growth
- Forecasted growth
- Sustainability needs

☐ **Are there related or dependent projects that should be identified for streamlining opportunities or for project phasing?**
- Are there upstream projects with increasing capacity?
- Are there projects within the same alignment or project area that could be combined? (e.g., growth projects, SPS, forcemain, sewer, corridor planning, sustainability projects, water, stormwater, etc.)
- If there are related projects, could the project timing be adjusted to combine or stage projects more efficiently?

☐ **What is the project EA Schedule and status?**

☐ **Are there historic or ongoing operational issues in the project area?**
- Confirm with Regional and LAM operations and maintenance groups
- i.e. historic overflows, low flow/odour issues, clogging issues, work order history, etc.

☐ **Are there any data gaps that should be incorporated into the Terms of Reference?**
- Refer to the Required Data section below for details
- How much does the project timeline and budget need to change to allow for the data collection?

☐ **Have the planning projections been updated to the best available information?**
- Consultation with Region and LAM planning groups to confirm planning projection
- Are projected needs for the project in place? Is actual growth in line with projected growth?)

☐ **Should the project be deferred until identified related works are completed?**

REQUIRED DATA

To support terms of reference and detailed design

☐ **Recently completed EA or servicing study**

(for growth triggered projects)

☐ **Historic flow records**
- Within the last 3 years
- Ideally one full year of flow monitoring data that covers 80% of the total contributing area
- Can be included in project scope if feasible

☐ **Existing pump, flow, and pressure data to identify/verify existing system issues**

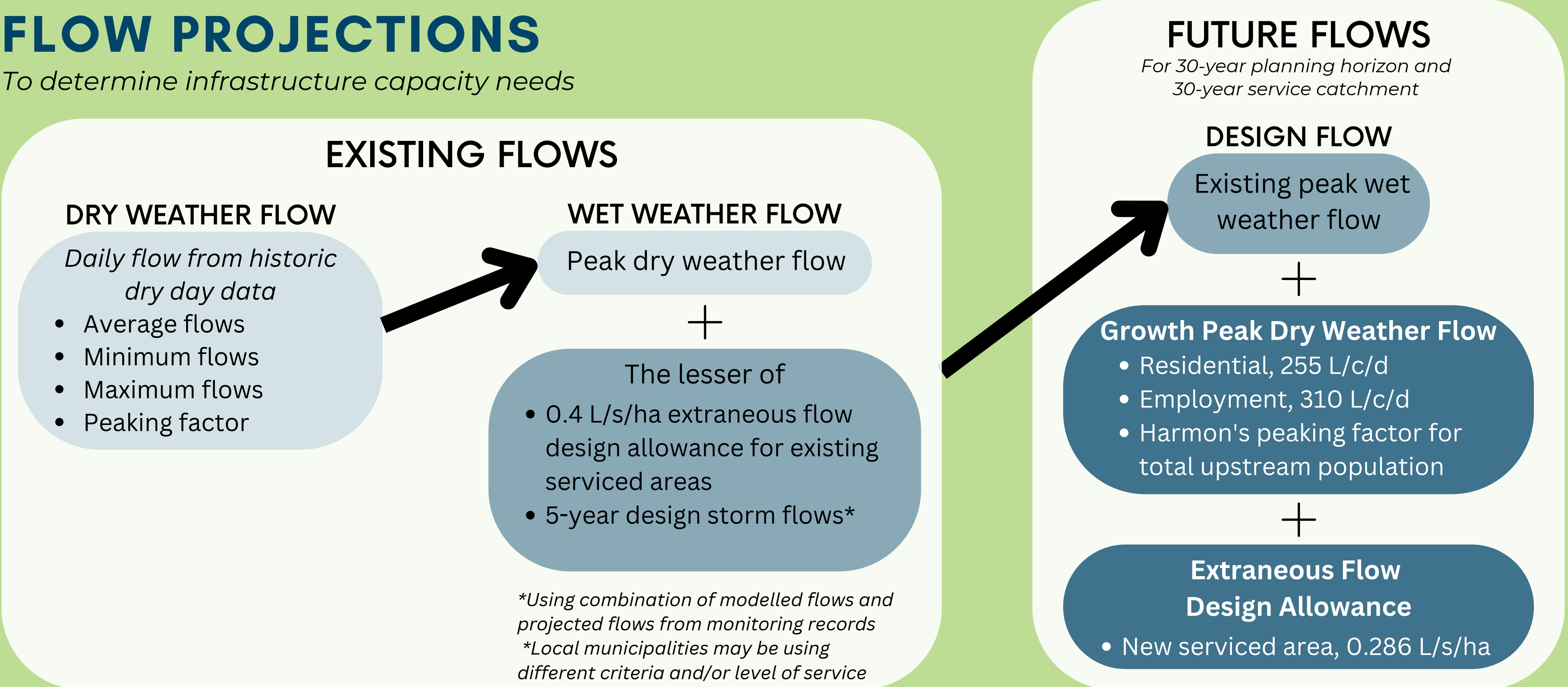
☐ **Asset inventory and condition assessment**
- All asset classes within the infrastructure type (sewer, forcemain, storage, pumping, or treatment facility)
- Within the last 5 years
- Can be part of project scope if the data is not available and would not significantly alter project scope - to assess need for related works (i.e. electrical, HVAC, structural upgrades at an SPS)

☐ **Service area growth potential to confirm projected population and demands**
- Consultation with Region and LAM planning groups within the past year
- Growth information for 30-year horizon and beyond (maximum service catchment)
  - Population, jobs, land use, area
  - Current inventory of development areas with associated development status

IF THE REQUIRED DATA IS NOT AVAILABLE AND IF IT HAS THE POTENTIAL TO SIGNIFICANTLY ALTER SCOPE OF THE DESIGN, IT IS STRONGLY RECOMMENDED THAT THE APPROPRIATE DATA COLLECTION AND FIELD INVESTIGATION BE COMPLETED PRIOR TO PROCEEDING WITH DESIGN. ALTERNATIVELY, WHERE FEASIBLE, DATA COLLECTION SHOULD BE INCLUDED IN THE PROJECT SCOPE AND INTEGRATED INTO THE DESIGN PROCESS.

FLOW PROJECTIONS

To determine infrastructure capacity needs



EXISTING FLOWS

DRY WEATHER FLOW

Daily flow from historic dry day data
- Average flows
- Minimum flows
- Maximum flows
- Peaking factor

WET WEATHER FLOW

Peak dry weather flow

+

The lesser of
- 0.4 L/s/ha extraneous flow design allowance for existing serviced areas
- 5-year design storm flows*

*Using combination of modelled flows and projected flows from monitoring records
*Local municipalities may be using different criteria and/or level of service

FUTURE FLOWS

For 30-year planning horizon and 30-year service catchment

DESIGN FLOW

Existing peak wet weather flow

+

Growth Peak Dry Weather Flow
- Residential, 255 L/c/d
- Employment, 310 L/c/d
- Harmon's peaking factor for total upstream population

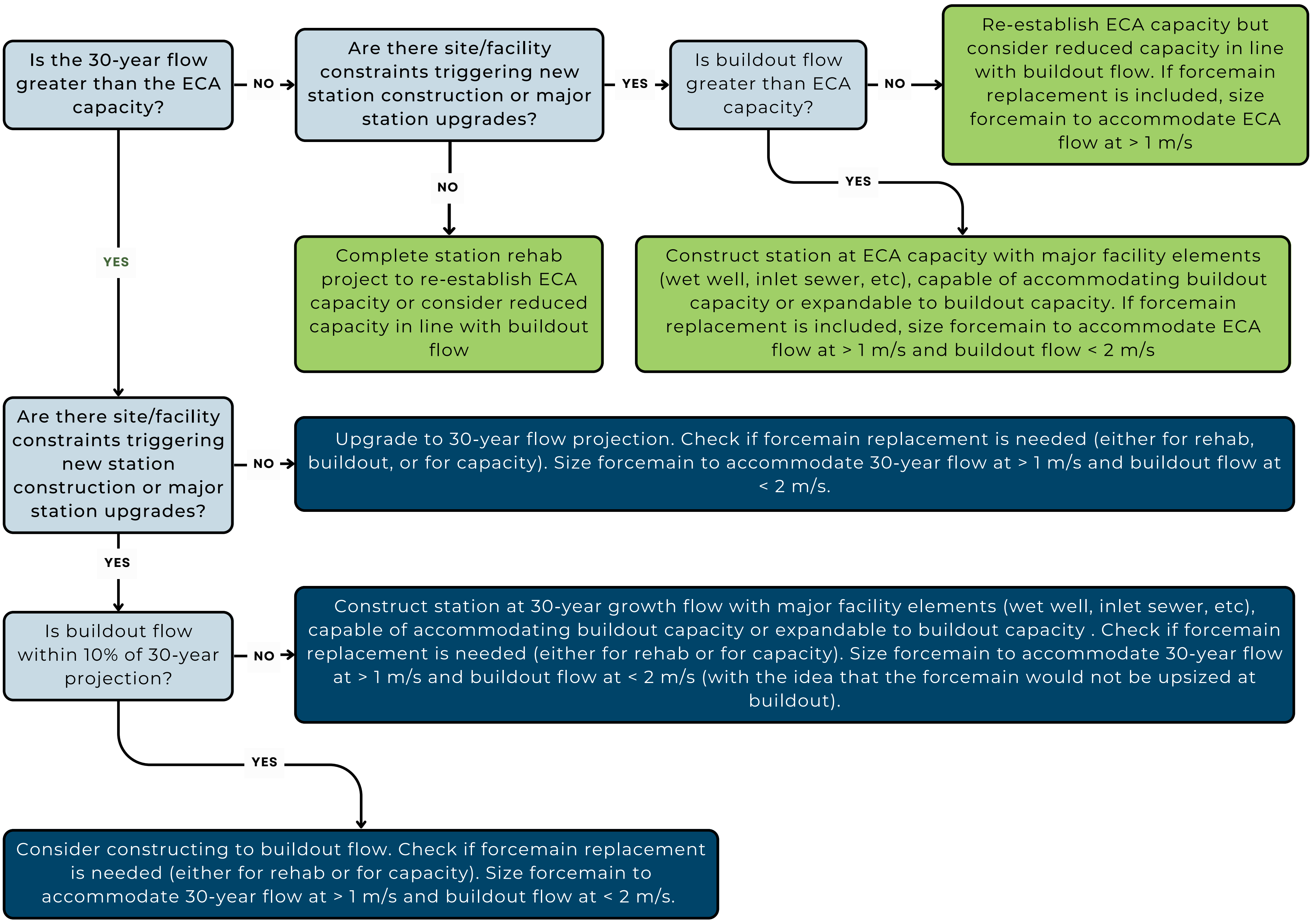
+

Extraneous Flow Design Allowance
- New serviced area, 0.286 L/s/ha

The design criteria presented in this document are based on the 2021 Master Servicing Plan Update Study

BluePlan ENGINEERING

SEWAGE PUMPING STATIONS



Is the 30-year flow greater than the ECA capacity?

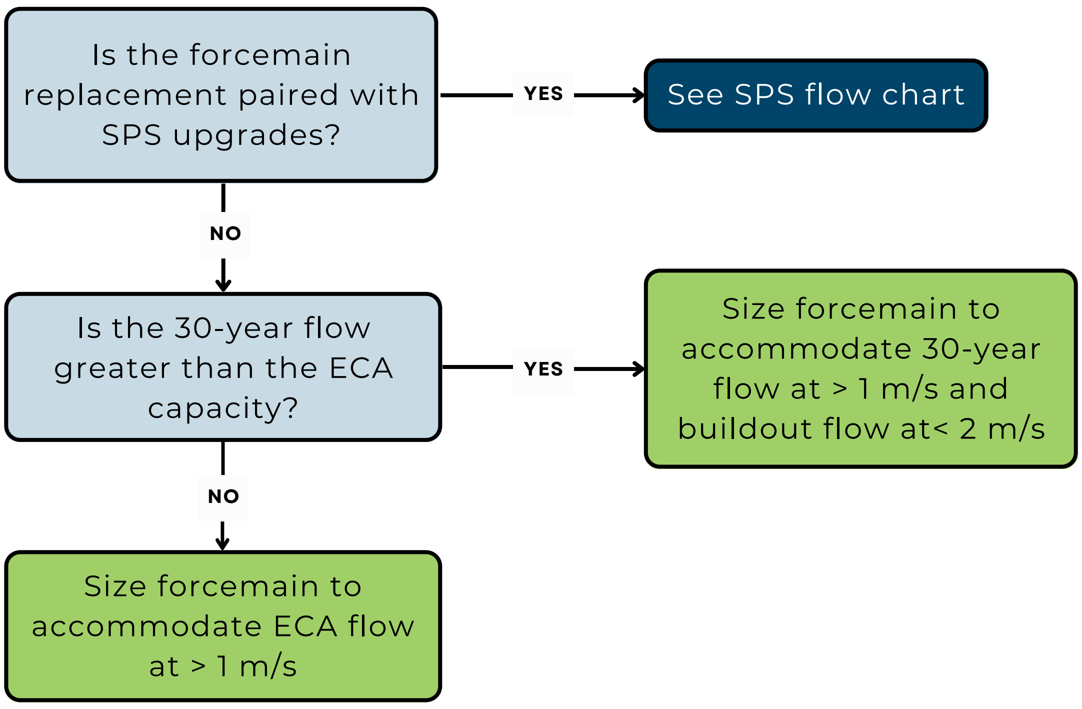
NO → Are there site/facility constraints triggering new station construction or major station upgrades?

- NO → Complete station rehab project to re-establish ECA capacity or consider reduced capacity in line with buildout flow
- YES → Is buildout flow greater than ECA capacity?
  - NO → Re-establish ECA capacity but consider reduced capacity in line with buildout flow. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s
  - YES → Construct station at ECA capacity with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s and buildout flow < 2 m/s

YES → Are there site/facility constraints triggering new station construction or major station upgrades?

- NO → Upgrade to 30-year flow projection. Check if forcemain replacement is needed (either for rehab, buildout, or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.
- YES → Is buildout flow within 10% of 30-year projection?
  - NO → Construct station at 30-year growth flow with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity . Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s (with the idea that the forcemain would not be upsized at buildout).
  - YES → Consider constructing to buildout flow. Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

FORCEMAINS



Is the forcemain replacement paired with SPS upgrades?

- YES → See SPS flow chart
- NO → Is the 30-year flow greater than the ECA capacity?
  - YES → Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at< 2 m/s
  - NO → Size forcemain to accommodate ECA flow at > 1 m/s

F.8.6 Detailed Project Costing Sheets

The detailed project costing sheets for the recommended 2021 MSPU capital projects within the Niagara Falls WWTP system are presented below.

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-FM-009**
PROJECT NAME: **Dorchester Forcemain Upgrade**
PROJECT DESCRIPTION: Replace Existing 350 mm Dorchester SPS Forcemain with new single 500 mm forcemain in Niagara Falls.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-FM-009**

Pump Station	**WW-SPS-026**	
ECA	235	1.20
Proposed	345	1.76
Buildout	345	1.76
Number of Pumps	3	0.88

PROPOSED DIAMETER:	500 mm	
TOTAL LENGTH:	50 m	
Tunnelled		0%
Open Cut	50 m	100%

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Forcemain

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	50 m	$1,216	$60,797	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$6,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	20%					$12,159	
Minor Creek Crossings			ea.	1	$230,000	$230,000	Cost for connection to existing Interceptor sewer
Major Creek Crossings			ea.	0	$1,049,000	$0	
Road Crossings			ea.	0	$482,000	$0	
Major Road Crossings (Highway)			ea.	0	$1,049,000	$0	
Utility Crossings			ea.	0	$482,000	$0	
Updated Soils Regulation Uplift	2%					$1,216	
Additional Construction Costs	20%		ea.			$60,834	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$36,501	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$402,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$8,000	
Geotechnical Sub-Total Cost						**$8,000**	
Property Requirements	2.0%					$ 8,000	
Property Requirements Sub-Total						**$8,000**	
Consultant Engineering/Design	15%					$ 60,300	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$60,300**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	25%					$130,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$130,000**	
Non-Refundable HST	1.76%					$10,700	
Non-Refundable HST Sub-Total						**$10,700**	
Total (2022 Dollars)						**$659,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$659,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$13,180		
Design	Design fees, Town fees for design, contract admin	13%	$85,670		
Construction	Town fees, base costs and project contingency	85%	$560,150		
TOTAL			$659,000		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-FM-010**
PROJECT NAME: **St. Davids #1 Forcemain Upgrade**
PROJECT DESCRIPTION: Replace existing 200 mm St. Davids #1 Forcemain with new single 400 mm in Niagara-on-the-Lake

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-FM-010**

Pump Station	**WW-SPS-032**	
ECA	41	0.33
Proposed	174	1.38
Buildout	174	1.38
Number of Pumps	2	1.38

PROPOSED DIAMETER:	400 mm	
TOTAL LENGTH:	2030 m	
Tunnelled		0%
Open Cut	2030 m	100%

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Forcemain

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	2030 m	$965	$1,958,350	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$6,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	20%					$391,670	
Minor Creek Crossings			ea.	2	$211,000	$422,000	
Major Creek Crossings			ea.	0	$1,030,000	$0	
Road Crossings			ea.	0	$463,000	$0	
Major Road Crossings (Highway)			ea.	0	$1,030,000	$0	
Utility Crossings			ea.	0	$463,000	$0	
Updated Soils Regulation Uplift	2%					$39,167	
Additional Construction Costs	20%		ea.			$562,237	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$337,342	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$3,711,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$74,200	
Geotechnical Sub-Total Cost						**$74,200**	
Property Requirements	2.0%					$ 74,200	
Property Requirements Sub-Total						**$74,200**	
Consultant Engineering/Design	15%					$ 556,700	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$556,700**	
In House Labour/Engineering/Wages/CA	4.0%					$ 148,440	
In-house Labour/Wages Sub-Total						**$148,440**	
Project Contingency	25%					$1,141,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$1,141,000**	
Non-Refundable HST	1.76%					$97,800	
Non-Refundable HST Sub-Total						**$97,800**	
Total (2022 Dollars)						**$5,803,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$5,803,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$116,060		
Design	Design fees, Town fees for design, contract admin	13%	$754,390		
Construction	Town fees, base costs and project contingency	85%	$4,932,550		
TOTAL			**$5,803,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-FM-024**
PROJECT NAME:	**St. David's #2 Forcemain Upgrade**
PROJECT DESCRIPTION:	Replace existing 250 mm St David's #2 SPS forcemain with new single 400 mm in Niagara Falls

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-FM-024

PROPOSED DIAMETER:	400 mm	
TOTAL LENGTH:	1420 m	
Tunnelled		0%
Open Cut	1420 m	100%

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Forcemain

Pump Station	**WW-SPS-031**	
ECA	44	0.35
Proposed	202	1.61
Buildout	202	1.61
Number of Pumps	2	1.61
		0.8 if 3 pumps

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	1420 m	$965	$1,369,880	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$6,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	20%					$273,976	
Minor Creek Crossings			ea.	0	$211,000	$0	
Major Creek Crossings			ea.	0	$1,030,000	$0	
Road Crossings			ea.	1	$463,000	$463,000	
Major Road Crossings (Highway)			ea.	1	$1,030,000	$1,030,000	Highway Crossing
Utility Crossings			ea.	0	$463,000	$0	
Updated Soils Regulation Uplift	2%					$27,398	
Additional Construction Costs	15%		ea.			$474,638	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$363,889	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$4,003,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$40,000	
Geotechnical Sub-Total Cost						**$40,000**	
Property Requirements	1.5%					$ 60,000	
Property Requirements Sub-Total						**$60,000**	
Consultant Engineering/Design	15%					$ 600,500	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$600,500**	
In House Labour/Engineering/Wages/CA	4.0%					$ 160,120	
In-house Labour/Wages Sub-Total						**$160,120**	
Project Contingency	15%					$730,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$730,000**	
Non-Refundable HST	1.76%					$95,600	
Non-Refundable HST Sub-Total						**$95,600**	
Total (2022 Dollars)						**$5,689,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$5,689,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$113,780		
Design	Design fees, Town fees for design, contract admin	13%	$739,570		
Construction	Town fees, base costs and project contingency	85%	$4,835,650		
TOTAL			**$5,689,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PL
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-II-017**
PROJECT NAME:	**Region Wide Wet weather Reduction**
PROJECT DESCRIPTION:	Wet weather reduction program in all systems to be executed from 2022-2051

Old ID		**Focus Areas**	Amount
_WW-II-001	Anger Ave WWTP	Lakeshore Road, Catharine Street, Dominion Road, Rose Avenue SPS, Anger Ave WWTP Catchments	
_WW-II-002	Crystal Beach WWTP	Nigh Road SPS and Crystal Beach WWTP Catchments	
_WW-II-003	Stevensville Douglastown	Stevensville, Douglastown catchments	
_WW-II-004	Welland WWTP	Feeder Road, Seaway Heights, Ontario Road SPS, Dain City, and Welland WWTP Catchments	
_WW-II-005	Baker - Grimsby	Woodsview, Biggar Lagoon, Old Orchard SPS Catchments	
_WW-II-006	Baker - Lincoln Beamsville	Ontario Street SPS Catchment	
_WW-II-007	Baker - Lincoln Vineland	Wet weather reduction in Jordan Valley***	
_WW-II-008	Port Dalhousie	Eastchester, Lakeside, Argyle, Renown SPS and Port Dalhousie WWTP Catchments	
_WW-II-009	Port Weller/Port Dalhousie	Wet weather reduction in North Thorold	
_WW-II-010	Port Weller	Haulage Road, Carlton Street SPS, and Port Weller WWTP Catchments	
_WW-II-011	Seaway WWTP	Union, Clarke Street, Arena, Elm Street, City Hall, Sugarloaf, Rosemount North and South SPS Catchments	
_WW-II-012	Niagara Falls WWTP	Central, Muddy Run, Seneca, Meadowvale, Drummond, Kalar Road SPS Catchments	
_WW-II-013	South Niagara Falls WWTP	South Side High Lift and South Side Low Lift SPS Catchments	
_WW-II-014	NOTL	Wet weather reduction in Northeast Niagara-on-the-Lake	
_WW-II-015	NOTL	Wet weather reduction in Virgil - NOTL	
_WW-II-016	Baker - West Lincoln	Wet weather reduction in West Lincoln - Baker	

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-026**

PROJECT NAME: **Dorchester SPS Pump Replacement**

PROJECT DESCRIPTION: Increase station capacity from 185 L/s to 345 L/s by replacing the existing three pumps.
Use implementation plan prior to upgrade: Flow monitoring, validate wet weather flows, re-evaluate required upgrades

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-026**

	L/s
ECA	235.0
Operational	185.0

PROPOSED CAPACITY		345 L/s	Firm Capacit
Design PWWF	**Existing**	304 L/s	445 L/s
	2051	330 L/s	470 L/s
	Buildout	345 L/s	483 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	110	172.4
2	110	172.4
3	110	172.4

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s			$2,100,000	$700k per pump, replace existing 3 pumps
Related Upgrades	30%					$630,000	
Bypass Pumping Allowance	6%					$150,150	
Additional Construction Costs	15%		ea.			$432,023	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$331,217	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$3,643,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$0	
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 546,500	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$546,500**	
In House Labour/Engineering/Wages/CA	4.0%					$ 145,720	
In-house Labour/Wages Sub-Total						**$145,720**	
Project Contingency	15%					$650,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$650,000**	
Non-Refundable HST	1.76%					$85,200	
Non-Refundable HST Sub-Total						**$85,200**	
Total (2022 Dollars)						**$5,070,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$5,070,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$101,400		
Design	Design fees, Town fees for design, contract admin	13%	$659,100		
Construction	Town fees, base costs and project contingency	85%	$4,309,500		
TOTAL			**$5,070,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-031**

PROJECT NAME: **St. Davids #2 SPS Upgrade**

PROJECT DESCRIPTION: Increase station capacity from 42 L/s to 202 L/s with a full station Reconstruction

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-031**

	L/s
ECA	43.6
Operational	42.9

PROPOSED CAPACITY		202 L/s	Firm Capacity
Design PWWF	**Existing**	113 L/s	99 L/s
	2051	189 L/s	175 L/s
	Buildout	202 L/s	189 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)*
1	42	202.0
2	42	202.0

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	202 L/s	$15,816	$3,194,931	Pumping station expansion at existing site, cost estimate based off unit rate applied to capacity increase
Related Upgrades	30%						
Bypass Pumping Allowance	6%					$175,721	
Additional Construction Costs	15%		ea.			$505,598	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$387,625	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$4,264,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$42,640	
Geotechnical Sub-Total Cost						**$42,640**	
Property Requirements	5.0%					$ 500,000	Region Special Uplift
Property Requirements Sub-Total						**$500,000**	
Consultant Engineering/Design	15%					$ 639,600	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$639,600**	
In House Labour/Engineering/Wages/CA	4.0%					$ 170,560	
In-house Labour/Wages Sub-Total						**$170,560**	
Project Contingency	15%					$843,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$843,000**	
Non-Refundable HST	1.76%					$110,700	
Non-Refundable HST Sub-Total						**$110,700**	
Total (2022 Dollars)						**$6,571,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$6,571,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$131,420		
Design	Design fees, Town fees for design, contract admin	13%	$854,230		
Construction	Town fees, base costs and project contingency	85%	$5,585,350		
TOTAL			**$6,571,000**		

PROJECT NO.:	**WW-SPS-032**
PROJECT NAME:	**St. Davids #1 SPS Upgrade**
PROJECT DESCRIPTION:	Increase station capacity from 29 L/s to 174 L/s. with a full station Reconstruction

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-032**

	L/s
ECA	40.9
Operational	28.8

PROPOSED CAPACITY	174 L/s	Firm capacity
Design PWWF Existing	98 L/s	86 L/s
2051	172 L/s	160 L/s
Buildout	174 L/s	163 L/s
	RDII	**5Y Design**

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	29	174.0
2	29	174.0

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	174 L/s	$15,816	$2,752,069	Pumping station expansion at existing site, cost estimate based off unit rate applied to capacity increase
Related Upgrades	30%						
Bypass Pumping Allowance	6%					$151,364	
Additional Construction Costs	15%		ea.			$435,515	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$333,895	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$3,673,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$36,730	
Geotechnical Sub-Total Cost						**$36,730**	
Property Requirements	5.0%					$ 500,000	Region Special Uplift
Property Requirements Sub-Total						**$500,000**	
Consultant Engineering/Design	15%					$ 551,000	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$551,000**	
In House Labour/Engineering/Wages/CA	4.0%					$ 146,920	
In-house Labour/Wages Sub-Total						**$146,920**	
Project Contingency	15%					$736,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$736,000**	
Non-Refundable HST	1.76%					$96,700	
Non-Refundable HST Sub-Total						**$96,700**	
Total (2022 Dollars)						**$5,740,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$5,740,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$114,800		
Design	Design fees, Town fees for design, contract admin	13%	$746,200		
Construction	Town fees, base costs and project contingency	85%	$4,879,000		
TOTAL			**$5,740,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SPS-050**
PROJECT NAME:	**Bender Hill SPS Pump Replacement**
PROJECT DESCRIPTION:	Full station replacement at new location from 237 L/s to re-establish 330 L/s ECA capacity.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-050**

	L/s
ECA	330.0
Operational	237.0

PROPOSED CAPACITY		330 L/s	Firm Capacity
Design PWWF	**Existing**	206 L/s	450 L/s
	2051	249 L/s	493 L/s
	Buildout	252 L/s	496 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	79	110.0
2	79	110.0
3	79	110.0
4	79	110.0

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	330 L/s	$15,816	$5,219,441	Full station replacement, per EA recommendation
Related Upgrades	30%					$1,565,832	Location uplift
Bypass Pumping Allowance	7%					$474,969	
Additional Construction Costs	20%		ea.			$1,452,048	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$871,229	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$9,584,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$191,680	
Geotechnical Sub-Total Cost						**$191,680**	
Property Requirements	5.0%					$479,200	
Property Requirements Sub-Total						**$479,200**	
Consultant Engineering/Design	15%					$ 1,437,600	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$1,437,600**	
In House Labour/Engineering/Wages/CA	3.0%					$ 287,520	
In-house Labour/Wages Sub-Total						**$287,520**	
Project Contingency	25%					$2,995,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$2,995,000**	
Non-Refundable HST	1.76%					$258,500	
Non-Refundable HST Sub-Total						**$258,500**	
Total (2022 Dollars)						**$15,234,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$15,234,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$304,680		
Design	Design fees, Town fees for design, contract admin	13%	$1,980,420		
Construction	Town fees, base costs and project contingency	85%	$12,948,900		
TOTAL			**$15,234,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SPS-051**
PROJECT NAME:	**Central SPS Pump Replacement**
PROJECT DESCRIPTION:	Increase station capacity from 800 L/s to re-establish 1000 L/s ECA capacity by replacing the existing five pumps.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-051**

	L/s
ECA	1,000.0
Operational	800.0

PROPOSED CAPACITY		1000 L/s	Firm Capacity
Design PWWF	**Existing**	738 L/s	5760 L/s
	2051	900 L/s	5923 L/s
	Buildout	906 L/s	5927 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	200	250.0
2	200	250.0
3	200	250.0
4	200	250.0
5	200	250.0

COST ESTIMATION

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	1000 L/s	$15,816	$4,500,000	$900k per pump, replace existing 5 pumps
Related Upgrades	30%					$1,350,000	
Bypass Pumping Allowance	6%					$321,750	
Additional Construction Costs	15%		ea.			$925,763	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$709,751	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$7,807,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 1,171,100	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$1,171,100**	
In House Labour/Engineering/Wages/CA	3.0%					$ 234,210	
In-house Labour/Wages Sub-Total						**$234,210**	
Project Contingency	15%					$1,382,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$1,382,000**	
Non-Refundable HST	1.76%					$182,300	
Non-Refundable HST Sub-Total						**$182,300**	
Total (2022 Dollars)						**$10,777,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$10,777,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$215,540		
Design	Design fees, Town fees for design, contract admin	13%	$1,401,010		
Construction	Town fees, base costs and project contingency	85%	$9,160,450		
TOTAL			**$10,777,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-052**

PROJECT NAME: **Lundy's Lane SPS Pump Replacement**

PROJECT DESCRIPTION: Increase station capacity from 56 L/s to re-establish 98 L/s ECA capacity by replacing the existing three pumps.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-052**

	L/s
ECA	98.4
Operational	56.3

PROPOSED CAPACITY		98 L/s	Firm Capacity
Design PWWF	**Existing**	50 L/s	150 L/s
	2051	66 L/s	166 L/s
	Buildout	69 L/s	169 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	28.2	49.2
2	28.2	49.2
3	28.2	49.2

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	98 L/s	$27,983	$1,275,000	$425k per pump, replace existing three pumps
Related Upgrades	30%					$382,500	
Bypass Pumping Allowance	6%					$91,163	
Additional Construction Costs	15%		ea.			$262,299	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$201,096	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$2,212,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 331,800	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$331,800**	
In House Labour/Engineering/Wages/CA	4.0%					$ 88,480	
In-house Labour/Wages Sub-Total						**$88,480**	
Project Contingency	15%					$395,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$395,000**	
Non-Refundable HST	1.76%					$51,700	
Non-Refundable HST Sub-Total						**$51,700**	
Total (2022 Dollars)						**$3,079,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$3,079,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$61,580		
Design	Design fees, Town fees for design, contract admin	13%	$400,270		
Construction	Town fees, base costs and project contingency	85%	$2,617,150		
TOTAL			**$3,079,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-053**

PROJECT NAME: **Royal Manor SPS Pump Replacement**

PROJECT DESCRIPTION: Increase station capacity from 9 L/s to 16 L/s by replacing existing two pumps

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-053**

	L/s
ECA	10.5
Operational	8.8

PROPOSED CAPACITY		16 L/s	Firm Capacity
Design PWWF	**Existing**	15 L/s	22 L/s
	2051	15 L/s	22 L/s
	Buildout	15 L/s	22 L/s
		RDII	5Y Design

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	9	16
2	9	16

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	16 L/s	$27,983	$500,000	$250k per pump, replace two existing pumps
Related Upgrades	30%					$150,000	
Bypass Pumping Allowance	6%					$35,750	
Additional Construction Costs	15%		ea.			$102,863	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$78,861	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$867,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 130,100	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$130,100**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	15%					$156,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$156,000**	
Non-Refundable HST	1.76%					$20,300	
Non-Refundable HST Sub-Total						**$20,300**	
Total (2022 Dollars)						**$1,213,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$1,213,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$24,260		
Design	Design fees, Town fees for design, contract admin	13%	$157,690		
Construction	Town fees, base costs and project contingency	85%	$1,031,050		
TOTAL			**$1,213,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: WW-TP-005
PROJECT NAME: Region-wide WWTP Process Upgrades
PROJECT DESCRIPTION: Process upgrades to re-establish ECA capacity

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-TP-005

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$50,000,000**	Placeholder Costs
Chosen Estimate						**$50,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$1,000,000		
Design	Design fees, Town fees for design, contract admin	13%	$6,500,000		
Construction	Town fees, base costs and project contingency	85%	$42,500,000		
TOTAL			**$50,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-TP-005**
PROJECT NAME:	**Region-wide WWTP Process Upgrades**
PROJECT DESCRIPTION:	Upgrades for odour control across the Region at forcemains, pump stations, and other locations.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$40,000,000**	Placeholder Costs
Chosen Estimate						**$40,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$800,000		
Design	Design fees, Town fees for design, contract admin	13%	$5,200,000		
Construction	Town fees, base costs and project contingency	85%	$34,000,000		
TOTAL			**$40,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-ST-001**
PROJECT NAME:	**Region Wide Flow Monitoring and Data Collection**
PROJECT DESCRIPTION:	Funding to support flow monitoring and data collection initiatives

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-ST-001**

PROPOSED CAPACITY	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction							
Additional Construction Costs	10%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ -	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$0**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	10%					$4,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$4,000**	
Non-Refundable HST	1.76%					$100	
Non-Refundable HST Sub-Total						**$100**	
Total (2022 Dollars)						**$44,000**	Rounded to nearest $1,000
Other Estimate						**$12,000,000**	Assumes 400k/year for 30 y
Chosen Estimate						**$12,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$240,000		
Design	Design fees, Town fees for design, contract admin	13%	$1,560,000		
Construction	Town fees, base costs and project contingency	85%	$10,200,000		
TOTAL			**$12,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-FM-005**
PROJECT NAME:	**New Peel Street SPS Forcemain**
PROJECT DESCRIPTION:	New 400 mm Peel Street SPS Forcemain in Thorold from station to Black Horse SPS

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Rural	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-FM-005**

Pump Station	**WW-SPS-058**	
ECA	252	2.01
Proposed	252	2.01
Buildout	252	2.01
Number of Pumps	3	1.00

PROPOSED DIAMETER:	400 mm	
TOTAL LENGTH:	2000 m	
Tunnelled	0 m	0%
Open Cut	2000 m	100%

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Forcemain

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	2000 m	$965	$1,929,409	Peel Street to Black Horse
Pipe Construction - Tunneling			m	0 m	$6,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	0%					$0	
Minor Creek Crossings			ea.	1	$211,000	$211,000	Beaver Creek at Peel Street
Major Creek Crossings			ea.	0	$1,030,000	$0	
Road Crossings			ea.	1	$463,000	$463,000	Rail
Major Road Crossings (Highway)			ea.	0	$1,030,000	$0	
Utility Crossings			ea.	0	$463,000	$0	
Updated Soils Regulation Uplift	2%					$38,588	
Additional Construction Costs	15%		ea.			$396,300	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$303,830	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$3,342,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$33,400	
Geotechnical Sub-Total Cost						**$33,400**	
Property Requirements	1.5%					$ 50,100	
Property Requirements Sub-Total						**$50,100**	
Consultant Engineering/Design	15%					$ 501,300	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$501,300**	
In House Labour/Engineering/Wages/CA	4.0%					$ 133,680	
In-house Labour/Wages Sub-Total						**$133,680**	
Project Contingency	15%					$609,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$609,000**	
Non-Refundable HST	1.76%					$79,800	
Non-Refundable HST Sub-Total						**$79,800**	
Total (2022 Dollars)						**$4,749,000**	Rounded to nearest $1,000
Other Estimate						**$5,061,524**	SNF EA 2021 Estimate, revised by Region Finance (2022-02-25)
Chosen Estimate						**$5,062,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$101,240		
Design	Design fees, Town fees for design, contract admin	13%	$658,060		
Construction	Town fees, base costs and project contingency	85%	$4,302,700		
TOTAL			**$5,062,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-FM-006**
PROJECT NAME: **New Black Horse Forcemain to Niagara Falls**
PROJECT DESCRIPTION: New Black Horse Forcemain to New South Niagara Falls Trunk on Barron Road to the Montrose Trunk Sewer

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Rural	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-FM-006**

Pump Station	**WW-SPS-028**	
ECA	70	0.56
Proposed	180	1.43
Buildout	356	2.84
Number of Pumps	3	0.72

PROPOSED DIAMETER:	400 mm	
TOTAL LENGTH:	2665 m	
Tunnelled		0%
Open Cut	2665 m	100%

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Forcemain

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	2665 m	$965	$2,570,937	Forcemain to new SNF Trunk sewer on Barron Road
Pipe Construction - Tunneling			m	0 m	$6,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	0%					$0	
Minor Creek Crossings			ea.	0	$211,000	$0	
Major Creek Crossings			ea.	0	$1,030,000	$0	
Road Crossings			ea.	1	$463,000	$463,000	Highway 20
Major Road Crossings (Highway)			ea.		$1,030,000	$0	
Utility Crossings			ea.	0	$463,000	$0	
Updated Soils Regulation Uplift	2%					$51,419	
Additional Construction Costs	10%		ea.			$308,536	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$339,389	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$3,733,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$37,300	
Geotechnical Sub-Total Cost						**$37,300**	
Property Requirements	1.0%					$ 37,300	
Property Requirements Sub-Total						**$37,300**	
Consultant Engineering/Design	15%					$ 560,000	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$560,000**	
In House Labour/Engineering/Wages/CA	4.0%					$ 149,320	
In-house Labour/Wages Sub-Total						**$149,320**	
Project Contingency	10%					$452,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$452,000**	
Non-Refundable HST	1.76%					$84,800	
Non-Refundable HST Sub-Total						**$84,800**	
Total (2022 Dollars)						**$5,054,000**	Rounded to nearest $1,000
Other Estimate						**$2,839,386**	SNF EA 2021 Estimate, revised by Region Finance (2022-02-25)
Chosen Estimate						**$2,839,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$56,780		
Design	Design fees, Town fees for design, contract admin	13%	$369,070		
Construction	Town fees, base costs and project contingency	85%	$2,413,150		
TOTAL			$2,839,000		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SS-006**
PROJECT NAME:	**New Montrose Trunk Sewer**
PROJECT DESCRIPTION:	New tunneled trunk sewer on Montrose conveying flows from South Side High Lift SPS to the new South Niagara Falls WWTP

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-SS-006

PROPOSED DIAMETER:	1500 mm	
TOTAL LENGTH:	5635 m	
Tunnelled	5635 m	100%
Open Cut	0 m	0%

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Tunnel

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	0 m	$0	$0	Existing road ROW
Pipe Construction - Tunneling			m	5635 m	$13,000	$73,255,000	
Pipe Construction Uplift (Based on Area Conditions)	20%					$0	
Minor Creek Crossings			ea.	0	$0	$0	
Major Creek Crossings			ea.	0	$0	$0	
Road Crossings			ea.	0	$0	$0	Rail
Major Road Crossings (Highway)			ea.	0	$0	$0	
Utility Crossings			ea.	0	$0	$0	
Updated Soils Regulation Uplift	2%					$1,465,100	
Additional Construction Costs	15%		ea.			$11,208,015	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$8,592,812	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$94,521,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$945,200	
Geotechnical Sub-Total Cost						**$945,200**	
Property Requirements	1.5%					$ 1,417,800	
Property Requirements Sub-Total						**$1,417,800**	
Consultant Engineering/Design	10%					$ 9,452,100	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$9,452,100**	
In House Labour/Engineering/Wages/CA	2.5%					$ 2,363,025	
In-house Labour/Wages Sub-Total						**$2,363,025**	
Project Contingency	15%					$16,305,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$16,305,000**	
Non-Refundable HST	1.76%					$2,158,500	
Non-Refundable HST Sub-Total						**$2,158,500**	
Total (2022 Dollars)						**$127,163,000**	Rounded to nearest $1,000
Other Estimate						**$88,621,348**	SNF EA 2021 Estimate, revised by Region Finance (2022-02-25)
Chosen Estimate						**$88,622,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$1,772,440		
Design	Design fees, Town fees for design, contract admin	13%	$11,520,860		
Construction	Town fees, base costs and project contingency	85%	$75,328,700		
TOTAL			**$88,622,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SS-007**
PROJECT NAME:	**New Brown Road Trunk Sewer**
PROJECT DESCRIPTION:	Shallow gravity trunk from South Thorold to Garner SPS-South Niagara Falls trunk connection

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Rural	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SS-007**

PROPOSED DIAMETER:	600 mm	
TOTAL LENGTH:	4500 m	
Tunnelled		0%
Open Cut	4500 m	100%

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Sewer 5m

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	4500 m	$1,133	$5,098,344	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$6,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	0%					$0	
Minor Creek Crossings			ea.	3	$196,000	$588,000	
Major Creek Crossings			ea.	0	$1,015,000	$0	
Road Crossings			ea.	1	$448,000	$448,000	Rail
Major Road Crossings (Highway)			ea.	0	$1,015,000	$0	
Utility Crossings			ea.	0	$448,000	$0	
Updated Soils Regulation Uplift	2%					$101,967	
Additional Construction Costs	15%		ea.			$935,447	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$717,176	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$7,889,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$78,900	
Geotechnical Sub-Total Cost						**$78,900**	
Property Requirements	1.5%					$ 118,300	
Property Requirements Sub-Total						**$118,300**	
Consultant Engineering/Design	15%					$ 1,183,400	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$1,183,400**	
In House Labour/Engineering/Wages/CA	3.0%					$ 236,670	
In-house Labour/Wages Sub-Total						**$236,670**	
Project Contingency	15%					$1,426,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$1,426,000**	
Non-Refundable HST	1.76%					$188,200	
Non-Refundable HST Sub-Total						**$188,200**	
Total (2022 Dollars)						**$11,120,000**	Rounded to nearest $1,000
Other Estimate						**$16,764,213**	SNF EA 2021 Estimate, revised by Region Finance (2022-02-25)
Chosen Estimate						**$16,765,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$335,300		
Design	Design fees, Town fees for design, contract admin	13%	$2,179,450		
Construction	Town fees, base costs and project contingency	85%	$14,250,250		
TOTAL			**$16,765,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SS-008**
PROJECT NAME:	**Chippawa Trunk Sewer Phase 1**
PROJECT DESCRIPTION:	New tunneled 1200 mm trunk sewer from west of Lyon's Creek to South Niagara Falls WWTP

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-SS-008

PROPOSED DIAMETER:	1200 mm	
TOTAL LENGTH:	3520 m	
Tunnelled	3520 m	100%
Open Cut	0 m	0%

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Sewer 10m

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	0 m	$5,622	$0	Existing road ROW from SSLL SPS to Lyon's Creek Crossing
Pipe Construction - Tunneling			m	3520 m	$9,800	$34,496,000	
Pipe Construction Uplift (Based on Area Conditions)	20%					$0	
Minor Creek Crossings			ea.	0	$416,000	$0	
Major Creek Crossings			ea.	0	$1,690,000	$0	included to accommodate additional shafts that may not have been needed otherwise
Road Crossings			ea.	0	$808,000	$0	
Major Road Crossings (Highway)			ea.	0	$1,690,000	$0	
Utility Crossings			ea.	0	$808,000	$0	
Updated Soils Regulation Uplift	2%					$689,920	
Additional Construction Costs	15%		ea.			$5,277,888	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$4,046,381	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$44,510,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$445,100	
Geotechnical Sub-Total Cost						**$445,100**	
Property Requirements	1.5%					$ 667,700	
Property Requirements Sub-Total						**$667,700**	
Consultant Engineering/Design	12%					$ 5,341,200	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$5,341,200**	
In House Labour/Engineering/Wages/CA	2.5%					$ 1,112,750	
In-house Labour/Wages Sub-Total						**$1,112,750**	
Project Contingency	15%					$7,812,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$7,812,000**	
Non-Refundable HST	1.76%					$1,034,500	
Non-Refundable HST Sub-Total						**$1,034,500**	
Total (2022 Dollars)						**$60,923,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$60,923,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$1,218,460		
Design	Design fees, Town fees for design, contract admin	13%	$7,919,990		
Construction	Town fees, base costs and project contingency	85%	$51,784,550		
TOTAL			**$60,923,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SS-014**
PROJECT NAME:	**South Niagara Falls SSO Trunk**
PROJECT DESCRIPTION:	New sewer to eliminate overflows upstream of South Side High Lift SPS

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-SS-014

PROPOSED DIAMETER:		1050 mm	
TOTAL LENGTH:		880 m	
	Tunnelled	0 m	0%
	Open Cut	880 m	100%

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Sewer 5m

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	880 m	$2,233	$1,965,318	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$9,800	$0	
Pipe Construction Uplift (Based on Area Conditions)	20%					$393,064	
Minor Creek Crossings			ea.	0	$416,000	$0	
Major Creek Crossings			ea.	0	$1,690,000	$0	
Road Crossings			ea.	0	$808,000	$0	
Major Road Crossings (Highway)			ea.	0	$1,690,000	$0	
Utility Crossings			ea.	0	$808,000	$0	
Updated Soils Regulation Uplift	2%					$39,306	
Additional Construction Costs	15%		ea.			$359,653	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$275,734	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$3,033,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$30,300	
Geotechnical Sub-Total Cost						**$30,300**	
Property Requirements	1.5%					$ 45,500	
Property Requirements Sub-Total						**$45,500**	
Consultant Engineering/Design	15%					$ 455,000	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$455,000**	
In House Labour/Engineering/Wages/CA	4.0%					$ 121,320	
In-house Labour/Wages Sub-Total						**$121,320**	
Project Contingency	15%					$553,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$553,000**	
Non-Refundable HST	1.76%					$72,500	
Non-Refundable HST Sub-Total						**$72,500**	
Total (2022 Dollars)						**$4,311,000**	Rounded to nearest $1,000
Other Estimate						**$1,554,000**	SNF EA 2021 Estimate, revised by Region Finance (2022-02-25)
Chosen Estimate						**$1,554,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$31,080		
Design	Design fees, Town fees for design, contract admin	13%	$202,020		
Construction	Town fees, base costs and project contingency	85%	$1,320,900		
TOTAL			$1,554,000		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SS-015**
PROJECT NAME:	**Chippawa Trunk Sewer Phase 2**
PROJECT DESCRIPTION:	New tunneled 1200 mm trunk sewer from South Side Low Lift to west of Lyon's Creek

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-SS-015

PROPOSED DIAMETER:	1200 mm	
TOTAL LENGTH:	1220 m	
Tunnelled	1220 m	100%
Open Cut	0 m	0%

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Sewer 10m

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	0 m	$5,622	$0	Existing road ROW from SSLL SPS to Lyon's Creek Crossing
Pipe Construction - Tunneling			m	1220 m	$9,800	$11,956,000	
Pipe Construction Uplift (Based on Area Conditions)	20%					$0	
Minor Creek Crossings			ea.	0	$416,000	$0	
Major Creek Crossings			ea.	2	$1,690,000	$3,380,000	included to accommodate additional shafts that may not have been needed otherwise
Road Crossings			ea.	0	$808,000	$0	
Major Road Crossings (Highway)			ea.	0	$1,690,000	$0	
Utility Crossings			ea.	0	$808,000	$0	
Updated Soils Regulation Uplift	2%					$239,120	
Additional Construction Costs	15%		ea.			$2,336,268	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$1,791,139	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$19,703,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$197,000	
Geotechnical Sub-Total Cost						**$197,000**	
Property Requirements	1.5%					$ 295,500	
Property Requirements Sub-Total						**$295,500**	
Consultant Engineering/Design	12%					$ 2,364,400	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$2,364,400**	
In House Labour/Engineering/Wages/CA	3.0%					$ 591,090	
In-house Labour/Wages Sub-Total						**$591,090**	
Project Contingency	15%					$3,473,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$3,473,000**	
Non-Refundable HST	1.76%					$458,200	
Non-Refundable HST Sub-Total						**$458,200**	
Total (2022 Dollars)						**$27,082,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$27,082,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$541,640		
Design	Design fees, Town fees for design, contract admin	13%	$3,520,660		
Construction	Town fees, base costs and project contingency	85%	$23,019,700		
TOTAL			**$27,082,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SPS-028**
PROJECT NAME:	**Black Horse SPS Upgrade**
PROJECT DESCRIPTION:	New SPS location with increased capacity from 67 L/s to 180 L/s.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-028**

	L/s
ECA	70.0
Operational	66.9

PROPOSED CAPACITY		180 L/s	Firm capacity
Design PWWF	**Existing**		NA
	2051	260 L/s	NA
	Buildout	356 L/s	NA
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	21	90.0
2	21	90.0
3	NA	90.0

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	180 L/s	$15,816	$2,846,968	New pumping station at new location, designed for buildout but can be phased.
Related Upgrades							
Bypass Pumping Allowance	7%					$199,288	
Additional Construction Costs	20%		ea.			$609,251	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$365,551	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$4,021,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$80,400	
Geotechnical Sub-Total Cost						**$80,400**	
Property Requirements	5.0%					$ 201,100	
Property Requirements Sub-Total						**$201,100**	
Consultant Engineering/Design	15%					$ 603,200	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$603,200**	
In House Labour/Engineering/Wages/CA	4.0%					$ 160,840	
In-house Labour/Wages Sub-Total						**$160,840**	
Project Contingency	25%					$1,267,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$1,267,000**	
Non-Refundable HST	1.76%					$108,600	
Non-Refundable HST Sub-Total						**$108,600**	
Total (2022 Dollars)						**$6,442,000**	Rounded to nearest $1,000
Other Estimate						**$5,053,828**	SNF EA Estimate, revised by Region Finance (2022-02-25)
Chosen Estimate						**$5,054,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$101,080		
Design	Design fees, Town fees for design, contract admin	13%	$657,020		
Construction	Town fees, base costs and project contingency	85%	$4,295,900		
TOTAL			**$5,054,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-058**

PROJECT NAME: **Peel Street SPS Upgrade**

PROJECT DESCRIPTION: Station upgrades which may be required to accommodate new forcemain

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-058**

	L/s
ECA	252.0
Operational	210.0

PROPOSED CAPACITY			Additional capacity
Design PWWF	**Existing**		
	2051	158 L/s	307 L/s
	Buildout	258 L/s	359 L/s
		RDII	5Y Design

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	105.0	
2	105.0	
3	105.0	

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	0 L/s			
Related Upgrades	30%						
Bypass Pumping Allowance	7%					$0	
Additional Construction Costs	20%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	2.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ -	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$0**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	25%					$10,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$10,000**	
Non-Refundable HST	1.76%					$200	
Non-Refundable HST Sub-Total						**$200**	
Total (2022 Dollars)						**$50,000**	Rounded to nearest $1,000
Other Estimate						**$500,000**	SNF EA Estimate
Chosen Estimate						**$500,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$10,000		
Design	Design fees, Town fees for design, contract admin	13%	$65,000		
Construction	Town fees, base costs and project contingency	85%	$425,000		
TOTAL			**$500,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-TP-002**

PROJECT NAME: **South Niagara Falls Wastewater Treatment Plant - Phase 1**

PROJECT DESCRIPTION: New South Niagara Falls WWTP Phase 1 with 30 MLD capacity

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-002**

PROPOSED CAPACITY	30 MLD

CLASS EA REQUIREMENTS:	C
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	30 MLD	$3,750,000	$112,500,000	
Additional Construction Costs	15%		ea.			$16,875,000	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$12,937,500	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$142,313,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$1,423,100	
Geotechnical Sub-Total Cost						**$1,423,100**	
Property Requirements	1.5%					$ 2,134,700	
Property Requirements Sub-Total						**$2,134,700**	
Consultant Engineering/Design	10%					$ 14,231,300	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$14,231,300**	
In House Labour/Engineering/Wages/CA	2.5%					$ 3,557,825	
In-house Labour/Wages Sub-Total						**$3,557,825**	
Project Contingency	15%					$24,549,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$24,549,000**	
Non-Refundable HST	1.76%					$3,249,900	
Non-Refundable HST Sub-Total						**$3,249,900**	
Total (2022 Dollars)						**$191,459,000**	Rounded to nearest $1,000
Other Estimate						**$203,557,135**	SNF EA Override - Niagara Region Finance Revision (2022-02-25)
Chosen Estimate						**$203,557,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$4,071,140		
Design	Design fees, Town fees for design, contract admin	13%	$26,462,410		
Construction	Town fees, base costs and project contingency	85%	$173,023,450		
TOTAL			**$203,557,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-TP-003**
PROJECT NAME:	**South Niagara Falls Wastewater Treatment Plant Phase 2**
PROJECT DESCRIPTION:	New South Niagara Falls WWTP Upgrade from 30 MLD to 60 MLD

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-003**

PROPOSED CAPACITY	30 MLD	Additional

CLASS EA REQUIREMENTS:	C
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	30 MLD	$3,750,000	$112,500,000	
Additional Construction Costs	15%		ea.			$16,875,000	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$12,937,500	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$142,313,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$1,423,100	
Geotechnical Sub-Total Cost						**$1,423,100**	
Property Requirements	1.5%					$ 2,134,700	
Property Requirements Sub-Total						**$2,134,700**	
Consultant Engineering/Design	10%					$ 14,231,300	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$14,231,300**	
In House Labour/Engineering/Wages/CA	2.5%					$ 3,557,825	
In-house Labour/Wages Sub-Total						**$3,557,825**	
Project Contingency	15%					$24,549,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$24,549,000**	
Non-Refundable HST	1.76%					$3,249,900	
Non-Refundable HST Sub-Total						**$3,249,900**	
Total (2022 Dollars)						**$191,459,000**	Rounded to nearest $1,000
Other Estimate						**$200,000,000**	SNF EA Override
Chosen Estimate						**$200,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$4,000,000		
Design	Design fees, Town fees for design, contract admin	13%	$26,000,000		
Construction	Town fees, base costs and project contingency	85%	$170,000,000		
TOTAL			**$200,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-TP-004**
PROJECT NAME:	**South Niagara Falls Wastewater Treatment Plant Outfall**
PROJECT DESCRIPTION:	New South Niagara Falls WWTP Outfall Structure

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-TP-004

PROPOSED CAPACITY	1800 mm	Additional

CLASS EA REQUIREMENTS:	C
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	1800 MLD	$2,750,000		
Additional Construction Costs	15%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	1.0%					$0	
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.5%					$ -	
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ -	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$0**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	15%					$6,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$6,000**	
Non-Refundable HST	1.76%					$100	
Non-Refundable HST Sub-Total						**$100**	
Total (2022 Dollars)						**$46,000**	Rounded to nearest $1,000
Other Estimate						**$4,718,197**	SNF EA Override - Niagara Region finance Revised (2022-02-25)
Chosen Estimate						**$4,718,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$94,360		
Design	Design fees, Town fees for design, contract admin	13%	$613,340		
Construction	Town fees, base costs and project contingency	85%	$4,010,300		
TOTAL			**$4,718,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-D-003**
PROJECT NAME:	**Decommissioning of South Side High Lift SPS**
PROJECT DESCRIPTION:	Decommissioning of SSHL SPS, to be replaced by gravity trunk sewer to SNF WWTP

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-D-003**

PROPOSED CAPACITY	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction							
Additional Construction Costs	10%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ -	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$0**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	10%					$4,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$4,000**	
Non-Refundable HST	1.76%					$100	
Non-Refundable HST Sub-Total						**$100**	
Total (2022 Dollars)						**$0**	Rounded to nearest $1,000
Other Estimate						**$500,000**	Estimated in SNF EA
Chosen Estimate						**$500,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$10,000		
Design	Design fees, Town fees for design, contract admin	13%	$65,000		
Construction	Town fees, base costs and project contingency	85%	$425,000		
TOTAL			$500,000		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-D-004**
PROJECT NAME: **Decommissioning of Garner SPS**
PROJECT DESCRIPTION: Decommissioning of Garner SPS to be replaced by gravity connection to SNF WWTP

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-D-004**

PROPOSED CAPACITY	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction							
Additional Construction Costs	10%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ -	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$0**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	10%					$4,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$4,000**	
Non-Refundable HST	1.76%					$100	
Non-Refundable HST Sub-Total						**$100**	
Total (2022 Dollars)						**$44,000**	Rounded to nearest $1,000
Other Estimate						**$450,000**	Estimated in SNF EA
Chosen Estimate						**$450,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$9,000		
Design	Design fees, Town fees for design, contract admin	13%	$58,500		
Construction	Town fees, base costs and project contingency	85%	$382,500		
TOTAL			**$450,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-D-006**
PROJECT NAME:	**Decommissioning of Grassy Brook SPS**
PROJECT DESCRIPTION:	Decommissioning of Grassy Brook SPS to be replaced by gravity connection to SNF WWTP

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-D-006**

PROPOSED CAPACITY	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction						$1,200,000	
Additional Construction Costs	10%		ea.			$120,000	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$132,000	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$1,452,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 217,800	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$217,800**	
In House Labour/Engineering/Wages/CA	4.0%					$ 58,080	
In-house Labour/Wages Sub-Total						**$58,080**	
Project Contingency	10%					$173,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$173,000**	
Non-Refundable HST	1.76%					$32,400	
Non-Refundable HST Sub-Total						**$32,400**	
Total (2022 Dollars)						**$1,933,000**	Rounded to nearest $1,000
Other Estimate						**$450,000**	Estimated in SNF EA
Chosen Estimate						**$450,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$9,000		
Design	Design fees, Town fees for design, contract admin	13%	$58,500		
Construction	Town fees, base costs and project contingency	85%	$382,500		
TOTAL			**$450,000**		

G

Regional Municipality of Niagara

Part G

STEVENSVILLE DOUGLASTOWN WASTEWATER SYSTEM

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G. STEVENSVILLE DOUGLASTOWN LAGOONS

G.1 Existing System Infrastructure

The Stevensville Douglastown wastewater system services the areas of Stevensville and Douglastown in northern part of the Town of Fort Erie. The system services an existing population of 3,699 and 964 employees. Note that this population and employment total is based on the Region's 2021 allocation of Traffic Area Zones planning data and has been processed through the allocation methodology presented in **Volume 2** to refine the data to include only serviced populations. As such, the population and employment total may not directly match the system totals using the Region's unprocessed planning data.

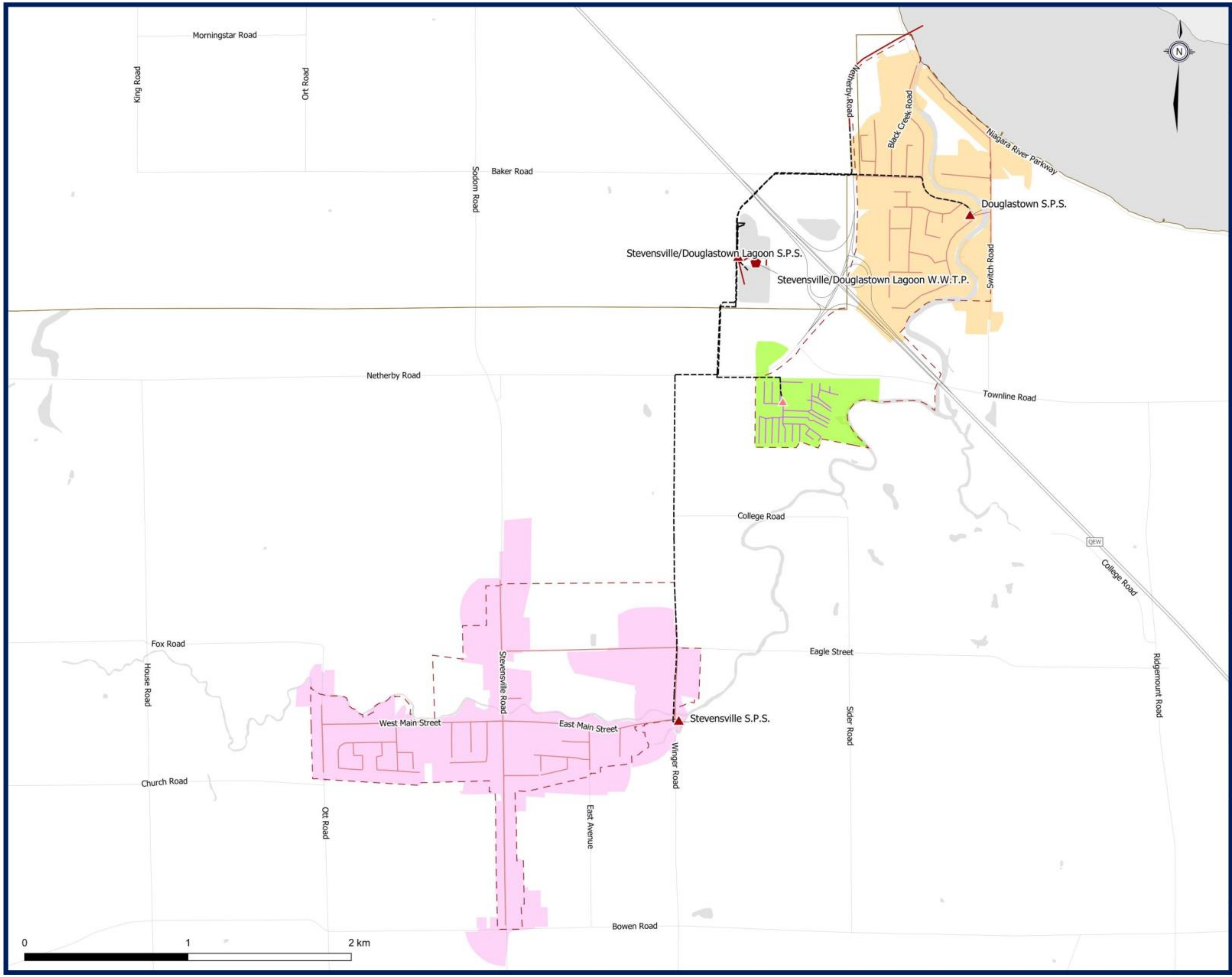
The system is serviced by the Stevensville Douglastown Lagoons located at 3274 Netherby Road, Niagara Falls. The Lagoons consists of two ponds operating in series with pumped sanitary flows received at the inlet box where ferric chloride is added for odour control. The Lagoons have a current rated capacity of 2.289 MLD.

System flows are conveyed to the treatment plant via a network of local owned sewer, and Regionally owned pump stations and forcemains.

Figure 4.G.1 presents an overview of the wastewater system, and **Figure 4.G.2** shows a schematic of the wastewater system.

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



Existing Wastewater Infrastructure

- ⬟ Wastewater Treatment Plant (WWTP)
- ■ Biosolids Storage Facility
- ✳ Odour Control Facility
- ♦ Leachate Pumping Station

Sanitary Pumping Stations (SPS)

- ▲ Regional
- ▲ Municipal
- ▲ Private

Wastewater Network

- ---- Force Mains
- — Regional Mains
- — Local Sewers
- — Private Sewers

Wastewater Catchments

- 🟩 Black Creek
- ▨ Stevensville
- ▨ Douglastown

Other Features

- ☐ Municipal Boundary
- ▨ Waterbodies
- ⌐¬ Urban Area Boundary

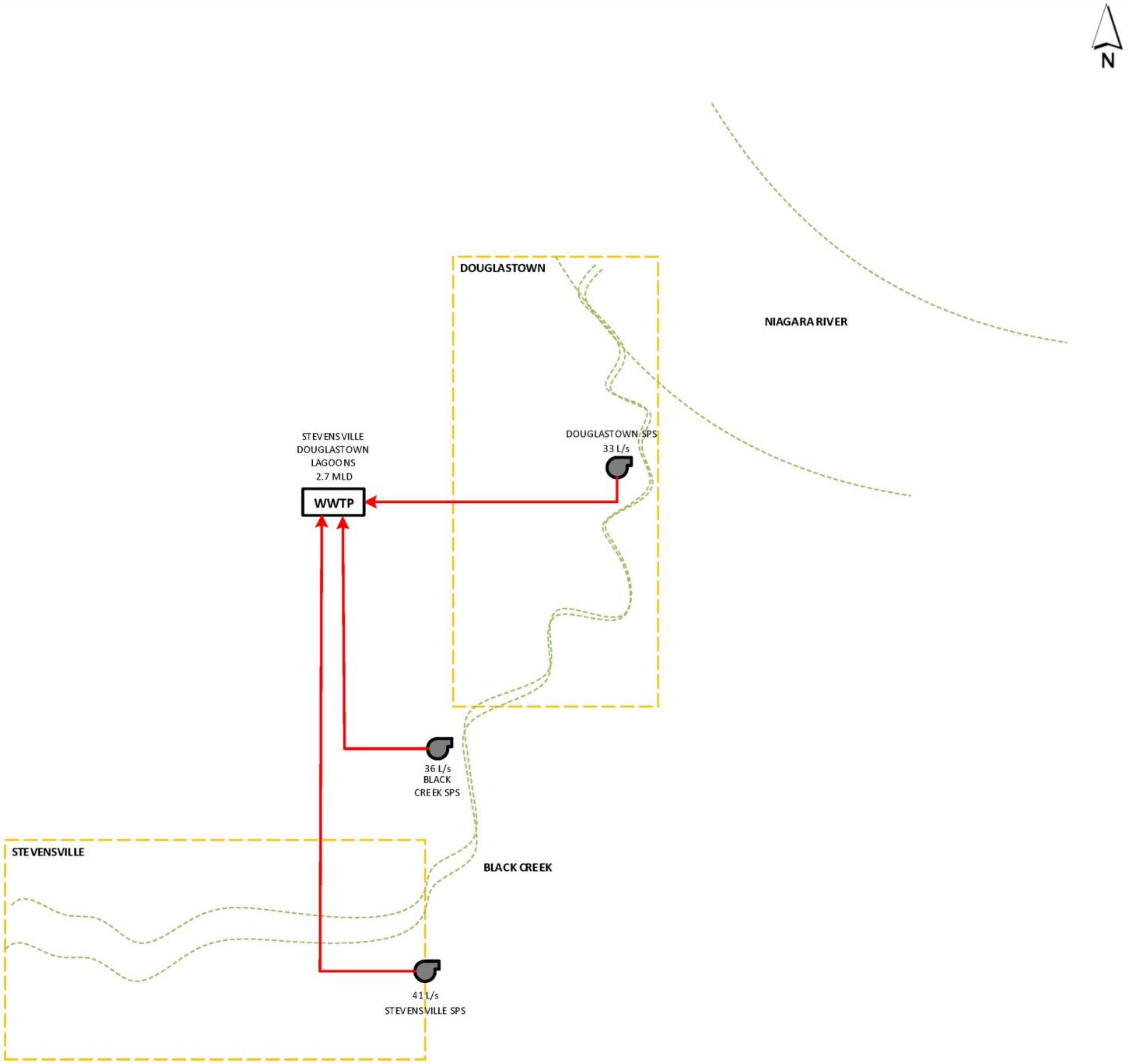
Figure 4.G.1

Stevensville / Douglastown System

Existing Wastewater Infrastructure

BluePlan ENGINEERING

March 2023
620126-WW-001
WKID: 26917



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WWTP RATED CAPACITY — Wastewater Treatment Plant

FIRM CAPACITY — Sewage Pumping Station

→ Forcemain

→ Connection from SPS to SPS

→ Connection from SPS to WWTP

Figure 4.G.2
Stevensville-Douglastown Lagoon

Existing Wastewater Infrastructure Schematic

GM BluePlan ENGINEERING

December 2022
621016-W-000
WKID: 26917

G.1.1 Facility Overview

Table 4.G.1 to **Table 4.G.2** present a summary of the environmental compliance approval (ECA) for the Stevensville Douglastown Lagoons usage, operation, and effluent concentration objectives.

Table 4.G.1 Wastewater Treatment Plant Overview

Plant Name	Stevensville Douglastown Lagoons
ECA #	#2588-7JTL5C Issued October 2, 2008
Address	3274 Netherby Road, Niagara Falls
Discharge Water	Niagara River
Rated Capacity: Average Daily Flow	2.289 MLD
Rated Capacity: Peak Flow Rate (Dry Weather)	Not available
Rated Capacity: Peak Flow Rate (Wet Weather)	Not available
Key Processes	• Odour Control • Grit removal • Phosphorous removal • Sludge thickening • Effluent disinfection

Table 4.G.2 Wastewater Treatment Plant Effluent Objectives

Effluent Parameter	Objective Concentration
$CBOD_5$	15.0 mg/L
TSS	15.0 mg/L
Total Phosphorus	0.75 mg/L
Total Ammonia Nitrogen	
January – April	*15 mg/L*
May – October	*10 mg/L*
November – December	*15 mg/L*

Table 4.G.3 lists each sewage pumping station's (SPS) listed ECA firm capacity as well as the station's existing operational firm capacity (the current operating capacity of the pumps station based on performance testing and/or supervisory control and data acquisition (SCADA) trending). As identified in **Volume 4,** the operational firm capacity was used as the basis of assessment for the 2021 MSPU. In some cases where the operational firm capacity was larger than the ECA firm capacity; the registered ECA capacity was used.

Table 4.G.3 Pumping Station and Forcemain Overview

Station Name	Location	Catchment Details		Pump Station Details			Forcemain Details		
		Area Exclusive of Upstream Catchments (ha)	Area Inclusive of Upstream Catchments (ha)	Number of Pumps	ECA Firm Capacity (L/s)	Operational Firm Capacity (L/s)	Single or Twinned Forcemain	Forcemain Diameter (mm)	Length (m)
└→**Stevensville SPS**	2550 Winger Road, Fort Erie	189.8	189.8	2	50.0	41.0	single	250	3,185
└→***Black Creek SPS***[1]	*Black Creek Trailer Park, Fort Erie*	*29.6*	*29.6*	*2*	*41.3*	*36.0*	*single*	*250*	*1,596*
└→**Douglastown SPS**	River Trail, Fort Erie	114.4	114.4	2	50.7	33.0	single	200	1,984

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[1] Black Creek SPS is a privately owned and operated SPS.

G.2 Basis for Analysis

G.2.1 Flow Criteria, System Performance, and Sizing Methodology

The Niagara Region Traffic Area Zone planning data was used to estimate growth related flow generation within the wastewater system and to spatially allocate growth demands within each individual system. **Table 4.G.4** presents a summary of the flow criteria, performance, and sizing methodology that was utilized. Refer to **Volume 4 - Introduction** for additional information.

The Region's per capita wastewater flows criteria were updated based on a historic review of the previous 3-year period for local billing meter and flow monitoring records. Given that more granular data was available to complete this analysis compared to previous master plan updates, the population and employment per capita rates were differentiated. The data showed a slight reduction in the population criteria and slight increase in the employment criteria, which more closely reflect existing flow generation trends compared to the Region's previous per capita rate. Further detail regarding the per capita flow generation is presented in **Volume 4 – Introduction.**

The Region's extraneous flow allowance criteria was also reviewed against historic flow monitoring and pump station performance records where available. The review of historic wet weather flows found that typically 2-year design storm peak flows within existing built systems exceeded the Region's existing extraneous flow design allowance of 0.286 L/s/ha; however, that a 2-year design storm peak flow below 0.286 L/s/ha was achievable as demonstrated in multiple catchment areas. Based on the analysis and an industry review, for the purpose of future planning, the extraneous flow design allowance for existing areas was increased to 0.4 L/s/ha but was maintained at 0.286 L/s/ha for new greenfield development areas to better reflect the existing high wet weather flows, while minimizing the magnitude of system upgrades with wet weather flow management as a critical priority. In areas where available historic flow monitoring and modelling results identify existing peak 5 year design flows below the 0.4 L/s/ha criteria, the lower 5 year design flows should be utilized. Further details regarding the extraneous flow design allowance are presented in **Volume 4 – Introduction**

Table 4.G.4 Flow Criteria, Scenarios, System Performance, and Sizing Methodology

	Component	Criteria	
Flow Criteria	Existing System Flows	Starting Point Methodology • Based on local billing meter records and flow monitoring data to establish existing dry and wet weather flows • Growth flows are added to the existing system baseline using design criteria	
	Flow Generation	Residential	255 L/c/d
		Employment	310 L/e/d

	Component	Criteria	
	Peaking Factor	Peak Dry Weather Flow	Harmon's Peaking Factor
	Extraneous Flow Design Allowance	• 0.4 L/s/ha for existing areas • 0.286 L/s/ha for new developments	
WWTP	System Performance and Triggers	• MECP Procedure F-5-1 • Trigger upgrade study at 80% capacity • Trigger upgrade construction at 90% capacity	
	Upgrade Sizing	• Average daily flow plus growth based on population design flows	

Pump Station	System Performance and Triggers Sizing	• Refer to **Section G.2.1.1**
		• Two flow scenarios considered
		    • **Design Allowance**: Peak wet weather flow using the peaked dry weather flow plus the extraneous flow design allowance
		    • **5-Year Storm**: Modelled peak wet weather flow using the 5-year design storm
		• Peak flow capacity to meet design peak wet weather flow using the extraneous flow design allowance
		• Wet well and system storage considerations under 5-year storm to minimize basement flooding and overflow risks	

Forcemain	System Performance and Triggers	• Flag velocities less than 0.6 m/s • Flag velocities greater than 2 m/s • Upgrade when velocities exceed 2.5 m/s and considering condition and age	
	Upgrade Sizing	• Design velocity target between 1 m/s and 2 m/s • Forcemain twinning to increase capacity where feasible	
Trunk	System Performance and Triggers	• Design allowance peak wet weather flows, using the extraneous flow design allowance, to be managed within pipe • Freeboard (depth between hydraulic grade line and surface) greater than 1.8 m below surface in 5-year design storm • Flag pipes velocities less than 0.6 m/s • Flag pipes velocities greater than 3.0 m/s	
	Upgrade Sizing	• Sized for full flow under post-2051 design peak wet weather flow • Assess 5-year design storm performance to minimize basement flooding risks and overflows	

G.2.1.1 SPS Performance Evaluation and Upgrade Framework

Although it is the Region's design philosophy to size SPS inline with the Region's extraneous flow design allowance, the 2021 MSPU undertook a hybrid evaluation approach to acknowledge that SPS are a major contributor to local wastewater system performance and that many legacy system's exiting wet weather flows exceed the extraneous flow design allowance. The SPS hybrid performance evaluation and upgrade framework are summarized in **Table 4.G.5** and strives to balance the magnitude of capacity upgrades, potential cascading downstream upgrades, and managing the potential risk of local sewer surcharging and system overflows.

Under the hybrid performance evaluation and upgrade framework, the SPS capacity was sized to meet the lesser of peak wet weather flow (PWWF) using the extraneous flow design allowance, referred to as "Design Allowance PWWF" or the estimated 5-year storm PWWF. Further, consideration for the SPS actual performance under the estimated 5-year design storm peak wet weather flow was evaluated to determine if the available system storage including the wet well, storage tanks, and in system capacity was sufficient to manage excess flows while maintaining the system hydraulic grade line (HGL) below the basement flooding level of 1.8 m below grade and/or below the local overflow level.

In instances where the 5-year storm PWWF flow exceeded the available system storage, additional system solutions such as wet weather management, system storage, and/or additional SPS capacity upgrades were incorporated into the servicing solution. The most efficient solution to manage capacity and flow reduction was determined through the assessment of calculated flows from the 2051 design allowance PWWF and modelled 5-year storm PWWF against the operational firm capacity of the station and system storage.

Each SPS with a preferred solution of a capacity upgrade was individually reviewed in detail to determine how capacity upgrades should best be achieved:

- Pump replacement
- Pump upgrades
- Pump additions
- Station replacement
- Existing wet well sizing changes
- FM sizing and capacity.

Due to data quality and availability, a prioritization of upgrade needs, and flow monitoring (data collection) was assigned to each case for the Region implementation plan, discussed later in **Section G.8**.

Table 4.G.5 SPS Assessment Framework

Case	2051 Design PWWF	2051 5 Year Storm PWWF	2051 5-Year Storm Storage Need	Preferred Solution	Upgrade Priority	Flow Monitoring Priority
Case 1	> Firm Capacity	> Firm Capacity	> Available Storage	Upgrade pumps to future design allowance flow with potential storage upgrades or wet weather management	High	Medium
Case 2	< Firm Capacity	> Firm Capacity	> Available Storage	Upgrade storage and/or wet weather management	High	High
Case 3	> Firm Capacity	> Firm Capacity	< Available Storage	Potential upgrade to design allowance flow and/or wet weather management	Medium	High
Case 4	< Firm Capacity	> Firm Capacity	< Available Storage	Potential wet weather management	Low	Medium
Case 5	> Firm Capacity	< Firm Capacity	< Available Storage	No upgrade, use actual peak flows	N/A	Low
Case 6	< Firm Capacity	< Firm Capacity	< Available Storage	No upgrade	N/A	Low

G.2.2 Growth Population Projections and Allocations

Table 4.G.6 outlines the existing and projected serviced population and employment by catchment.

Table 4.G.6 Stevensville Douglastown Wastewater Treatment Plant Existing and Projected Serviced Population by Catchment

Sewage Pumping Station (SPS)	Existing Population & Employment			2051 Population & Employment			Post 2051 Population & Employment			2021-2051 Growth		
	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population Growth	Employment Growth	Total Growth
└→**Stevensville SPS**	2,287	808	3,095	2,734	1,973	4,706	2,816	2,030	4,846	447	1,164	1,612
└→**Black Creek SPS**[2]	243	38	281	246	165	411	250	170	420	3	127	130
└→**Douglastown SPS**	1,169	119	1,288	2,049	480	2,529	2,639	490	3,129	879	361	1,241
Total	**3,699**	**964**	**4,664**	**5,028**	**2,618**	**7,646**	**5,705**	**2,690**	**8,395**	**1,329**	**1,653**	**2,983**

Note: Population numbers may not sum due to rounding.

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[2] Black Creek SPS is a privately owned and operated SPS.

G.3 System Performance

G.3.1 Wastewater Treatment Plant

The starting point flow for the Stevensville Douglastown Lagoons was calculated using historic SCADA flow data. Ten years of data (2011 to 2020) was reviewed to provide historical context and assess overall long-term trends; however, the most recent five years of data was used to determine the average daily flow. **Table 4.G.7** shows the historical system flows obtained from wastewater treatment plant production data.

Table 4.G.7 Historic Stevensville Douglastown Lagoon Flows

Year	Average Daily Flow		Peak Daily Flow	
	(MLD)	(L/s)	(MLD)	(L/s)
2011	1.5	17.8	2.1	24.8
2012	1.1	12.7	1.4	16.7
2013	1.3	14.9	4.7	54.7
2014	1.2	14.2	4.3	49.2
2015	1.2	14.2	3.8	44.5
5 Year Average	1.3	14.7	3.3	38.0
5 Year Peak	1.5	17.8	4.7	54.7
2016	1.3	15.2	3.3	37.7
2017	1.6	18.9	5.8	67.2
2018	1.7	19.3	6.7	77.7
2019	1.7	20.0	4.5	51.5
2020	1.6	18.4	4.2	48.4
5-Year Average	1.6	18.4	4.9	56.5
5-Year Peak	1.7	20.0	6.7	77.7
10-Year Average	1.4	16.6	4.1	47.2
10-Year Peak	1.7	20.0	6.7	77.7

The 10-year trend analysis showed that flows to the Stevensville Douglastown Lagoons continue to reflect high flows in wetter years. The 5-year average flow has increased approximately 22% from the 2016 MSP starting point.

The starting point flow used for the Stevensville Douglastown Lagoons was 1.6 MLD.

Figure 4.G.3 shows the projected future flows at the Stevensville Douglastown Lagoon. The Lagoons are approaching capacity, reaching the 80% planning trigger by 2031, and will require an upgrade within the 2051-time horizon.

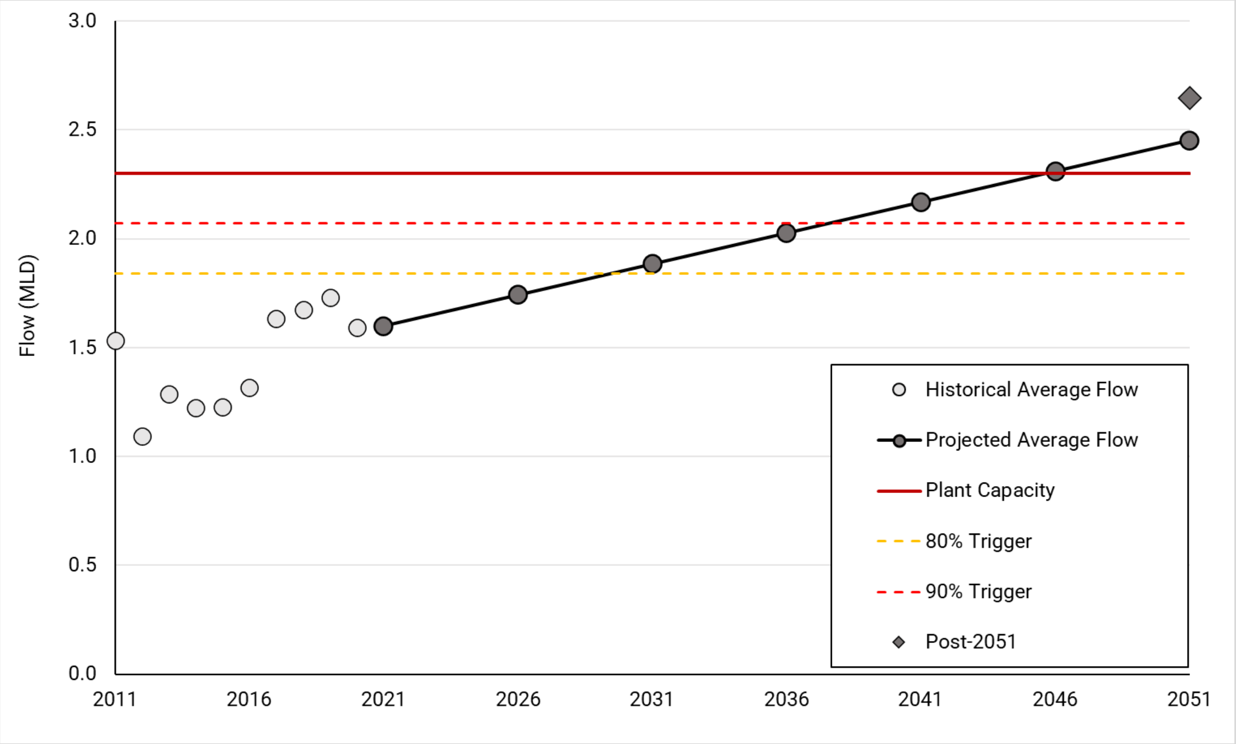

Figure 4.G.3 Projected Sewage Generation at Stevensville Douglastown Wastewater Treatment Plant

G.3.2 Sewage Pumping Station

Table 4.G.8 highlights the sewage pumping station operational firm capacities and the existing and projected flows. The existing average and peak dry weather flows were estimated using the wastewater system model, which was updated using the best available billing, flow monitoring, and SCADA data from 2018 to 2020.

Table 4.G.8 System Sewage Pumping Station Performance

Station Name	Station Capacity	2021 Flows				2051 Flows			Post-2051 Flows		
	Operational Firm Capacity	Average Dry Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow
└→**Stevensville SPS**	**41.0**	7.6	9.1	85.1	99.3	29.2	107.7	122.0	30.7	109.2	123.4
└→**Douglastown SPS**	**33.0**	7.1	7.8	53.5	29.6	22.3	73.4	49.5	28.3	79.4	55.5

The following SPS have existing and future deficiencies under both design allowance PWWF and 5-year storm, requiring upgrades to support existing and future flows.

- Stevensville SPS
- Douglastown SPS

G.3.3 Forcemain

Table 4.G.9 highlights the existing and projected forcemain performance. Velocities less than 0.6 m/s were flagged in yellow and velocities exceeding 2.5 m/s were flagged in red. Note, if a pumping deficit was identified in **Table 4.G.8,** then projected forcemain velocities were based on the higher of the station's ECA firm capacity or the governing peak wet weather flow scenario, otherwise if no pumping deficit was identified, the operational firm capacity was used for future capacity assessment.

Table 4.G.9 Forcemain Performance

Station Name	Forcemain Diameter (mm)	Operational Firm Capacity		2051		Post-2051	
		Pumped Flow (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)
└→**Stevensville SPS**	**250**	41.0	0.8	107.7[3]	2.2	109.2[3]	2.2
└→**Douglastown SPS**	**200**	33.0	1.1	49.5[3]	1.6	55.5[3]	1.8

[1] Operational firm capacity

[2] ECA capacity

[3] Minimum of future design allowance PWWF or 5-year storm PWWF

There are no forcemains with low velocities in the current operating regime.

All forcemains have sufficient capacity to meet future flows.

G.3.4 Trunk Sewer

Figure 4.G.4 and **Figure 4.G.5** highlight the system performance in the existing and 2051 projected design allowance peak wet weather flow scenarios, respectively.

- There are no Region-owned trunk sewers in the Stevensville Douglastown system.

G.3.5 Overflows

Under the design allowance peak flows no overflows are anticipated; however, many of the CSOs become active from 5-year storm peak wet weather flows. The adverse risks of wet weather inflows are currently partially managed through CSOs; however, the Region and LAMs are working together to reduce wet weather inflows to the system in order to reduce system overflows.

Detailed assessment of system CSO are addressed in the Fort Erie Pollution Prevention Control Plan; which outlines the proposed wet weather flow management approach to manage CSO volumes.

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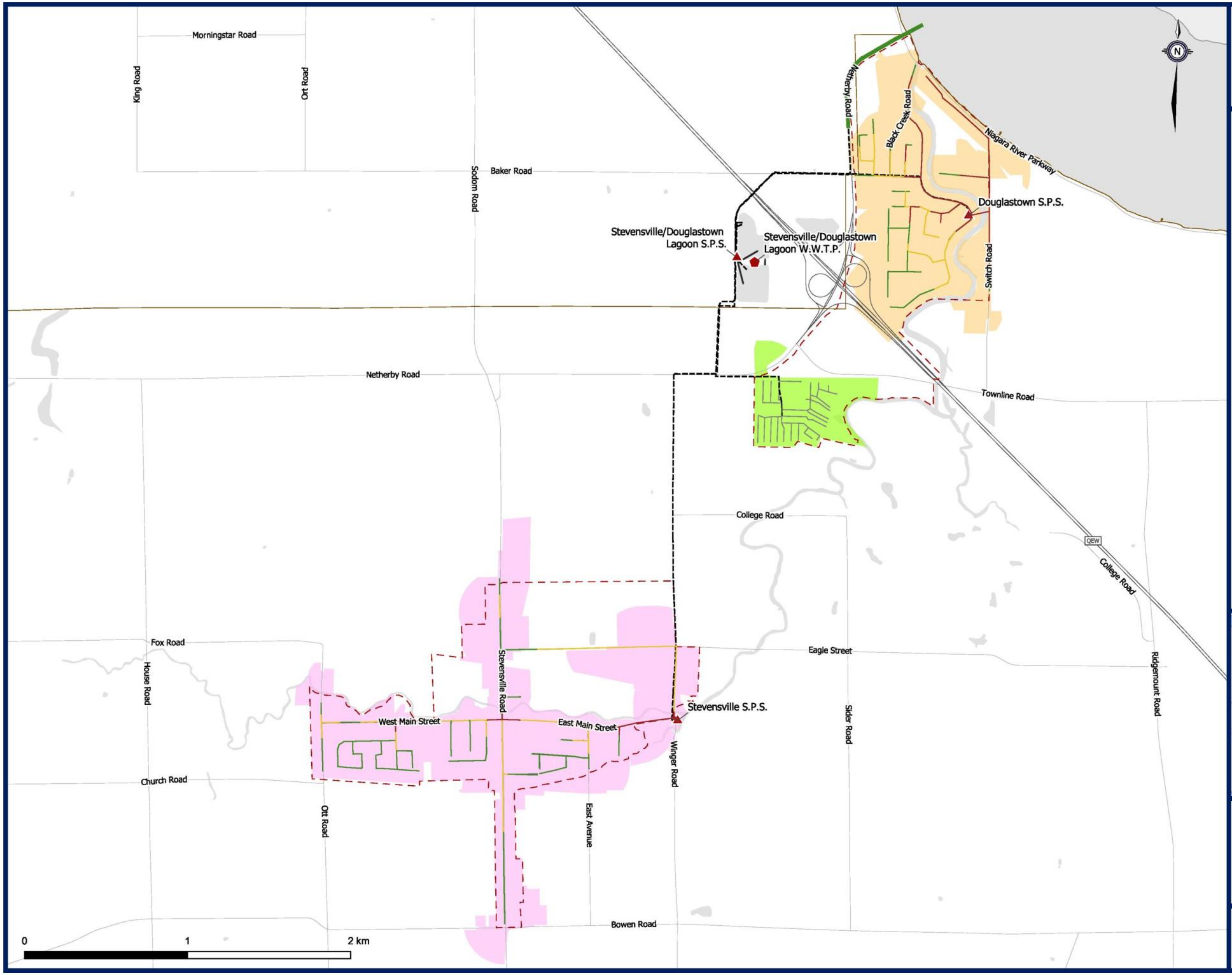

Existing Wastewater Infrastructure

- ● Combined Sewage Detention Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant

Wastewater Network

- Force Mains
- Local Sewers
- Regional Mains
- Private Sewers

Wastewater Catchments

- 🟩 Black Creek
- 🟧 Douglastown
- 🟪 Stevensville

Other Features

- ☐ Municipal Boundary
- ☐ Urban Area Boundary
- ▨ Waterbodies

System Performance

- Surplus Capacity
- Surcharging Sewer
- Surcharging Sewer with Basement Flooding Risk

Figure 4.G.4

Existing Design

Peak Wet Weather Flows

Stevensville-Douglastown Lagoon WWTP

BluePlan ENGINEERING

May 2023
620126
Projection EPSG: 26917

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

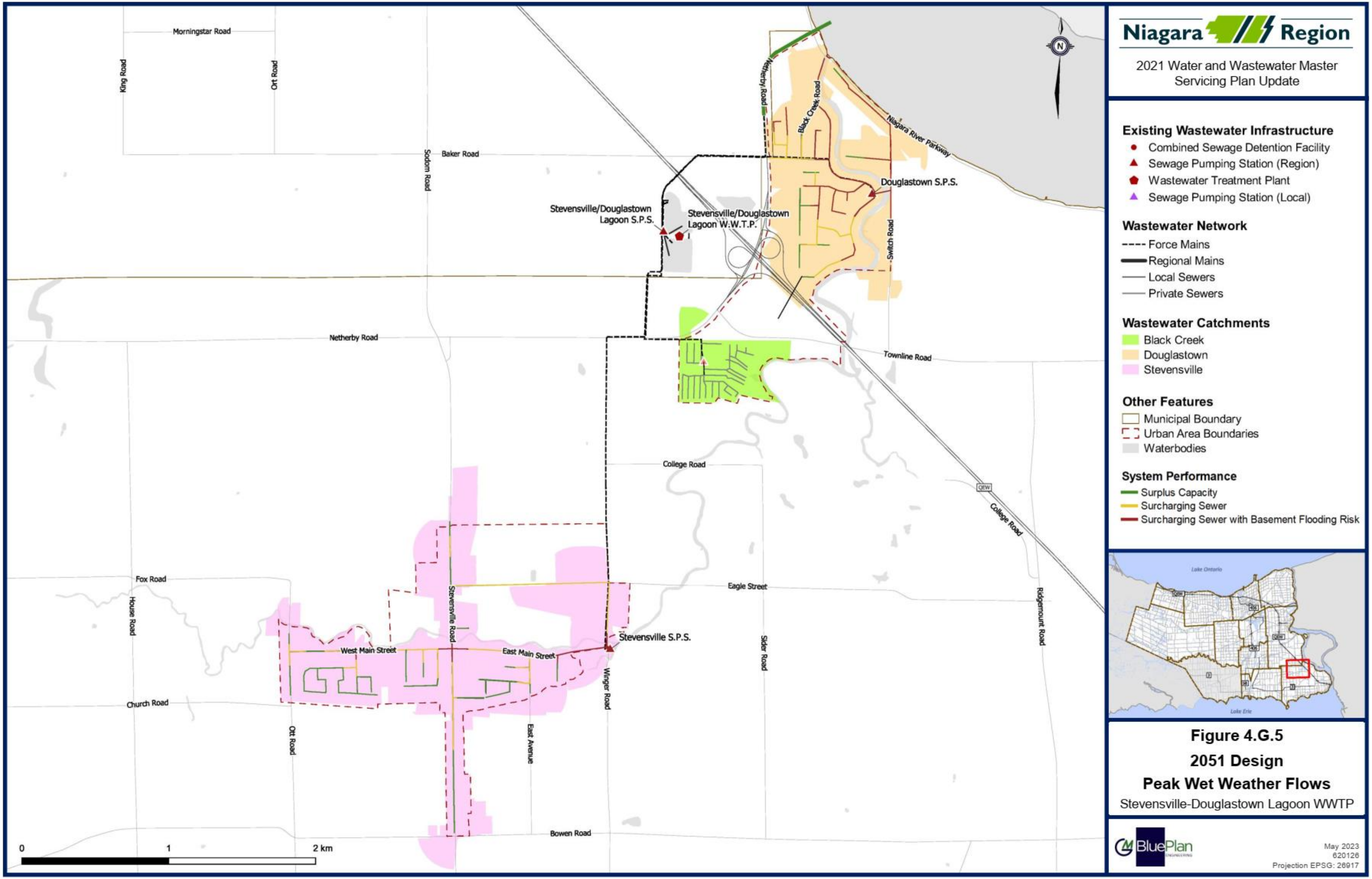

Figure 4.G.5

2051 Design

Peak Wet Weather Flows

Stevensville-Douglastown Lagoon WWTP

BluePlan

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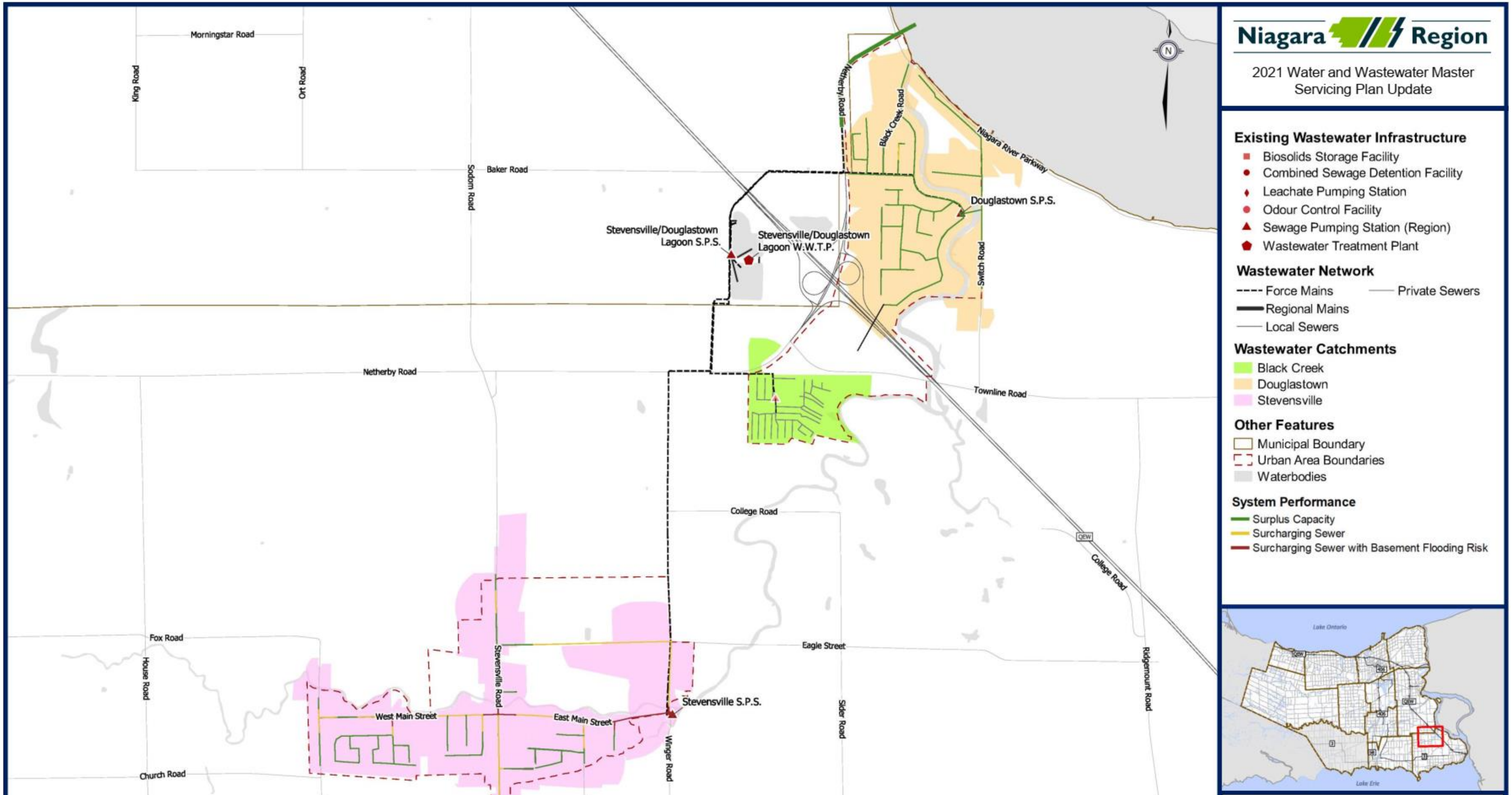


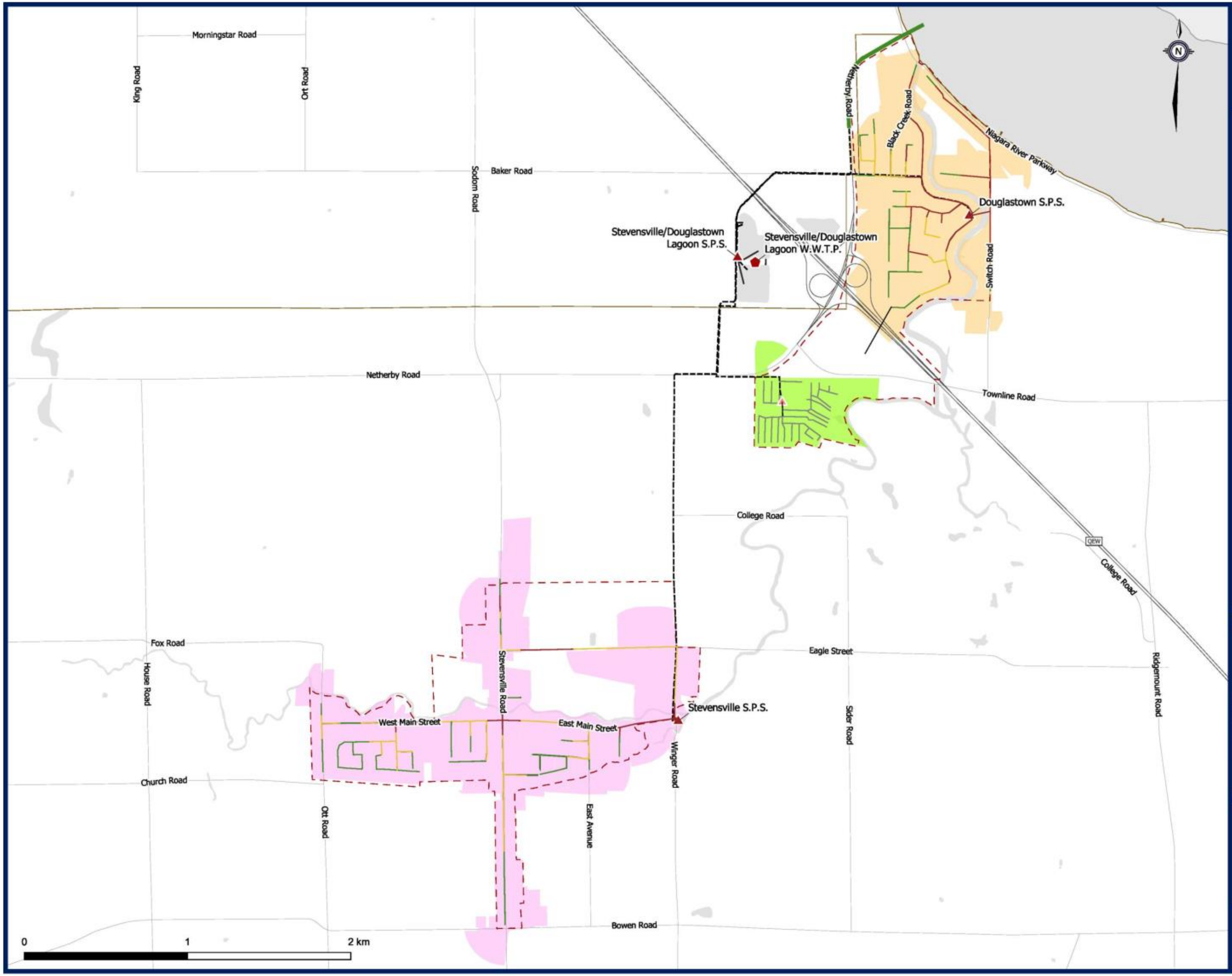
Figure 4.G.6

Existing 5-Year Storm Peak Wet Weather Flows

Stevensville-Douglastown Lagoon WWTP

GM BluePlan

May 2023
620126
Projection EPSG: 26917



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Existing Wastewater Infrastructure
- ● Combined Sewage Detention Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Local)

Wastewater Network
- ---- Force Mains
- ━ Regional Mains
- — Local Sewers
- — Private Sewers

Wastewater Catchments
- 🟩 Black Creek
- 🟧 Douglastown
- 🟪 Stevensville

Other Features
- ☐ Municipal Boundary
- ⬚ Urban Area Boundaries
- ⬜ Waterbodies

System Performance
- — Surplus Capacity
- — Surcharging Sewer
- — Surcharging Sewer with Basement Flooding Risk

Figure 4.G.7
2051 5-year Storm Peak Wet Weather Flows
Stevensville-Douglastown Lagoon WWTP

GM BluePlan

May 2023
620126
Projection EPSG: 26917

G.4 System Opportunities and Constraints

Figure 4.G.8 Highlights the existing opportunities and constraints.

G.4.1 Stevensville Douglastown Lagoons

- The current rated average daily flow capacity of the plant is 2.289 MLD, with an existing flow of 1.6 MLD and a projected 2051 average daily flow of 2.5 MLD, which exceeds the Lagoons' rated capacity.
- The Lagoons are approaching capacity, reaching the 80% planning trigger by 2031, and will require an upgrade within the 2051-time horizon.

G.4.2 Stevensville

- Residential and employment growth primarily consists of intensification and greenfield within the urban boundary.
- There are existing and future capacity limitations at Stevensville SPS.
- Generally, there are high wet weather flows observed across the system.

G.4.3 Douglastown

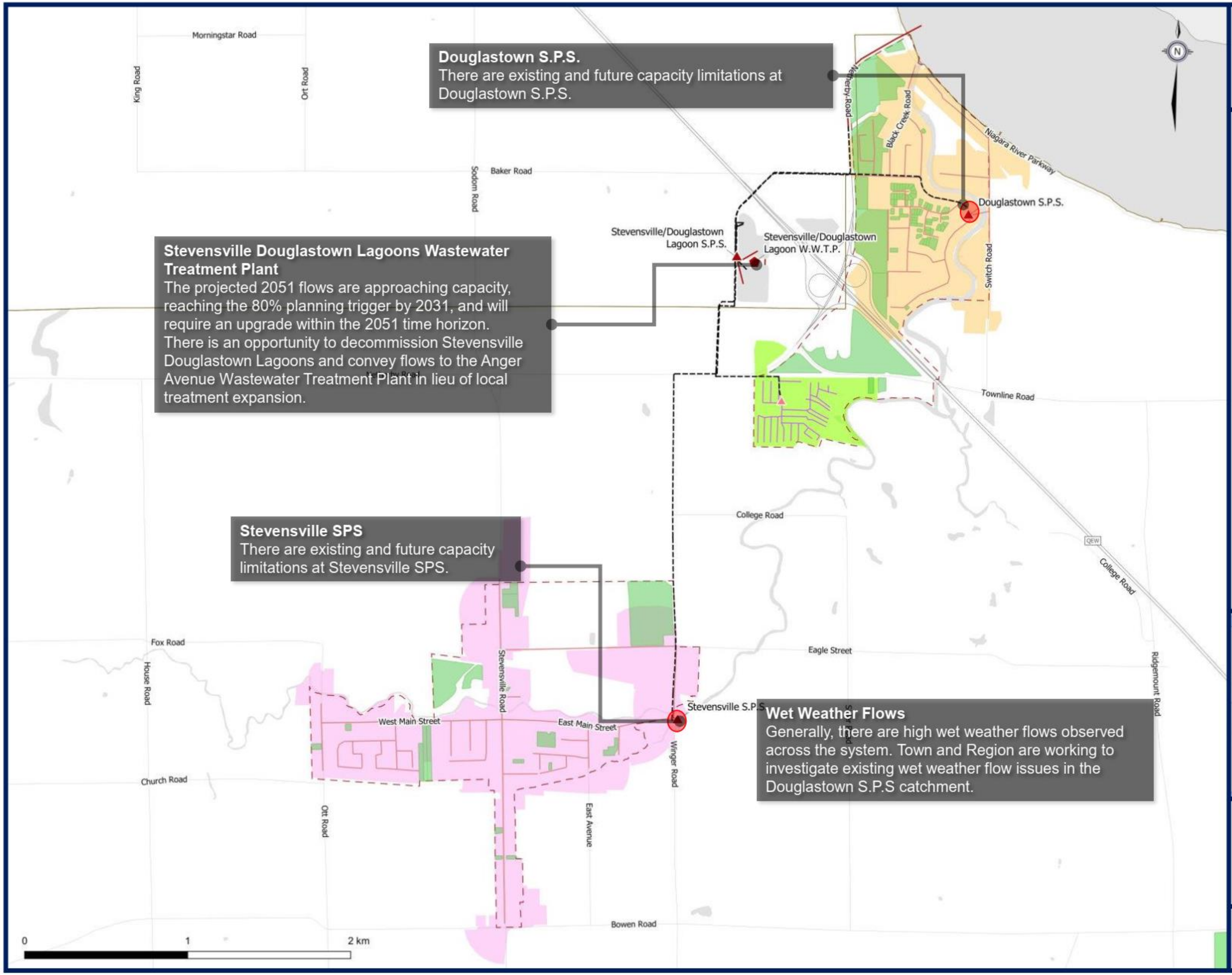
- Residential and employment growth primarily consists of intensification and greenfield within the urban boundary.
- There are existing and future capacity limitations at Douglastown SPS.
- Generally, there are high wet weather flows observed across the system. The Town and Region are working together to investigate existing wet weather flow issues in the Douglastown SPS catchment.

G.4.4 System Optimization Opportunities

- Opportunity explores a consolidated Fort Erie treatment strategy; this may include an opportunity to decommission Stevensville Douglastown Lagoons and convey flows to the Anger Avenue Wastewater Treatment Plant in lieu of local treatment expansion.

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



Douglastown S.P.S.
There are existing and future capacity limitations at Douglastown S.P.S.

Stevensville Douglastown Lagoons Wastewater Treatment Plant
The projected 2051 flows are approaching capacity, reaching the 80% planning trigger by 2031, and will require an upgrade within the 2051 time horizon. There is an opportunity to decommission Stevensville Douglastown Lagoons and convey flows to the Anger Avenue Wastewater Treatment Plant in lieu of local treatment expansion.

Stevensville SPS
There are existing and future capacity limitations at Stevensville SPS.

Wet Weather Flows
Generally, there are high wet weather flows observed across the system. Town and Region are working to investigate existing wet weather flow issues in the Douglastown S.P.S catchment.

Existing Wastewater Infrastructure

- ⬟ Wastewater Treatment Plant (WWTP)
- ● Combined Sewage Detention Facility
- ■ Biosolids Storage Facility
- ✳ Odour Control Facility
- ♦ Leachate Pumping Station

Sanitary Pumping Stations (SPS)

- ▲ Regional
- ▲ Municipal
- ▲ Private

Wastewater Network

- ---- Force Mains
- — Regional Mains
- — Local Sewers
- — Private Sewers

Wastewater Catchments

- 🟩 Black Creek
- 🟧 Douglastown
- 🟪 Stevensville

Other Features

- ☐ Municipal Boundary
- ▨ Waterbodies
- ⬚ Urban Area Boundary

Development Locations

- 🟫 Post-2051
- 🟩 Pre-2051

Figure 4.G.8

Stevensville/Douglastown WWTP

Opportunities and Constraints

GM BluePlan Engineering

February 2023
6210126-WW-002

G.5 Assessment of Alternatives

Generally, the previously recommended strategies from the 2016 MSP program were carried forward which included capacity upgrades to all stations, and wet weather management strategies in key areas.

While the strategies remained the same, the following details including alignment, sizing, or wet weather areas have been updated to reflect the latest system understanding and reflect updated criteria changed through this iteration of the 2021 MSPU.

- Providing capacity within Region-owned pumping stations and trunk sewers to convey peak wet weather flows up to the lesser of the 5-year design storm or extraneous flow design allowance criteria of 0.4 L/s/ha for existing areas and 0.286 L/s/ha for growth areas, needs to be verified based on the updated flow criteria and actual flows.
- Provide upstream flow management to address high peak flows in the system where peak wet weather flows exceed the extraneous flow design allowance criteria of 0.4 L/s/ha resulting in basement flooding and overflow risks. Upstream flow management can include but is not limited to these options, in the preferred order of implementation:
    - Inflow and infiltration reduction in public right of way
    - Inflow and infiltration reduction from private properties
    - Enhanced system storage
    - Peak flow control using system controls or engineered solutions
- As shown in **Section G.3.2**, pump station capacity assessments were completed by reviewing the projected design allowance peak flows and 5-year storm flows against the operational firm capacity of each station.
    - Where the peak storm flows were less than design flows and the operational firm capacity of the station, the storm flows were used as actual flows, and therefore would not have triggered an upgrade.
    - Where the projected peak design allowance flows and 5-year storm flows exceeded the operational firm capacity of the station, a pump upgrade was recommended. Additional storage options and wet weather management were also considered.

To address existing and growth-related capacity needs, the following servicing concepts were evaluated:

- Do nothing
- Station capacity upgrade for pumping or storage
- Wet weather management
- Hybrid solution

G.6 Preferred Servicing Strategy

The following is a summary of Stevensville Douglastown Lagoons system as recommended through the 2016 Master Servicing Plan Update and carried forward through this update:

- An upgrade at the Stevensville SPS was identified to support growth in the area.

Strategies that were added since the 2016 MSP are:

- Potential upgrade to the Stevensville Douglastown Lagoons
- Upgrade to the Douglastown SPS
- A study is recommended to evaluate a consolidated Fort Erie treatment strategy; this includes the potential decommissioning of the Stevensville Douglastown Lagoons and convey flows to the Anger Ave WWTP.

Figure 4.G.10 and **Figure 4.G.11** show the preferred servicing strategy, consisting of:

G.6.1 Treatment Plant Works

- The Region to undertake a study to identify solutions to address the additional 0.15 MLD needed to support 2051 flows.
- The 80% threshold for an upgrade study is expected to be passed before 2031.

G.6.2 Pumping Stations

- Increase Stevensville SPS capacity from 41 L/s to 109L/s.
- Increase Douglastown SPS capacity from 33 L/s to 79 L/s.

G.6.3 Forcemains

- No forcemains require upgrades.

G.6.4 Decommissioning of Existing Facilities

- Decommissioning of the Stevensville Douglastown Lagoons would be evaluated further is the Fort Erie QEW Corridor Study.

G.6.5 Wet Weather Flow Management Program

A significant element of the Niagara Region wastewater servicing strategy is the wet weather management program. The program is intended to address existing capacity constraints, and to provide for growth-related capacity without expanding/upgrading existing trunk infrastructure, or by minimizing the required expansion/upgrades.

The wet weather management program currently identifies overall preliminary priority, staging of location and target amount of inflow and infiltration reduction across all systems. This program provides for a proactive and targeted approach to addressing wet weather impacts. These wet weather management programs will need to be a joint initiative between the Region and local municipalities.

For the Stevensville Douglastown system, both SPS catchments were identified as medium priorities for inflow and infiltration reduction in the 2017 Fort Erie PPCP targeting 25% of inflow and infiltration reduction.

G.6.6 Additional Studies and Investigations

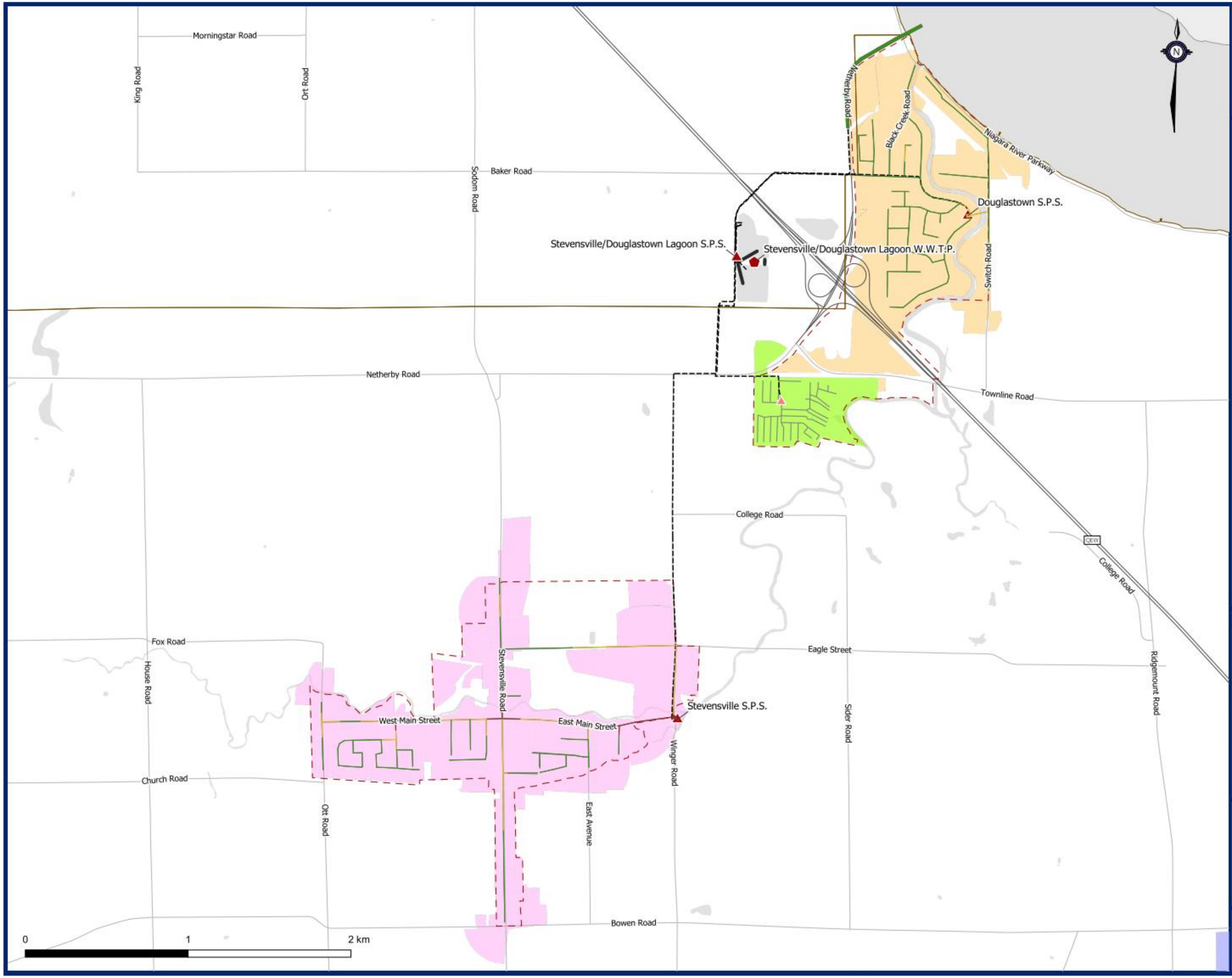
The Town should continue to implement the recommendations of the PPCP including more extensive flow monitoring and field investigations such as smoke and dye testing and other fieldwork.

Fort Erie QEW Corridor Long-Term Study: study is recommended to assess wastewater treatment options for the Fort Erie area, which would include reviewing options:

- Assess the viability decommissioning the Crystal Beach WWTP and conveying Crystal Beach system flows to the Anger Ave WWTP service area via a new SPS and forcemain.
- Assess options to decommission the Stevensville Douglastown Lagoons by replacing the Lagoons with a new SPS and forcemain to convey flows to either the Anger Avenue WWTP or new South Niagara Falls WWTP.
- The outcome of the study will be an updated capacity assessment of the Anger Avenue WWTP based on the preferred servicing strategy for Crystal Beach and Stevensville Douglastown areas.

G.6.7 Future System Performance

Figure 4.G.9 presents the future system performance, based on the preferred servicing strategy configuration and capacities; but excludes the potential benefits of the local wet weather flow management program.



Niagara Region

2021 Water and Wastewater
Master Servicing Plan Update

Existing Wastewater Infrastructure
- ● Combined Sewage Detention Facility
- % Leachate Pumping Station
- ● Odour Control Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Private)
- ▲ Sewage Pumping Station (Local)

Wastewater Network
- Force Mains
- Regional Mains
- Local Sewers
- Private Sewers

Wastewater Catchments
- 🟩 Black Creek
- 🟧 Douglastown
- 🟪 Stevensville

Other Features
- ☐ Municipal Boundary
- ☐ Urban Area Boundaries
- ⬜ Waterbodies

System Performance
- Surplus Capacity
- Surcharging Sewer
- Surcharging Sewer with Basement Flooding Risk

Figure 4.G.9

Future Capital Program Peak Wet Weather Flow

Stevensville / Douglastown Lagoon WWTP

BluePlan

May, 2023
620126
Projection EPSG:26917

Document Path: W:\Hamilton\620000\620126 Niagara 2021 MSP Update\5 Work in Progress\3. GIS and Database\4. Wastewater\System Performance\2051 CP RDII_new.qgz

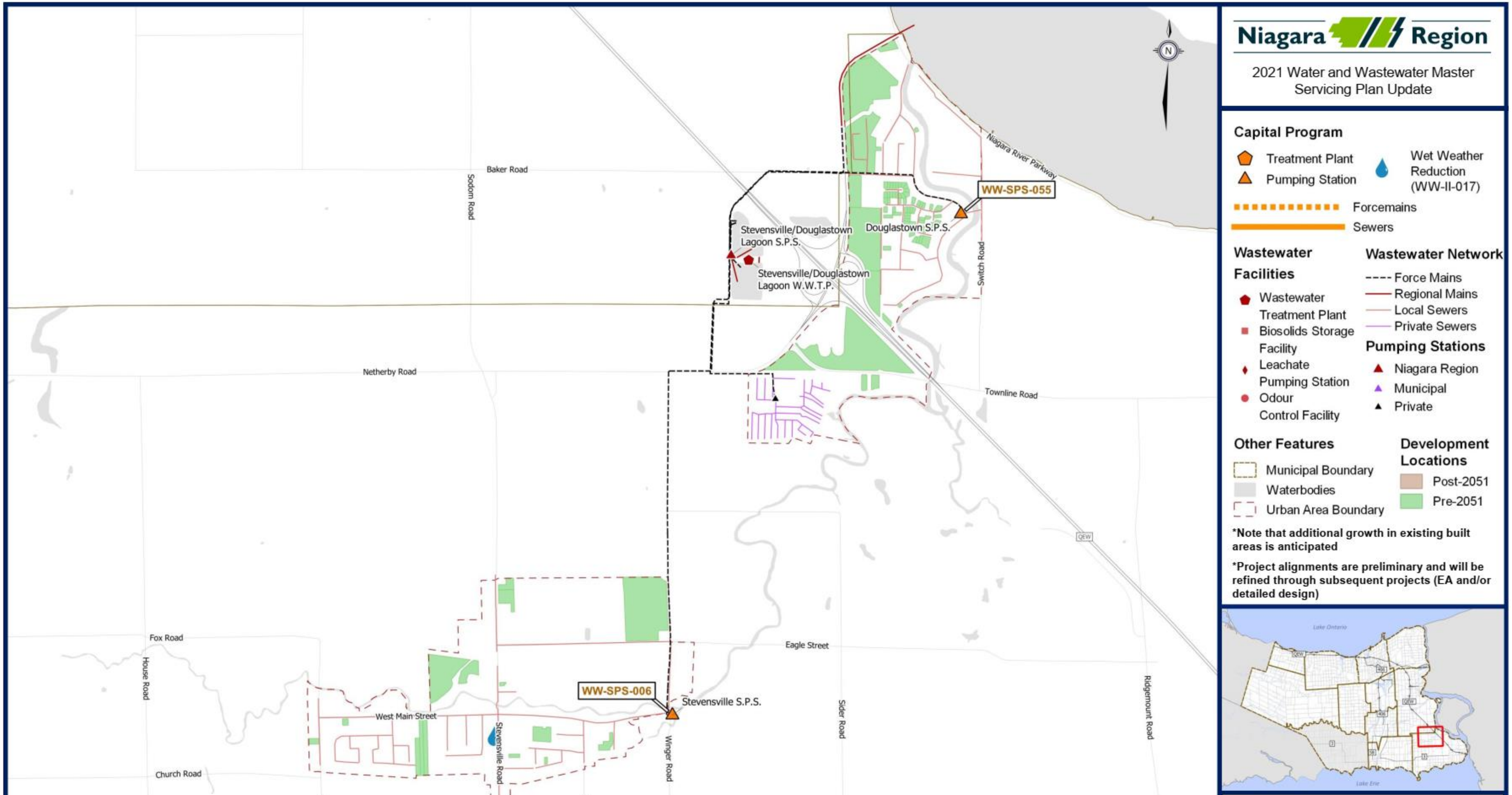
G.7 Capital Program

Figure 4.G.10 and **Figure 4.G.11** present the preferred servicing strategy map and schematic

Table 4.G.10 summarizes the recommended project costing timing and Class EA requirements. Individual detailed costing sheets are presented in **Section G.8.6.**

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



*Note that additional growth in existing built areas is anticipated

*Project alignments are preliminary and will be refined through subsequent projects (EA and/or detailed design)

Figure 4.G.10

Stevensville / Douglastown System

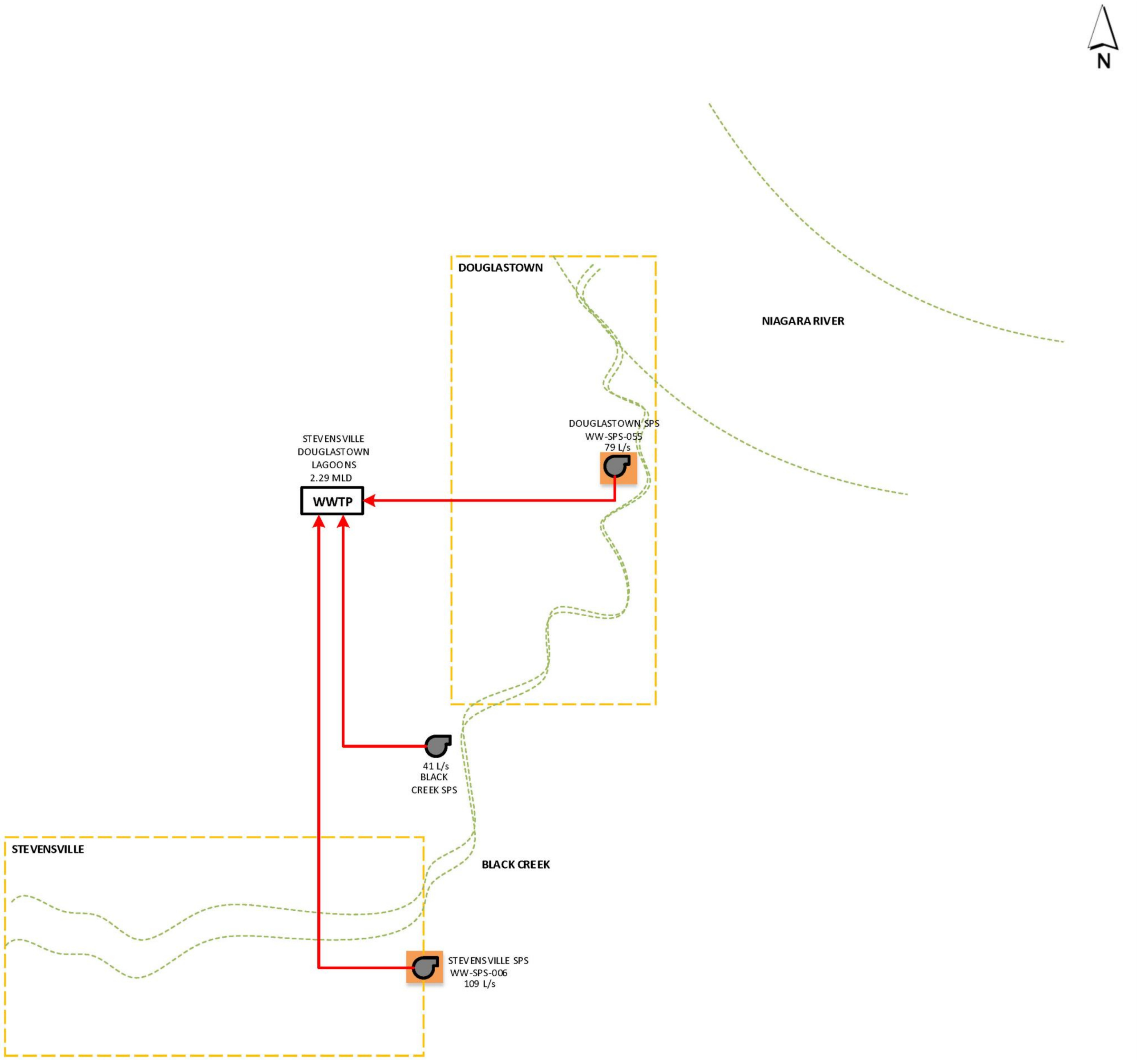
Preferred Wastewater Servicing Strategy

GM BluePlan

December 2022
620126-WW-006
WKID: 26917

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



WWTP RATED CAPACITY	Wastewater Treatment Plant
FIRM CAPACITY	Sewage Pumping Station
→	Forcemain
→	Connection from SPS to SPS
→	Connection from SPS to WWTP
🟧	Facility Upgrade
🟩	New Facility
—	Upgrade Forcemain or Sewer
—	New Forcemain or Sewer
⊗	Decommission Project

Figure 4.G.11
Stevensville-Douglastown Lagoon
Future Wastewater Infrastructure Schematic

GM BluePlan
ENGINEERING

December 2022
621016-W-000
WKID: 26917

Table 4.G.10 Summary of Stevensville Douglastown Lagoons Capital Program

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost ($)
WW-SPS-006	Stevensville SPS Upgrade	Increase station capacity from 41 L/s to 109 L/s. Scope includes wet well expansion and replacing the two existing pumps.	109 L/s	2022-2026	Fort Erie	A+	Satisfied	Pumping	$2,797,000
WW-SPS-055	Douglastown SPS Upgrade	Increase station capacity from 33 L/s to 79 L/s. Scope includes wet well expansion and pump upgrades. Use implementation plan prior to upgrade: Flow monitoring, validate wet weather flows, re-evaluate required upgrades	79 L/s	2037-2041	Fort Erie	A+	Satisfied	Pumping	$2,428,000
WW-II-017[1]	Region-Wide Wet weather Reduction	Wet weather reduction program in all systems to be executed from 2022-2051	N/A	2022-2051	Region-Wide		Dependent on outcome of wet weather flow study	Wet Weather Reduction	$225,000,000
WW-ST-001[1]	Region-Wide Flow Monitoring and Data Collection	Funding to support flow monitoring and data collection initiatives	N/A	2022-2051	Region-Wide			Wet Weather Reduction	$12,000,000
WW-ST-002[2]	Fort Erie QEW Corridor Long-Term Study	Crystal Beach WWTP, SD WWTP long term strategy	N/A	2022-2026	Fort Erie	-	Separate EA Required	Treatment	$500,000
WW-TP-005[1]	Region-Wide WWTP Process Upgrades	Process upgrades to re-establish ECA capacity	N/A	2022-2051	Region-Wide			Treatment	$50,000,000
WW-TP-006[1]	Region-Wide WWTP Process Upgrades	Upgrades for odour control across the Region at forcemains, pump stations, and other locations.	N/A	2022-2051	Region-Wide			Treatment	$40,000,000
								Total for Stevensville Douglastown	**$5,225,000**

[1] Project cost not included in subtotal as it is a Region-wide project

[2] Project cost not included in subtotal as it is a Fort Erie wide project

G.8 Project Implementation and Considerations

G.8.1 10-Year Program Sequencing

The recommended year in service for the capital projects is presented in **Section G.6.6**. Special project implementation and considerations for the preferred servicing strategy consist of:

- Completing the Fort Erie QEW Corridor Long-Term Study before 2026 to support implementation of a Stevensville Douglastown Lagoons solutions prior the lagoons exceeding their capacity.

It is understood that the timing for the recommended projects may be subject to change due to a variety of external factors such as overall balancing of the Region's capital budget, changes to growth projections, and other unforeseen circumstances. As such, **Table 4.G.11** presents the preferred priority of the projects within the first 10-years of the capital program.

Table 4.G.11 Preferred Project Order

Master Plan ID	Name	2021 MSPU Year in Service	Order
WW-ST-002	Fort Erie QEW Corridor Long-Term Study	2022-2026	1
WW-SPS-006	Stevensville SPS Upgrade	2022-2026	2

G.8.2 EA Requirements and Studies

The following summarizes the status of EA requirements for recommended capital projects which will require Schedule B or C EAs.

- **EA has been satisfied through previous projects:**
    - None
- **Currently ongoing separate EA studies:**
    - None
- **EAs or studies to be completed through separate studies:**
    - Fort Erie QEW Corridor Long-Term Study envisioned as a Master Plan EA; requiring a Schedule B or C EA(s) to implement the recommended solutions.

G.8.3 Region-Wide Projects and Collaboration with Local Area Municipalities

Acknowledging that the overall wastewater systems are jointly owned and operated by the Region and LAMs, the continued operation and expansion of the wastewater systems to support existing users and accommodate projected growth relies upon the cooperation of the upper and lower tier municipalities. Major updates and adjustments to planning projections should be continued to be communicated as this may affect project details such as trigger timelines and design capacities, which is discussed further in **Section G.8.5**.

One initiative that will be predominately driven by the LAMs is wet weather management. While wet weather management should be completed in all municipalities, this 2021 MSPU assumes that the catchments where the peak wet weather flows exceed the peak design flows and contribute to increased risk of basement flooding or overflows will put a specific focus on wet weather management. The Region is committed to continuing the joint CSO funding program through which LAMs can apply for funding support for inflow and infiltration reduction programs and projects such as those identified through the PPCP.

As the flow monitoring completed for the PPCP is greater than 5 years old, additional flow monitoring and system data collection, in partnership with LAM, may be needed to improve system understanding, support proposed wet weather flow reductions, and identify opportunities for system optimization and overflow removals.

G.8.4 Sustainability Projects

It is important to recognize that the 2021 MSPU servicing strategies identify new infrastructure to service the additional growth out to year 2051 but these strategies are built by extending infrastructure from the existing systems and leveraging the existing Region infrastructure in place. It is essential that the existing infrastructure is maintained in good condition and performance to support servicing growth.

The Region continually establishes and implements a sustainability program that addresses priority projects to ensure the existing infrastructure is in a state-of-good-repair and continues to perform and meet the intended level of services. Region-wide programs including but not limited to replacement programs for pipes and manholes, boilers, meters, generators, SCADA upgrades, sludge management programs, laboratory and sampling equipment upgrades, process electrical, process instrumentation. Pump station upgrades through the sustainability capital plan re-establish the SPS ECA capacity.

Independent of the 2021 MSPU, the Region has completed a sustainability program analysis to identify the projects on a yearly basis, with focus on a 10 year program, to address the sustainability needs. This Sustainability Capital Plan is first developed to demonstrate the total investment needs and may identify a level of investment and implementation exceeding Region resources. The next steps for the Sustainability Capital Plan will be the development of the Financial Plan for existing Water and Wastewater assets which is anticipated to be completed in 2024. It should be noted that the Sustainability Capital Plan represents investment required over and above the growth-related 2021 MSPU program.

There are no additional sustainability projects in the Stevensville Douglastown system.

G.8.5 Project Implementation Flow Chart

The recommended design capacities within the growth capital program are based on the best available information at the time of analysis, including existing system flows, facility capacities, and projected growth. It is understood that this data is not static and often changes over the years between the regular updates of the Region's Master Plan and between those updates. Design assumptions should be revisited before initiation of all projects to reconfirm the appropriate design capacities, along with identification of any associated or dependent projects which can be combined or staged to optimize implementation efficiency and cost, and/or system operation.

To support the Region's process in implementing all recommended 2021 MSPU capital projects, the following flow chart has been developed for the wastewater system. This flow chart document is intended to be a reference resource for the Region and should be treated as a guideline to support existing internal Region processes in project implementation.

The wastewater implementation flow chart is shown in **Figure 4.G.12.**

Niagara Region

WASTEWATER PROJECT IMPLEMENTATION

The intent of this document is to support the Region in confirming the scope of work for wastewater infrastructure projects.

CONFIRM PROJECT SCOPE

To define Terms of Reference

☐ **What triggered this project?**
- Known development growth
- Forecasted growth
- Sustainability needs

☐ **Are there related or dependent projects that should be identified for streamlining opportunities or for project phasing?**
- Are there upstream projects with increasing capacity?
- Are there projects within the same alignment or project area that could be combined? (e.g., growth projects, SPS, forcemain, sewer, corridor planning, sustainability projects, water, stormwater, etc.)
- If there are related projects, could the project timing be adjusted to combine or stage projects more efficiently?

☐ **What is the project EA Schedule and status?**

☐ **Are there historic or ongoing operational issues in the project area?**
- Confirm with Regional and LAM operations and maintenance groups
- i.e. historic overflows, low flow/odour issues, clogging issues, work order history, etc.

☐ **Are there any data gaps that should be incorporated into the Terms of Reference?**
- Refer to the Required Data section below for details
- How much does the project timeline and budget need to change to allow for the data collection?

☐ **Have the planning projections been updated to the best available information?**
- Consultation with Region and LAM planning groups to confirm planning projection
- Are projected needs for the project in place? Is actual growth in line with projected growth?)

☐ **Should the project be deferred until identified related works are completed?**

REQUIRED DATA

To support terms of reference and detailed design

☐ **Recently completed EA or servicing study**

(for growth triggered projects)

☐ **Historic flow records**
- Within the last 3 years
- Ideally one full year of flow monitoring data that covers 80% of the total contributing area
- Can be included in project scope if feasible

☐ **Existing pump, flow, and pressure data to identify/verify existing system issues**

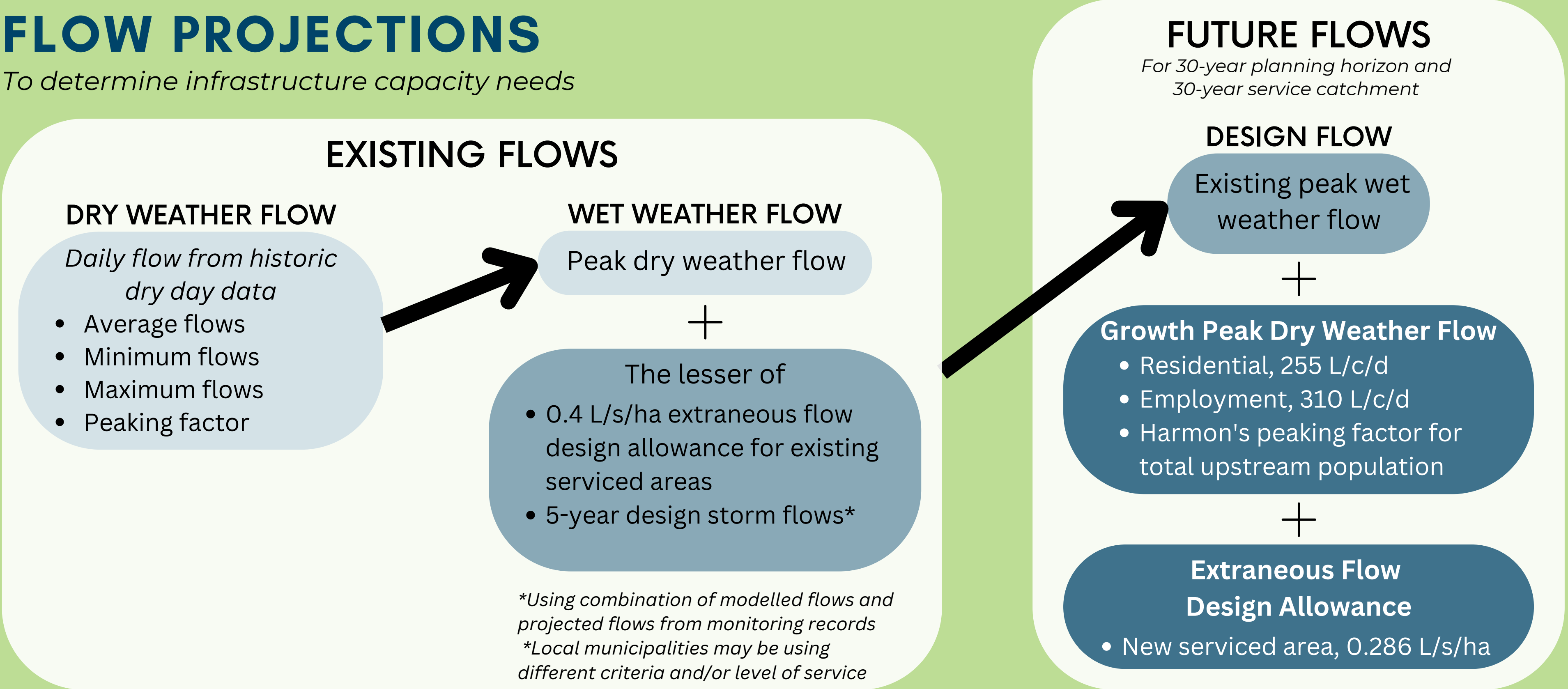
☐ **Asset inventory and condition assessment**
- All asset classes within the infrastructure type (sewer, forcemain, storage, pumping, or treatment facility)
- Within the last 5 years
- Can be part of project scope if the data is not available and would not significantly alter project scope - to assess need for related works (i.e. electrical, HVAC, structural upgrades at an SPS)

☐ **Service area growth potential to confirm projected population and demands**
- Consultation with Region and LAM planning groups within the past year
- Growth information for 30-year horizon and beyond (maximum service catchment)
  - Population, jobs, land use, area
  - Current inventory of development areas with associated development status

IF THE REQUIRED DATA IS NOT AVAILABLE AND IF IT HAS THE POTENTIAL TO SIGNIFICANTLY ALTER SCOPE OF THE DESIGN, IT IS STRONGLY RECOMMENDED THAT THE APPROPRIATE DATA COLLECTION AND FIELD INVESTIGATION BE COMPLETED PRIOR TO PROCEEDING WITH DESIGN. ALTERNATIVELY, WHERE FEASIBLE, DATA COLLECTION SHOULD BE INCLUDED IN THE PROJECT SCOPE AND INTEGRATED INTO THE DESIGN PROCESS.

FLOW PROJECTIONS

To determine infrastructure capacity needs



EXISTING FLOWS

DRY WEATHER FLOW

Daily flow from historic dry day data
- Average flows
- Minimum flows
- Maximum flows
- Peaking factor

WET WEATHER FLOW

Peak dry weather flow

+

The lesser of
- 0.4 L/s/ha extraneous flow design allowance for existing serviced areas
- 5-year design storm flows*

*Using combination of modelled flows and projected flows from monitoring records

*Local municipalities may be using different criteria and/or level of service

FUTURE FLOWS

For 30-year planning horizon and 30-year service catchment

DESIGN FLOW

Existing peak wet weather flow

+

Growth Peak Dry Weather Flow
- Residential, 255 L/c/d
- Employment, 310 L/c/d
- Harmon's peaking factor for total upstream population

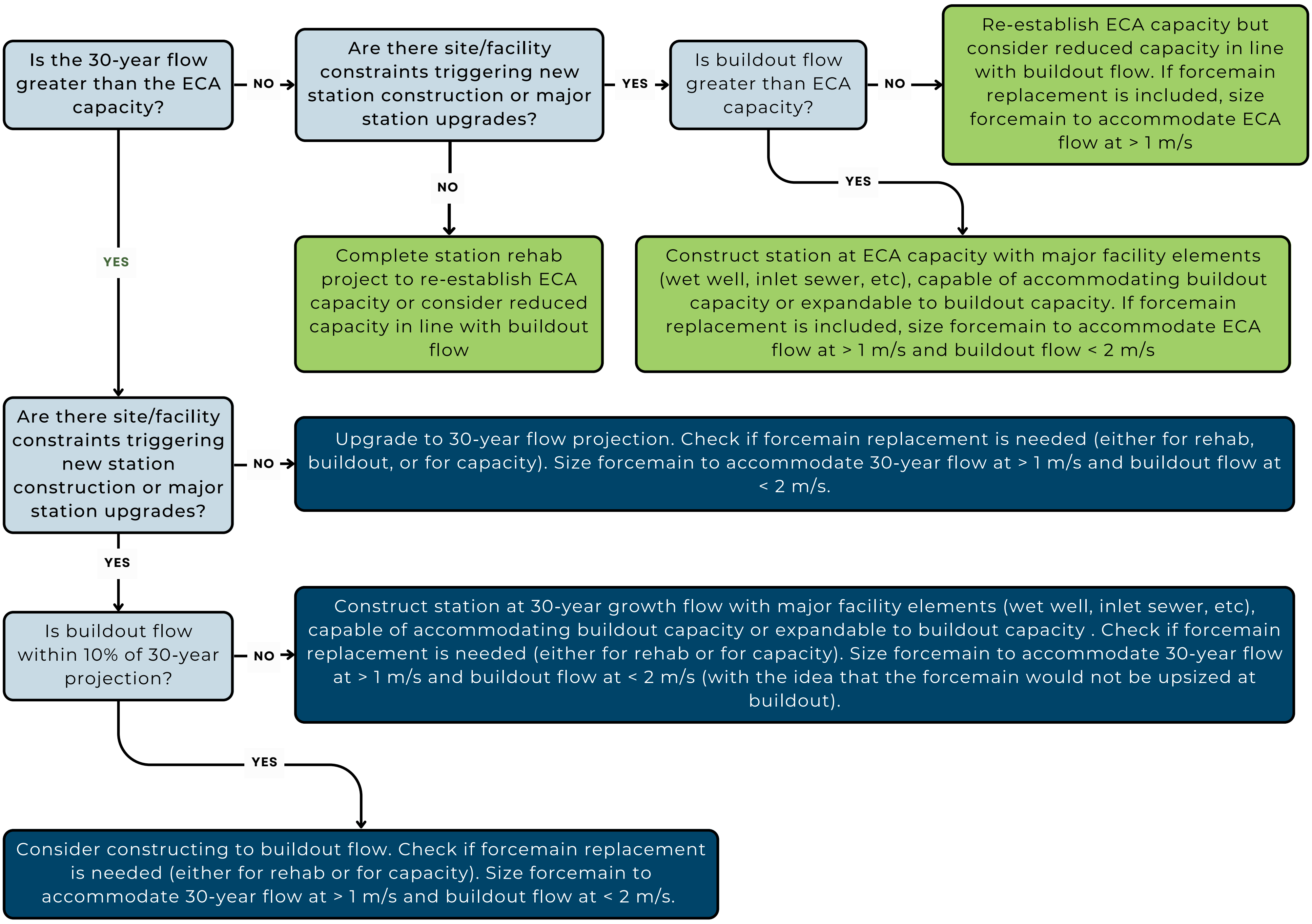
+

Extraneous Flow Design Allowance
- New serviced area, 0.286 L/s/ha

The design criteria presented in this document are based on the 2021 Master Servicing Plan Update Study

GM BluePlan ENGINEERING

SEWAGE PUMPING STATIONS



Is the 30-year flow greater than the ECA capacity?

Are there site/facility constraints triggering new station construction or major station upgrades?

Is buildout flow greater than ECA capacity?

Re-establish ECA capacity but consider reduced capacity in line with buildout flow. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s

Complete station rehab project to re-establish ECA capacity or consider reduced capacity in line with buildout flow

Construct station at ECA capacity with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s and buildout flow < 2 m/s

Are there site/facility constraints triggering new station construction or major station upgrades?

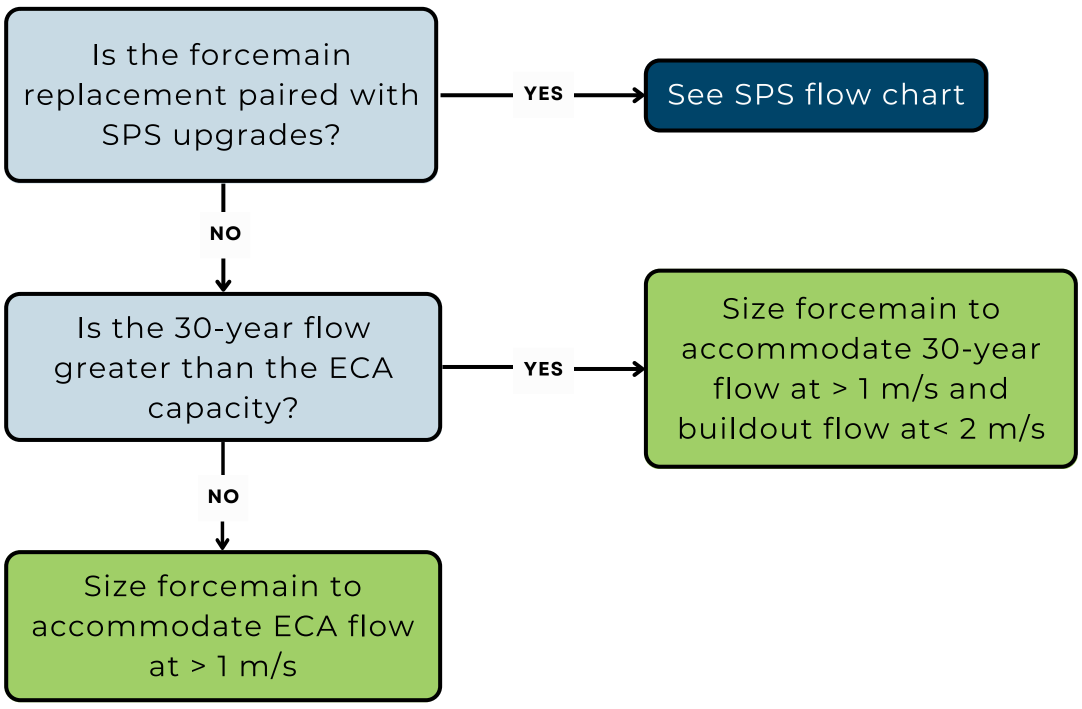
Upgrade to 30-year flow projection. Check if forcemain replacement is needed (either for rehab, buildout, or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

Is buildout flow within 10% of 30-year projection?

Construct station at 30-year growth flow with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity . Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s (with the idea that the forcemain would not be upsized at buildout).

Consider constructing to buildout flow. Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

FORCEMAINS



Is the forcemain replacement paired with SPS upgrades?

See SPS flow chart

Is the 30-year flow greater than the ECA capacity?

Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at< 2 m/s

Size forcemain to accommodate ECA flow at > 1 m/s

G.8.6 Detailed Project Costing Sheets

The detailed project costing sheets for the recommended 2021 MSPU capital projects within the Stevensville Douglastown Lagoons system are presented below.

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PL
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-II-017**
PROJECT NAME:	**Region Wide Wet weather Reduction**
PROJECT DESCRIPTION:	Wet weather reduction program in all systems to be executed from 2022-2051

Old ID		**Focus Areas**	Amount
_WW-II-001	Anger Ave WWTP	Lakeshore Road, Catharine Street, Dominion Road, Rose Avenue SPS, Anger Ave WWTP Catchments	
_WW-II-002	Crystal Beach WWTP	Nigh Road SPS and Crystal Beach WWTP Catchments	
_WW-II-003	Stevensville Douglastown	Stevensville, Douglastown catchments	
_WW-II-004	Welland WWTP	Feeder Road, Seaway Heights, Ontario Road SPS, Dain City, and Welland WWTP Catchments	
_WW-II-005	Baker - Grimsby	Woodsview, Biggar Lagoon, Old Orchard SPS Catchments	
_WW-II-006	Baker - Lincoln Beamsville	Ontario Street SPS Catchment	
_WW-II-007	Baker - Lincoln Vineland	Wet weather reduction in Jordan Valley***	
_WW-II-008	Port Dalhousie	Eastchester, Lakeside, Argyle, Renown SPS and Port Dalhousie WWTP Catchments	
_WW-II-009	Port Weller/Port Dalhousie	Wet weather reduction in North Thorold	
_WW-II-010	Port Weller	Haulage Road, Carlton Street SPS, and Port Weller WWTP Catchments	
_WW-II-011	Seaway WWTP	Union, Clarke Street, Arena, Elm Street, City Hall, Sugarloaf, Rosemount North and South SPS Catchments	
_WW-II-012	Niagara Falls WWTP	Central, Muddy Run, Seneca, Meadowvale, Drummond, Kalar Road SPS Catchments	
_WW-II-013	South Niagara Falls WWTP	South Side High Lift and South Side Low Lift SPS Catchments	
_WW-II-014	NOTL	Wet weather reduction in Northeast Niagara-on-the-Lake	
_WW-II-015	NOTL	Wet weather reduction in Virgil - NOTL	
_WW-II-016	Baker - West Lincoln	Wet weather reduction in West Lincoln - Baker	

PROJECT NO.:	**WW-SPS-006**
PROJECT NAME:	**Stevensville SPS Upgrade**
PROJECT DESCRIPTION:	Increase station capacity from 41 L/s to 109 L/s. Scope includes wet well expansion and replacing the two existing pumps.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.:	**WW-SPS-006**
	L/s
ECA	50.0
Operational	41.0

PROPOSED CAPACITY		109 L/s	Firm Capacity
Design PWWF	**Existing**	87 L/s	99 L/s
	2051	108 L/s	122 L/s
	Buildout	109 L/s	123 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	41	109
2	41	109

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	46 L/s	$27,983	$1,287,219	Replacement of 2 existing pumps, cost estimate based off unit rate applied to capacity increase
Related Upgrades	30%						does not apply with unit based upgrade
Bypass Pumping Allowance	7%					$90,105	
Additional Construction Costs	20%		ea.			$275,465	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$165,279	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$1,818,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$36,360	
Geotechnical Sub-Total Cost						**$36,360**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 272,700	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$272,700**	
In House Labour/Engineering/Wages/CA	4.0%					$ 72,720	
In-house Labour/Wages Sub-Total						**$72,720**	
Project Contingency	25%					$550,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$550,000**	
Non-Refundable HST	1.76%					$47,100	
Non-Refundable HST Sub-Total						**$47,100**	
Total (2022 Dollars)						**$2,797,000**	Rounded to nearest $1,000
Other Estimate							Override to match DC numbers; Planning allocation update post-DC
Chosen Estimate						**$2,797,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$55,940		
Design	Design fees, Town fees for design, contract admin	13%	$363,610		
Construction	Town fees, base costs and project contingency	85%	$2,377,450		
TOTAL			**$2,797,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-055**

PROJECT NAME: **Douglastown SPS Upgrade**

PROJECT DESCRIPTION: Increase station capacity from 33 L/s to 79 L/s. Scope includes wet well expansion and pump upgrades. Use implementation plan prior to upgrade: Flow

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-055**

	L/s
ECA	50.7
Operational	33.0

PROPOSED CAPACITY	79 L/s	Firm capacity
Design PWWF Existing	53 L/s	
2051	73 L/s	
Buildout	79 L/s	
	RDII	5Y Design

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	33.0	79.3
2	33.0	79.3

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	46 L/s	$27,983	$1,296,408	Pumping station expansion, cost estimate based off unit rate applied to capacity increase
Related Upgrades	30%						
Bypass Pumping Allowance	6%					$71,302	
Additional Construction Costs	15%		ea.			$205,156	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$157,287	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$1,730,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$17,300	
Geotechnical Sub-Total Cost						**$17,300**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 259,500	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$259,500**	
In House Labour/Engineering/Wages/CA	4.0%					$ 69,200	
In-house Labour/Wages Sub-Total						**$69,200**	
Project Contingency	15%					$311,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$311,000**	
Non-Refundable HST	1.76%					$40,800	
Non-Refundable HST Sub-Total						**$40,800**	
Total (2022 Dollars)						**$2,428,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$2,428,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$48,560		
Design	Design fees, Town fees for design, contract admin	13%	$315,640		
Construction	Town fees, base costs and project contingency	85%	$2,063,800		
TOTAL			**$2,428,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-TP-005**
PROJECT NAME: **Region-wide WWTP Process Upgrades**
PROJECT DESCRIPTION: Process upgrades to re-establish ECA capacity

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$50,000,000**	Placeholder Costs
Chosen Estimate						**$50,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$1,000,000		
Design	Design fees, Town fees for design, contract admin	13%	$6,500,000		
Construction	Town fees, base costs and project contingency	85%	$42,500,000		
TOTAL			**$50,000,000**		

PROJECT NO.:	**WW-TP-005**
PROJECT NAME:	**Region-wide WWTP Process Upgrades**
PROJECT DESCRIPTION:	Upgrades for odour control across the Region at forcemains, pump stations, and other locations.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$40,000,000**	Placeholder Costs
Chosen Estimate						**$40,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$800,000		
Design	Design fees, Town fees for design, contract admin	13%	$5,200,000		
Construction	Town fees, base costs and project contingency	85%	$34,000,000		
TOTAL			**$40,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-ST-001**
PROJECT NAME:	**Region Wide Flow Monitoring and Data Collection**
PROJECT DESCRIPTION:	Funding to support flow monitoring and data collection initiatives

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-ST-001

PROPOSED CAPACITY	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction							
Additional Construction Costs	10%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ -	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$0**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	10%					$4,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$4,000**	
Non-Refundable HST	1.76%					$100	
Non-Refundable HST Sub-Total						**$100**	
Total (2022 Dollars)						**$44,000**	Rounded to nearest $1,000
Other Estimate						**$12,000,000**	Assumes 400k/year for 30 y
Chosen Estimate						**$12,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$240,000		
Design	Design fees, Town fees for design, contract admin	13%	$1,560,000		
Construction	Town fees, base costs and project contingency	85%	$10,200,000		
TOTAL			$12,000,000		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-ST-002**
PROJECT NAME: **Fort Erie QEW Corridor Long-Term Study**
PROJECT DESCRIPTION: Crystal Beach WWTP, SD WWTP long term strategy

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-ST-002**

PROPOSED CAPACITY	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction							
Additional Construction Costs	10%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 400,000	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$400,000**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	10%					$50,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$50,000**	
Non-Refundable HST	1.76%					$7,900	
Non-Refundable HST Sub-Total						**$7,900**	
Total (2022 Dollars)						**$498,000**	Rounded to nearest $1,000
Other Estimate						**$500,000**	Study Estimate
Chosen Estimate						**$500,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$10,000		
Design	Design fees, Town fees for design, contract admin	13%	$65,000		
Construction	Town fees, base costs and project contingency	85%	$425,000		
TOTAL			**$500,000**		

H

Regional Municipality of Niagara

Part H

ANGER AVENUE WASTEWATER SYSTEM

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H. ANGER WASTEWATER TREATMENT PLANT

H.1 Existing System Infrastructure

The Anger Avenue wastewater system services the eastern part of the Town of Fort Erie. The system in services an existing population of 16,717 and 7,213 employees. Note that this population and employment total is based on the Region's 2021 allocation of Traffic Area Zones planning data and has been processed through the allocation methodology presented in **Volume 2** to refine the data to include only serviced populations. As such, the population and employment total may not directly match the system totals using the Region's unprocessed planning data.

The system is serviced by the Anger Avenue Wastewater Treatment Plant, located on 1 Anger Avenue, Fort Erie. The Anger Avenue Wastewater Treatment Plant is a conventional facility with a current rated capacity of 24.5 MLD, a peak dry weather flow capacity of 49.0 MLD and a peak wet weather flow capacity of 98.0 MLD.

System flows are conveyed to the treatment plant via a network of local and Regionally owned sewer, and Regionally owned pump stations and forcemains.

Figure 4.H.1 presents an overview of the wastewater system, and Figure 4.H.2 shows a schematic of the wastewater system.

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

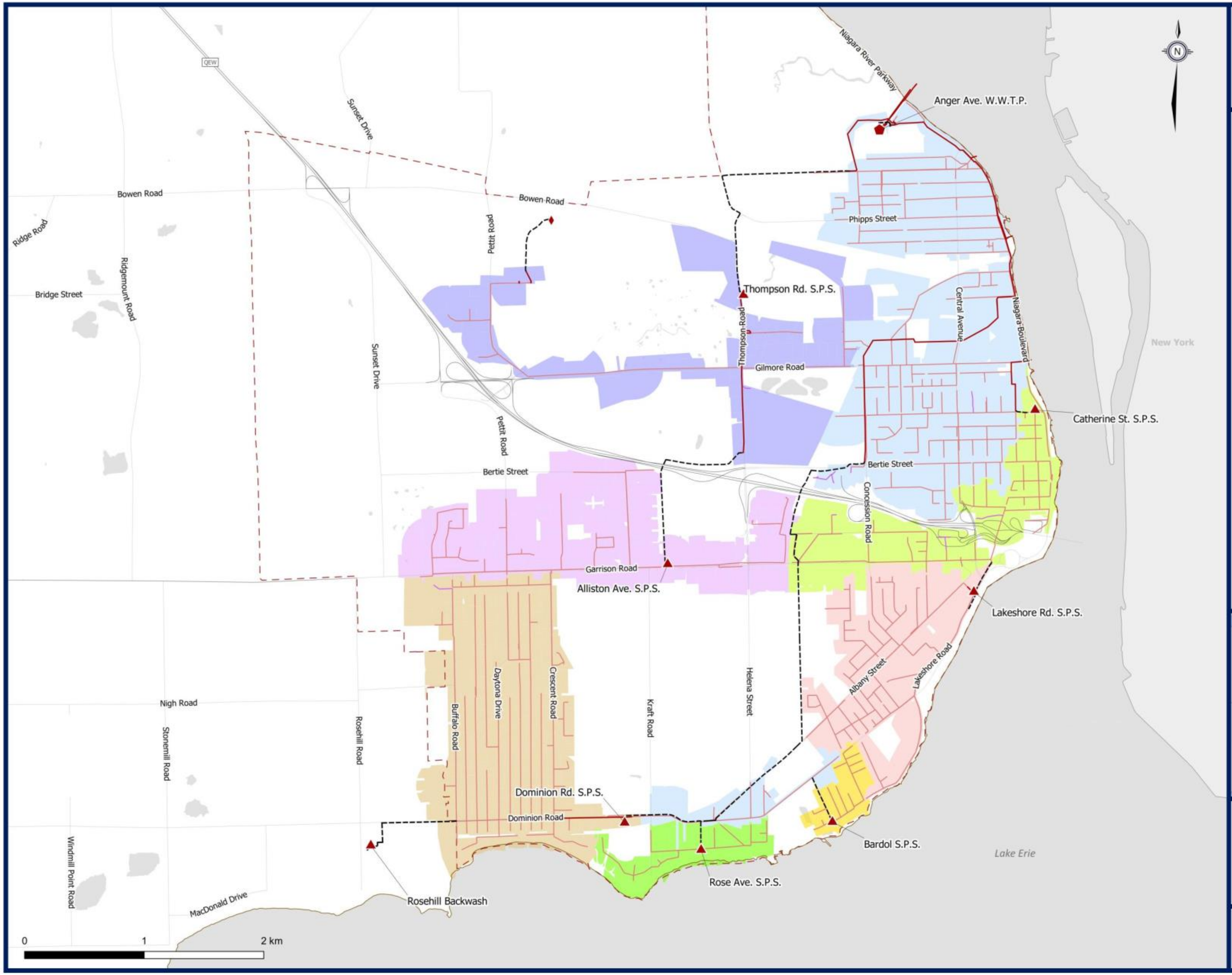


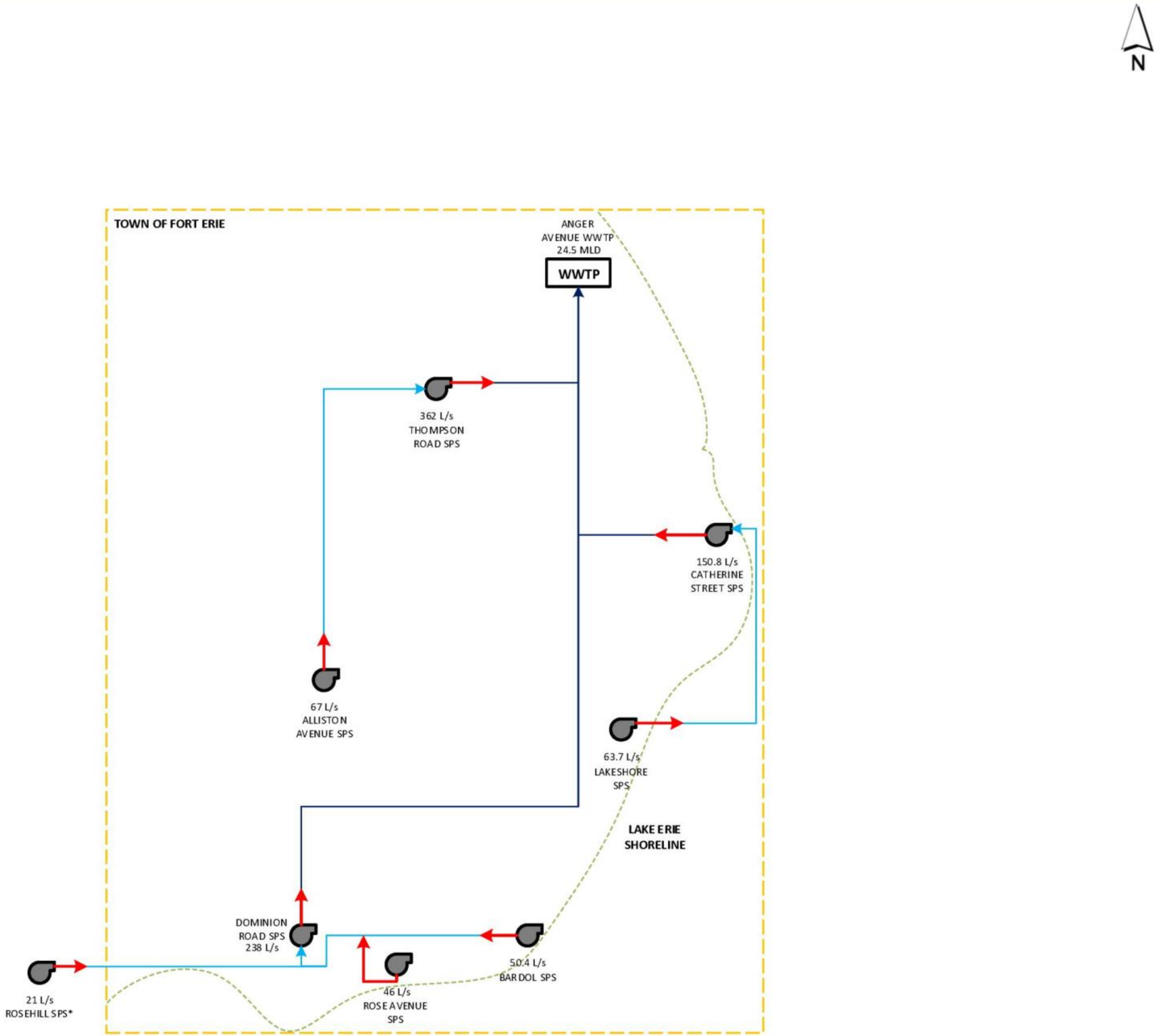
Figure 4.H.1
Anger Avenue WWTP System
Existing Wastewater Infrastructure

BluePlan ENGINEERING

March 2023
620126-WW-001
WKID: 26917

Niagara Region

2021 Water and Wastewater Master
Servicing Plan Update



WWTP RATED CAPACITY — Wastewater Treatment Plant

FIRM CAPACITY — Sewage Pumping Station

→ Forcemain

→ Connection from SPS to SPS

→ Connection from SPS to WWTP

*Rosehill Sewage Pumping Station only services the Rosehill Water Treatment Plant.

Figure 4.H.2
Anger Avenue WWTP
Existing Wastewater Infrastructure Schematic

GM BluePlan ENGINEERING

December 2022
621016-W-000
WKID: 26917

H.1.1 Facility Overview

Table 4.H.1 to **Table 4.H.2** present a summary of the environmental compliance approval (ECA) for the Anger Avenue wastewater treatment plant (WWTP) usage, operation, and effluent concentration objectives.

Table 4.H.1 Wastewater Treatment Plant Overview

Plant Name	Anger Avenue Wastewater Treatment Plant
ECA	#0421-8LVJ3N Issued October 24, 2011
Address	1 Anger Avenue, Fort Erie
Discharge Water	Niagara River
Rated Capacity: Average Daily Flow	24.5 MLD
Rated Capacity: Peak Flow Rate (Dry Weather)	49.0 MLD
Rated Capacity: Peak Flow Rate (Wet Weather)	98.0 MLD
Key Processes	• Conventional activated sludge treatment with screening • Grit removal • Sludge thickening • Effluent disinfection • Phosphorus removal • Chlorination of secondary bypass flow

Table 4.H.2 Wastewater Treatment Plant Effluent Objectives

Effluent Parameter	Objective Concentration
$CBOD_5$	15.0 mg/L
TSS	15.0 mg/L
Total Phosphorus	1.0 mg/L
E. Coli	200 organisms/100 mL
Total Chlorine Residual	0.5 mg/L (Maximum concentration during disinfection period: April 01 to October 31)

Table 4.H.3 lists each sewage pumping station’s (SPS) listed ECA firm capacity as well as the station’s existing operational firm capacity (the current operating capacity of the pumps station based on performance testing and/or supervisory control and data acquisition (SCADA) trending). As identified in Volume 4, the operational firm capacity was used as the basis of assessment for the 2021 MSPU. In some cases where the operational firm capacity was larger than the ECA firm capacity; the registered ECA capacity was used.

Table 4.H.3 Pumping Station and Forcemain Overview

Station Name	Location	Catchment Details		Pump Station Details			Forcemain Details		
		Area Exclusive of Upstream Catchments (ha)	Area Inclusive of Upstream Catchments (ha)	Number of Pumps	ECA Firm Capacity (L/s)	Operational Firm Capacity (L/s)	Single or Twinned Forcemain	Forcemain Diameter (mm)	Length (m)
└→**Thompson Road SPS**	1800 Thompson Road, Fort Erie	198.2	430.3	3	680.0	362.0	Single	600	2,145
└→**Alliston Road SPS**	900 Garrison Road, Fort Erie	232.1	232.1	2	43.0	67.0	Single	250	1,556
└→**Catherine Street SPS**	8 Catherine Street, Fort Erie	132.1	282.4	2	162.0	150.8	Single	300	165
└→**Lakeshore SPS**	Lakeshore Road, Fort Erie	150.3	150.3	2	36.7	63.7	Single	200	178
└→**Dominion Road SPS**	1027 Dominion Road, Fort Erie	280.2	353.1	3	256.0	238.0	Single	450	3,550
└→**Rose Ave SPS**	Rose Avenue at Edgemere Road, Fort Erie	48.5	48.5	2	50.6	46.0	Single	200	245
└→**Bardol SPS**	Lakeshore Road at Bardol Road, Fort Erie	24.5	24.5	2	43.2	50.4	Single	250	397

H.2 Basis for Analysis

H.2.1 Flow Criteria, System Performance, and Sizing Methodology

The Niagara Region Traffic Area Zone planning data was used to estimate growth related flow generation within the wastewater system and to spatially allocate growth flows within each individual system. **Table 4.H.4** presents a summary of the flow criteria, performance, and sizing methodology that was utilized. Refer to **Volume 4 - Introduction** for additional information.

The Region's per capita wastewater flows criteria were updated based on a historic review of the previous 3-year period for local billing meter and flow monitoring records. Given that more granular data was available to complete this analysis compared to previous master plan updates, the population and employment per capita rates were differentiated. The data showed a slight reduction in the population criteria and slight increase in the employment criteria, which reflect existing flow generation trends more closely compared to the Region's previous per capita rate. Further detail regarding the per capita flow generation is presented in **Volume 4 – Introduction.**

The Region's extraneous flow allowance criteria was also reviewed against historic flow monitoring and pump station performance records where available. The review of historic wet weather flows found that typically 2-year design storm peak flows within existing built systems exceeded the Region's existing extraneous flow design allowance of 0.286 L/s/ha; however, that a 2-year design storm peak flow below 0.286 L/s/ha was achievable as demonstrated in multiple catchment areas. Based on the analysis and an industry review, for the purpose of future planning, the extraneous flow design allowance for existing areas was increased to 0.4 L/s/ha but was maintained at 0.286 L/s/ha for new greenfield development areas to better reflect the existing high wet weather flows, while minimizing the magnitude of system upgrades with wet weather flow management as a critical priority. In areas where available historic flow monitoring and modelling results identify existing peak 5 year design flows below the 0.4 L/s/ha criteria, the lower 5 year design flows should be utilized. Further details regarding the extraneous flow design allowance are presented in **Volume 4 – Introduction**

Table 4.H.4 Flow Criteria, Scenarios, System Performance, and Sizing Methodology

	Component	Criteria	
Flow Criteria	Existing System Flows	Starting Point Methodology • Based on local billing meter records and flow monitoring data to establish existing dry and wet weather flows • Growth flows are added to the existing system baseline using design criteria	
	Flow Generation	Residential	255 L/c/d
		Employment	310 L/e/d

	Component	Criteria	
	Peaking Factor	Peak Dry Weather Flow	Harmon’s Peaking Factor
	Extraneous Flow Design Allowance	• 0.4 L/s/ha for existing areas • 0.286 L/s/ha for new developments	
WWTP	System Performance and Triggers	• MECP Procedure F-5-1 • Trigger upgrade study at 80% capacity • Trigger upgrade construction at 90% capacity	
	Upgrade Sizing	• Average daily flow plus growth based on population design flows	

Pump Station	System Performance and Triggers Sizing	• Refer to **Section H.2.1.1**
		• Two flow scenarios considered
		  • **Design Allowance**: Peak wet weather flow using the peaked dry weather flow plus the extraneous flow design allowance
		  • **5-Year Storm**: Modelled peak wet weather flow using the 5-year design storm
		• Peak flow capacity to meet design peak wet weather flow using the extraneous flow design allowance
		• Wet well and system storage considerations under 5-year storm to minimize basement flooding and overflow risks	

Forcemain	System Performance and Triggers	• Flag velocities less than 0.6 m/s • Flag velocities greater than 2 m/s • Upgrade when velocities exceed 2.5 m/s and considering condition and age	
	Upgrade Sizing	• Design velocity target between 1 m/s and 2 m/s • Forcemain twinning to increase capacity where feasible	
Trunk	System Performance and Triggers	• Design allowance peak wet weather flows, using the extraneous flow design allowance, to be managed within pipe • Freeboard (depth between hydraulic grade line and surface) greater than 1.8 m below surface in 5-year design storm • Flag pipes velocities less than 0.6 m/s • Flag pipes velocities greater than 3.0 m/s	
	Upgrade Sizing	• Sized for full flow under post-2051 design peak wet weather flow • Assess 5-year design storm performance to minimize basement flooding risks and overflows	

H.2.1.1 SPS Performance Evaluation and Upgrade Framework

Although it is the Region's design philosophy to size SPS inline with the Region's extraneous flow design allowance, the 2021 MSPU undertook a hybrid evaluation approach in an effort to acknowledge that SPS are a major contributor to local wastewater system performance and that many legacy system's exiting wet weather flows exceed the extraneous flow design allowance. The SPS hybrid performance evaluation and upgrade framework are summarized in **Table 4.H.5** and strives to balance the magnitude of capacity upgrades, potential cascading downstream upgrades, and managing the potential risk of local sewer surcharging and system overflows.

Under the hybrid performance evaluation and upgrade framework, the SPS capacity was sized to meet the lesser of peak wet weather flow (PWWF) using the extraneous flow design allowance, referred to as "Design Allowance PWWF" or the estimated 5-year storm PWWF. Further, consideration for the SPS actual performance under the estimated 5-year design storm peak wet weather flow was evaluated to determine if the available system storage including the wet well, storage tanks, and in system capacity was sufficient to manage excess flows while maintaining the system hydraulic grade line (HGL) below the basement flooding level of 1.8 m below grade and/or below the local overflow level.

In instances where the 5-year storm PWWF flow exceeded the available system storage, additional system solutions such as wet weather management, system storage, and/or additional SPS capacity upgrades were incorporated into the servicing solution. The most efficient solution to manage capacity and flow reduction was determined through the assessment of calculated flows from the 2051 design allowance PWWF and modelled 5-year storm PWWF against the operational firm capacity of the station and system storage.

Each SPS with a preferred solution of a capacity upgrade was individually reviewed in detail to determine how capacity upgrades should best be achieved:

- Pump replacement
- Pump upgrades
- Pump additions
- Station replacement
- Existing wet well sizing changes
- FM sizing and capacity.

Due to data quality and availability, a prioritization of upgrade needs, and flow monitoring (data collection) was assigned to each case for the Region implementation plan, discussed later in **Section H.8**.

Table 4.H.5 SPS Assessment Framework

Case	2051 Design PWWF	2051 5 Year Storm PWWF	2051 5-Year Storm Storage Need	Preferred Solution	Upgrade Priority	Flow Monitoring Priority
Case 1	> Firm Capacity	> Firm Capacity	> Available Storage	Upgrade pumps to future design allowance flow with potential storage upgrades or wet weather management	High	Medium
Case 2	< Firm Capacity	> Firm Capacity	> Available Storage	Upgrade storage and/or wet weather management	High	High
Case 3	> Firm Capacity	> Firm Capacity	< Available Storage	Potential upgrade to design allowance flow and/or wet weather management	Medium	High
Case 4	< Firm Capacity	> Firm Capacity	< Available Storage	Potential wet weather management	Low	Medium
Case 5	> Firm Capacity	< Firm Capacity	< Available Storage	No upgrade, use actual peak flows	N/A	Low
Case 6	< Firm Capacity	< Firm Capacity	< Available Storage	No upgrade	N/A	Low

H.2.2 Growth Population Projections and Allocations

Table 4.H.6 outlines the existing and projected serviced population and employment by catchment.

Table 4.H.6 Anger Ave Wastewater Treatment Plant Existing and Projected Serviced Population by Catchment

Sewage Pumping Station (SPS)	Existing Population & Employment			2051 Population & Employment			Post 2051 Population & Employment			2021-2051 Growth		
	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population Growth	Employment Growth	Total Growth
Anger Avenue WWTP	6,943	2,312	9,255	11,768	2,593	14,362	19,770	3,026	22,797	4,825	282	5,107
└→Thompson Road SPS	215	1,135	1,350	1,006	4,748	5,755	1,321	5,410	6,732	791	3,613	4,404
| └→Alliston Road SPS	1,163	1,156	2,319	2,670	1,450	4,120	3,967	1,691	5,658	1,507	295	1,801
└→Catherine Street SPS	1,369	1,310	2,679	1,700	1,427	3,127	1,763	1,485	3,247	331	117	448
| └→Lakeshore SPS	2,526	457	2,983	2,786	475	3,260	2,866	477	3,343	259	18	277
└→Dominion Road SPS	3,704	790	4,493	4,428	939	5,367	5,246	1,124	6,370	724	150	874
└→Rose Ave SPS	318	29	347	1,531	43	1,574	1,654	46	1,700	1,213	15	1,228
└→Bardol SPS	478	25	503	519	37	556	523	39	562	41	12	53
TOTAL	**16,717**	**7,213**	**23,930**	**26,408**	**11,713**	**38,121**	**37,110**	**13,299**	**50,409**	**9,691**	**4,500**	**14,191**

Note: Population numbers may not sum due to rounding.

H.3 System Performance

H.3.1 Wastewater Treatment Plant

The starting point flows for the Anger Ave WWTP was calculated using historic SCADA flow data. Ten years of data (2011 to 2020) was reviewed to provide historical context and assess overall long-term trends; however, the most recent five years of data was used to determine the average daily flow**. Table 4.H.7** shows the historical system flows obtained from wastewater treatment plant production data.

Table 4.H.7 Historic Anger Ave Wastewater Treatment Plant Flows

Year	Average Daily Flow		Peak Daily Flow	
	(MLD)	(L/s)	(MLD)	(L/s)
2011	14.5	168.0	53.1	614.5
2012	11.1	128.7	51.5	595.7
2013	12.6	146.4	94.3	1091.3
2014	14.3	165.8	59.3	685.9
2015	12.9	149.5	46.7	540.7
5 Year Average	13.1	151.7	61.0	705.6
5 Year Peak	14.5	168.0	94.3	1091.3
2016	12.7	146.4	41.4	479.0
2017	15.0	173.6	51.8	599.6
2018	14.6	169.3	54.7	632.8
2019	15.1	175.3	52.3	605.1
2020	13.6	157.2	45.3	524.3
5-Year Average	14.2	164.4	49.1	568.2
5-Year Peak	15.1	175.3	54.7	632.8
10-Year Average	13.7	158.0	55.0	636.9
10-Year Peak	15.1	175.3	94.3	1,091.3

The 10-year trend analysis showed that flows to the Anger Ave WWTP continue to reflect high flows in wetter years. The 5-year average flow has increased approximately 8% from the 2016 MSP starting point.

The starting point flow used for the Anger Ave WWTP was 14.2 MLD.

Figure 4.H.3 shows the projected future flows at the Anger WWTP. The plant has surplus capacity to support growth and will not reach 80% capacity within the 2051-time horizon. The post-2051 flows are expected to exceed the 80% capacity, at which time a potential upgrade study may be triggered.

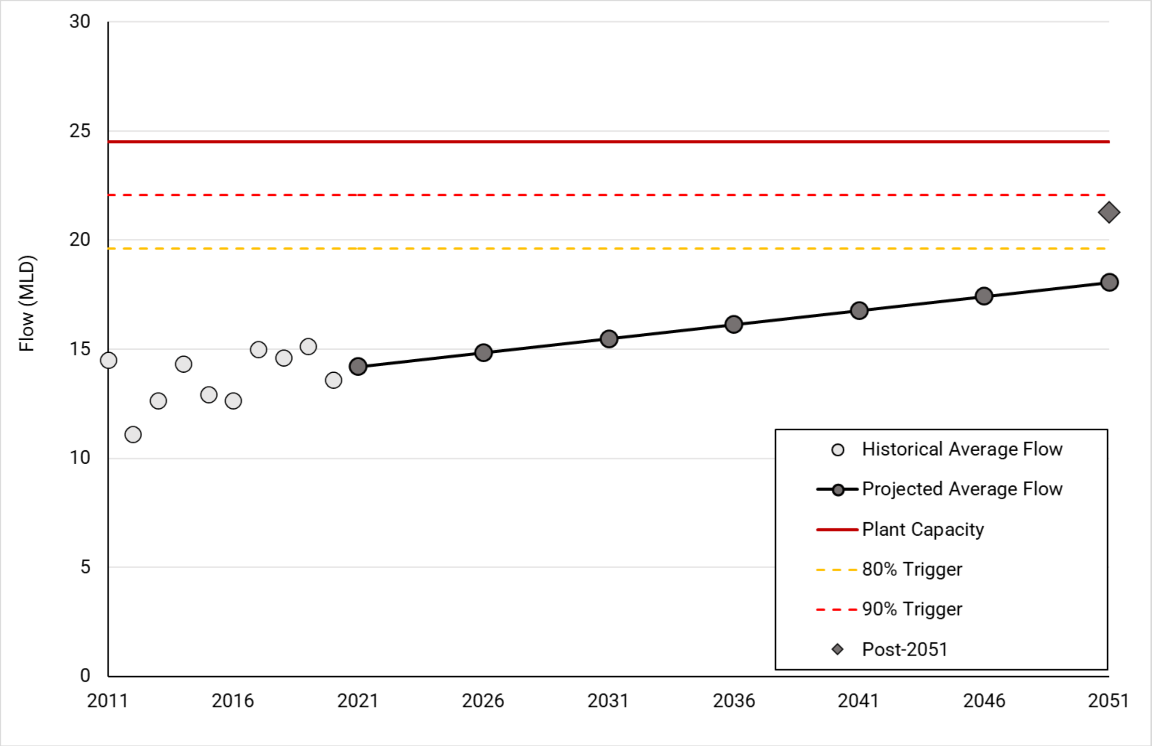


Figure 4.H.3 Projected Sewage Generation at Anger Avenue WWTP

H.3.2 Sewage Pumping Station

Table 4.H.8 highlights the sewage pumping station operational firm capacities and the existing and projected flows. The existing average and peak dry weather flows were estimated using the wastewater system model, which was updated using the best available billing, flow monitoring, and SCADA data from 2018 to 2020.

Table 4.H.8 System Sewage Pumping Station Performance

Station Name	Station Capacity	2021 Flows				2051 Flows			Post-2051 Flows		
	Operational Firm Capacity	Average Dry Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow
	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)
└→Thompson Road SPS	362.0	23.0	36.8	208.9	331.7	102.4	415.3	538.2	123.5	436.5	559.3
| └→Alliston Road SPS	67.0	7.6	9.2	102.0	100.0	29.1	133.7	131.8	43.9	148.5	146.5
└→Catherine Street SPS	150.8	22.3	66.1	179.0	428.1	74.7	187.7	436.7	77.0	190.0	439.0
| └→Lakeshore SPS	63.7	12.8	17.3	77.4	175.8	20.7	80.8	179.2	21.6	81.8	180.1
└→Dominion Road SPS	238.0	32.9	49.3	190.6	485.5	72.4	220.9	515.8	83.2	231.7	526.6
└→Rose Ave SPS	46.0	1.9	2.2	21.6	47.2	15.8	39.4	65.0	17.1	40.7	66.3
└→Bardol SPS	50.4	3.0	3.6	13.4	57.2	4.3	14.1	57.9	4.4	14.2	57.9

The following SPS have existing and future deficiencies under both design allowance PWWF and 5-year storm, requiring upgrades to support existing and future flows.

- Alliston Road SPS
- Catherine Street SPS
- Lakeshore SPS

The following SPS have future deficiencies under design allowance PWWF and 5-year storm, requiring upgrades to support future flows.

- Thompson Road SPS

The following SPS have sufficient capacity to support 2051 flows using the design allowance PWWF, however, the projected 5-year storm PWWF exceeds the operational firm capacity as such potential system or facility upgrades may be required.

- Dominion Road SPS
- Rose Ave SPS
- Bardol SPS

H.3.3 Forcemain

Table 4.H.9 highlights the existing and projected forcemain performance. Velocities less than 0.6 m/s were flagged in yellow and velocities exceeding 2.5 m/s were flagged in red. Note, if a pumping deficit was identified in **Table 4.H.8**, then projected forcemain velocities were based on the higher of the station's ECA firm capacity or the governing peak wet weather flow scenario, otherwise if no pumping deficit was identified, the operational firm capacity was used for future capacity assessment.

Table 4.H.9 Forcemain Performance

Station Name	Forcemain Diameter (mm)	Operational Firm Capacity		2051		Post-2051	
		Pumped Flow (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)
└→Thompson Road SPS	**600**	362.0	1.3	680.0[2]	2.4	680.0[2]	2.4
| └→Alliston Road SPS	**250**	67.0	1.4	131.8[3]	2.7	146.5[3]	3.0
└→Catherine Street SPS	**300**	150.8	2.1	187.7[3]	2.7	190.0[3]	2.7
| └→Lakeshore SPS	**200**	63.7	2.0	80.8[3]	2.6	81.8[3]	2.6
└→Dominion Road SPS	**450**	238.0	1.5	238.0[1]	1.5	238.0[1]	1.5
└→Rose Ave SPS	**200**	46.0	1.5	46.0[1]	1.5	46.0[1]	1.5
└→Bardol SPS	**250**	50.4	1.0	50.4[1]	1.0	50.4[1]	1.0

[1] Operational firm capacity

[2] ECA capacity

[3] Minimum of future design allowance PWWF or 5-year storm PWWF

There are no forcemains with low velocities in the current operating regime.

The following forcemains had a projected forcemain capacity deficit in the 2051 growth scenario:

- Alliston Road SPS
- Catherine Street SPS
- Lakeshore SPS

All other forcemains have capacity to support flows to 2051.

H.3.4 Trunk Sewer

Figure 4.H.4 and **Figure 4.H.5** highlight the trunk performance in the existing and 2051 projected design allowance peak wet weather flow scenarios, respectively.

- There are no Region trunk sewers with existing or future pipe capacity deficits from the design allowance peak wet weather flows.
- There are some sewers surcharging above the basement flooding freeboard from the existing and future 5-year storm peak wet weather flows.
    - Thompson Road SPS Road shows surcharging in Region trunks and local sewers due to SPS capacity and high growth in the future scenarios.
    - WWTP shows surcharging in Region trunks sewers due to high wet weather inflows in the existing and future scenarios.
- Note that the Anger Avenue WWTP system has several combined sewer overflows (CSO), that help regulate the hydraulic grade line (HGL) within the trunk system to reduce basement flooding risks.
- Local surcharging above the basement flooding freeboard was identified in the Fort Erie WWTP Pollution Prevention and Control Plan (PPCP). The PPCP identified sewers which required upgrades for local sewers; those projects were not carried forward into the MSP as they will be funded and implemented by the local area municipalities (LAMs).

H.3.5 Overflows

Under the design allowance peak flows no overflows are anticipated; however, many of the CSOs become active from 5-year storm peak wet weather flows. The adverse risks of wet weather inflows are currently partially managed through CSOs; however, the Region and LAMs are working together to reduce wet weather inflows to the system in order to reduce system overflows.

Detailed assessment of system CSO are addressed in the Fort Erie PPCP; which outlines the proposed wet weather flow management approach to manage CSO volumes.

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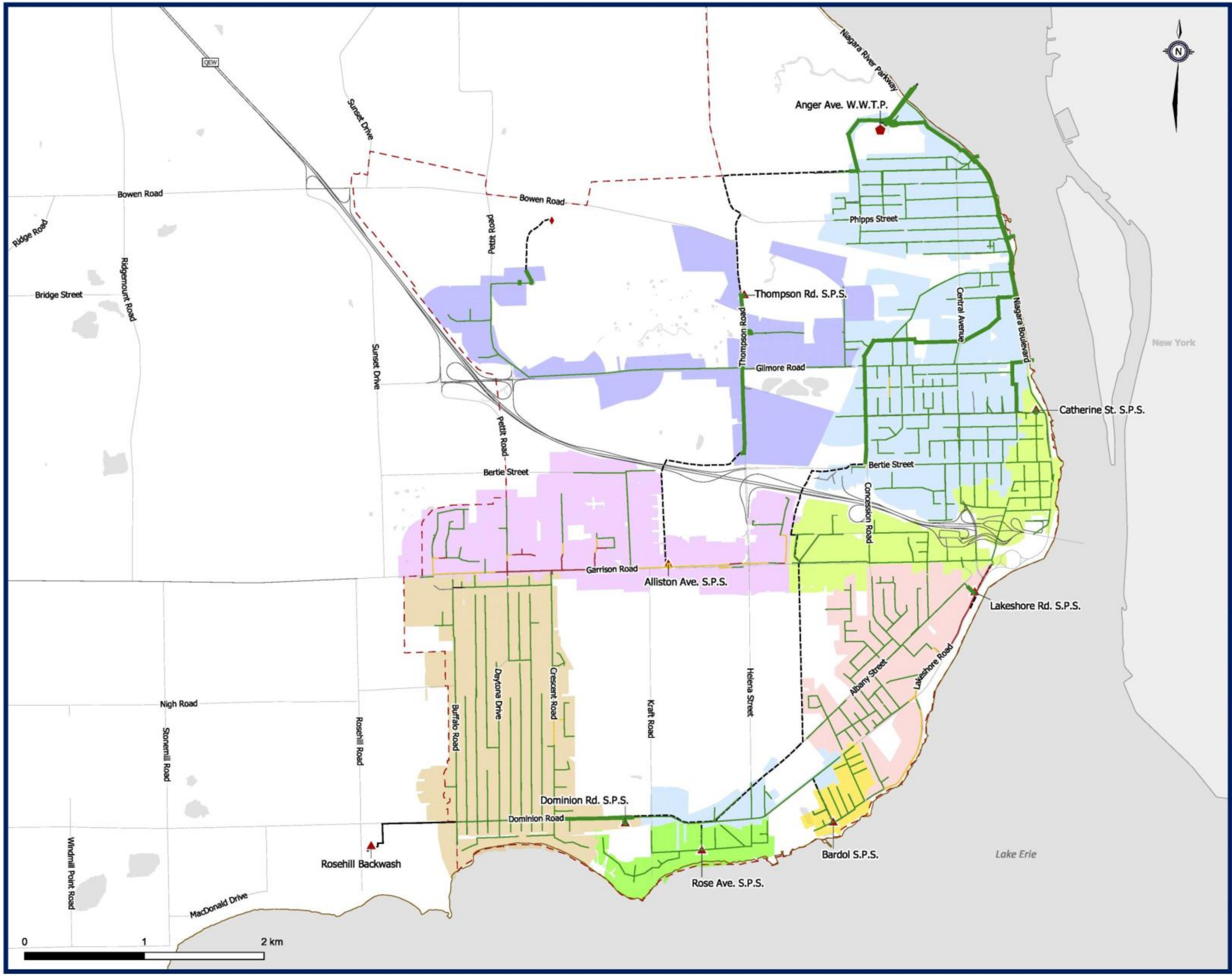

Figure 4.H.4

Existing Design

Peak Wet Weather Flows

Anger Avenue WWTP

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Servicing Plan Update

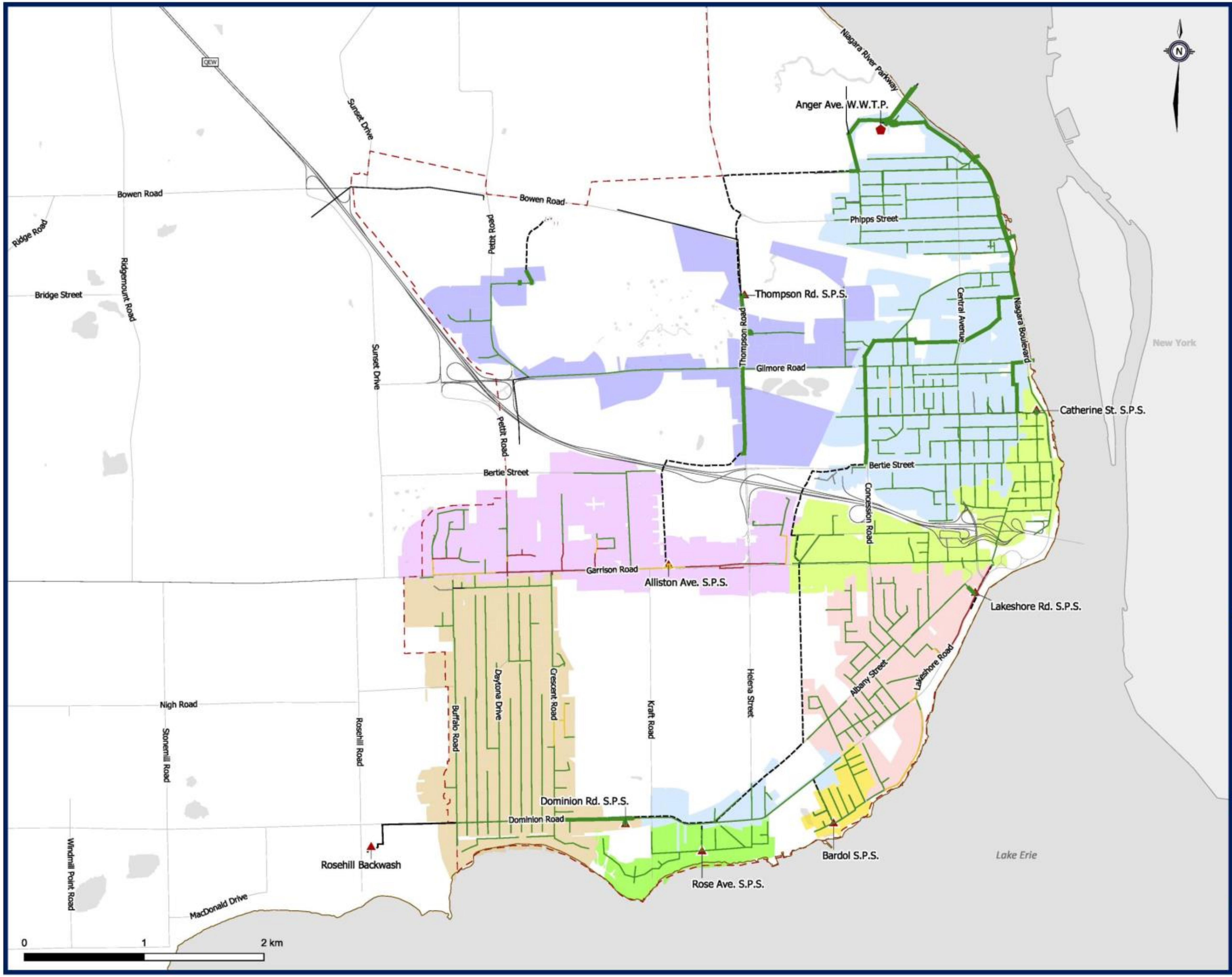

Figure 4.H.5

2051 Design

Peak Wet Weather Flows

Anger Avenue WWTP

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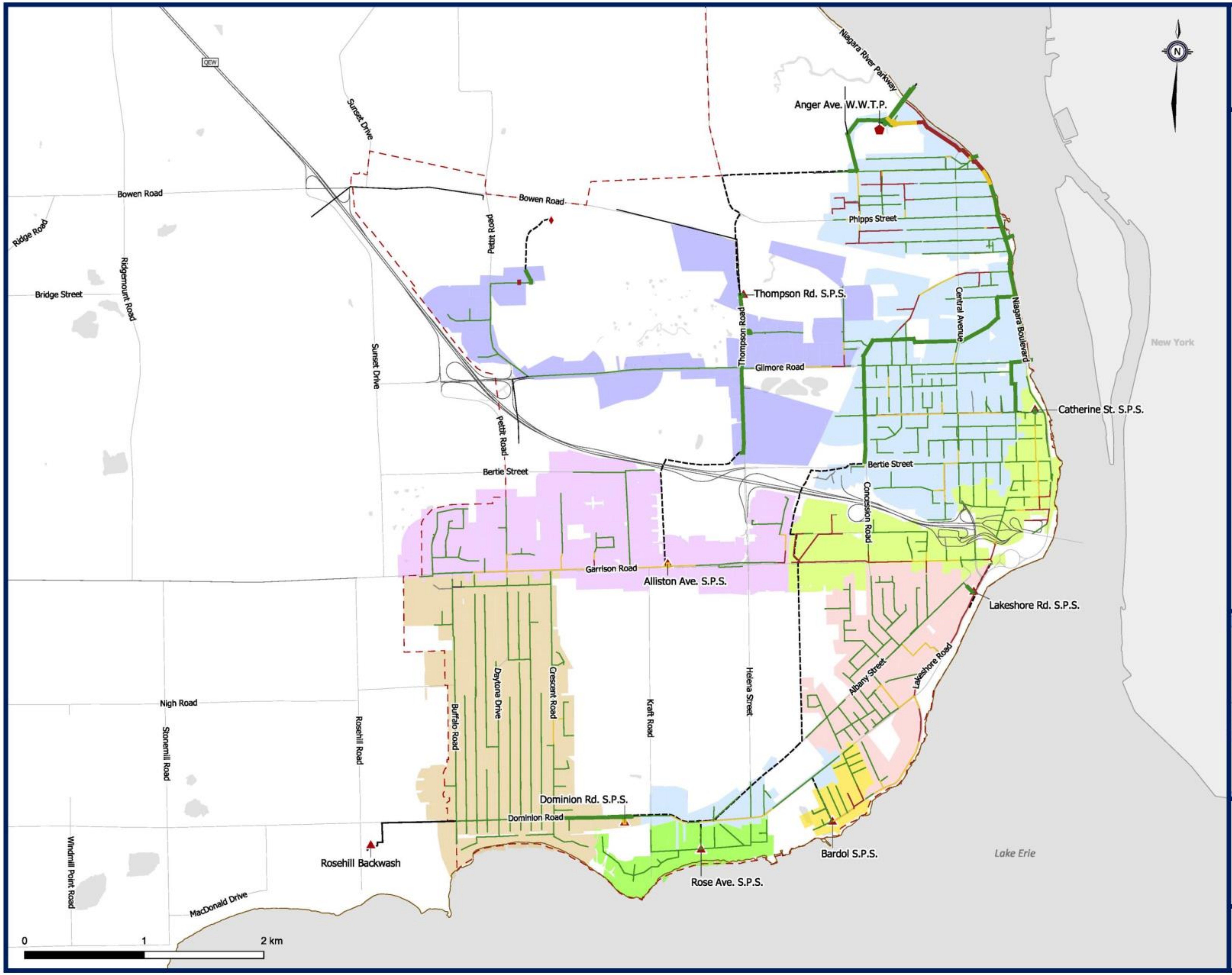

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Existing Wastewater Infrastructure
- ● Combined Sewage Detention Facility
- ♦ Leachate Pumping Station
- ● Odour Control Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant

Wastewater Network
- Force Mains
- Local Sewers
- Regional Mains
- Private Sewers

Wastewater Catchments
- Alliston Road
- Dominion Road
- Anger Avenue WWTP
- Lakeshore
- Bardol
- Rose Avenue
- Catherine Street
- Thompson Road

Other Features
- Municipal Boundary
- Waterbodies
- Urban Area Boundary

System Performance
- 🟩 Surplus Capacity
- 🟨 Surcharging Sewer
- 🟥 Surcharging Sewer with Basement Flooding Risk

Figure 4.H.6

Existing 5-Year Storm Peak Wet Weather Flows

Anger Avenue WWTP

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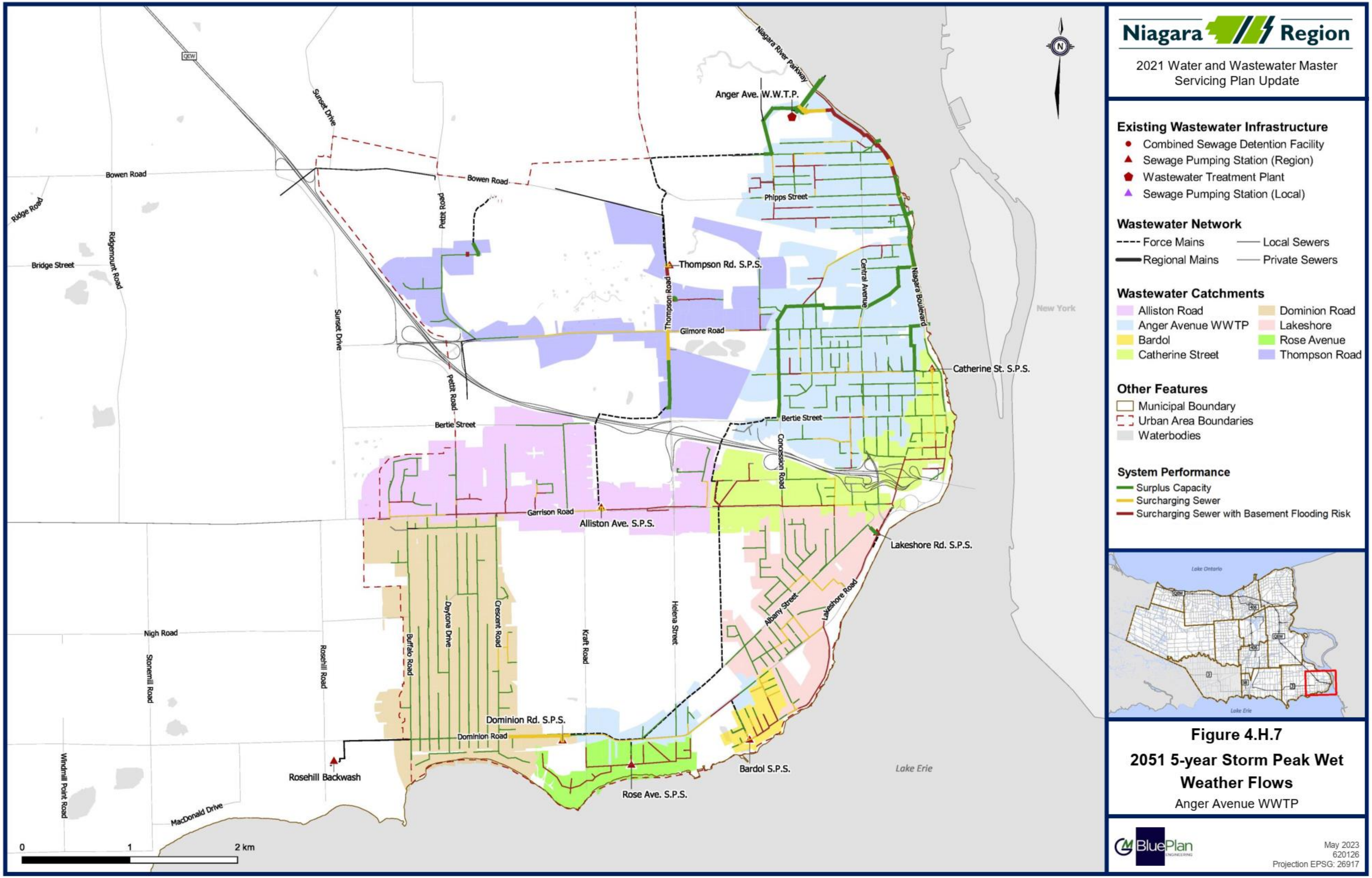

2021 Water and Wastewater Master Servicing Plan Update

Existing Wastewater Infrastructure

- ● Combined Sewage Detention Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Local)

Wastewater Network

- ---- Force Mains
- ━ Regional Mains
- — Local Sewers
- — Private Sewers

Wastewater Catchments

- 🟪 Alliston Road
- 🟦 Anger Avenue WWTP
- 🟨 Bardol
- 🟩 Catherine Street
- 🟫 Dominion Road
- 🟥 Lakeshore
- 🟩 Rose Avenue
- 🟪 Thompson Road

Other Features

- ☐ Municipal Boundary
- ⬚ Urban Area Boundaries
- ▨ Waterbodies

System Performance

- — Surplus Capacity
- — Surcharging Sewer
- — Surcharging Sewer with Basement Flooding Risk

Figure 4.H.7

2051 5-year Storm Peak Wet Weather Flows

Anger Avenue WWTP

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Projection EPSG: 26917

H.4 System Opportunities and Constraints

Figure 4.H.8 Highlights the existing opportunities and constraints.

H.4.1 Anger Ave Wastewater Treatment Plant

- The current rated average daily flow capacity of the plant is 24.5 MLD, with an existing flow of 14.2 MLD and a projected 2051 average daily flow of 18.0 MLD, which is below 80% of the wastewater treatment plant rated capacity. As such, the plant has surplus capacity and will not reach 80% capacity within the 2051-time horizon.
- The post-2051 flows are expected to exceed the 80% capacity, at which time a potential upgrade study may be triggered.

H.4.2 Fort Erie

- Several large residential and employment growth areas identified outside existing serviced area. Local servicing strategy identified in Bridgeburg Wastewater Servicing Strategy.
- Existing and growth-related capacity deficits at Alliston SPS, Lakeshore Road SPS and Catherine Street SPS.
- Growth is expected to trigger capacity deficit at
    - Alliston SPS forcemain
    - Lakeshore SPS forcemain
    - Catherine Street SPS forcemain
    - Thompson Road SPS
- Areas of significant wet weather flows and system overflows, which will need to be managed to allow for growth.
- Existing trunk infrastructure, sewers, and pumping stations have sufficient capacity to support design peak wet weather flows.

H.4.3 System Optimization Opportunities

- Existing system configuration provides limited opportunities to optimize system including system diversions to reduce sewage pumping station upgrades and/or eliminated existing sewage pumping stations.
- Significant opportunity to provide capacity for growth through implementation of wet weather flow management within the Anger Ave system.
- Opportunity explores a consolidated Fort Erie treatment strategy; this may include
    - Decommissioning the Crystal Beach Wastewater Treatment Plant and conveying flows to the Anger Avenue Wastewater Treatment Plant in lieu of extensive treatment plant rehabilitations.
    - Opportunity to decommission Stevensville Douglastown Lagoons and convey flows to the Anger Avenue Wastewater Treatment Plant in lieu of local treatment expansion.

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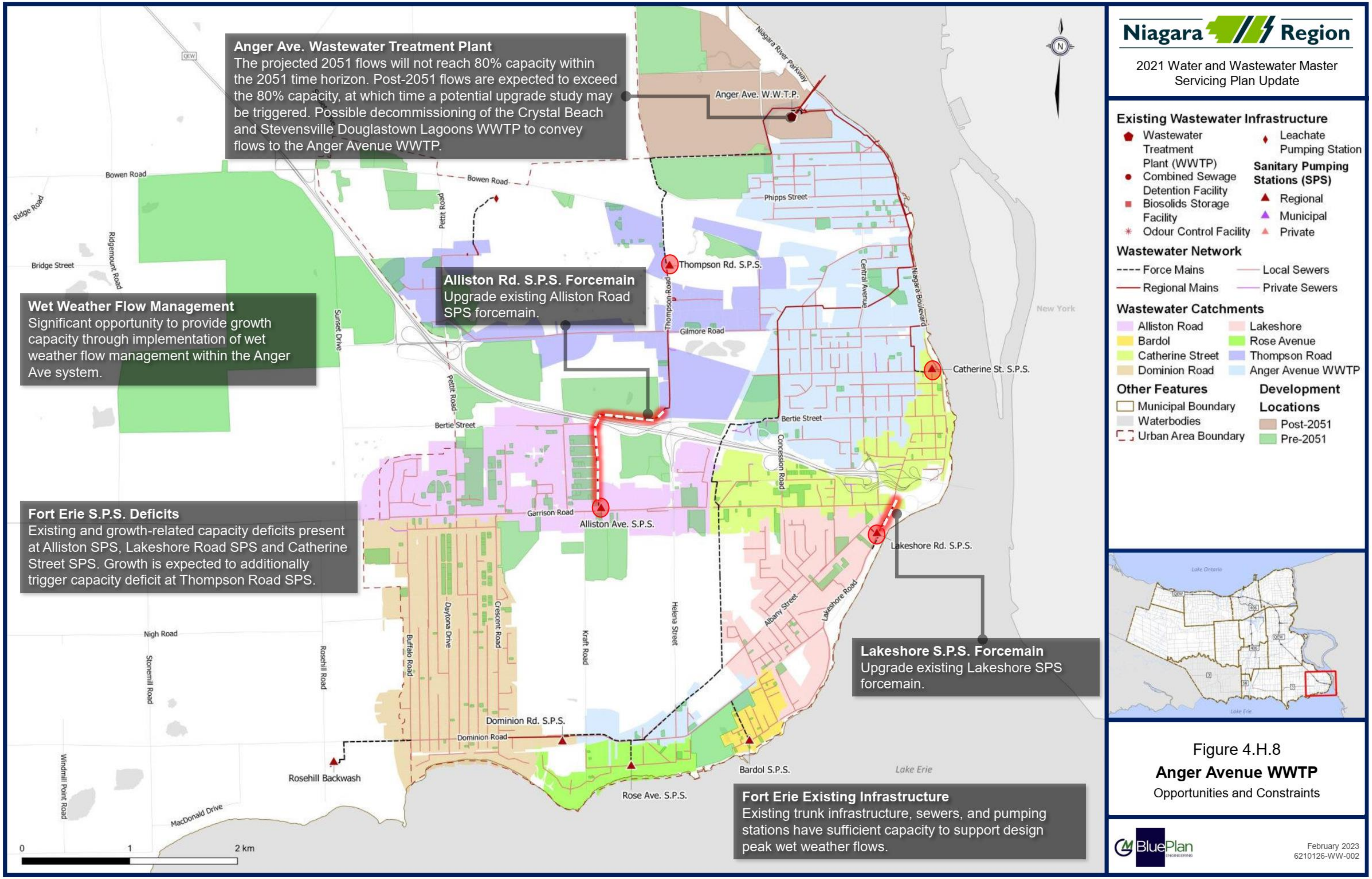
2021 Water and Wastewater Master Servicing Plan Update



Anger Ave. Wastewater Treatment Plant
The projected 2051 flows will not reach 80% capacity within the 2051 time horizon. Post-2051 flows are expected to exceed the 80% capacity, at which time a potential upgrade study may be triggered. Possible decommissioning of the Crystal Beach and Stevensville Douglastown Lagoons WWTP to convey flows to the Anger Avenue WWTP.

Wet Weather Flow Management
Significant opportunity to provide growth capacity through implementation of wet weather flow management within the Anger Ave system.

Alliston Rd. S.P.S. Forcemain
Upgrade existing Alliston Road SPS forcemain.

Fort Erie S.P.S. Deficits
Existing and growth-related capacity deficits present at Alliston SPS, Lakeshore Road SPS and Catherine Street SPS. Growth is expected to additionally trigger capacity deficit at Thompson Road SPS.

Lakeshore S.P.S. Forcemain
Upgrade existing Lakeshore SPS forcemain.

Fort Erie Existing Infrastructure
Existing trunk infrastructure, sewers, and pumping stations have sufficient capacity to support design peak wet weather flows.

Figure 4.H.8
Anger Avenue WWTP
Opportunities and Constraints

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February 2023
6210126-WW-002

H.5 Assessment of Alternatives

Generally, the previously recommended strategies from the 2016 MSP program were carried forward which included capacity upgrades at select stations, and wet weather management strategies in key areas.

While the strategies remained the same, the following details including alignment, sizing, or wet weather areas have been updated to reflect the latest system understanding and reflect updated criteria changed through this iteration of the 2021 MSPU.

- Providing capacity within Region-owned pumping stations and trunk sewers to convey peak wet weather flows up to the lesser of the 5-year design storm or extraneous flow design allowance criteria of 0.4 L/s/ha for existing areas and 0.286 L/s/ha for growth areas, based on the updated flow criteria and actual flows.
- Provide upstream flow management to address high peak flows in the system where peak wet weather flows exceed the extraneous flow design allowance criteria of 0.4 L/s/ha resulting in basement flooding and overflow risks. Upstream flow management can include but is not limited to these options, in the preferred order of implementation:
  - Inflow and infiltration reduction in public right of way
  - Inflow and infiltration reduction from private properties
  - Enhanced system storage
  - Peak flow control using system controls or engineered solutions
- As shown in **Section H.3.2**, pump station capacity assessments were completed by reviewing the projected design allowance peak flows and 5-year storm flows against the operational firm capacity of each station.
  - Where the peak storm flows were less than design flows and the operational firm capacity of the station, the storm flows were used as actual flows, and therefore would not have triggered an upgrade.
  - Where the projected peak design allowance flows and 5-year storm flows exceeded the operational firm capacity of the station, a pump upgrade was recommended. Additional storage options and wet weather management were also considered.

To address existing and growth-related capacity needs, the following servicing concepts were evaluated:

- Do nothing
- Station capacity upgrade for pumping or storage
- Wet weather management
- Hybrid solution

H.6 Preferred Servicing Strategy

The following is a summary of Anger WWTP system as recommended through the 2016 Master Servicing Plan Update and carried forward through this update:

- The recommended solution for the Anger Ave Wastewater Treatment Plant system is to provide wet weather management across the system. This will require Regional solutions as well as local municipality solutions.
- Upgrades to some sewage pumping stations and forcemains in the system due to high growth and existing deficiencies.
- A study is recommended to evaluate a consolidated Fort Erie treatment strategy; this includes the potential convey of the Crystal Beach WWTP and/or Stevensville Douglastown Lagoons to the Anger Ave WWTP.

Figure 4.H.10 and **Figure 4.H.11** show the preferred servicing strategy, consisting of:

H.6.1 Treatment Plant Works

- No capacity upgrades are required.

The Region has a number of Region-wide programs focused on maintaining and enhancing the treatment capacity at the Region's existing WWTP. The programs applicable to the Anger Avenue WWTP include:

- WWTP Process Upgrades (WW-TP-005) which funds projects to improve treatment processes to re-establish the ECA capacity at plants.

H.6.2 Pumping Stations

- Increase Catherine Street SPS capacity from 150.8 L/s to 190 L/s.
- Increase Lakeshore SPS capacity from 63 L/s to 82 L/s.
- Upgrade Alliston SPS from 67 L/s to ultimate ECA of 130 L/s by installing one additional planned pump.
- Increase Thompson SPS capacity from 362 L/s to 510 L/s by installing one additional planned pump; consistent with phased approach under ultimate ECA capacity of 680 L/s.

Further to the pump station upgrades, the Region-wide allowance to address odour control needs that are the result of growth-related system upgrades has been included.

- WWTP Process Upgrades (WW-TP-006) which funds in-system and plant upgrades to control odour.

H.6.3 Forcemains

- Upgrade existing 200 mm Lakeshore SPS forcemain with new single 250 mm.
- Upgrade existing 250 mm Alliston Road SPS forcemain with new single 400 mm.

H.6.4 Decommissioning of Existing Facilities

- No decommissioning projects are recommended in the Anger Ave WWTP system.

H.6.5 Wet Weather Flow Management Program

A significant element of the Niagara Region wastewater servicing strategy is the wet weather management program. The program is intended to address existing capacity constraints, and to provide for growth-related capacity without expanding/upgrading existing trunk infrastructure, or by minimizing the required expansion/upgrades.

The wet weather management program currently identifies overall preliminary priority, staging of location and target amount of inflow and infiltration reduction across all systems. This program provides for a proactive and targeted approach to addressing wet weather impacts. These wet weather management programs will need to be a joint initiative between the Region and local municipalities.

For the Anger Ave system, all SPS catchments were identified as high priorities for inflow and infiltration reduction in the 2017 Fort Erie PPCP: Many areas were identified as targeting between 50-75% of inflow and infiltration reduction.

H.6.6 Additional Studies and Investigations

The Town should continue to implement the recommendations of the PPCP including more extensive flow monitoring and field investigations such as smoke and dye testing and other fieldwork.

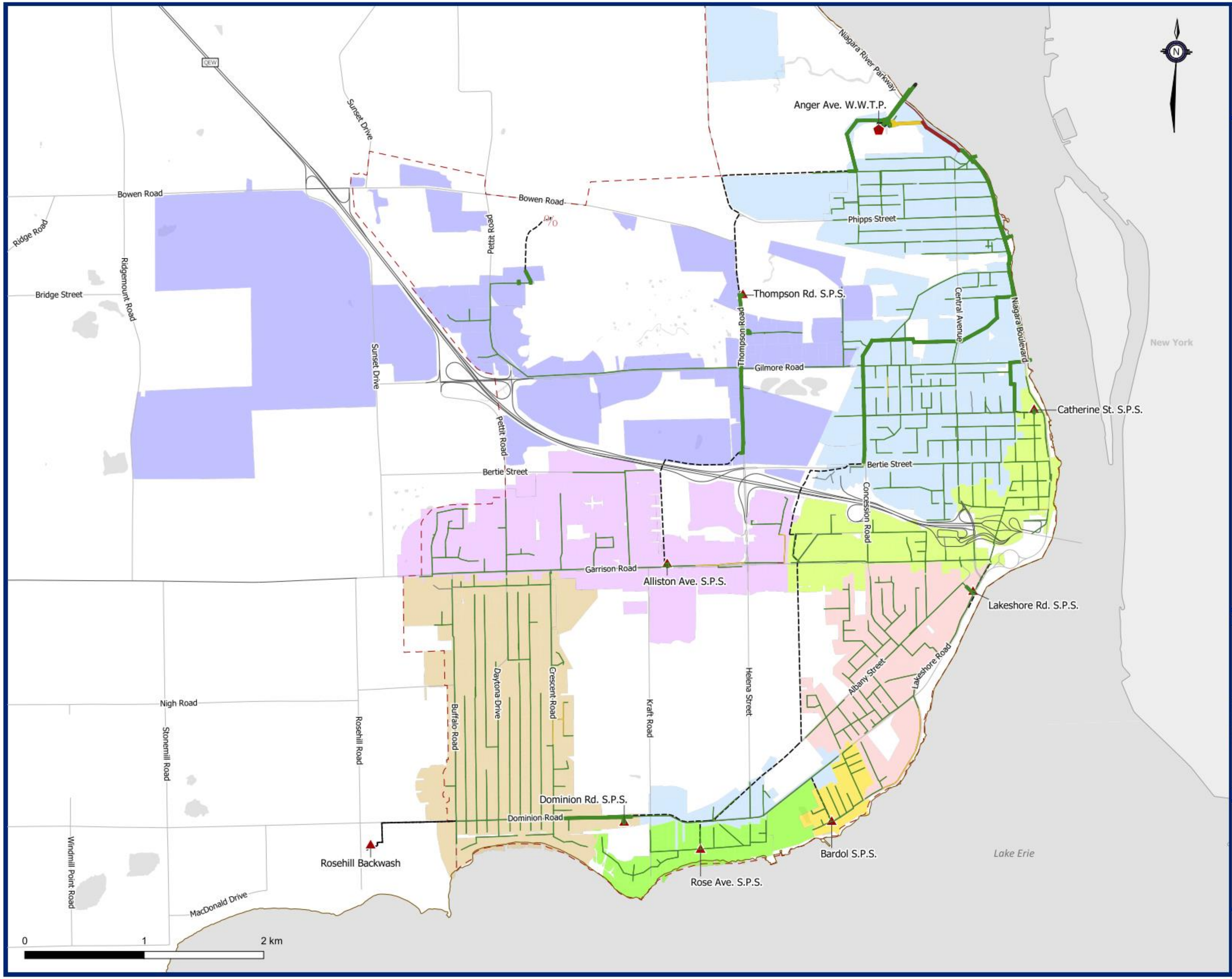
Fort Erie QEW Corridor Long-Term Study: study is recommended to assess wastewater treatment options for the Fort Erie area, which would include reviewing options:

- Assess the viability decommissioning the Crystal Beach WWTP and conveying Crystal Beach system flows to the Anger Ave WWTP service area via a new SPS and forcemain.
- Assess options to decommission the Stevensville Douglastown Lagoons by replacing the Lagoons with a new SPS and forcemain to convey flows to either the Anger Avenue WWTP or new South Niagara Falls WWTP.

The outcome of the study will be an updated capacity assessment of the Anger Avenue WWTP based on the preferred servicing strategy for Crystal Beach and Stevensville Douglastown areas.

H.6.7 Future System Performance

Figure 4.H.9 presents the future system performance, based on the preferred servicing strategy configuration and capacities; but excludes the potential benefits of the local wet weather flow management program.



Niagara Region

2021 Water and Wastewater
Master Servicing Plan Update

Existing Wastewater Infrastructure
- ● Combined Sewage Detention Facility
- % Leachate Pumping Station
- ● Odour Control Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Private)
- ▲ Sewage Pumping Station (Local)

Wastewater Network
- - - - Force Mains
- ━ Regional Mains
- — Local Sewers
- — Private Sewers

Wastewater Catchments
- 🟪 Alliston Road
- 🟦 Anger Avenue WWTP
- 🟨 Bardol
- 🟩 Catherine Street
- 🟫 Dominion Road
- 🟥 Lakeshore
- 🟩 Rose Avenue
- 🟪 Thompson Road

Other Features
- ☐ Municipal Boundary
- ⬚ Urban Area Boundaries
- ⬜ Waterbodies

System Performance
- ━ Surplus Capacity
- ━ Surcharging Sewer
- ━ Surcharging Sewer with Basement Flooding Risk

Figure 4.H.9

Future Capital Program Peak Wet Weather Flow

Anger Avenue WWTP

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620126
Projection EPSG:26917

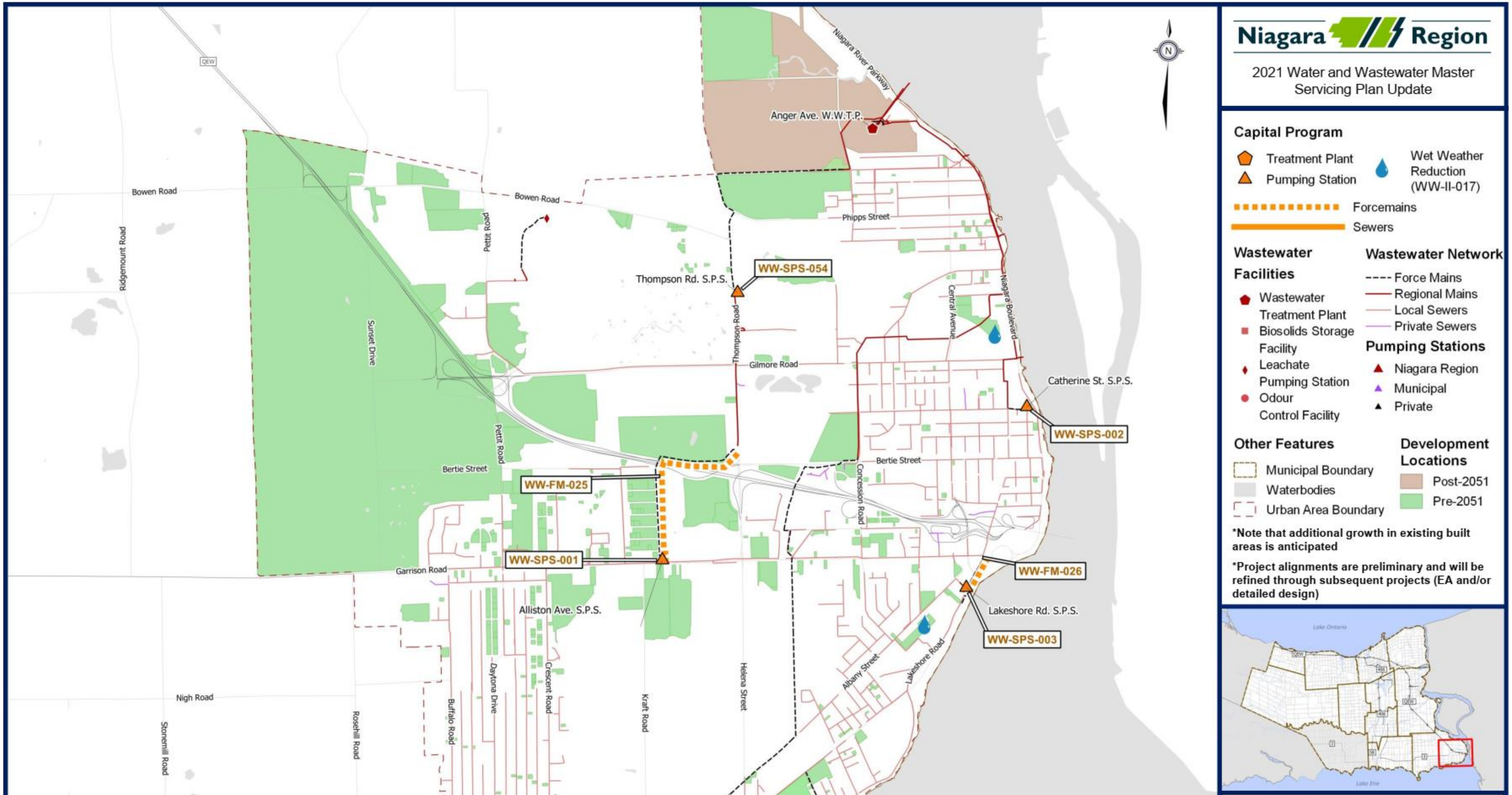
H.7 Capital Program

Figure 4.H.10 and **Figure 4.H.11** present the preferred servicing strategy map and schematic

Table 4.H.10 summarizes the recommended project costing timing and Class EA requirements. Individual detailed costing sheets are presented in **Section H.8.6.**

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



Capital Program

- ⬟ Treatment Plant
- △ Pumping Station
- 💧 Wet Weather Reduction (WW-II-017)
- ▪▪▪ Forcemains
- ▬ Sewers

Wastewater Facilities

- ⬟ Wastewater Treatment Plant
- ■ Biosolids Storage Facility
- ♦ Leachate Pumping Station
- ● Odour Control Facility

Wastewater Network

- ---- Force Mains
- ― Regional Mains
- ― Local Sewers
- ― Private Sewers

Pumping Stations

- ▲ Niagara Region
- ▲ Municipal
- ▲ Private

Other Features

- ☐ Municipal Boundary
- ■ Waterbodies
- ☐ Urban Area Boundary

Development Locations

- 🟫 Post-2051
- 🟩 Pre-2051

***Note that additional growth in existing built areas is anticipated**

***Project alignments are preliminary and will be refined through subsequent projects (EA and/or detailed design)**

Figure 4.H.10

Anger Avenue WWTP System

Preferred Wastewater Servicing Strategy

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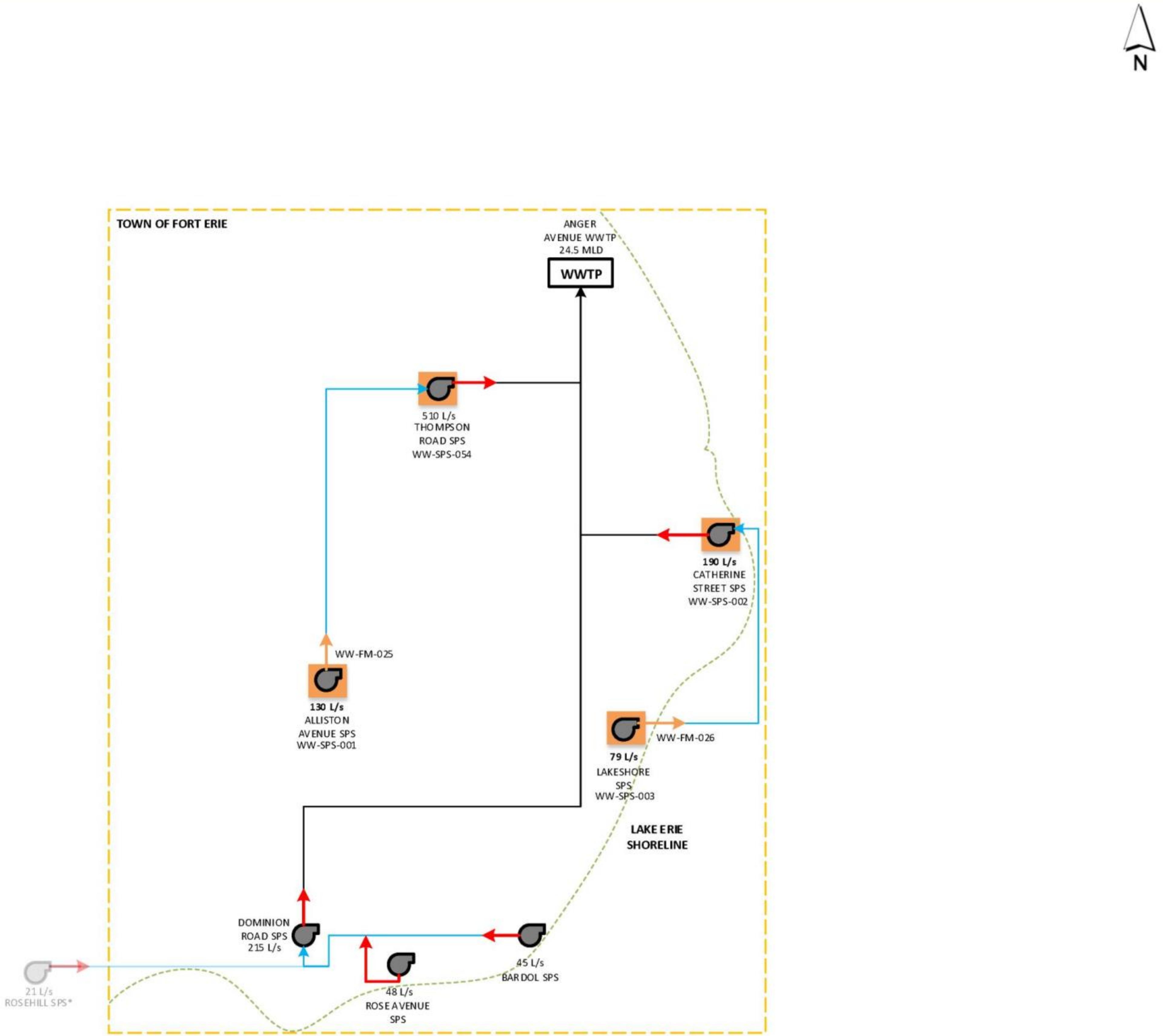
December 2022
620126-WW-006
WKID: 26917

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



WWTP RATED CAPACITY	Wastewater Treatment Plant
FIRM CAPACITY	Sewage Pumping Station
→	Forcemain
→	Connection from SPS to SPS
→	Connection from SPS to WWTP
🟧	Facility Upgrade
🟩	New Facility
—	Upgrade Forcemain or Sewer
—	New Forcemain or Sewer
⊗	Decommission Project

*Rosehill Sewage Pumping Station only services the Rosehill Water Treatment Plant.

Figure 4.H.11
Anger Avenue WWTP

Future Wastewater Infrastructure Schematic

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December 2022
621016-W-000
WKID: 26917

Table 4.H.10 Summary of Anger Wastewater Treatment Plant Capital Program

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost ($)
WW-FM-025	Alliston Road Forcemain Upgrade	Replace existing 250 mm Alliston Road SPS forcemain with new single 300 mm in Fort Erie	300 mm	2027-2031	Fort Erie	A+	Satisfied	Forcemain	$4,233,000
WW-FM-026	Lakeshore Forcemain Replacement	Upgrade existing 200 mm Lakeshore SPS forcemain with new single 250 mm in Fort Erie	250 mm	2022-2026	Fort Erie	A+	Satisfied	Forcemain	$1,155,000
WW-SPS-001	Alliston SPS Upgrade	Upgrade from 67 L/s to ultimate ECA of 130 L/s by adding final pump.	130 L/s	2027-2031	Fort Erie	A+	Satisfied	Pumping	$1,107,000
WW-SPS-002	Catherine Street SPS Replacement	Increase station capacity from 150.8 L/s to 190 L/s by replacing station at new location.	190 L/s	2022-2026	Fort Erie	B	Separate EA Ongoing	Pumping	$9,372,000
WW-SPS-003	Lakeshore SPS Upgrade (Fort Erie - Anger Ave WWTP)	Increase station capacity from 63 L/s to79 L/s by replacing the station at a new location.	79 L/s	2022-2026	Fort Erie	B	Separate EA Ongoing	Pumping	$7,748,000
WW-SPS-054	Thompson SPS Upgrade	Increase station capacity from 362 L/s to 510 L/s by installing one additional planned pump: consistent with phased approach under ultimate ECA capacity of 680 L/s	510 L/s	2032-2036	Fort Erie	A+	Satisfied	Pumping	$1,690,000
WW-II-017(1)	Region-Wide Wet weather Reduction	Wet weather reduction program in all systems to be executed from 2022-2051	N/A	2022-2051	Region-Wide		Dependent on outcome of wet weather flow study	Wet Weather Reduction	$225,000,000
WW-ST-001(1)	Region-Wide Flow Monitoring and Data Collection	Funding to support flow monitoring and data collection initiatives	N/A	2022-2051	Region-Wide			Wet Weather Reduction	$12,000,000
WW-ST-002(2)	Fort Erie QEW Corridor Long-Term Study	Crystal Beach WWTP, SD WWTP long term strategy	N/A	2022-2026	Fort Erie		Separate EA Required	Treatment	$500,000
WW-TP-005(1)	Region-Wide WWTP Process Upgrades	Process upgrades to re-establish ECA capacity	N/A	2022-2051	Region-Wide			Treatment	$50,000,000
WW-TP-006(1)	Region-Wide WWTP Process Upgrades	Upgrades for odour control across the Region at forcemains, pump stations, and other locations.	N/A	2022-2051	Region-Wide			Treatment	$40,000,000
								Total	**$25,305,000**

(1) Project cost not included in subtotal as it is a Region-wide project

(2) Project cost not included in subtotal as it is a Fort Erie wide project

H.8 Project Implementation and Considerations

H.8.1 10-Year Program Sequencing

The recommended year in service for the capital projects is presented in **Section H.7**. Special project implementation and considerations for the preferred servicing strategy consist of:

- Completing the Fort Erie QEW Corridor Long-Term Study before 2026 to support the implementation of a Stevensville Douglastown Lagoons solutions prior to the lagoons exceeding their capacity.
- Coordination of the Lakeshore SPS and Catherine Street SPS upgrades. The preferred approach is to complete the Catherine Street SPS upgrade in advance of the Lakeshore SPS upgrade. However, it is understood that due to potential challenges with the Catherine Street SPS site, the Lakeshore SPS and forcemain upgrades may be completed first. Completion of the Lakeshore SPS upgrade project in advance of the Catherine Street SPS upgrade may increase the frequency or volume of overflows at the Catherine Street SPS.

It is understood that the timing for the recommended projects may be subject to change due to a variety of external factors such as overall balancing of the Region's capital budget, changes to growth projections, and other unforeseen circumstances. As such, **Table 4.H.11** presents the preferred priority of the projects within the first 10-years of the capital program.

Table 4.H.11 Preferred Project Order

Master Plan ID	Name	2021 MSPU Year in Service	Order
WW-SPS-002	Catherine Street SPS Replacement	2022-2026	1
WW-SPS-003	Lakeshore SPS Upgrade	2022-2026	2
WW-FM-026	Lakeshore Forcemain Replacement	2022-2026	2
WW-SPS-001	Alliston SPS Upgrade	2027-2031	3
WW-FM-025	Alliston Road Forcemain Upgrade	2027-2031	3

H.8.2 EA Requirements and Studies

The following summarizes the status of EA requirements for recommended capital projects which will require Schedule B or C EAs.

- **EA has been satisfied through previous projects:**
    - **WW-SPS-003** and **WW-FM-026** (Lakeshore Road SPS) - Schedule B
- **Currently ongoing separate EA studies:**
    - None
- **EA studies to be completed through separate studies:**
    - Fort Erie QEW Corridor Long-Term Study envisioned as a Master Plan EA; requiring a Schedule B or C EA(s) to implement the recommended solutions.

H.8.3 Region-Wide Projects and Collaboration with Local Area Municipalities

Acknowledging that the overall wastewater systems are jointly owned and operated by the Region and LAMs, the continued operation and expansion of the wastewater systems to support existing users and accommodate projected growth relies upon the cooperation of the upper and lower tier municipalities. Major updates and adjustments to planning projections should be continued to be communicated as this may affect project details such as trigger timelines and design capacities, which is discussed further in **Section H.8.5**.

One initiative that will be predominately driven by the LAMs is wet weather management. While wet weather management should be completed in all municipalities, this 2021 MSPU assumes that the catchments where the peak wet weather flows exceed the peak design flows and contribute to increased risk of basement flooding or overflows will put a specific focus on wet weather management. The Region is committed to continuing the joint CSO funding program through which LAMs can apply for funding support for inflow and infiltration reduction programs and projects such as those identified through the PPCP.

As the flow monitoring completed for the PPCP is greater than 5 years old, additional flow monitoring and system data collection, in partnership with LAM, may be needed to improve system understanding, support proposed wet weather flow reductions, and identify opportunities for system optimization and overflow removals.

H.8.4 Sustainability Projects

It is important to recognize that the 2021 MSPU servicing strategies identify new infrastructure to service the additional growth out to year 2051 but these strategies are built by extending infrastructure from the existing systems and leveraging the existing Region infrastructure in place. It is essential that the existing infrastructure is maintained in good condition and performance to support servicing growth.

The Region continually establishes and implements a sustainability program that addresses priority projects to ensure the existing infrastructure is in a state-of-good-repair and continues to perform and meet the intended level of services. Region-wide programs including but not limited to replacement programs for pipes and manholes, boilers, meters, generators, SCADA upgrades, sludge management programs, laboratory and sampling equipment upgrades, process electrical, process instrumentation. Pump station upgrades through the sustainability capital plan re-establish the SPS ECA capacity.

Independent of the 2021 MSPU, the Region has completed a sustainability program analysis to identify the projects on a yearly basis, with focus on a 10 year program, to address the sustainability needs. This Sustainability Capital Plan is first developed to demonstrate the total investment needs and may identify a level of investment and implementation exceeding Region resources. The next steps for the Sustainability Capital Plan will be the development of the Financial Plan for existing Water and Wastewater assets which is anticipated to be completed in 2024. It should be noted that the Sustainability Capital Plan represents investment required over and above the growth-related 2021 MSPU program.

Anger Ave WWTP system specific projects include:

- Anger Ave Biosolids Handling Program
- Anger Ave WWTP Aeration and grit upgrades

H.8.5 Project Implementation Flow Chart

The recommended design capacities within the growth capital program are based on the best available information at the time of analysis, including existing system flows, facility capacities, and projected growth. It is understood that this data is not static and often changes over the years between the regular updates of the Region's Master Plan and between those updates. Design assumptions should be revisited before initiation of all projects to reconfirm the appropriate design capacities, along with identification of any associated or dependent projects which can be combined or staged to optimize implementation efficiency and cost, and/or system operation.

To support the Region's process in implementing all recommended 2021 MSPU capital projects, the following flow chart has been developed for the wastewater system. This flow chart document is intended to be a reference resource for the Region and should be treated as a guideline to support existing internal Region processes in project implementation.

The wastewater implementation flow chart is shown in **Figure 4.H.12.**

WASTEWATER PROJECT IMPLEMENTATION

The intent of this document is to support the Region in confirming the scope of work for wastewater infrastructure projects.

CONFIRM PROJECT SCOPE

To define Terms of Reference

☐ **What triggered this project?**
- Known development growth
- Forecasted growth
- Sustainability needs

☐ **Are there related or dependent projects that should be identified for streamlining opportunities or for project phasing?**
- Are there upstream projects with increasing capacity?
- Are there projects within the same alignment or project area that could be combined? (e.g., growth projects, SPS, forcemain, sewer, corridor planning, sustainability projects, water, stormwater, etc.)
- If there are related projects, could the project timing be adjusted to combine or stage projects more efficiently?

☐ **What is the project EA Schedule and status?**

☐ **Are there historic or ongoing operational issues in the project area?**
- Confirm with Regional and LAM operations and maintenance groups
- i.e. historic overflows, low flow/odour issues, clogging issues, work order history, etc.

☐ **Are there any data gaps that should be incorporated into the Terms of Reference?**
- Refer to the Required Data section below for details
- How much does the project timeline and budget need to change to allow for the data collection?

☐ **Have the planning projections been updated to the best available information?**
- Consultation with Region and LAM planning groups to confirm planning projection
- Are projected needs for the project in place? Is actual growth in line with projected growth?)

☐ **Should the project be deferred until identified related works are completed?**

REQUIRED DATA

To support terms of reference and detailed design

☐ **Recently completed EA or servicing study**
(for growth triggered projects)

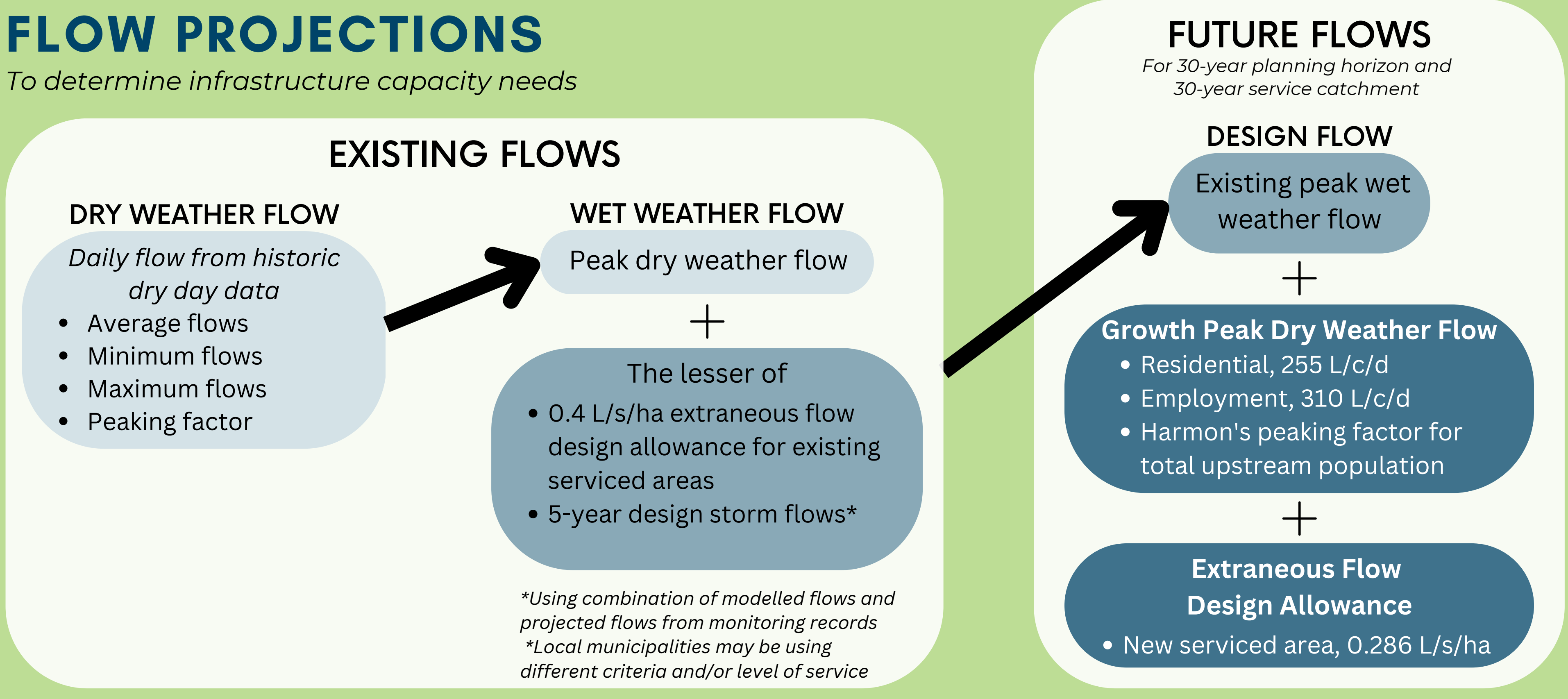
☐ **Historic flow records**
- Within the last 3 years
- Ideally one full year of flow monitoring data that covers 80% of the total contributing area
- Can be included in project scope if feasible

☐ **Existing pump, flow, and pressure data to identify/verify existing system issues**

☐ **Asset inventory and condition assessment**
- All asset classes within the infrastructure type (sewer, forcemain, storage, pumping, or treatment facility)
- Within the last 5 years
- Can be part of project scope if the data is not available and would not significantly alter project scope - to assess need for related works (i.e. electrical, HVAC, structural upgrades at an SPS)

☐ **Service area growth potential to confirm projected population and demands**
- Consultation with Region and LAM planning groups within the past year
- Growth information for 30-year horizon and beyond (maximum service catchment)
  - Population, jobs, land use, area
  - Current inventory of development areas with associated development status

IF THE REQUIRED DATA IS NOT AVAILABLE AND IF IT HAS THE POTENTIAL TO SIGNIFICANTLY ALTER SCOPE OF THE DESIGN, IT IS STRONGLY RECOMMENDED THAT THE APPROPRIATE DATA COLLECTION AND FIELD INVESTIGATION BE COMPLETED PRIOR TO PROCEEDING WITH DESIGN. ALTERNATIVELY, WHERE FEASIBLE, DATA COLLECTION SHOULD BE INCLUDED IN THE PROJECT SCOPE AND INTEGRATED INTO THE DESIGN PROCESS.



FLOW PROJECTIONS

To determine infrastructure capacity needs

EXISTING FLOWS

DRY WEATHER FLOW

Daily flow from historic dry day data
- Average flows
- Minimum flows
- Maximum flows
- Peaking factor

WET WEATHER FLOW

Peak dry weather flow

+

The lesser of
- 0.4 L/s/ha extraneous flow design allowance for existing serviced areas
- 5-year design storm flows*

*Using combination of modelled flows and projected flows from monitoring records
*Local municipalities may be using different criteria and/or level of service

FUTURE FLOWS

For 30-year planning horizon and 30-year service catchment

DESIGN FLOW

Existing peak wet weather flow

+

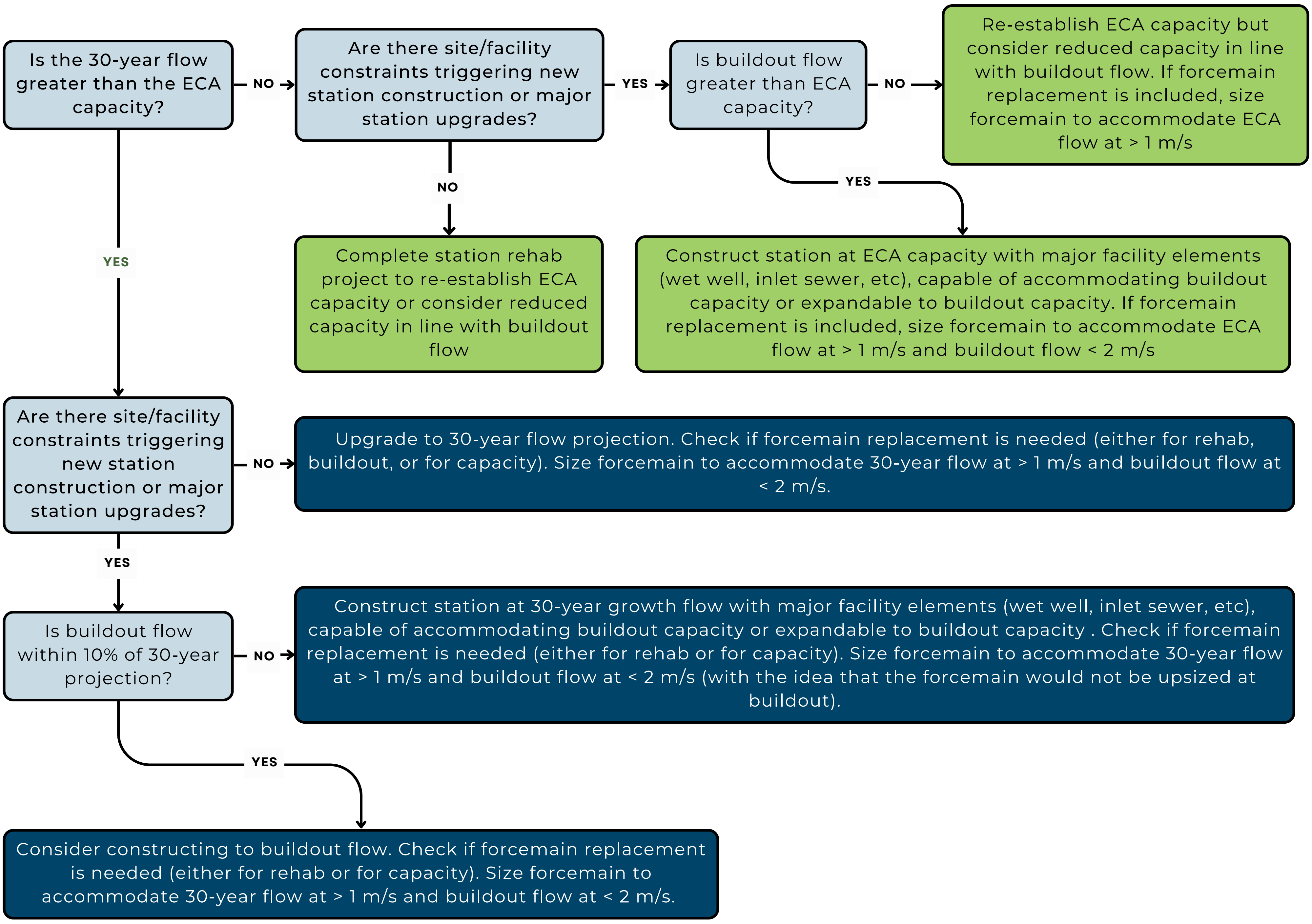
Growth Peak Dry Weather Flow
- Residential, 255 L/c/d
- Employment, 310 L/c/d
- Harmon's peaking factor for total upstream population

+

Extraneous Flow Design Allowance
- New serviced area, 0.286 L/s/ha

The design criteria presented in this document are based on the 2021 Master Servicing Plan Update Study

SEWAGE PUMPING STATIONS



Is the 30-year flow greater than the ECA capacity?

NO → Are there site/facility constraints triggering new station construction or major station upgrades?

YES → Is buildout flow greater than ECA capacity?

NO → Re-establish ECA capacity but consider reduced capacity in line with buildout flow. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s

YES → Construct station at ECA capacity with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s and buildout flow < 2 m/s

NO → Complete station rehab project to re-establish ECA capacity or consider reduced capacity in line with buildout flow

YES → Are there site/facility constraints triggering new station construction or major station upgrades?

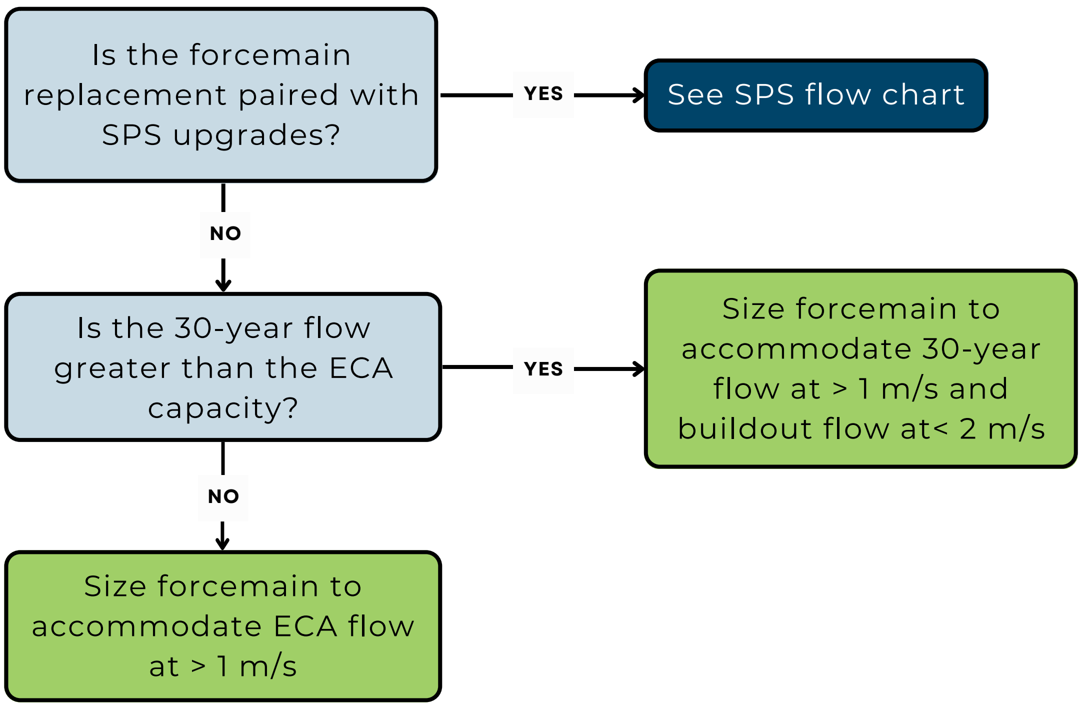
NO → Upgrade to 30-year flow projection. Check if forcemain replacement is needed (either for rehab, buildout, or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

YES → Is buildout flow within 10% of 30-year projection?

NO → Construct station at 30-year growth flow with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity . Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s (with the idea that the forcemain would not be upsized at buildout).

YES → Consider constructing to buildout flow. Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

FORCEMAINS



Is the forcemain replacement paired with SPS upgrades?

YES → See SPS flow chart

NO → Is the 30-year flow greater than the ECA capacity?

YES → Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at< 2 m/s

NO → Size forcemain to accommodate ECA flow at > 1 m/s

H.8.6 Detailed Project Costing Sheets

The detailed project costing sheets for the recommended 2021 MSPU capital projects within the Anger Avenue WWTP system are presented below.

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-FM-025**
PROJECT NAME: **Alliston Road Forcemain Upgrade**
PROJECT DESCRIPTION: Replace existing 250 mm Alliston Road SPS forcemain with new single 300 mm in Fort Erie

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-FM-025**

Pump Station	**WW-SPS-001**	
ECA	43	0.61
Proposed	130	1.84
Buildout	149	2.11
Number of Pumps	3	0.92

PROPOSED DIAMETER:	300 mm	
TOTAL LENGTH:	1560 m	
Tunnelled		0%
Open Cut	1560 m	100%

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Forcemain

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	1560 m	$965	$1,504,939	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$1,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	20%					$300,988	
Minor Creek Crossings			ea.	0	$39,000	$0	
Major Creek Crossings			ea.	0	$208,000	$0	
Road Crossings			ea.	0	$91,000	$0	
Major Road Crossings (Highway)			ea.	1	$208,000	$208,000	QEW Crossing
Utility Crossings			ea.	0	$91,000	$0	
Updated Soils Regulation Uplift	2%					$30,099	
Additional Construction Costs	20%		ea.			$408,805	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$245,283	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$2,698,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$54,000	
Geotechnical Sub-Total Cost						**$54,000**	
Property Requirements	2.4%					$ 64,800	
Property Requirements Sub-Total						**$64,800**	
Consultant Engineering/Design	15%					$ 404,700	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$404,700**	
In House Labour/Engineering/Wages/CA	4.0%					$ 107,920	
In-house Labour/Wages Sub-Total						**$107,920**	
Project Contingency	25%					$832,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$832,000**	
Non-Refundable HST	1.76%					$71,300	
Non-Refundable HST Sub-Total						**$71,300**	
Total (2022 Dollars)						**$4,233,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$4,233,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$84,660		
Design	Design fees, Town fees for design, contract admin	13%	$550,290		
Construction	Town fees, base costs and project contingency	85%	$3,598,050		
TOTAL			**$4,233,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-FM-026**
PROJECT NAME:	**Lakeshore Forcemain Replacement**
PROJECT DESCRIPTION:	Upgrade existing 200 mm Lakeshore SPS forcemain with new single 250 mm in Fort Erie

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-FM-026

Pump Station	**WW-SPS-003**	
ECA	37	0.75
Proposed	82	1.67
Buildout	82	1.67
Number of	2	1.67

PROPOSED DIAMETER:	250 mm	
TOTAL LENGTH:	300 m	
Tunnelled		0%
Open Cut	300 m	100%

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Forcemain

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	300 m	$965	$289,411	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$1,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	20%					$57,882	
Minor Creek Crossings			ea.	0	$31,000	$0	
Major Creek Crossings			ea.	0	$200,000	$0	
Road Crossings			ea.	0	$83,000	$0	
Major Road Crossings (Highway)			ea.	1	$200,000	$200,000	Major Road Crossing
Utility Crossings			ea.	0	$83,000	$0	
Updated Soils Regulation Uplift	2%					$5,788	
Additional Construction Costs	20%		ea.			$110,616	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$66,370	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$730,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$14,600	
Geotechnical Sub-Total Cost						**$14,600**	
Property Requirements	2.0%					$ 14,600	
Property Requirements Sub-Total						**$14,600**	
Consultant Engineering/Design	15%					$ 109,500	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$109,500**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	25%					$227,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$227,000**	
Non-Refundable HST	1.76%					$19,300	
Non-Refundable HST Sub-Total						**$19,300**	
Total (2022 Dollars)						**$1,155,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$1,155,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$23,100		
Design	Design fees, Town fees for design, contract admin	13%	$150,150		
Construction	Town fees, base costs and project contingency	85%	$981,750		
TOTAL			**$1,155,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PL
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-II-017**

PROJECT NAME: **Region Wide Wet weather Reduction**

PROJECT DESCRIPTION: Wet weather reduction program in all systems to be executed from 2022-2051

Old ID		**Focus Areas**	Amount
_WW-II-001	Anger Ave WWTP	Lakeshore Road, Catharine Street, Dominion Road, Rose Avenue SPS, Anger Ave WWTP Catchments	
_WW-II-002	Crystal Beach WWTP	Nigh Road SPS and Crystal Beach WWTP Catchments	
_WW-II-003	Stevensville Douglastown	Stevensville, Douglastown catchments	
_WW-II-004	Welland WWTP	Feeder Road, Seaway Heights, Ontario Road SPS, Dain City, and Welland WWTP Catchments	
_WW-II-005	Baker - Grimsby	Woodsview, Biggar Lagoon, Old Orchard SPS Catchments	
_WW-II-006	Baker - Lincoln Beamsville	Ontario Street SPS Catchment	
_WW-II-007	Baker - Lincoln Vineland	Wet weather reduction in Jordan Valley***	
_WW-II-008	Port Dalhousie	Eastchester, Lakeside, Argyle, Renown SPS and Port Dalhousie WWTP Catchments	
_WW-II-009	Port Weller/Port Dalhousie	Wet weather reduction in North Thorold	
_WW-II-010	Port Weller	Haulage Road, Carlton Street SPS, and Port Weller WWTP Catchments	
_WW-II-011	Seaway WWTP	Union, Clarke Street, Arena, Elm Street, City Hall, Sugarloaf, Rosemount North and South SPS Catchments	
_WW-II-012	Niagara Falls WWTP	Central, Muddy Run, Seneca, Meadowvale, Drummond, Kalar Road SPS Catchments	
_WW-II-013	South Niagara Falls WWTP	South Side High Lift and South Side Low Lift SPS Catchments	
_WW-II-014	NOTL	Wet weather reduction in Northeast Niagara-on-the-Lake	
_WW-II-015	NOTL	Wet weather reduction in Virgil - NOTL	
_WW-II-016	Baker - West Lincoln	Wet weather reduction in West Lincoln - Baker	

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-001**

PROJECT NAME: **Alliston SPS Upgrade**

PROJECT DESCRIPTION: Upgrade from 67 L/s to ultimate ECA of 130 L/s by adding final pump.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-001**

	L/s	Notes
ECA	43	ultimate ECA = 130 L/s
Operational Firm (2021)	67	

PROPOSED CAPACITY	130 L/s	Firm capacity
Design PWWF Existing	102 L/s	100 L/s
2051	134 L/s	132 L/s
Buildout	149 L/s	147 L/s
	RDII	5Y Design

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	67	67
2	67	67
3	planned	67
4		

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	63 L/s	$27,983	$500,000	$500k per pump, 1 additional pumps and maintain existing 2 pumps
Related Upgrades	30%					$150,000	
Bypass Pumping Allowance	5%					$32,500	
Additional Construction Costs	10%		ea.			$68,250	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$75,075	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$826,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$0	
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%					$ -	
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 123,900	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$123,900**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	10%					$99,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$99,000**	
Non-Refundable HST	1.76%					$18,500	
Non-Refundable HST Sub-Total						**$18,500**	
Total (2022 Dollars)						**$1,107,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$1,107,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$22,140		
Design	Design fees, Town fees for design, contract admin	13%	$143,910		
Construction	Town fees, base costs and project contingency	85%	$940,950		
TOTAL			**$1,107,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-002**

PROJECT NAME: **Catherine Street SPS Replacement**

PROJECT DESCRIPTION: Increase station capacity from 150.8 L/s to 190 L/s by replacing station at new location.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-002**

	L/s	**Notes**
Operational	150.8	

PROPOSED CAPACITY		190 L/s	Firm capacity
Design PWWF note overage of 150 is from 04	**Existing**	178 L/s	428 L/s
	2051	188 L/s	437 L/s
	Buildout	190 L/s	439 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	150	190
2	150	190

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	190 L/s	$15,816	$3,003,445	Full pump station replacement as per sustainability upgrades, based on unit cost.
Related Upgrades	30%						does not apply with unit based upgrade
Bypass Pump in station				1	$700,000	$700,000	
Decomissioning of Existing Station				1	$350,000	$350,000	
Bypass Pumping Allowance	7%					$283,741	
Additional Construction Costs	20%		ea.			$867,437	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$520,462	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$5,725,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$ 114,500	
Geotechnical Sub-Total Cost						**$114,500**	
Property Requirements	5.0%					$ 500,000	Region Special Uplift
Property Requirements Sub-Total						**$500,000**	
Consultant Engineering/Design	15%					$ 858,800	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$858,800**	
In House Labour/Engineering/Wages/CA	3.0%					$ 171,750	
In-house Labour/Wages Sub-Total						**$171,750**	
Project Contingency	25%					$1,843,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$1,843,000**	
Non-Refundable HST	1.76%					$159,100	
Non-Refundable HST Sub-Total						**$159,100**	
Total (2022 Dollars)						**$9,372,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$9,372,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$187,440		
Design	Design fees, Town fees for design, contract admin	13%	$1,218,360		
Construction	Town fees, base costs and project contingency	85%	$7,966,200		
TOTAL			**$9,372,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SPS-003**
PROJECT NAME:	**Lakeshore SPS Upgrade (Fort Erie - Anger Ave WWTP)**
PROJECT DESCRIPTION:	Increase station capacity from 63 L/s to 79 L/s by replacing the station at a new location.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-003**

	L/s	Notes
ECA	36.7	
Operational	63.7	

PROPOSED CAPACITY		79 L/s	Firm capacity
Design PWWF	**Existing**	75 L/s	176 L/s
	2051	79 L/s	179 L/s
	Buildout	79 L/s	180 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	63.7	82
2	63.7	82

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	79 L/s	$27,983	$2,210,658	Full pump station replacement as per EA recommendation
Related Upgrades	30%						does not apply with unit based upgrade
Bypass Pump in station				1	$700,000	$700,000	
Decommissioning of Existing Station				1	$280,000	$280,000	
Bypass Pumping Allowance	7%					$221,751	
Additional Construction Costs	20%		ea.			$682,482	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$409,489	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$4,623,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$ 92,460	
Geotechnical Sub-Total Cost						**$92,460**	
Property Requirements	5.0%					$ 500,000	Region Special Uplift
Property Requirements Sub-Total						**$500,000**	
Consultant Engineering/Design	15%					$ 693,500	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$693,500**	
In House Labour/Engineering/Wages/CA	4.0%					$ 184,920	
In-house Labour/Wages Sub-Total						**$184,920**	
Project Contingency	25%					$1,523,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$1,523,000**	
Non-Refundable HST	1.76%					$130,800	
Non-Refundable HST Sub-Total						**$130,800**	
Total (2022 Dollars)						**$7,748,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$7,748,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$154,960		
Design	Design fees, Town fees for design, contract admin	13%	$1,007,240		
Construction	Town fees, base costs and project contingency	85%	$6,585,800		
TOTAL			**$7,748,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-054**

PROJECT NAME: **Thompson SPS Upgrade**

PROJECT DESCRIPTION: Increase station capacity from 362 L/s to 510 L/s by installing one additional planned pump; consistent with phased approach under ultimate ECA capacity of 680 L/s

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-054**

	L/s
ECA	680.0
Operational	362.0

PROPOSED CAPACITY		510 L/s	Firm Capacity
Design PWWF	**Existing**	209 L/s	331 L/s
	2051	415 L/s	538 L/s
	Buildout	436 L/s	559 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	170.0	170.0
2	170.0	170.0
3	170.0	170.0
4	planned	170.0
5		

COST ESTIMATION

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	510 L/s	$15,816	$700,000	$700k per pump, add one of two planned pumps
Related Upgrades	30%					$210,000	
Bypass Pumping Allowance	6%					$50,050	
Additional Construction Costs	15%		ea.			$144,008	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$110,406	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$1,214,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 182,100	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$182,100**	
In House Labour/Engineering/Wages/CA	4.0%					$ 48,560	
In-house Labour/Wages Sub-Total						**$48,560**	
Project Contingency	15%					$217,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$217,000**	
Non-Refundable HST	1.76%					$28,400	
Non-Refundable HST Sub-Total						**$28,400**	
Total (2022 Dollars)						**$1,690,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$1,690,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$33,800		
Design	Design fees, Town fees for design, contract admin	13%	$219,700		
Construction	Town fees, base costs and project contingency	85%	$1,436,500		
TOTAL			$1,690,000		

PROJECT NO.:	**WW-TP-005**
PROJECT NAME:	**Region-wide WWTP Process Upgrades**
PROJECT DESCRIPTION:	Process upgrades to re-establish ECA capacity

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$50,000,000**	Placeholder Costs
Chosen Estimate						**$50,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$1,000,000		
Design	Design fees, Town fees for design, contract admin	13%	$6,500,000		
Construction	Town fees, base costs and project contingency	85%	$42,500,000		
TOTAL			**$50,000,000**		

PROJECT NO.:	**WW-TP-005**
PROJECT NAME:	**Region-wide WWTP Process Upgrades**
PROJECT DESCRIPTION:	Upgrades for odour control across the Region at forcemains, pump stations, and other locations.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$40,000,000**	Placeholder Costs
Chosen Estimate						**$40,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$800,000		
Design	Design fees, Town fees for design, contract admin	13%	$5,200,000		
Construction	Town fees, base costs and project contingency	85%	$34,000,000		
TOTAL			**$40,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-ST-001**
PROJECT NAME:	**Region Wide Flow Monitoring and Data Collection**
PROJECT DESCRIPTION:	Funding to support flow monitoring and data collection initiatives

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-ST-001

PROPOSED CAPACITY	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction							
Additional Construction Costs	10%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ -	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$0**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	10%					$4,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$4,000**	
Non-Refundable HST	1.76%					$100	
Non-Refundable HST Sub-Total						**$100**	
Total (2022 Dollars)						**$44,000**	Rounded to nearest $1,000
Other Estimate						**$12,000,000**	Assumes 400k/year for 30 y
Chosen Estimate						**$12,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$240,000		
Design	Design fees, Town fees for design, contract admin	13%	$1,560,000		
Construction	Town fees, base costs and project contingency	85%	$10,200,000		
TOTAL			$12,000,000		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-ST-002**
PROJECT NAME:	**Fort Erie QEW Corridor Long-Term Study**
PROJECT DESCRIPTION:	Crystal Beach WWTP, SD WWTP long term strategy

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-ST-002**

PROPOSED CAPACITY	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction							
Additional Construction Costs	10%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 400,000	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$400,000**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	10%					$50,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$50,000**	
Non-Refundable HST	1.76%					$7,900	
Non-Refundable HST Sub-Total						**$7,900**	
Total (2022 Dollars)						**$498,000**	Rounded to nearest $1,000
Other Estimate						**$500,000**	Study Estimate
Chosen Estimate						**$500,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$10,000		
Design	Design fees, Town fees for design, contract admin	13%	$65,000		
Construction	Town fees, base costs and project contingency	85%	$425,000		
TOTAL			**$500,000**		

Regional Municipality of Niagara

Part I

CRYSTAL BEACH WASTEWATER SYSTEM

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I. CRYSTAL BEACH WASTEWATER TREATMENT PLANT

I.1 Existing System Infrastructure

The Crystal Beach wastewater system services the southwestern part of the Town of Fort Erie. The system in services an existing population of 9,870 and 1,406 employees. Note that this population and employment total is based on the Region's 2021 allocation of Traffic Area Zones planning data and has been processed through the allocation methodology presented in **Volume 2** to refine the data to include only serviced populations. As such, the population and employment total may not directly match the system totals using the Region's unprocessed planning data.

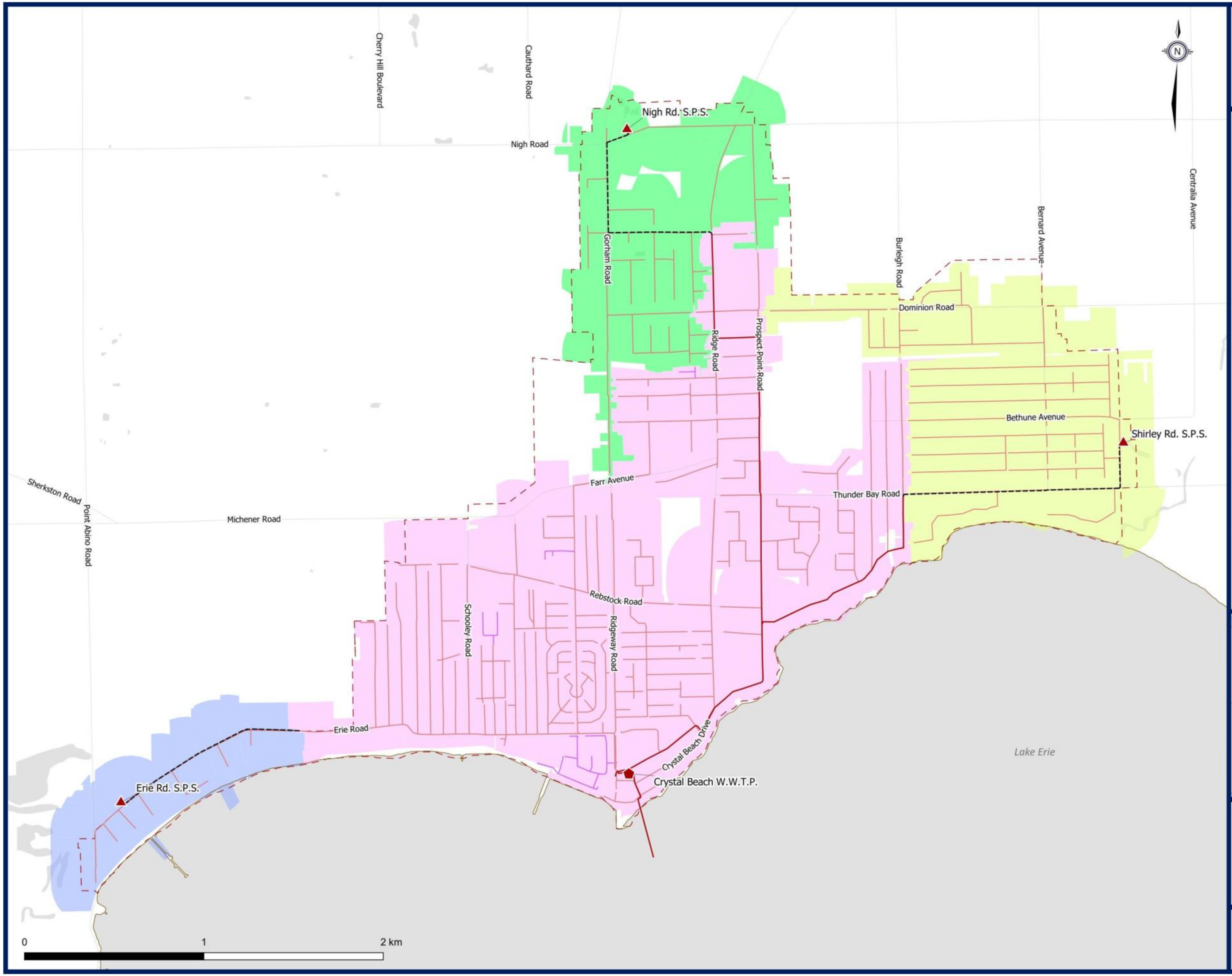
The system is serviced by the Crystal Beach Wastewater Treatment Plant, located on 500 Ridgeway Road, Fort Erie. The Crystal Beach Wastewater Treatment Plant is a conventional facility with a current rated capacity of 9.1 MLD, a peak dry weather flow capacity of 16.8 MLD, and a peak wet weather flow capacity of 27.3 MLD.

System flows are conveyed to the treatment plant via a network of local and Regionally owned sewer, and Regionally owned pump stations and forcemains.

Figure 4.I.1 presents an overview of the wastewater system, and Figure 4.I.2 shows a schematic of the wastewater system.

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



Existing Wastewater Infrastructure

- ⬟ Wastewater Treatment Plant (WWTP)
- ■ Biosolids Storage Facility
- ✳ Odour Control Facility
- ♦ Leachate Pumping Station

Sanitary Pumping Stations (SPS)

- ▲ Regional
- ▲ Municipal
- ▲ Private

Wastewater Network

- ---- Force Mains
- —— Regional Mains
- —— Local Sewers
- —— Private Sewers

Wastewater Catchments

- 🟦 Erie Road
- 🟩 Nigh Road
- 🟨 Shirley
- 🟪 Crystal Beach WWTP

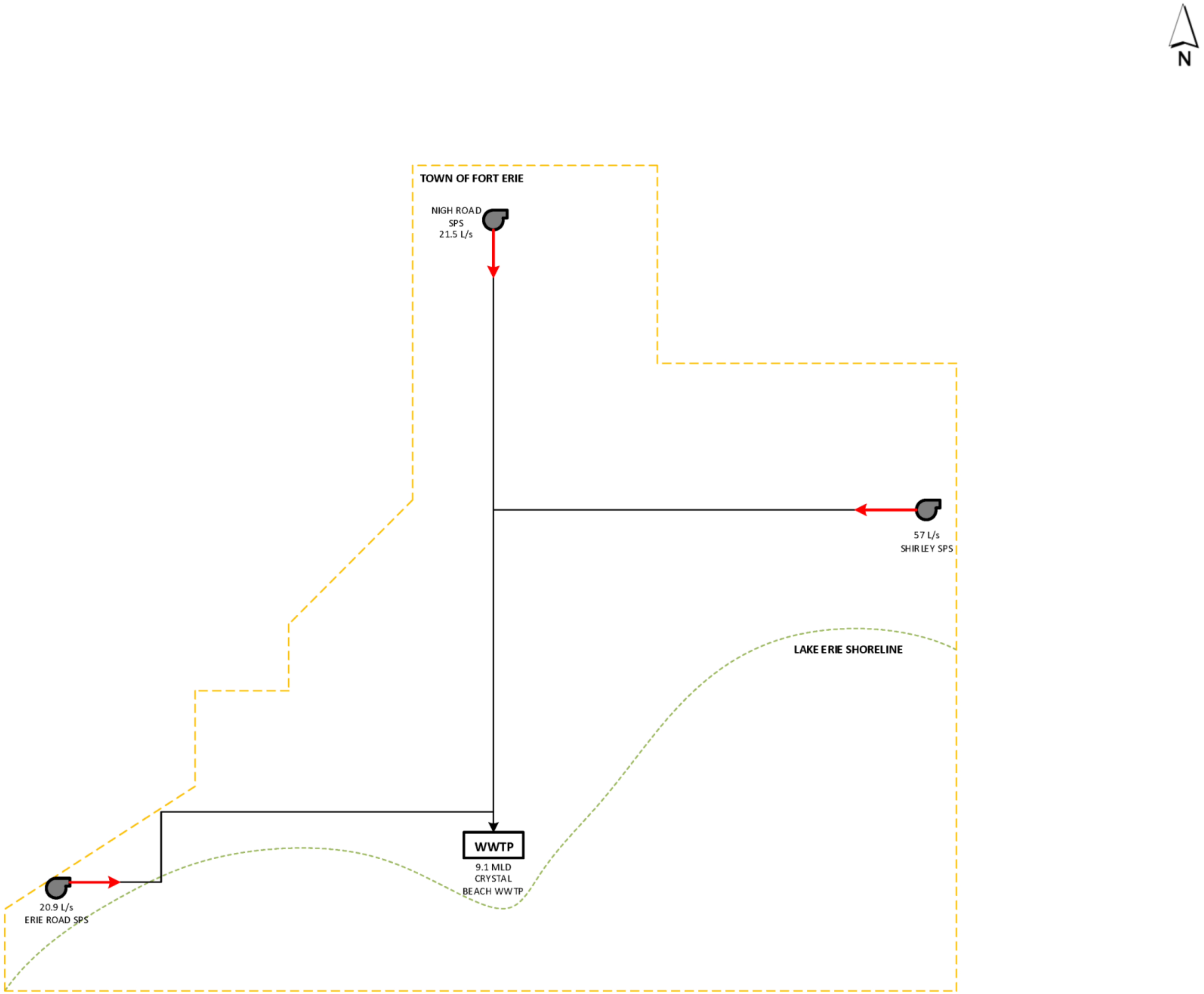
Other Features

- ☐ Municipal Boundary
- ■ Waterbodies
- ⬚ Urban Area Boundary

Figure 4.I.1
Crystal Beach WWTP System
Existing Wastewater Infrastructure

BluePlan ENGINEERING

March 2023
620126-WW-001
WKID: 26917



Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

WWTP RATED CAPACITY	Wastewater Treatment Plant
FIRM CAPACITY	Sewage Pumping Station
🟥→	Forcemain
🟦→	Connection from SPS to SPS
→	Connection from SPS to WWTP

Figure 4.I.2
Crystal Beach WWTP
Existing Wastewater Infrastructure Schematic

GM BluePlan ENGINEERING

December 2022
621016-W-000
WKID: 26917

I.I.I Facility Overview

Table 4.I.1 to **Table 4.I.2** present a summary of the environmental compliance approval (ECA) for the Crystal Beach wastewater treatment plant (WWTP) usage, operation, and effluent concentration objectives.

Table 4.I.1 Wastewater Treatment Plant Overview

Plant Name	Crystal Beach Wastewater Treatment Plant
ECA #	#7162-8G5GVU Issued June 9, 2011
Address	500 Ridgeway Road, Fort Erie
Discharge Water	Lake Erie
Rated Capacity: Average Daily Flow	9.1 MLD
Rated Capacity: Peak Flow Rate (Dry Weather)	16.8 MLD
Rated Capacity: Peak Flow Rate (Wet Weather)	27.3 MLD
Key Processes	• Conventional activated sludge treatment with screening • Grit removal • Phosphorous removal • Sludge thickening • Effluent disinfection

Table 4.I.2 Wastewater Treatment Plant Effluent Objectives

Effluent Parameter	Objective Concentration
$CBOD_5$	15.0 mg/L
TSS	15.0 mg/L
Total Phosphorus	1.0 mg/L
E. Coli	200 organisms/100 mL
Total Chlorine Residual	0.5 mg/L

Table 4.I.3 lists each sewage pumping station's (SPS) listed ECA firm capacity as well as the station's existing operational firm capacity (the current operating capacity of the pumps station based on performance testing and/or supervisory control and data acquisition (SCADA) trending). As identified in **Volume 4**, the operational firm capacity was used as the basis of assessment for the 2021 MSPU. In some cases where the operational firm capacity was larger than the ECA firm capacity; the registered ECA capacity was used.

Table 4.I.3 Pumping Station and Forcemain Overview

Station Name	Location	Catchment Details		Pump Station Details			Forcemain Details		
		Area Exclusive of Upstream Catchments (ha)	Area Inclusive of Upstream Catchments (ha)	Number of Pumps	ECA Firm Capacity (L/s)	Operational Firm Capacity (L/s)	Single or Twinned Forcemain	Forcemain Diameter (mm)	Length (m)
└→**Nigh Road SPS**	3828 Nigh Road, Fort Erie	141.1	141.1	2	31.8	21.5	Single	275	1,246
└→**Shirley SPS**	120 Shirley Road, Fort Erie	201.0	201.0	2	57.0*	57.0	Single	250	1,489
└→**Erie Road SPS**	Erie Road, Fort Erie	72.2	72.2	2	20.7	20.9	Single	150	1,121

*Shirley SPS upgrade to 57 L/s was being constructed within the duration of the Master Plan Project. The SPS capacity was updated to reflect the upgraded capacity; however, the Shirley SPS upgrade remained in the final capital program recommendations.

I.2 Basis for Analysis

I.2.1 Flow Criteria, System Performance, and Sizing Methodology

The Niagara Region Traffic Area Zone planning data was used to estimate growth related flow generation within the wastewater system and to spatially allocate growth flows within each individual system. **Table 4.I.4** presents a summary of the flow criteria, performance, and sizing methodology that was utilized. Refer to **Volume 4 - Introduction** for additional information.

The Region's per capita wastewater flows criteria were updated based on a historic review of the previous 3-year period for local billing meter and flow monitoring records. Given that more granular data was available to complete this analysis compared to previous master plan updates, the population and employment per capita rates were differentiated. The data showed a slight reduction in the population criteria and slight increase in the employment criteria, which more closely reflect existing flow generation trends compared to the Region's previous per capita rate. Further detail regarding the per capita flow generation is presented in **Volume 4 – Introduction.**

The Region's extraneous flow allowance criteria was also reviewed against historic flow monitoring and pump station performance records where available. The review of historic wet weather flows found that typically 2-year design storm peak flows within existing built systems exceeded the Region's existing extraneous flow design allowance of 0.286 L/s/ha; however, that a 2-year design storm peak flow below 0.286 L/s/ha was achievable as demonstrated in multiple catchment areas. Based on the analysis and an industry review, for the purpose of future planning, the extraneous flow design allowance for existing areas was increased to 0.4 L/s/ha but was maintained at 0.286 L/s/ha for new greenfield development areas to better reflect the existing high wet weather flows, while minimizing the magnitude of system upgrades with wet weather flow management as a critical priority. In areas where available historic flow monitoring and modelling results identify existing peak 5 year design flows below the 0.4 L/s/ha criteria, the lower 5 year design flows should be utilized. Further details regarding the extraneous flow design allowance are presented in **Volume 4 – Introduction**

Table 4.I.4 Flow Criteria, Scenarios, System Performance, and Sizing Methodology

	Component	Criteria	
Flow Criteria	Existing System Flows	Starting Point Methodology • Based on local billing meter records and flow monitoring data to establish existing dry and wet weather flows • Growth flows are added to the existing system baseline using design criteria	
	Flow Generation	Residential	255 L/c/d
		Employment	310 L/e/d

	Component	Criteria	
	Peaking Factor	Peak Dry Weather Flow	Harmon's Peaking Factor
	Extraneous Flow Design Allowance	• 0.4 L/s/ha for existing areas • 0.286 L/s/ha for new developments	
WWTP	System Performance and Triggers	• MECP Procedure F-5-1 • Trigger upgrade study at 80% capacity • Trigger upgrade construction at 90% capacity	
	Upgrade Sizing	• Average daily flow plus growth based on population design flows	

Pump Station	System Performance and Triggers Sizing	• Refer to **Section I.2.1.1.**
		• Two flow scenarios considered
		  • **Design Allowance**: Peak wet weather flow using the peaked dry weather flow plus the extraneous flow design allowance
		  • **5-Year Storm**: Modelled peak wet weather flow using the 5-year design storm
		• Peak flow capacity to meet design peak wet weather flow using the extraneous flow design allowance
		• Wet well and system storage considerations under 5-year storm to minimize basement flooding and overflow risks	

Forcemain	System Performance and Triggers	• Flag velocities less than 0.6 m/s • Flag velocities greater than 2 m/s • Upgrade when velocities exceed 2.5 m/s and considering condition and age	
	Upgrade Sizing	• Design velocity target between 1 m/s and 2 m/s • Forcemain twinning to increase capacity where feasible	
Trunk	System Performance and Triggers	• Design allowance peak wet weather flows, using the extraneous flow design allowance, to be managed within pipe • Freeboard (depth between hydraulic grade line and surface) greater than 1.8 m below surface in 5-year design storm • Flag pipes velocities less than 0.6 m/s • Flag pipes velocities greater than 3.0 m/s	
	Upgrade Sizing	• Sized for full flow under post-2051 design peak wet weather flow • Assess 5-year design storm performance to minimize basement flooding risks and overflows	

I.2.1.1 SPS Performance Evaluation and Upgrade Framework

Although it is the Region's design philosophy to size SPS inline with the Region's extraneous flow design allowance, the 2021 MSPU undertook a hybrid evaluation approach to acknowledge that SPS are a major contributor to local wastewater system performance and that many legacy system's exiting wet weather flows exceed the extraneous flow design allowance. The SPS hybrid performance evaluation and upgrade framework are summarized in **Figure 4.I.5** and strives to balance the magnitude of capacity upgrades, potential cascading downstream upgrades, and managing the potential risk of local sewer surcharging and system overflows.

Under the hybrid performance evaluation and upgrade framework, the SPS capacity was sized to meet the lesser of peak wet weather flow (PWWF) using the extraneous flow design allowance, referred to as "Design Allowance PWWF" or the estimated 5-year storm PWWF. Further, consideration for the SPS actual performance under the estimated 5-year design storm peak wet weather flow was evaluated to determine if the available system storage including the wet well, storage tanks, and in system capacity was sufficient to manage excess flows while maintaining the system hydraulic grade line (HGL) below the basement flooding level of 1.8 m below grade and/or below the local overflow level.

In instances where the 5-year storm PWWF flow exceeded the available system storage, additional system solutions such as wet weather management, system storage, and/or additional SPS capacity upgrades were incorporated into the servicing solution. The most efficient solution to manage capacity and flow reduction was determined through the assessment of calculated flows from the 2051 design allowance PWWF and modelled 5-year storm PWWF against the operational firm capacity of the station and system storage.

Each SPS with a preferred solution of a capacity upgrade was individually reviewed in detail to determine how capacity upgrades should best be achieved:

- Pump replacement
- Pump upgrades
- Pump additions
- Station replacement
- Existing wet well sizing changes
- FM sizing and capacity.

Due to data quality and availability, a prioritization of upgrade needs, and flow monitoring (data collection) was assigned to each case for the Region implementation plan, discussed later in **Section I.8**.

Table 4.I.5 SPS Assessment Framework

Case	2051 Design PWWF	2051 5 Year Storm PWWF	2051 5-Year Storm Storage Need	Preferred Solution	Upgrade Priority	Flow Monitoring Priority
Case 1	> Firm Capacity	> Firm Capacity	> Available Storage	Upgrade pumps to future design allowance flow with potential storage upgrades or wet weather management	High	Medium
Case 2	< Firm Capacity	> Firm Capacity	> Available Storage	Upgrade storage and/or wet weather management	High	High
Case 3	> Firm Capacity	> Firm Capacity	< Available Storage	Potential upgrade to design allowance flow and/or wet weather management	Medium	High
Case 4	< Firm Capacity	> Firm Capacity	< Available Storage	Potential wet weather management	Low	Medium
Case 5	> Firm Capacity	< Firm Capacity	< Available Storage	No upgrade, use actual peak flows	N/A	Low
Case 6	< Firm Capacity	< Firm Capacity	< Available Storage	No upgrade	N/A	Low

I.2.2 Growth Population Projections and Allocations

Table 4.I.6 outlines the existing and projected serviced population and employment by catchment.

Table 4.I.6 Crystal Beach Wastewater Treatment Plant Existing and Projected Serviced Population by Catchment

Sewage Pumping Station (SPS)	Existing Population & Employment			2051 Population & Employment			Post 2051 Population & Employment			2021-2051 Growth		
	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population Growth	Employment Growth	Total Growth
Crystal Beach WWTP	6,443	807	7,250	8,616	1,159	9,774	9,499	1,206	10,704	2,172	352	2,525
└→Nigh Road SPS	1,314	406	1,720	1,493	446	1,939	1,817	464	2,281	179	41	219
└→Shirley SPS	1,937	134	2,071	2,271	280	2,550	2,426	294	2,720	334	146	480
└→Erie Road SPS	176	60	236	188	68	256	195	70	266	12	8	20
Total	**9,870**	**1,406**	**11,276**	**12,567**	**1,953**	**14,520**	**13,937**	**2,034**	**15,972**	**2,697**	**547**	**3,244**

Note: Population numbers may not sum due to rounding.

I.3 System Performance

I.3.1 Wastewater Treatment Plant

The starting point flow for the Crystal Beach WWTP was calculated using historic SCADA flow data. Ten years of data (2011 to 2020) was reviewed to provide historical context and assess overall long-term trends, however, the most recent five years of data was used to determine the average daily flow. **Table 4.I.7** shows the historical system flows obtained from wastewater treatment plant production data.

Table 4.I.7 Historic Crystal Beach Wastewater Treatment Plant Flows

Year	Average Daily Flow		Peak Daily Flow	
	(MLD)	(L/s)	(MLD)	(L/s)
2011	6.3	72.8	23.4	271.0
2012	4.7	54.0	17.8	206.5
2013	5.8	67.3	24.3	281.1
2014	5.8	66.7	30.5	352.6
2015	5.1	59.4	16.1	185.9
5 Year Average	5.5	64.0	22.4	259.4
5 Year Peak	6.3	72.8	30.5	352.6
2016	4.6	53.0	13.7	158.7
2017	5.9	68.5	23.2	268.6
2018	5.9	68.0	26.0	301.4
2019	6.3	72.6	25.9	299.4
2020	5.7	65.8	15.4	177.9
5-Year Average	5.7	65.6	20.8	241.2
5-Year Peak	6.3	72.6	26.0	301.4
10-Year Average	5.6	64.8	21.6	250.3
10-Year Peak	6.3	72.8	30.5	352.6

The 10-year trend analysis showed that flows to the Crystal Beach WWTP continue to reflect high flows in wetter years. The 5-year average flow has not changed significantly from the 2016.

The starting point flow used for the Crystal Beach WWTP was 5.7 MLD.

Figure 4.I.3 shows the projected future flows at the Crystal Beach WWTP. The plant has surplus capacity to support growth and will not reach 80% capacity within the 2051 time horizon.

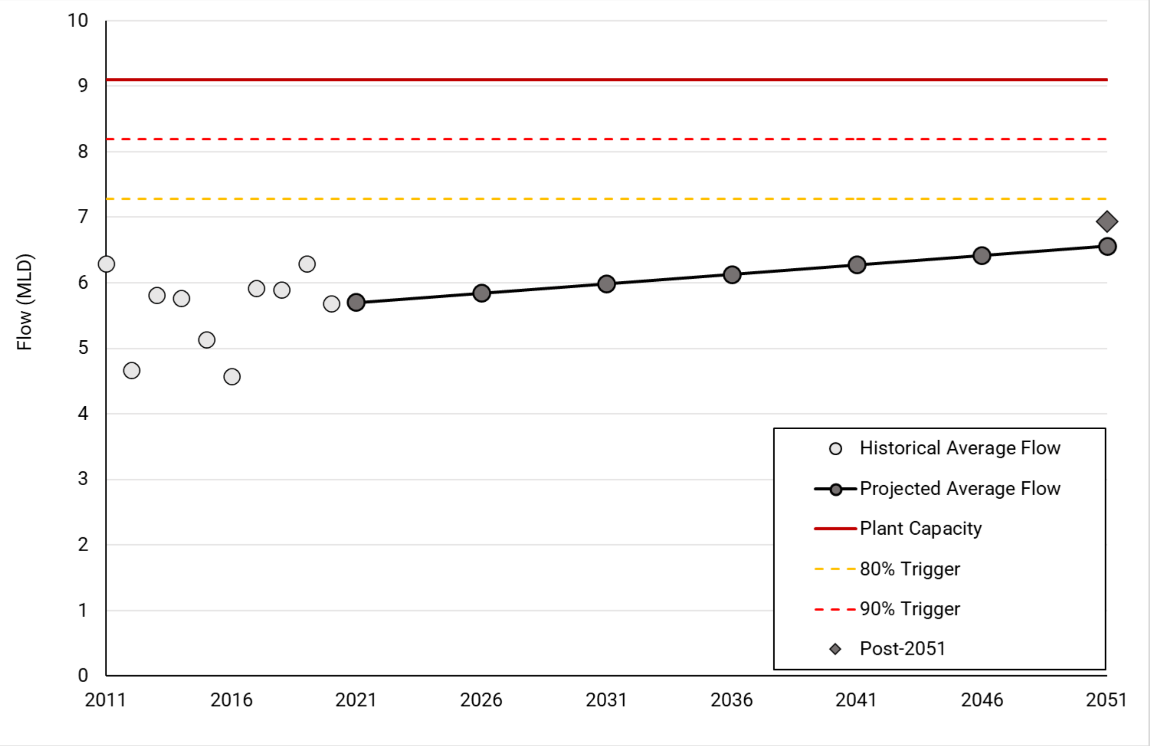


Figure 4.I.3 Projected Sewage Generation at Crystal Beach Wastewater Treatment Plant

I.3.2 Sewage Pumping Station

Table 4.I.8 highlights the sewage pumping station operational firm capacities and the existing and projected flows. The existing average and peak dry weather flows were estimated using the wastewater system model, which was updated using the best available billing, flow monitoring, and SCADA data from 2018 to 2020.

Table 4.I.8 System Sewage Pumping Station Performance

Station Name	Station Capacity	2021 Flows				2051 Flows			Post-2051 Flows		
	Operational Firm Capacity	Average Dry Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow
	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)
└→Nigh Road SPS	21.5	4.1	5.1	61.5	50.5	7.9	65.2	54.2	11.8	69.1	58.1
└→Shirley SPS	57.0*	6.6	8.1	88.5	44.9	14.1	95.0	51.4	16.0	96.9	53.3
└→Erie Road SPS	20.9	7.9	8.1	36.9	10.9	8.3	37.2	11.1	8.5	37.3	11.3

*Shirley SPS upgrade to 57 L/s was being constructed within the duration of the Master Plan Project. The SPS capacity was updated to reflect the upgraded capacity; however, the Shirley SPS upgrade remained in the final capital program recommendations.

The following SPS have existing and future deficiencies under both design allowance PWWF and 5-year storm, requiring upgrades to support existing and future flows.

- Nigh Road

The following SPS have existing and future deficiencies under the design allowance PWWF; however, the existing and projected 5-year storm PWWF is withing the station’s capacity, as such, the stations capacity is sufficient to support future flows.

- Shirley SPS
- Erie Road SPS

I.3.3 Forcemain

Table 4.I.9 highlights the existing and projected forcemain performance. Velocities less than 0.6 m/s were flagged in yellow and velocities exceeding 2.5 m/s were flagged in red. Note, if a pumping deficit was identified in **Table 4.I.8**, then projected forcemain velocities were based on the higher of the station's ECA firm capacity or the governing peak wet weather flow scenario, otherwise if no pumping deficit was identified, the operational firm capacity was used for future capacity assessment.

Table 4.I.9 Forcemain Performance

Station Name	Forcemain Diameter (mm)	Operational Firm Capacity		2051		Post-2051	
		Pumped Flow (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)
└→Nigh Road SPS	**275**	21.5	0.4	54.2[3]	0.9	58.1[3]	1.0
└→Shirley SPS	**250**	57.0	1.2	57.0[1]	1.2	57.0[1]	1.2
└→Erie Road SPS	**150**	20.9	1.2	20.9[1]	1.2	20.9[1]	1.2

[1] Operational firm capacity

[2] ECA capacity

[3] Minimum of future design allowance PWWF or 5-year storm PWWF

The existing nigh Road SPS forcemain was flagged for low velocities in the existing operating regime. Growth flows are anticipated to improve the velocity in the future.

All forcemains have sufficient capacity to meet future flows.

I.3.4 Trunk Sewer

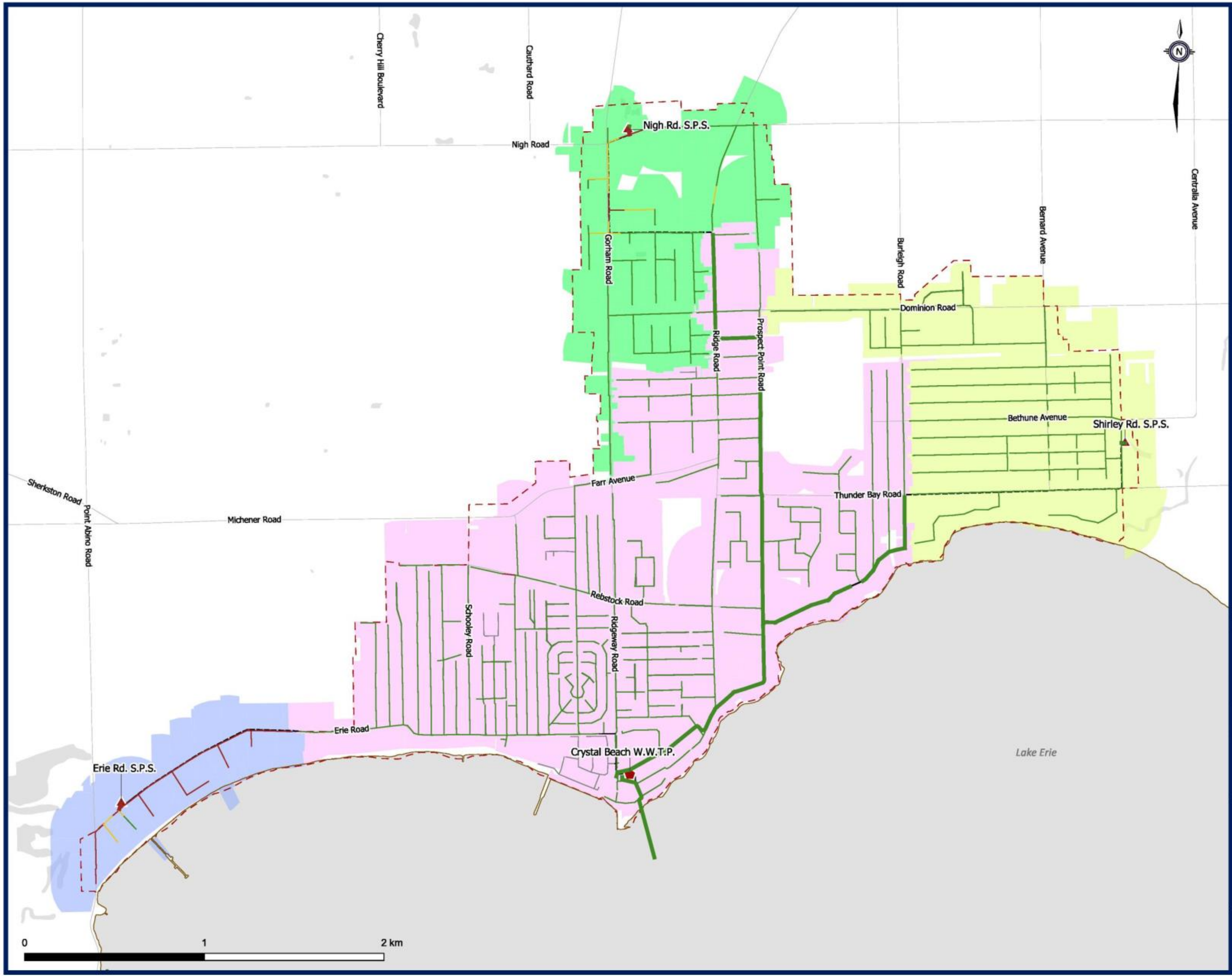
Figure 4.I.4 and **Figure 4.I.5** highlight the trunk performance in the existing and 2051 projected design allowance peak wet weather flow scenarios, respectively.

- There are no Region trunk sewers with existing or future pipe capacity deficits from the design allowance peak wet weather flows.
- Note that the Anger Avenue WWTP system has several combined sewer overflows (CSO) that help regulate the hydraulic grade line (HGL) within the trunk system to reduce basement flooding risks.
- Local surcharging above the basement flooding freeboard was identified in the Fort Erie WWTP Pollution Prevention and Control Plan (PPCP). The PPCP identified sewers which required upgrades for local sewers; those projects were not carried forward into the MSP as they will be funded and implemented by the local area municipalities (LAMs).

I.3.5 Overflows

Under the design allowance peak flows no overflows are anticipated; however, many of the CSOs become active from 5-year storm peak wet weather flows. The adverse risks of wet weather inflows are currently partially managed through CSOs; however, the Region and LAMs are working together to reduce wet weather inflows to the system in order to reduce system overflows.

Detailed assessment of system CSO are addressed in the Fort Erie PPCP; which outlines the proposed wet weather flow management approach to manage CSO volumes



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Existing Wastewater Infrastructure

- ● Combined Sewage Detention Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant

Wastewater Network

- ---- Force Mains
- ━ Regional Mains
- ─ Local Sewers
- ─ Private Sewers

Wastewater Catchments

- 🟪 Crystal Beach WWTP
- 🟦 Erie Road
- 🟩 Nigh Road
- 🟨 Shirley

Other Features

- ☐ Municipal Boundary
- ☐ Urban Area Boundaries
- ⬜ Waterbodies

System Performance

- ━ Surplus Capacity
- ━ Surcharging Sewer
- ━ Surcharging Sewer with Basement Flooding Risk

Figure 4.I.4
Existing Design Peak Wet Weather Flows
Crystal Beach WWTP

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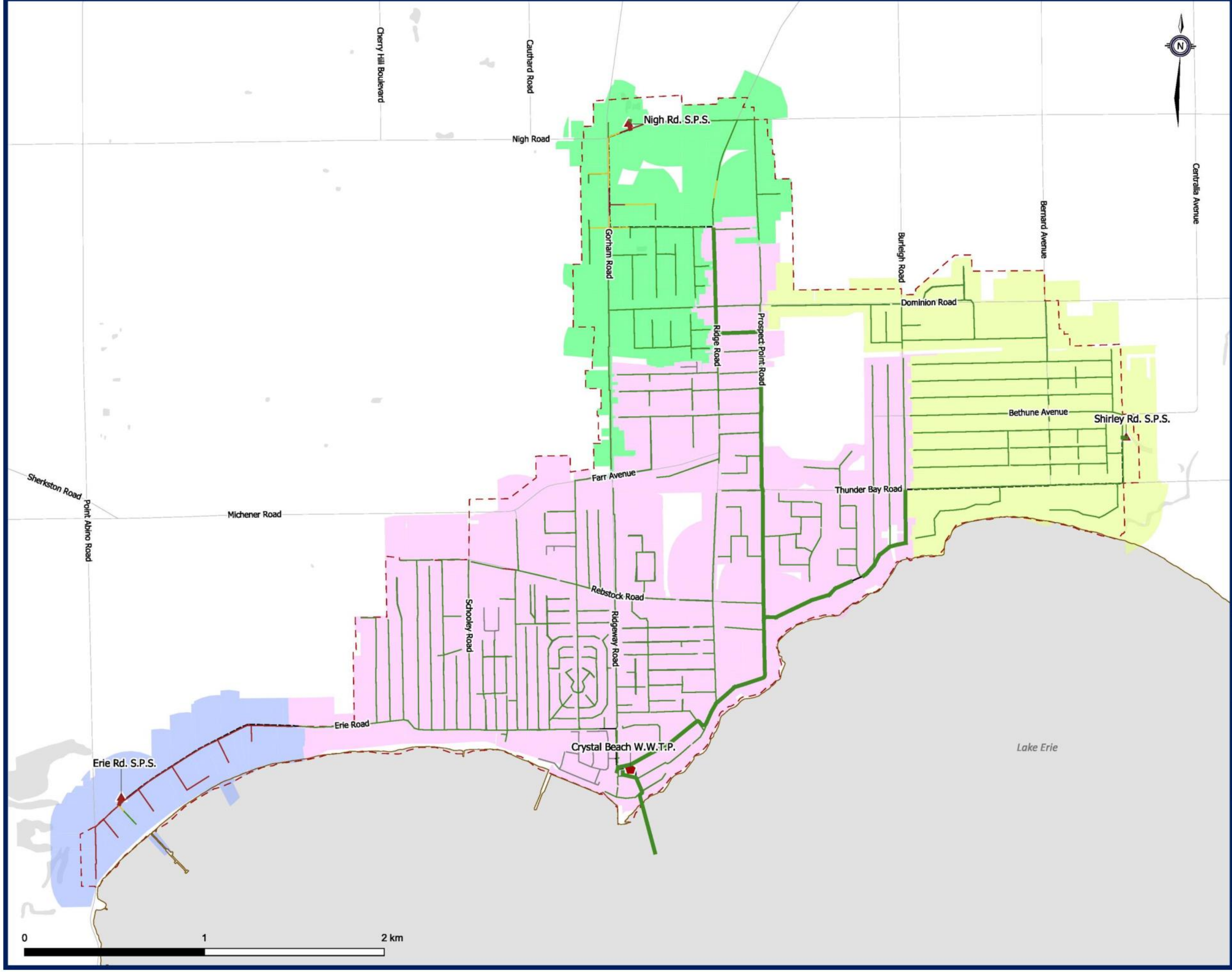

Existing Wastewater Infrastructure
- ● Combined Sewage Detention Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Local)

Wastewater Network
- ---- Force Mains
- ━ Regional Mains
- — Local Sewers
- — Private Sewers

Wastewater Catchments
- 🟪 Crystal Beach WWTP
- 🟦 Erie Road
- 🟩 Nigh Road
- 🟨 Shirley

Other Features
- ☐ Municipal Boundary
- ☐ Urban Area Boundaries
- ⬜ Waterbodies

System Performance
- 🟩 Surplus Capacity
- 🟨 Surcharging Sewer
- 🟥 Surcharging Sewer with Basement Flooding Risk

Figure 4.I.5

2051 Design

Peak Wet Weather Flows

Crystal Beach WWTP

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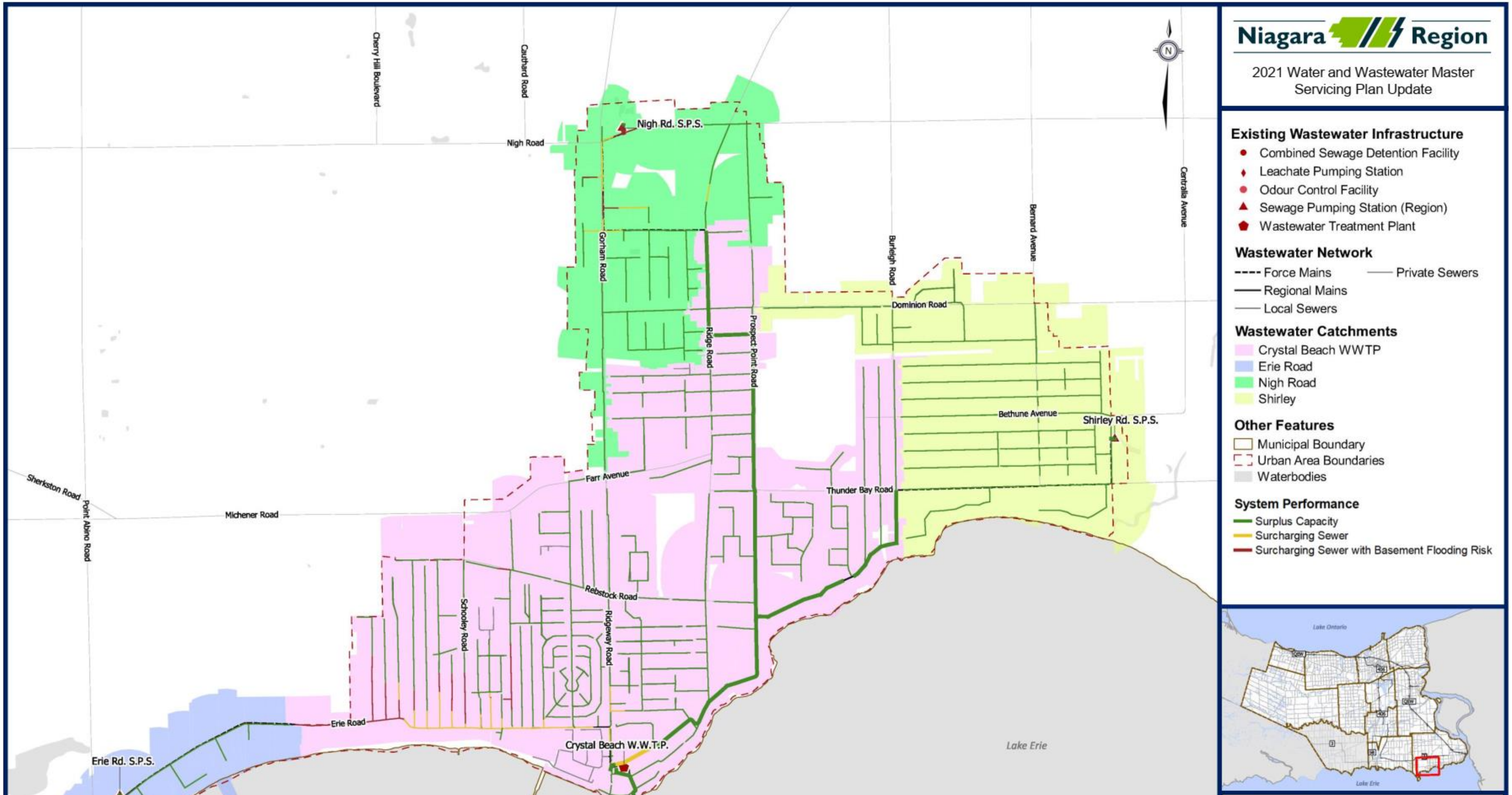

Figure 4.I.6

Existing 5-Year Storm Peak Wet Weather Flows

Crystal Beach WWTP

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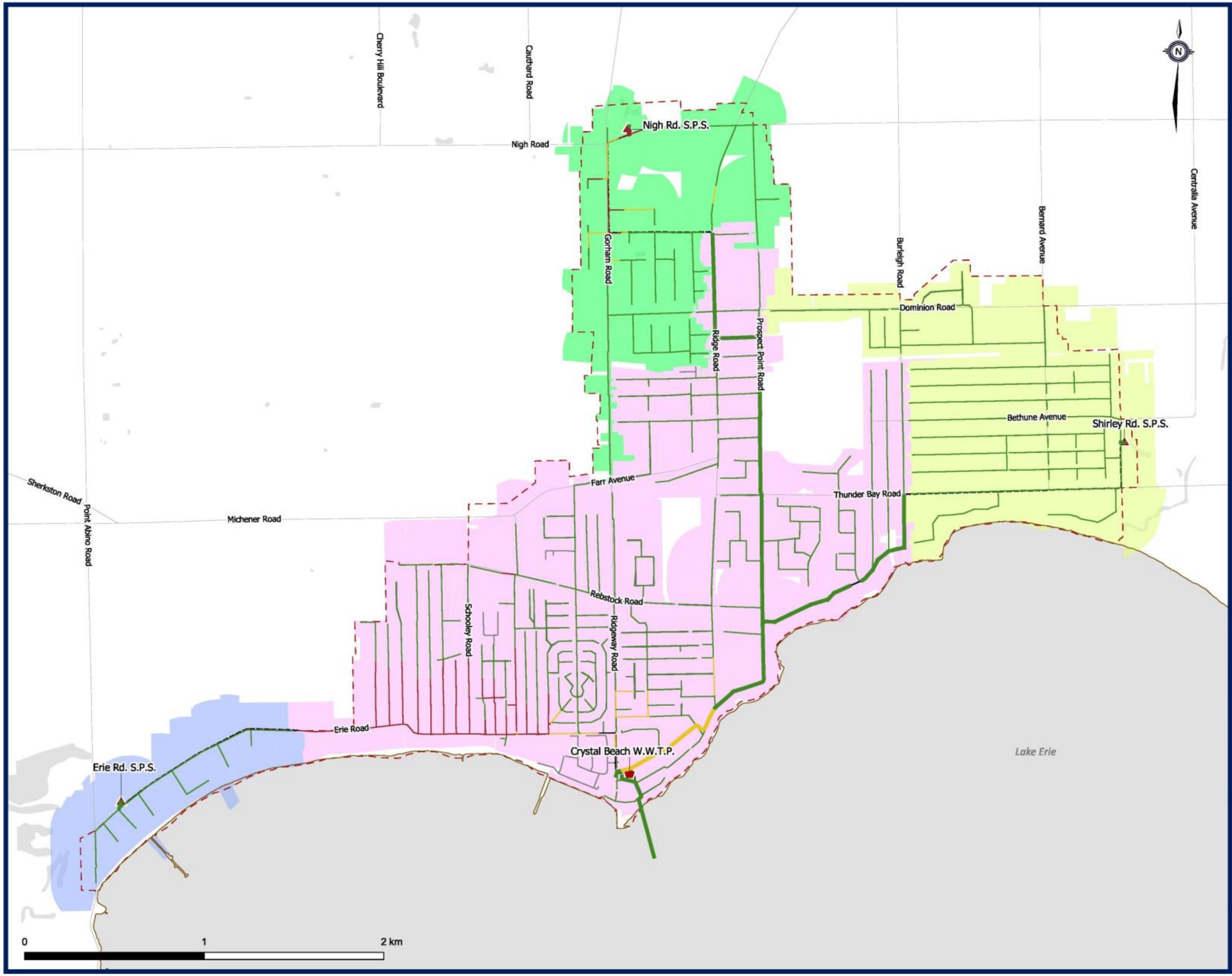

Niagara Region

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Existing Wastewater Infrastructure
- ● Combined Sewage Detention Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Local)

Wastewater Network
- ---- Force Mains
- ━ Regional Mains
- ─ Local Sewers
- ─ Private Sewers

Wastewater Catchments
- 🟪 Crystal Beach WWTP
- 🟦 Erie Road
- 🟩 Nigh Road
- 🟨 Shirley

Other Features
- ☐ Municipal Boundary
- ⬚ Urban Area Boundaries
- ⬜ Waterbodies

System Performance
- ━ Surplus Capacity
- ━ Surcharging Sewer
- ━ Surcharging Sewer with Basement Flooding Risk

Figure 4.I.7

2051 5-year Storm Peak Wet Weather Flows

Crystal Beach WWTP

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620126
Projection EPSG: 26917

I.4 System Opportunities and Constraints

Figure 4.I.8 Highlights the existing opportunities and constraints.

I.4.1 Crystal Beach Wastewater Treatment Plant

- The current rated average daily flow capacity of the plant is 9.1 MLD, with an existing flow of 5.7 MLD and a projected 2051 average daily flow of 6.6 MLD, which is below 80% of the wastewater treatment plant rated capacity. As such, the wastewater treatment plant has surplus capacity to accommodate growth beyond 2051.
- The Region has a planned sustainability upgrade for the plant’s process and biosolids.

I.4.2 Crystal Beach

- Limited residential and employment growth consisting of infill development within existing urban boundary.
- Existing and growth-related wet weather capacity deficits at sewage pumping stations including:
    - Nigh Road SPS
- The recently upgraded Shirley SPS has sufficient capacity to support growth to post-2051.
- Existing sewer network has capacity to meet design criteria wet weather flows; however, actual wet weather flows exceed sewer capacity in several areas.

I.4.3 System Optimization Opportunities

- Existing system configuration provides limited opportunities to optimize system including; system diversions to reduce sewage pumping station upgrades and/or eliminated existing sewage pumping stations.
- Opportunity explore a consolidated Fort Erie treatment strategy; this may include decommissioning the Crystal Beach Wastewater Treatment Plant and conveying flows to the Anger Avenue Wastewater Treatment Plant in lieu of extensive treatment plant rehabilitations.
- Opportunity to provide localized growth capacity through implementation of wet weather flow management within the Crystal Beach system.

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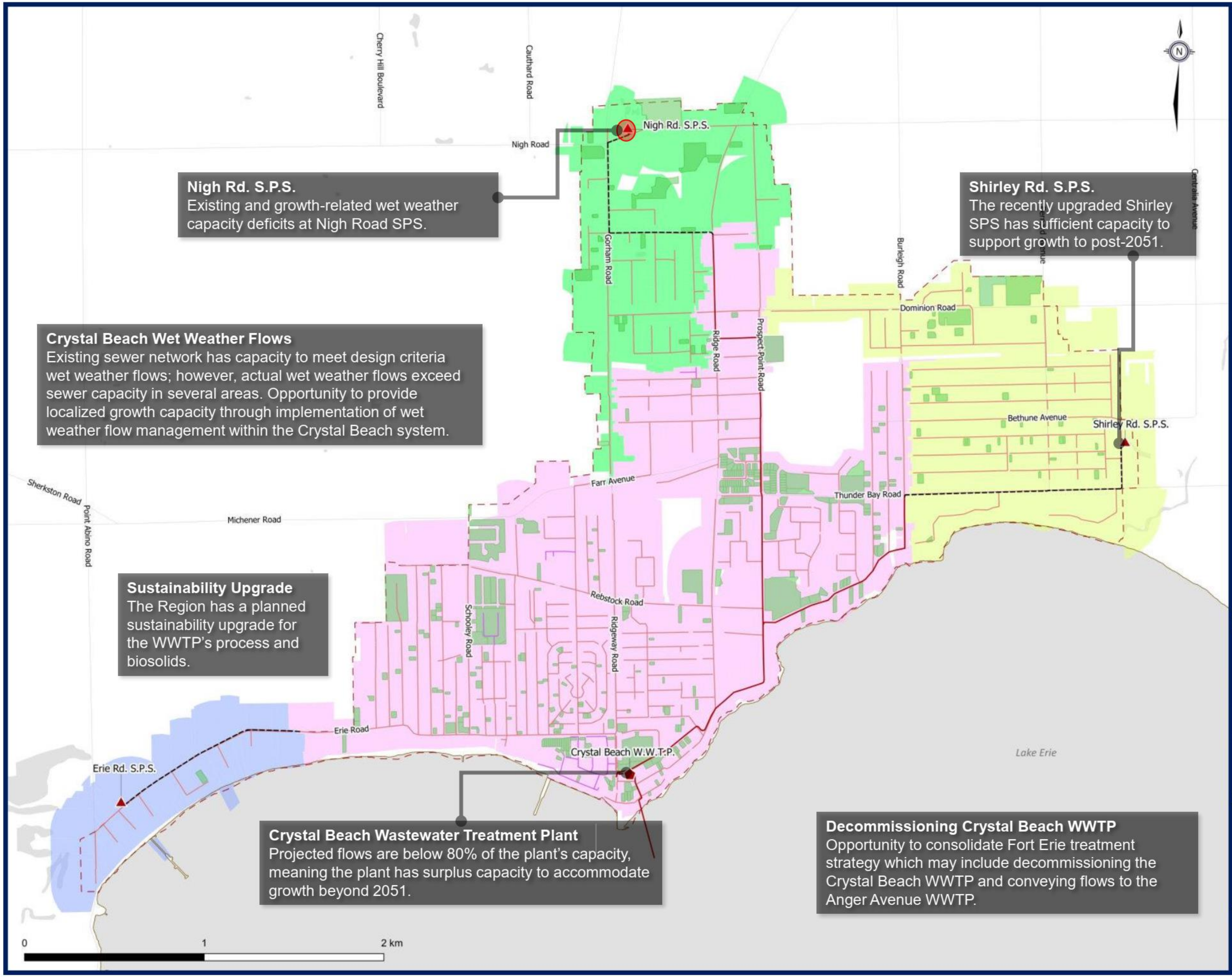

Nigh Rd. S.P.S.
Existing and growth-related wet weather capacity deficits at Nigh Road SPS.

Shirley Rd. S.P.S.
The recently upgraded Shirley SPS has sufficient capacity to support growth to post-2051.

Crystal Beach Wet Weather Flows
Existing sewer network has capacity to meet design criteria wet weather flows; however, actual wet weather flows exceed sewer capacity in several areas. Opportunity to provide localized growth capacity through implementation of wet weather flow management within the Crystal Beach system.

Sustainability Upgrade
The Region has a planned sustainability upgrade for the WWTP's process and biosolids.

Crystal Beach Wastewater Treatment Plant
Projected flows are below 80% of the plant's capacity, meaning the plant has surplus capacity to accommodate growth beyond 2051.

Decommissioning Crystal Beach WWTP
Opportunity to consolidate Fort Erie treatment strategy which may include decommissioning the Crystal Beach WWTP and conveying flows to the Anger Avenue WWTP.

Existing Wastewater Infrastructure
- ⬟ Wastewater Treatment Plant (WWTP)
- ● Combined Sewage Detention Facility
- ■ Biosolids Storage Facility
- ✳ Odour Control Facility
- ♦ Leachate Pumping Station

Sanitary Pumping Stations (SPS)
- ▲ Regional
- ▲ Municipal
- ▲ Private

Wastewater Network
- ---- Force Mains
- — Regional Mains
- — Local Sewers
- — Private Sewers

Wastewater Catchments
- 🟦 Erie Road
- 🟩 Nigh Road
- 🟨 Shirley
- 🟪 Crystal Beach WWTP

Other Features
- ☐ Municipal Boundary
- ▨ Waterbodies
- ⬚ Urban Area Boundary

Development Locations
- 🟫 Post-2051
- 🟩 Pre-2051

Figure 4.I.8

Crystal Beach WWTP

Opportunities and Constraints

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February 2023
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I.5 Assessment of Alternatives

Generally, the previously recommended strategies from the 2016 MSP program were carried forward which included capacity upgrades at select stations, and wet weather management strategies in key areas.

While the strategies remained the same, the following details including alignment, sizing, or wet weather areas have been updated to reflect the latest system understanding and reflect updated criteria changed through this iteration of the 2021 MSPU.

- Providing capacity within Region-owned pumping stations and trunk sewers to convey peak wet weather flows up to the lesser of the 5-year design storm or extraneous flow design allowance criteria of 0.4 L/s/ha for existing areas and 0.286 L/s/ha for growth areas, needs to be verified based on the updated flow criteria and actual flows.
- Provide upstream flow management to address high peak flows in the system where peak wet weather flows exceed the extraneous flow design allowance criteria of 0.4 L/s/ha resulting in basement flooding and overflow risks. Upstream flow management can include but is not limited to these options, in the preferred order of implementation:
  - Inflow and infiltration reduction in public right of way
  - Inflow and infiltration reduction from private properties
  - Enhanced system storage
  - Peak flow control using system controls or engineered solutions

As shown in **Section I.3.2**, pump station capacity assessments were completed by reviewing the projected design allowance peak flows and 5-year storm flows against the operational firm capacity of each station.

  - Where the peak storm flows were less than design flows and the operational firm capacity of the station, the storm flows were used as actual flows, and therefore would not have triggered an upgrade.
  - Where the projected peak design allowance flows and 5-year storm flows exceeded the operational firm capacity of the station, a pump upgrade was recommended. Additional storage options and wet weather management were also considered.

To address existing and growth-related capacity needs, the following servicing concepts were evaluated:

- Do nothing
- Station capacity upgrade for pumping or storage
- Wet weather management
- Hybrid solution

I.6 Preferred Servicing Strategy

The following is a summary of Crystal Beach WWTP system as recommended through the 2016 Master Servicing Plan Update and carried forward through this update:

- The recommended solution for the Crystal Beach Wastewater Treatment Plant system is to provide wet weather management across the system. This will require Regional solutions as well as local municipality solutions.
- An upgrade at the Nigh Road SPS and Shirley SPS were identified to support existing users and growth in the area.
- With the implementation of the wet weather program, the Crystal Beach Wastewater Treatment Plant will have sufficient capacity to meet growth to year 2051.
- A study is recommended to evaluate a consolidated Fort Erie treatment strategy; this includes the potential decommissioning of the Crystal Beach WWTP and convey flows to the Anger Ave WWTP.

Figure 4.I.10 and **Figure 4.I.11** show the preferred servicing strategy, consisting of:

I.6.1 Treatment Plant Works

- No capacity upgrades are required.

The Region has several Region-wide programs focused on maintaining and enhancing the treatment capacity at the Region's existing WWTP. The programs applicable to the Crystal Beach WWTP include:

- WWTP Process Upgrades (WW-TP-005) which funds projects to improve treatment processes to re-establish the ECA capacity at plants.

I.6.2 Pumping Stations

- Increase Shirley SPS capacity from 29 L/s to 57 L/s. (Note station upgrade to 57 L/s is being completed during the course of this Master Plan)
- Increase Nigh Road SPS capacity from 22 L/s to 54 L/s.

Further to the pump station upgrades, the Region-wide allowance to address odour control needs that are the result of growth-related system upgrades has been included.

- WWTP Process Upgrades (WW-TP-006) which funds in-system and plant upgrades to control odour.

I.6.3 Forcemains

- No forcemains require upgrades.

I.6.4 Decommissioning of Existing Facilities

- No decommissioning projects are recommended in the Crystal Beach WWTP system.

I.6.5 Wet Weather Flow Management Program

A significant element of the Niagara Region wastewater servicing strategy is the wet weather management program. The program is intended to address existing capacity constraints, and to provide for growth-related capacity without expanding/upgrading existing trunk infrastructure, or by minimizing the required expansion/upgrades.

The wet weather management program currently identifies overall preliminary priority, staging of location and target amount of inflow and infiltration reduction across all systems. This program provides for a proactive and targeted approach to addressing wet weather impacts. These wet weather management programs will need to be a joint initiative between the Region and local municipalities.

For the Crystal Beach system, all SPS catchments were identified as high priorities for inflow and infiltration reduction in the 2017 Fort Erie PPCP: Sub-catchment areas in the Crystal Beach WWTP catchment were targeting between 25-75% of inflow and infiltration reduction.

I.6.6 Additional Studies and Investigations

Flow Monitoring Program: Additional flow monitoring data collection will improve the confidence of the system performance results from the model. Best practices for improving understanding of wastewater systems include:

- Monitoring upstream from pump stations to capture peak wet weather flows
- Increasing the density of monitoring in catchments identified for wet weather flow management, where the flows from the 5-year design storm exceed the design flows.

The Town should continue to implement the recommendations of the PPCP including more extensive flow monitoring and field investigations such as smoke and dye testing and other fieldwork.

Fort Erie QEW Corridor Long-Term Study: study is recommended to assess wastewater treatment options for the Fort Erie area, which would include reviewing options:

- Assess the viability decommissioning the Crystal Beach WWTP and conveying Crystal Beach system flows to the Anger Ave WWTP service area via a new SPS and forcemain.
- Assess options to decommission the Stevensville Douglastown Lagoons by replacing the Lagoons with a new SPS and forcemain to convey flows to either the Anger Avenue WWTP or new South Niagara Falls WWTP.
- The outcome of the study will be an updated capacity assessment of the Anger Avenue WWTP based on the preferred servicing strategy for Crystal Beach and Stevensville Douglastown areas.

I.6.7 Future System Performance

Figure 4.I.9 presents the future system performance, based on the preferred servicing strategy configuration and capacities; but excludes the potential benefits of the local wet weather flow management program.

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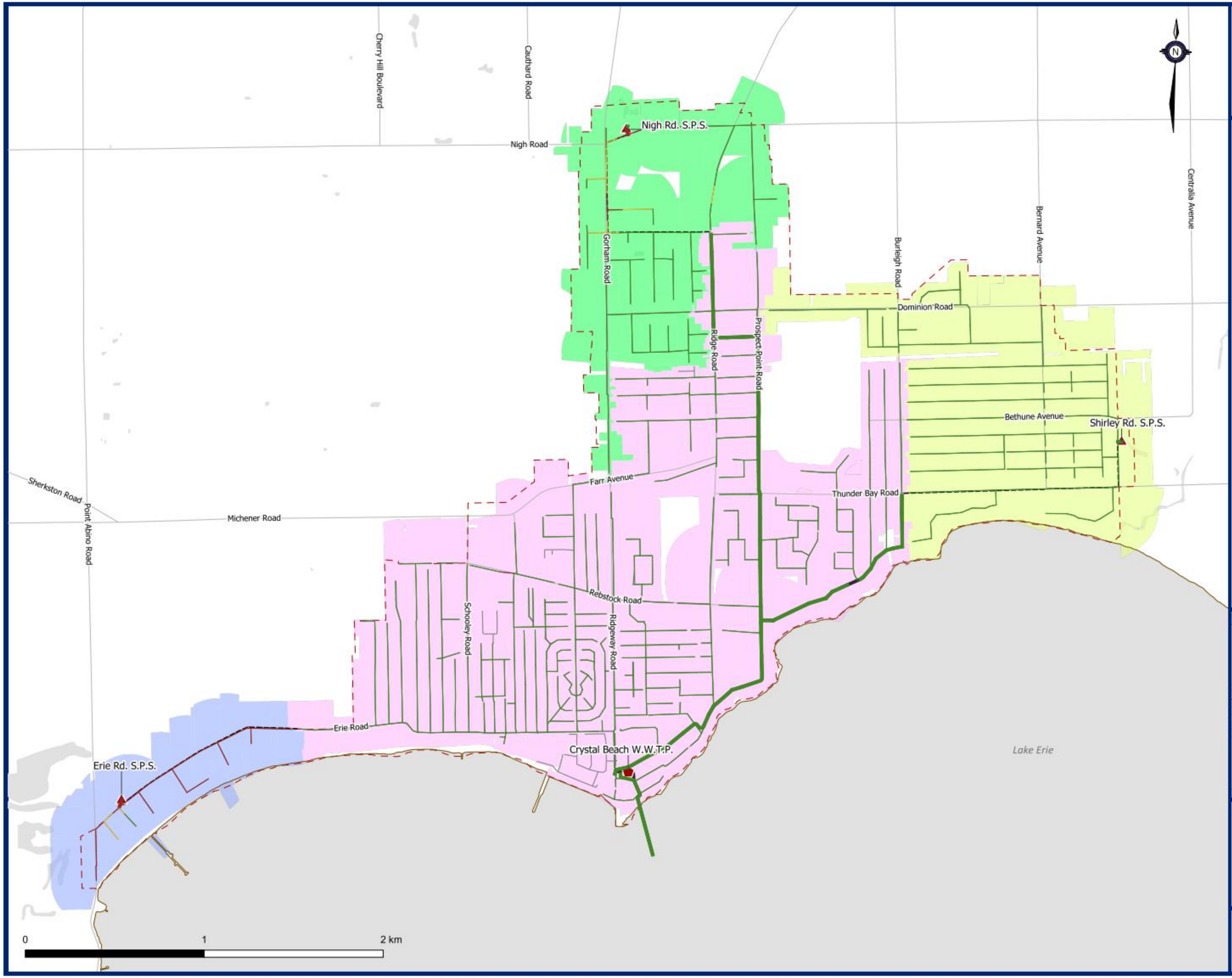

Existing Wastewater Infrastructure
- ● Combined Sewage Detention Facility
- % Leachate Pumping Station
- ● Odour Control Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Private)
- ▲ Sewage Pumping Station (Local)

Wastewater Network
- Force Mains
- Regional Mains
- Local Sewers
- Private Sewers

Wastewater Catchments
- Crystal Beach WWTP
- Erie Road
- Nigh Road
- Shirley

Other Features
- Municipal Boundary
- Urban Area Boundaries
- Waterbodies

System Performance
- Surplus Capacity
- Surcharging Sewer
- Surcharging Sewer with Basement Flooding Risk

Figure 4.I.9

Future Capital Program Peak Wet Weather Flow

Crystal Beach WWTP

BluePlan

May, 2023
620126
Projection EPSG:26917

I.7 Capital Program

Figure 4.I.10 and **Figure 4.I.11** present the preferred servicing strategy map and schematic

Table 4.I.10 summarizes the recommended project costing timing and Class EA requirements. Individual detailed costing sheets are presented in **Section I.8.6.**

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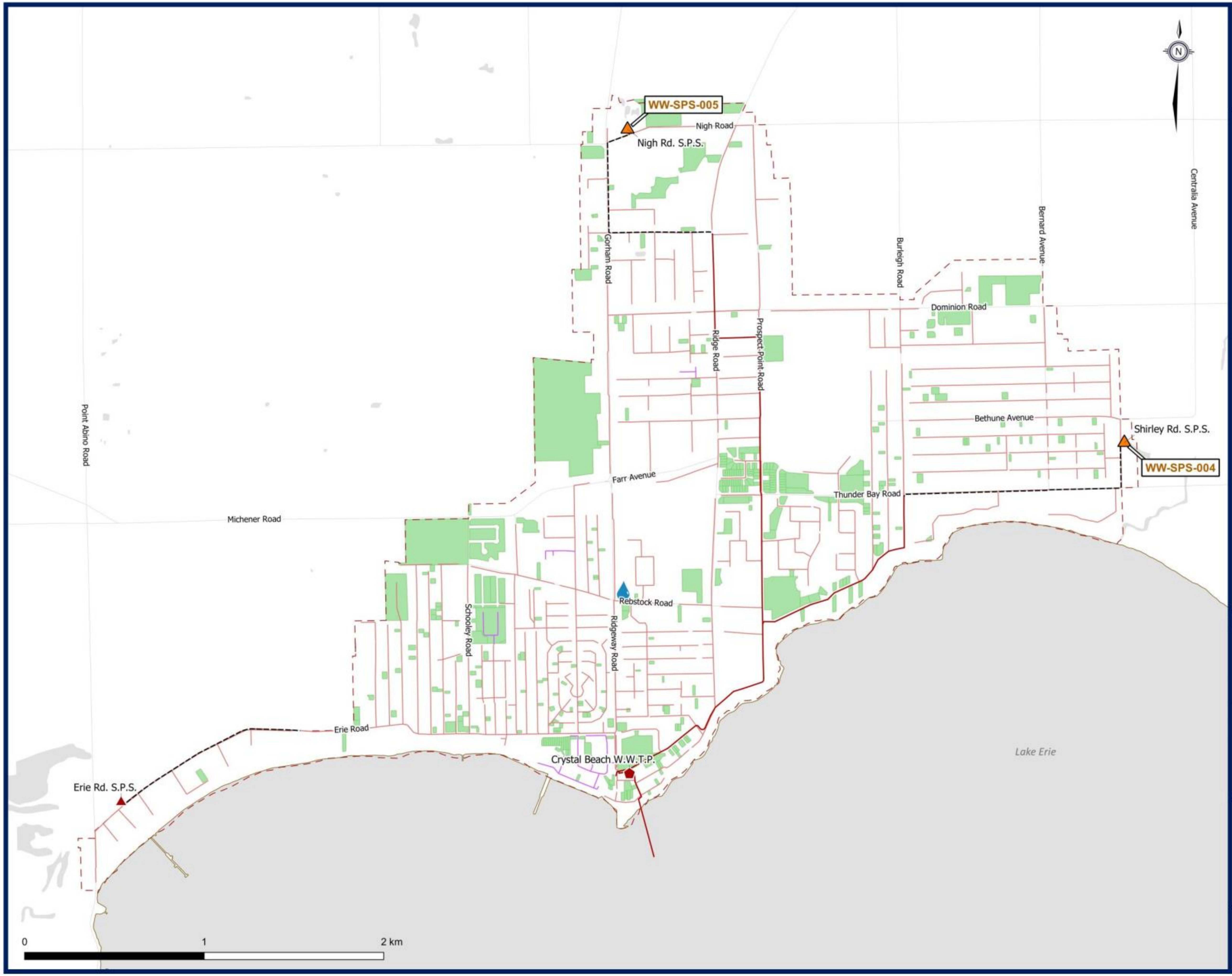
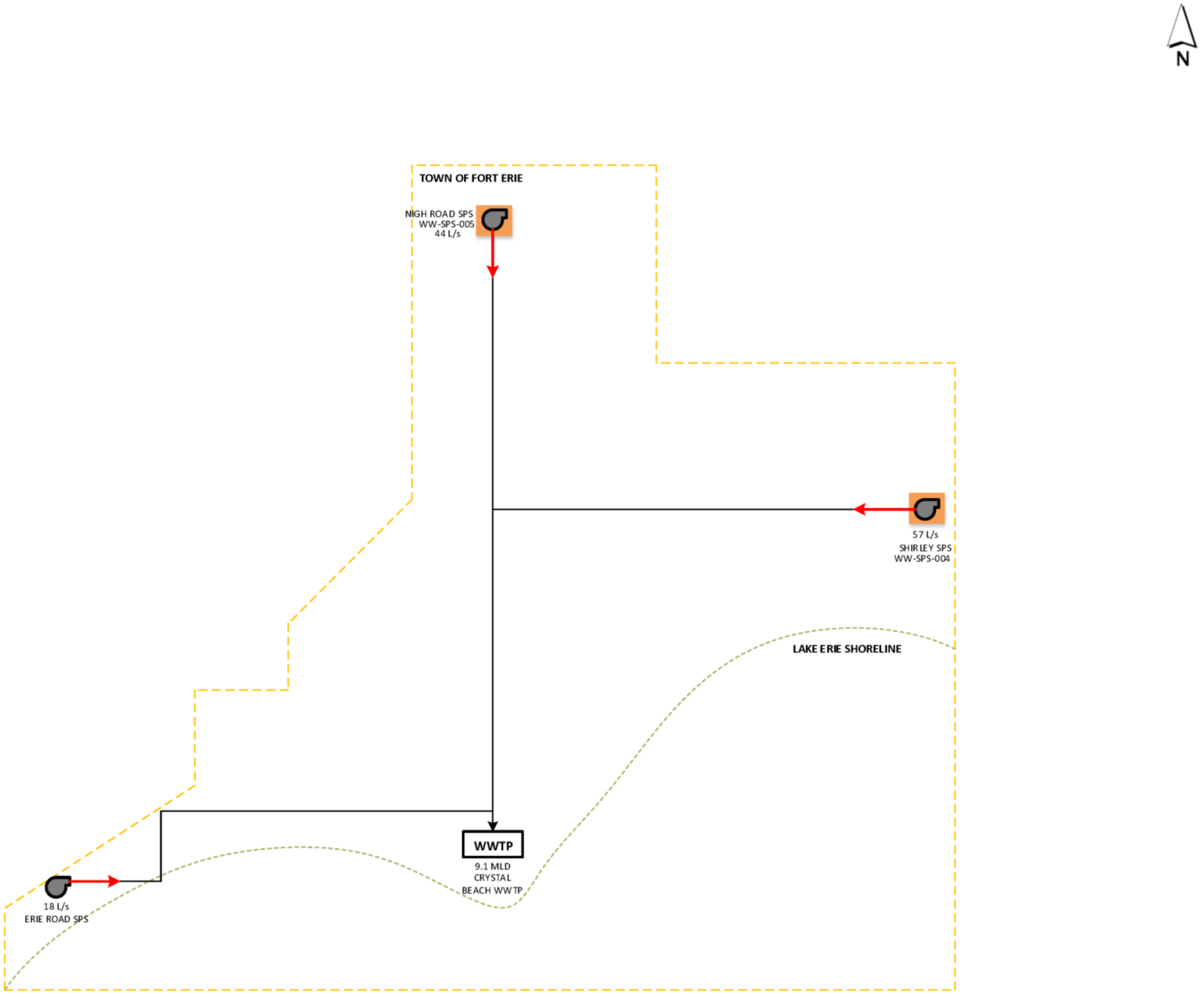
2021 Water and Wastewater Master Servicing Plan Update



***Note that additional growth in existing built areas is anticipated**

***Project alignments are preliminary and will be refined through subsequent projects (EA and/or detailed design)**

Figure 4.I.10
Crystal Beach WWTP System
Preferred Wastewater Servicing Strategy



Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

WWTP RATED CAPACITY	Wastewater Treatment Plant
FIRM CAPACITY	Sewage Pumping Station
→	Forcemain
→	Connection from SPS to SPS
→	Connection from SPS to WWTP
🟧	Facility Upgrade
🟩	New Facility
—	Upgrade Forcemain or Sewer
—	New Forcemain or Sewer
⊗	Decommission Project

Figure 4.I.11
Crystal Beach WWTP
Future Wastewater Infrastructure Schematic

December 2022
621016-W-000
WKID: 26917

Table 4.I.10 Summary of Crystal Beach Wastewater Treatment Plant Capital Program

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost ($)
WW-SPS-004	Shirley SPS Upgrade	Increase station capacity from 29 L/s to 57 L/s; Also includes sustainability upgrades to the station	57 L/s	2024	Fort Erie	A+	Satisfied	Pumping	$4,845,000
WW-SPS-005	Nigh Road SPS Pump Replacement	Increase station capacity from 22 L/s to 54 L/s by replacing the existing two pumps.	54 L/s	2027-2031	Fort Erie	A+	Dependent on outcome of wet weather flow study	Pumping	$2,053,000
WW-II-017[(1)]	Region-Wide Wet weather Reduction	Wet weather reduction program in all systems to be executed from 2022-2051	N/A	Post-2051	Region-Wide		Dependent on outcome of wet weather flow study	Wet Weather Reduction	$225,000,000
WW-ST-001[(1)]	Region-Wide Flow Monitoring and Data Collection	Funding to support flow monitoring and data collection initiatives	N/A	2022-2051	Region-Wide			Wet Weather Reduction	$12,000,000
WW-ST-002[(2)]	Fort Erie QEW Corridor Long-Term Study	Crystal Beach WWTP, SD WWTP long term strategy	N/A	2022-2026	Fort Erie		Separate EA Required	Treatment	$500,000
WW-TP-005[(1)]	Region-Wide WWTP Process Upgrades	Process upgrades to re-establish ECA capacity	N/A	2022-2051	Region-Wide			Treatment	$50,000,000
WW-TP-006[(1)]	Region-Wide WWTP Process Upgrades	Upgrades for odour control across the Region at forcemains, pump stations, and other locations.	N/A	2022-2051	Region-Wide			Treatment	$40,000,000
								Total	**$6,898,000**

(1) Project cost not included in subtotal as it is a Region-wide project

(2) Project cost not included in subtotal as it is a Fort Erie wide project

I.8 Project Implementation and Considerations

I.8.1 10-Year Program Sequencing

The recommended year in service for the capital projects is presented in **Section I.6.6**. Special project implementation and considerations for the preferred servicing strategy consist of:

- Completing the Fort Erie QEW Corridor Long-Term Study before 2026 to support implementation of a Stevensville Douglastown Lagoons solutions prior the lagoons exceeding their capacity. .

It is understood that the timing for the recommended projects may be subject to change due to a variety of external factors such as overall balancing of the Region's capital budget, changes to growth projections, and other unforeseen circumstances. As such, **Table 4.I.11** presents the preferred priority of the projects within the first 10-years of the capital program.

Table 4.I.11 Preferred Project Order

Master Plan ID	Name	2021 MSPU Year in Service	Order
WW-SPS-004	Shirley SPS Upgrade	2024	1
WW-SPS-005	Nigh Road SPS Pump Replacement	2027-2031	2

I.8.2 EA Requirements and Studies

The following summarizes the status of EA requirements for recommended capital projects which will require Schedule B or C EAs.

- **EA has been satisfied through previous projects:**
    - None
- **Currently ongoing separate EA studies:**
    - CB WWTP Process Optimization Study
- **EA studies to be completed through separate studies:**
    - Fort Erie QEW Corridor Long-Term Study envisioned as a Master Plan EA; requiring a Schedule B or C EA(s) to implement the recommended solutions.

I.8.3 Region-Wide Projects and Collaboration with Local Area Municipalities

Acknowledging that the overall wastewater systems are jointly owned and operated by the Region and LAM, the continued operation and expansion of the wastewater systems to support existing users and accommodate projected growth relies upon the cooperation of the upper and lower tier municipalities. Major updates and adjustments to planning projections should be continued to be communicated as this may affect project details such as trigger timelines and design capacities, which is discussed further in **Section I.8.5**.

One initiative that will be predominately driven by the LAMs is wet weather management. While wet weather management should be completed in all municipalities, this 2021 MSPU assumes that the catchments where the peak wet weather flows exceed the peak design flows and contribute to increased risk of basement flooding or overflows will put a specific focus on wet weather management. The Region is committed to continuing the joint CSO funding program through which LAMs can apply for funding support for inflow and infiltration reduction programs and projects such as those identified through the PPCP.

As the flow monitoring completed for the PPCP is greater than 5 years old, additional flow monitoring and system data collection, in partnership with LAM, may be needed to improve system understanding, support proposed wet weather flow reductions, and identify opportunities for system optimization and overflow removals.

I.8.4 Sustainability Projects

It is important to recognize that the 2021 MSPU servicing strategies identify new infrastructure to service the additional growth out to year 2051 but these strategies are built by extending infrastructure from the existing systems and leveraging the existing Region infrastructure in place. It is essential that the existing infrastructure is maintained in good condition and performance to support servicing growth.

The Region continually establishes and implements a sustainability program that addresses priority projects to ensure the existing infrastructure is in a state-of-good-repair and continues to perform and meet the intended level of services. Region-wide programs including but not limited to replacement programs for pipes and manholes, boilers, meters, generators, SCADA upgrades, sludge management programs, laboratory and sampling equipment upgrades, process electrical, process instrumentation. Pump station upgrades through the sustainability capital plan re-establish the SPS ECA capacity.

Independent of the 2021 MSPU, the Region has completed a sustainability program analysis to identify the projects on a yearly basis, with focus on a 10 year program, to address the sustainability needs. This Sustainability Capital Plan is first developed to demonstrate the total investment needs and may identify a level of investment and implementation exceeding Region resources. The next steps for the Sustainability Capital Plan will be the development of the Financial Plan for existing Water and Wastewater assets which is anticipated to be completed in 2024. It should be noted that the Sustainability Capital Plan represents investment required over and above the growth-related 2021 MSPU program.

Crystal Beach system specific projects include:

- Crystal Beach WWTP Process and Biosolids Upgrade
- Erie SPS Upgrade

I.8.5 Project Implementation Flow Chart

The recommended design capacities within the growth capital program are based on the best available information at the time of analysis, including existing system flows, facility capacities, and projected growth. It is understood that this data is not static and often changes over the years between the regular updates of the Region's Master Plan and between those updates. Design assumptions should be revisited before initiation of all projects to reconfirm the appropriate design capacities, along with identification of any associated or dependent projects which can be combined or staged to optimize implementation efficiency and cost, and/or system operation.

To support the Region's process in implementing all recommended 2021 MSPU capital projects, the following flow chart has been developed for the wastewater system. This flow chart document is intended to be a reference resource for the Region and should be treated as a guideline to support existing internal Region processes in project implementation.

The wastewater implementation flow chart is shown in **Figure 4.I.12**.

Niagara Region

WASTEWATER PROJECT IMPLEMENTATION

The intent of this document is to support the Region in confirming the scope of work for wastewater infrastructure projects.

CONFIRM PROJECT SCOPE

To define Terms of Reference

☐ **What triggered this project?**
- Known development growth
- Forecasted growth
- Sustainability needs

☐ **Are there related or dependent projects that should be identified for streamlining opportunities or for project phasing?**
- Are there upstream projects with increasing capacity?
- Are there projects within the same alignment or project area that could be combined? (e.g., growth projects, SPS, forcemain, sewer, corridor planning, sustainability projects, water, stormwater, etc.)
- If there are related projects, could the project timing be adjusted to combine or stage projects more efficiently?

☐ **What is the project EA Schedule and status?**

☐ **Are there historic or ongoing operational issues in the project area?**
- Confirm with Regional and LAM operations and maintenance groups
- i.e. historic overflows, low flow/odour issues, clogging issues, work order history, etc.

☐ **Are there any data gaps that should be incorporated into the Terms of Reference?**
- Refer to the Required Data section below for details
- How much does the project timeline and budget need to change to allow for the data collection?

☐ **Have the planning projections been updated to the best available information?**
- Consultation with Region and LAM planning groups to confirm planning projection
- Are projected needs for the project in place? Is actual growth in line with projected growth?)

☐ **Should the project be deferred until identified related works are completed?**

REQUIRED DATA

To support terms of reference and detailed design

☐ **Recently completed EA or servicing study**
(for growth triggered projects)

☐ **Historic flow records**
- Within the last 3 years
- Ideally one full year of flow monitoring data that covers 80% of the total contributing area
- Can be included in project scope if feasible

☐ **Existing pump, flow, and pressure data to identify/verify existing system issues**

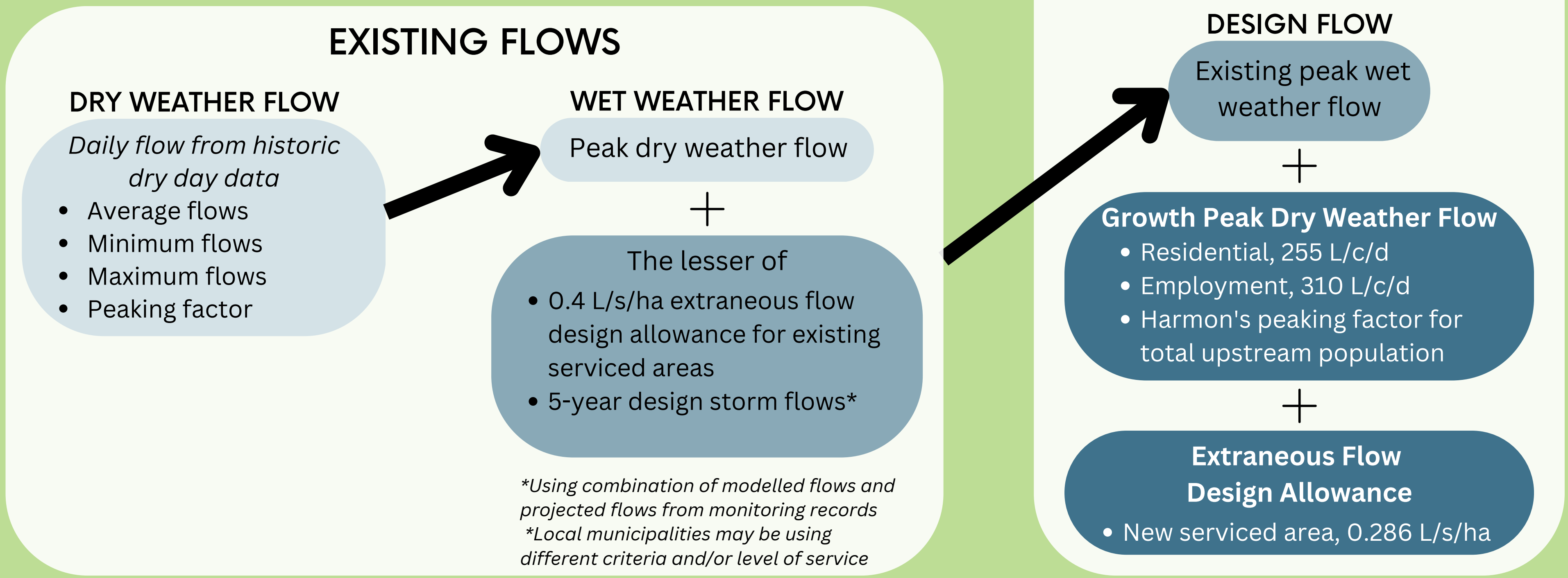
☐ **Asset inventory and condition assessment**
- All asset classes within the infrastructure type (sewer, forcemain, storage, pumping, or treatment facility)
- Within the last 5 years
- Can be part of project scope if the data is not available and would not significantly alter project scope - to assess need for related works (i.e. electrical, HVAC, structural upgrades at an SPS)

☐ **Service area growth potential to confirm projected population and demands**
- Consultation with Region and LAM planning groups within the past year
- Growth information for 30-year horizon and beyond (maximum service catchment)
  - Population, jobs, land use, area
  - Current inventory of development areas with associated development status

IF THE REQUIRED DATA IS NOT AVAILABLE AND IF IT HAS THE POTENTIAL TO SIGNIFICANTLY ALTER SCOPE OF THE DESIGN, IT IS STRONGLY RECOMMENDED THAT THE APPROPRIATE DATA COLLECTION AND FIELD INVESTIGATION BE COMPLETED PRIOR TO PROCEEDING WITH DESIGN. ALTERNATIVELY, WHERE FEASIBLE, DATA COLLECTION SHOULD BE INCLUDED IN THE PROJECT SCOPE AND INTEGRATED INTO THE DESIGN PROCESS.

FLOW PROJECTIONS

To determine infrastructure capacity needs



EXISTING FLOWS

DRY WEATHER FLOW

Daily flow from historic dry day data
- Average flows
- Minimum flows
- Maximum flows
- Peaking factor

WET WEATHER FLOW

Peak dry weather flow

\+

The lesser of
- 0.4 L/s/ha extraneous flow design allowance for existing serviced areas
- 5-year design storm flows*

**Using combination of modelled flows and projected flows from monitoring records*
**Local municipalities may be using different criteria and/or level of service*

FUTURE FLOWS

For 30-year planning horizon and 30-year service catchment

DESIGN FLOW

Existing peak wet weather flow

\+

Growth Peak Dry Weather Flow
- Residential, 255 L/c/d
- Employment, 310 L/c/d
- Harmon's peaking factor for total upstream population

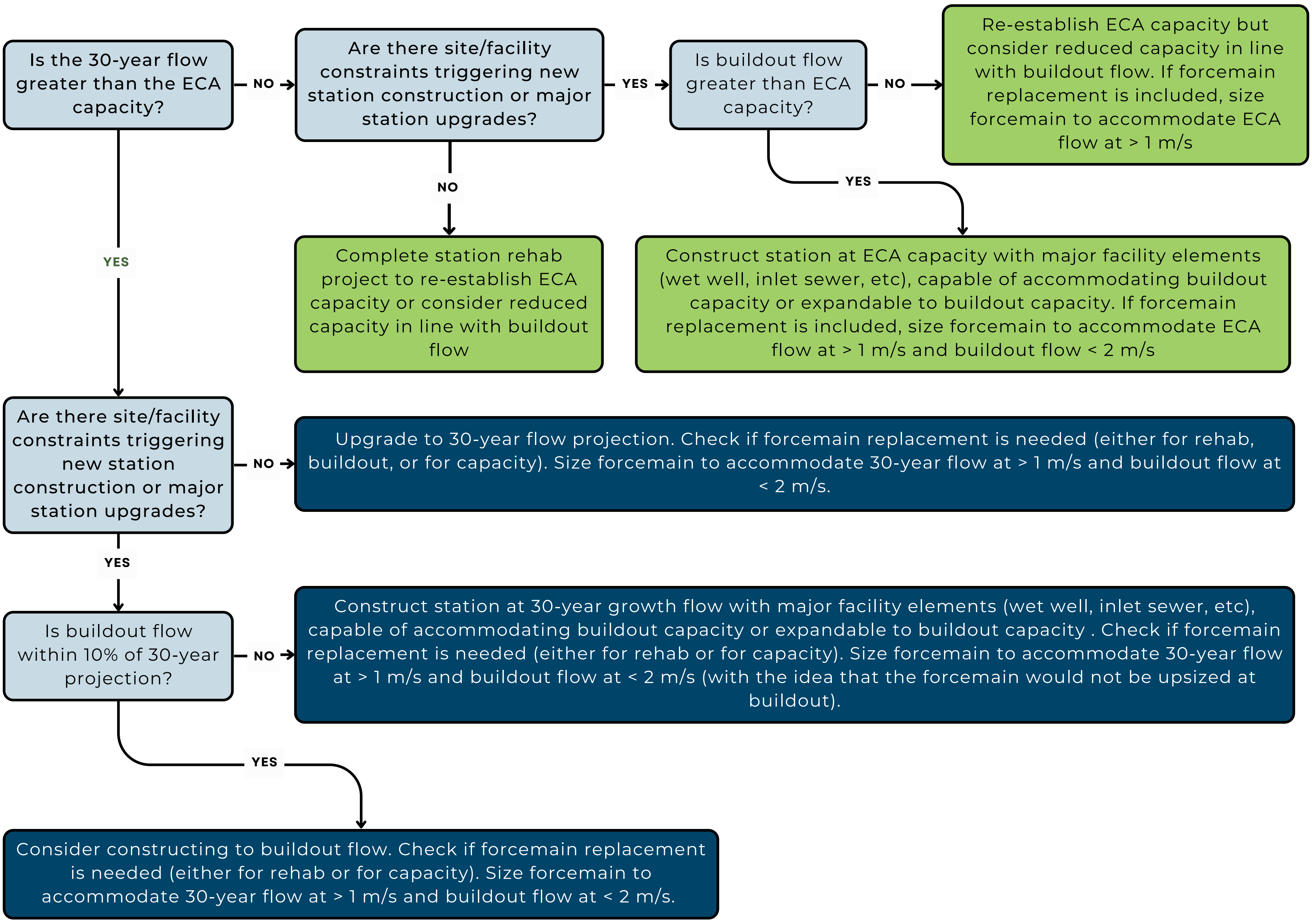
\+

Extraneous Flow Design Allowance
- New serviced area, 0.286 L/s/ha

The design criteria presented in this document are based on the 2021 Master Servicing Plan Update Study

BluePlan ENGINEERING

SEWAGE PUMPING STATIONS



Is the 30-year flow greater than the ECA capacity?

Are there site/facility constraints triggering new station construction or major station upgrades?

Is buildout flow greater than ECA capacity?

Re-establish ECA capacity but consider reduced capacity in line with buildout flow. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s

Complete station rehab project to re-establish ECA capacity or consider reduced capacity in line with buildout flow

Construct station at ECA capacity with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s and buildout flow < 2 m/s

Are there site/facility constraints triggering new station construction or major station upgrades?

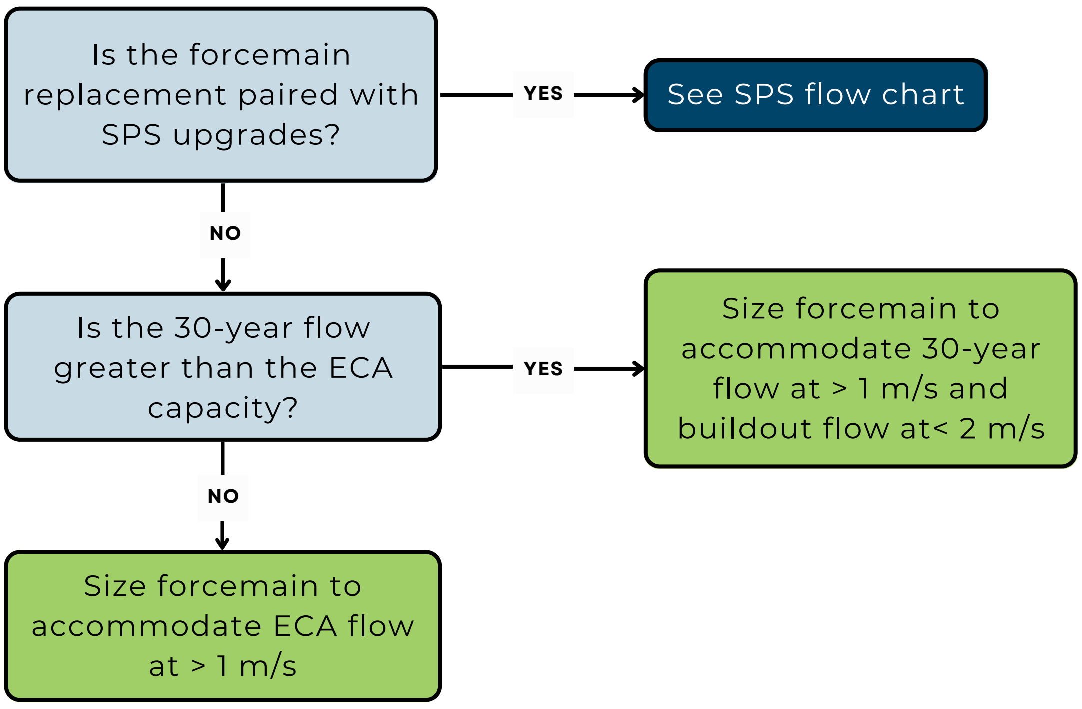
Upgrade to 30-year flow projection. Check if forcemain replacement is needed (either for rehab, buildout, or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

Is buildout flow within 10% of 30-year projection?

Construct station at 30-year growth flow with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity . Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s (with the idea that the forcemain would not be upsized at buildout).

Consider constructing to buildout flow. Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

FORCEMAINS



Is the forcemain replacement paired with SPS upgrades?

See SPS flow chart

Is the 30-year flow greater than the ECA capacity?

Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at< 2 m/s

Size forcemain to accommodate ECA flow at > 1 m/s

I.8.6 Detailed Project Costing Sheets

The detailed project costing sheets for the recommended 2021 MSPU capital projects within the Crystal Beach WWTP system are presented below.

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PL
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-II-017**

PROJECT NAME: **Region Wide Wet weather Reduction**

PROJECT DESCRIPTION: Wet weather reduction program in all systems to be executed from 2022-2051

Old ID		**Focus Areas**	Amount
_WW-II-001	Anger Ave WWTP	Lakeshore Road, Catharine Street, Dominion Road, Rose Avenue SPS, Anger Ave WWTP Catchments	
_WW-II-002	Crystal Beach WWTP	Nigh Road SPS and Crystal Beach WWTP Catchments	
_WW-II-003	Stevensville Douglastown	Stevensville, Douglastown catchments	
_WW-II-004	Welland WWTP	Feeder Road, Seaway Heights, Ontario Road SPS, Dain City, and Welland WWTP Catchments	
_WW-II-005	Baker - Grimsby	Woodsview, Biggar Lagoon, Old Orchard SPS Catchments	
_WW-II-006	Baker - Lincoln Beamsville	Ontario Street SPS Catchment	
_WW-II-007	Baker - Lincoln Vineland	Wet weather reduction in Jordan Valley***	
_WW-II-008	Port Dalhousie	Eastchester, Lakeside, Argyle, Renown SPS and Port Dalhousie WWTP Catchments	
_WW-II-009	Port Weller/Port Dalhousie	Wet weather reduction in North Thorold	
_WW-II-010	Port Weller	Haulage Road, Carlton Street SPS, and Port Weller WWTP Catchments	
_WW-II-011	Seaway WWTP	Union, Clarke Street, Arena, Elm Street, City Hall, Sugarloaf, Rosemount North and South SPS Catchments	
_WW-II-012	Niagara Falls WWTP	Central, Muddy Run, Seneca, Meadowvale, Drummond, Kalar Road SPS Catchments	
_WW-II-013	South Niagara Falls WWTP	South Side High Lift and South Side Low Lift SPS Catchments	
_WW-II-014	NOTL	Wet weather reduction in Northeast Niagara-on-the-Lake	
_WW-II-015	NOTL	Wet weather reduction in Virgil - NOTL	
_WW-II-016	Baker - West Lincoln	Wet weather reduction in West Lincoln - Baker	

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-004**

PROJECT NAME: **Shirley SPS Upgrade**

PROJECT DESCRIPTION: Increase station capacity from 29 L/s to 57 L/s; Also includes sustainability upgrades to the station

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-004**

	L/s	Notes
ECA	29.0	
Operational	29.0	

PROPOSED CAPACITY		57 L/s	Additional capacity	
Design PWWF	**Existing**	88 L/s	45 L/s	
	2051	95 L/s	51 L/s	
	Buildout	97 L/s	53 L/s	
		RDII	**5Y Design**	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	29	57
2	29	57

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	28 L/s	$27,983	$1,000,000	2 Pump replacement at 500K per pump
Related Upgrades	40%					$400,000	
Bypass Pumping Allowance	6%					$77,000	
Additional Construction Costs	15%		ea.			$221,550	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$169,855	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$2,400,000**	**Region Overide based on 90 % Design**
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.5%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 360,000	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$360,000**	
In House Labour/Engineering/Wages/CA	4.0%					$ 100,000	
In-house Labour/Wages Sub-Total						**$100,000**	
Project Contingency	15%					$429,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$429,000**	
Non-Refundable HST	1.76%					$56,100	
Non-Refundable HST Sub-Total						**$56,100**	
Total (2016 Dollars)						**$3,345,000**	Rounded to nearest $1,000
Other Estimate						**$1,500,000**	Sustainability Upgrades as per Niagara Region capital forecast
Chosen Estimate						**$4,845,000**	**2016 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$96,900		
Design	Design fees, Town fees for design, contract admin	13%	$629,850		
Construction	Town fees, base costs and project contingency	85%	$4,118,250		
TOTAL			**$4,845,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SPS-005**
PROJECT NAME:	**Nigh Road SPS Pump Replacement**
PROJECT DESCRIPTION:	Increase station capacity from 22 L/s to 54 L/s by replacing the existing two pumps.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-005**

	L/s	Notes
ECA	31.8	
Operational	21.5	

PROPOSED CAPACITY		54 L/s	Firm capacity
Design PWWF	**Existing**	61 L/s	51 L/s
	2051	65 L/s	54 L/s
	Buildout	69 L/s	58 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	21.5	54 L/s
2	21.5	54 L/s

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	33 L/s	$27,983	$850,000	$425K per pump, replacing existing 2 pumps
Related Upgrades	30%					$255,000	
Bypass Pumping Allowance	6%					$60,775	
Additional Construction Costs	15%		ea.			$174,866	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$134,064	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$1,475,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 221,300	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$221,300**	
In House Labour/Engineering/Wages/CA	4.0%					$ 59,000	
In-house Labour/Wages Sub-Total						**$59,000**	
Project Contingency	15%					$263,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$263,000**	
Non-Refundable HST	1.76%					$34,500	
Non-Refundable HST Sub-Total						**$34,500**	
Total (2022 Dollars)						**$2,053,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$2,053,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$41,060		
Design	Design fees, Town fees for design, contract admin	13%	$266,890		
Construction	Town fees, base costs and project contingency	85%	$1,745,050		
TOTAL			**$2,053,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-TP-005**
PROJECT NAME:	**Region-wide WWTP Process Upgrades**
PROJECT DESCRIPTION:	Process upgrades to re-establish ECA capacity

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$50,000,000**	Placeholder Costs
Chosen Estimate						**$50,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$1,000,000		
Design	Design fees, Town fees for design, contract admin	13%	$6,500,000		
Construction	Town fees, base costs and project contingency	85%	$42,500,000		
TOTAL			**$50,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-TP-005**
PROJECT NAME: **Region-wide WWTP Process Upgrades**
PROJECT DESCRIPTION: Upgrades for odour control across the Region at forcemains, pump stations, and other locations.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$40,000,000**	Placeholder Costs
Chosen Estimate						**$40,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$800,000		
Design	Design fees, Town fees for design, contract admin	13%	$5,200,000		
Construction	Town fees, base costs and project contingency	85%	$34,000,000		
TOTAL			**$40,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-ST-001**
PROJECT NAME: **Region Wide Flow Monitoring and Data Collection**
PROJECT DESCRIPTION: Funding to support flow monitoring and data collection initiatives

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-ST-001**

PROPOSED CAPACITY	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction							
Additional Construction Costs	10%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ -	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$0**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	10%					$4,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$4,000**	
Non-Refundable HST	1.76%					$100	
Non-Refundable HST Sub-Total						**$100**	
Total (2022 Dollars)						**$44,000**	Rounded to nearest $1,000
Other Estimate						**$12,000,000**	Assumes 400k/year for 30 y
Chosen Estimate						**$12,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$240,000		
Design	Design fees, Town fees for design, contract admin	13%	$1,560,000		
Construction	Town fees, base costs and project contingency	85%	$10,200,000		
TOTAL			$12,000,000		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-ST-002**
PROJECT NAME: **Fort Erie QEW Corridor Long-Term Study**
PROJECT DESCRIPTION: Crystal Beach WWTP, SD WWTP long term strategy

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-ST-002**

PROPOSED CAPACITY	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction							
Additional Construction Costs	10%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 400,000	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$400,000**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	10%					$50,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$50,000**	
Non-Refundable HST	1.76%					$7,900	
Non-Refundable HST Sub-Total						**$7,900**	
Total (2022 Dollars)						**$498,000**	Rounded to nearest $1,000
Other Estimate						**$500,000**	Study Estimate
Chosen Estimate						**$500,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$10,000		
Design	Design fees, Town fees for design, contract admin	13%	$65,000		
Construction	Town fees, base costs and project contingency	85%	$425,000		
TOTAL			**$500,000**		

J

Regional Municipality of Niagara

Part J

SEAWAY WASTEWATER SYSTEM

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J. SEAWAY WASTEWATER TREATMENT PLANT

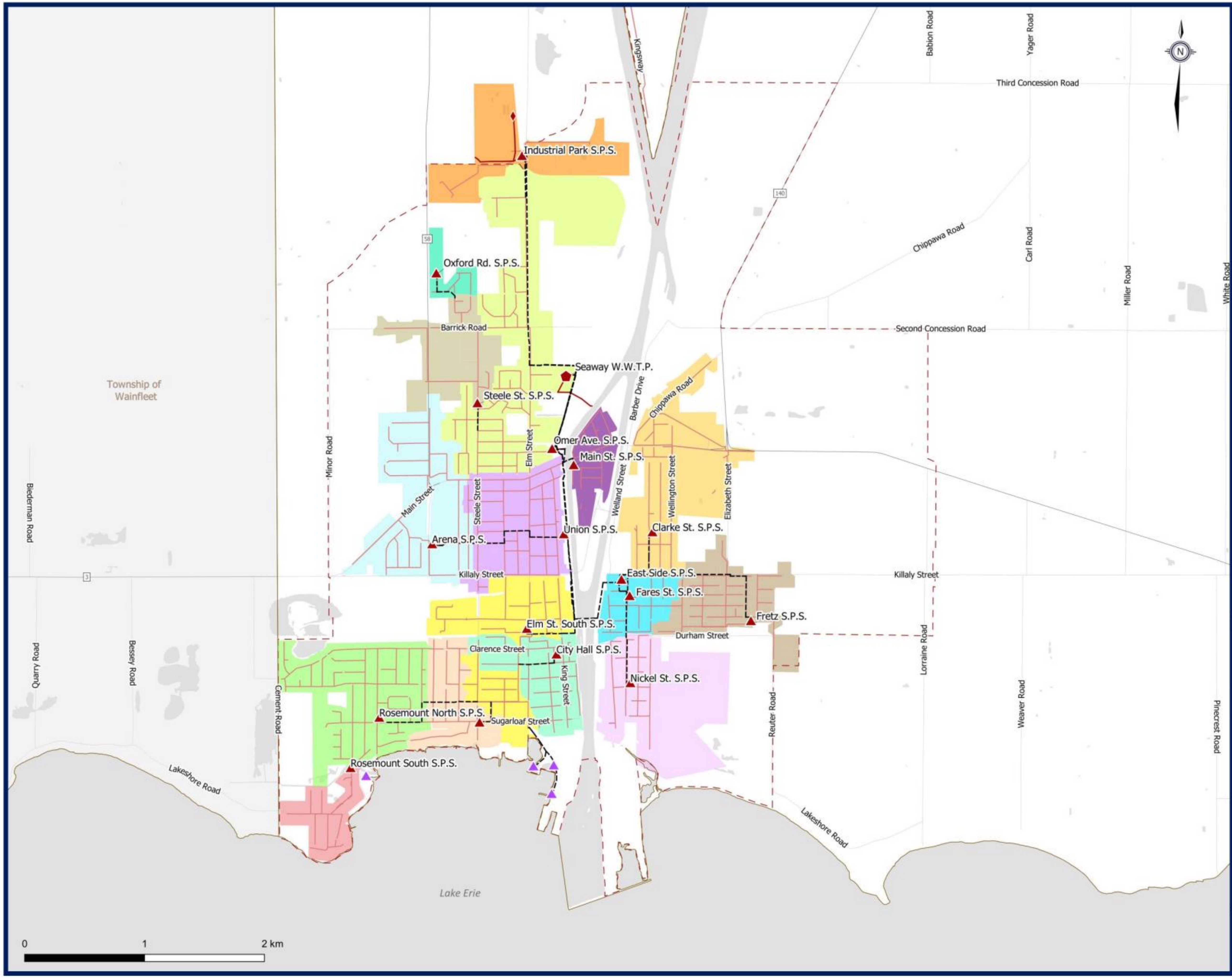
J.1 Existing System Infrastructure

The Seaway wastewater system services the City of Port Colborne. The system services an existing population of 15,969and 4,693 employees. Note that this population and employment total is based on the Region's 2021 allocation of Traffic Area Zones planning data and has been processed through the allocation methodology presented in **Volume 2** to refine the data to include only serviced populations. As such, the population and employment total may not directly match the system totals using the Region's unprocessed planning data.

The system is serviced by the Seaway Wastewater Treatment Plant, located on 30 Prosperity Avenue, Port Colborne. The Seaway Wastewater Treatment Plant is a modified conventional activated sludge facility with a current rated capacity of 19.6 MLD, and a peak flow capacity of 45.4 MLD; with flows over 45.4 MLD are diverted to a 5.67 ML storage tank.

Because of the unique topography in Port Colborne, system flows are pumped to the treatment plant via Regionally owned pump stations and forcemains.

Figure 4.J.1 presents an overview of the wastewater system, and **Figure 4.J.2** shows a schematic of the wastewater system.



Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

Existing Wastewater Infrastructure

⬟ Wastewater Treatment Plant (WWTP)
■ Biosolids Storage Facility
✳ Odour Control Facility
♦ Leachate Pumping Station

Sanitary Pumping Stations (SPS)

▲ Regional
▲ Municipal
▲ Private

Wastewater Network

- - - - Force Mains
—— Regional Mains
—— Local Sewers
—— Private Sewers

Wastewater Catchments

■ Arena
■ City Hall
■ Clarke Street
■ Eastside
■ Elm
■ Fretz
■ Industrial
■ Main Street
■ Nickel
■ Omer
■ Oxford Road
■ Rosemount North
■ Rosemount South
■ Steele
■ Sugarloaf
■ Union

Other Features

☐ Municipal Boundary
☐ Urban Area Boundary
■ Waterbodies

Figure 4.J.1
Seaway WWTP System
Existing Wastewater Infrastructure

BluePlan ENGINEERING

March 2023
620126-WW-001
WKID: 26917

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

WWTP RATED CAPACITY	Wastewater Treatment Plant
FIRM CAPACITY	Sewage Pumping Station
🡒	Forcemain
🡒	Connection from SPS to SPS
🡒	Connection from SPS to WWTP

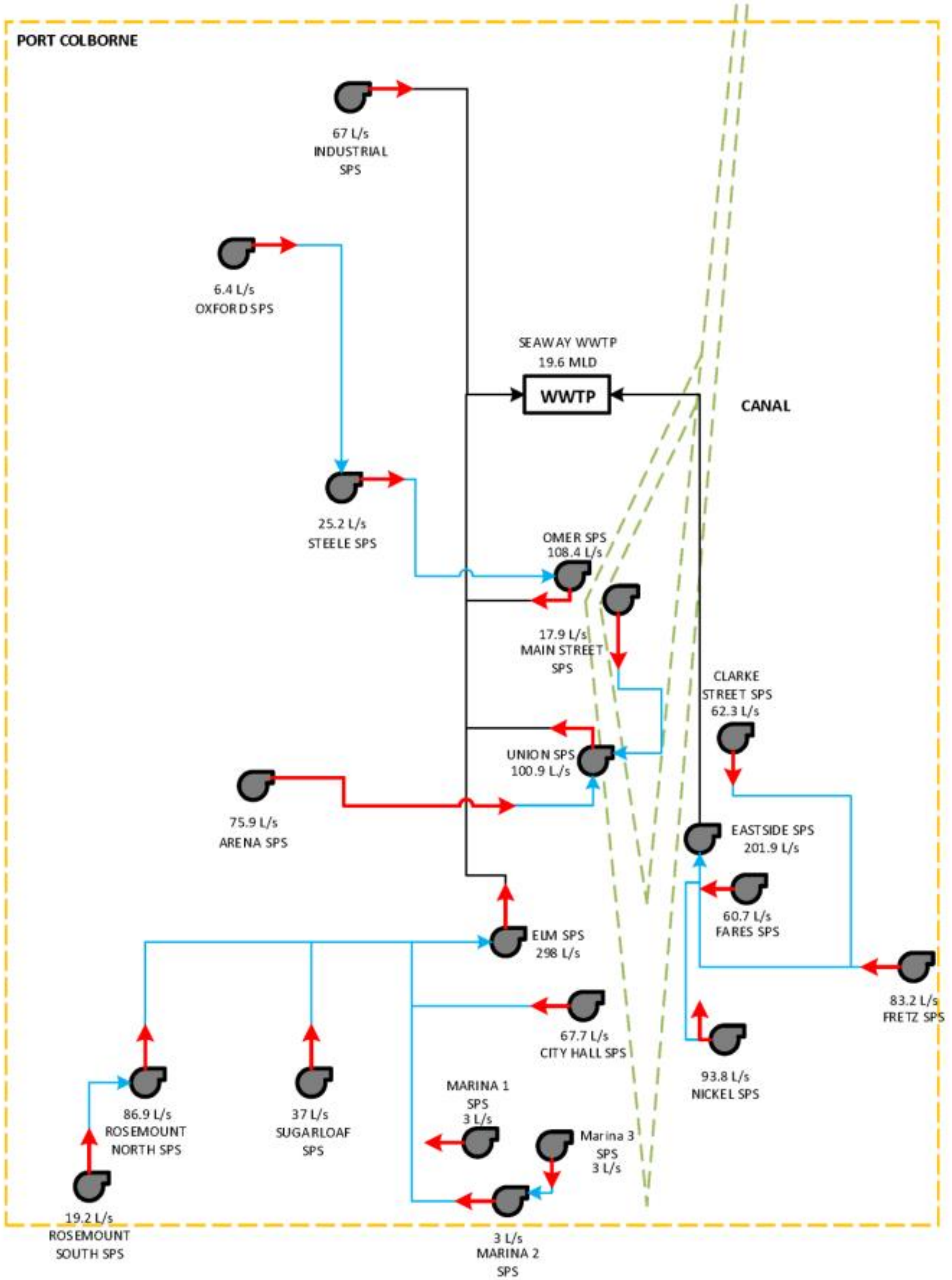


Figure 4.J.2
Seaway WWTP

Existing Wastewater Infrastructure Schematic

GM BluePlan

December 2022
621016-W-000
WKID: 26917

J.1.1 Facility Overview

Table 4.J.1 to **Table 4.J.2** present a summary of the environmental compliance approval (ECA) for the Seaway wastewater treatment plant (WWTP) usage, operation, and effluent concentration objectives.

Table 4.J.1 Wastewater Treatment Plant Overview

Plant Name	Seaway Wastewater Treatment Plant
ECA	#8325-AWPRYR Issued June 13, 2018
Address	30 Prosperity Ave, Port Colborne, ON, L3K 5X9
Discharge Water	Welland Canal
Rated Capacity: Average Daily Flow	19.6 MLD
Rated Capacity: Peak Flow Rate (Wet Weather)	45.4 MLD
Key Processes	• Conventional activated sludge treatment with screening • Grit removal • Secondary treatment and sedimentation • Phosphorous removal • Effluent disinfection • UV treatment of secondary effluent

Table 4.J.2 Wastewater Treatment Plant Effluent Objectives

Effluent Parameter	Objective Concentration
$CBOD_5$	15.0 mg/L
TSS	15.0 mg/L
Total Phosphorus	0.5 mg/L
E. Coli	200 organisms/100 mL
Total Chlorine Residual	0.5 mg/L

Table 4.J.3 lists each sewage pumping station's (SPS) listed ECA firm capacity as well as the station's existing operational firm capacity (the current operating capacity of the pumps station based on performance testing and/or supervisory control and data acquisition (SCADA) trending). As identified in Volume 4, the operational firm capacity was used as the basis of assessment for the 2021 MSPU. In some cases where the operational firm capacity was larger than the ECA firm capacity; the registered ECA capacity was used.

Table 4.J.3 Pumping Station and Forcemain Overview

Station Name	Location	Catchment Details		Pump Station Details			Forcemain Details		
		Area Exclusive of Upstream Catchments (ha)	Area Inclusive of Upstream Catchments (ha)	Number of Pumps	ECA Firm Capacity (L/s)	Operational Firm Capacity (L/s)	Single or Twinned Forcemain	Forcemain Diameter (mm)	Length (m)
└→Industrial SPS	1680 Elm Street, Port Colborne	66.8	66.8	2	80.0	67.0	Twinned (single operational)	350	2,279
└→Omer SPS	Omer Street, Port Colborne	164.9	230.0	3	107.0	108.4	Single	311	654
└→Steele SPS	940 Steele Street, Port Colborne	52.6	52.6	2	35.0	25.2	Single	200	225
└→Oxford SPS	16 Oxford Boulevard, Port Colborne	12.5	12.5	2	7.6	6.4	Single	100	335
└→East Side SPS	Killaly Street, Port Colborne	0.0	286.5	3	252.0	201.9	Single	500	2,754
└→Nickel SPS	Nickel Street, Port Colborne	97.1	97.1	3	117.2	93.8	Single	300	962
└→Fares SPS	Fares Street, Port Colborne	29.3	29.3	3	65.8	60.7	Single	250	333
└→Fretz SPS	185 Johnson Street, Port Colborne	58.7	58.7	3	95.8	83.2	Single	300	1,560
└→Clarke Street SPS	111 Clarke Street, Port Colborne	101.4	101.4	2	73.8	62.3	Single	250	590
└→Union SPS	Union Street, Port Colborne	71.9	194.4	3	126.2	100.9	Single	311	1,428
└→Arena SPS	West Side Road, Port Colborne	98.1	98.1	2	116.0	75.9	Single	300	1,201
└→Main Street SPS	Main Street, Port Colborne	24.4	24.4	2	16.4	17.9	Single	150	205
└→Elm SPS	137 Princess Street, Port Colborne	74.1	291.0	4	400.0	298.0	Single	500	2,641
└→City Hall SPS	City Hall, Port Colborne	47.9	47.9	3	76.0	67.7	Single	250	378
└→Sugarloaf SPS	274 Sugarloaf Street, Port Colborne	39.9	39.9	2	36.0	37.0	Single	200	284
└→Rosemount North SPS	101 Rosemount Avenue North, Port Colborne	100.4	129.1	2	95.0	86.9	Single	356	1,000
└→Rosemount South SPS	Bayview Lane, Port Colborne	28.7	28.7	2	20.0	19.2	Single	150	92

J.2 Basis for Analysis

J.2.1 Flow Criteria, System Performance, and Sizing Methodology

The Niagara Region Traffic Area Zone planning data was used to estimate growth related flow generation within the wastewater system and to spatially allocate growth flows within each individual system. **Table 4.J.4** presents a summary of the flow criteria, performance, and sizing methodology that was utilized. Refer to **Volume 4 - Introduction** for additional information.

The Region's per capita wastewater flows criteria were updated based on a historic review of the previous 3-year period for local billing meter and flow monitoring records. Given that more granular data was available to complete this analysis compared to previous master plan updates, the population and employment per capita rates were differentiated. The data showed a slight reduction in the population criteria and slight increase in the employment criteria, which more closely reflect existing flow generation trends compared to the Region's previous per capita rate. Further detail regarding the per capita flow generation is presented in **Volume 4 – Introduction.**

The Region's extraneous flow allowance criteria was also reviewed against historic flow monitoring and pump station performance records where available. The review of historic wet weather flows found that typically 2-year design storm peak flows within existing built systems exceeded the Region's existing extraneous flow design allowance of 0.286 L/s/ha; however, that a 2-year design storm peak flow below 0.286 L/s/ha was achievable as demonstrated in multiple catchment areas. Based on the analysis and an industry review, for the purpose of future planning, the extraneous flow design allowance for existing areas was increased to 0.4 L/s/ha but was maintained at 0.286 L/s/ha for new greenfield development areas to better reflect the existing high wet weather flows, while minimizing the magnitude of system upgrades with wet weather flow management as a critical priority. In areas where available historic flow monitoring and modelling results identify existing peak 5 year design flows below the 0.4 L/s/ha criteria, the lower 5 year design flows should be utilized. Further details regarding the extraneous flow design allowance are presented in **Volume 4 – Introduction.**

Table 4.J.4 Flow Criteria, Scenarios, System Performance, and Sizing Methodology

	Component	Criteria	
Flow Criteria	Existing System Flows	Starting Point Methodology • Based on local billing meter records and flow monitoring data to establish existing dry and wet weather flows • Growth flows are added to the existing system baseline using design criteria	
	Flow Generation	Residential	255 L/c/d
		Employment	310 L/e/d

	Component	Criteria	
	Peaking Factor	Peak Dry Weather Flow	Harmon’s Peaking Factor
	Extraneous Flow Design Allowance	• 0.4 L/s/ha for existing areas • 0.286 L/s/ha for new developments	
WWTP	System Performance and Triggers	• MECP Procedure F-5-1 • Trigger upgrade study at 80% capacity • Trigger upgrade construction at 90% capacity	
	Upgrade Sizing	• Average daily flow plus growth based on population design flows	

Pump Station	System Performance and Triggers Sizing	• Refer to **Section J.2.1.1**
		• Two flow scenarios considered
		    • **Design Allowance**: Peak wet weather flow using the peaked dry weather flow plus the extraneous flow design allowance
		    • **5-Year Storm**: Modelled peak wet weather flow using the 5-year design storm
		• Peak flow capacity to meet design peak wet weather flow using the extraneous flow design allowance
		• Wet well and system storage considerations under 5-year storm to minimize basement flooding and overflow risks	

Forcemain	System Performance and Triggers	• Flag velocities less than 0.6 m/s • Flag velocities greater than 2 m/s • Upgrade when velocities exceed 2.5 m/s and considering condition and age	
	Upgrade Sizing	• Design velocity target between 1 m/s and 2 m/s • Forcemain twinning to increase capacity where feasible	
Trunk	System Performance and Triggers	• Design allowance peak wet weather flows, using the extraneous flow design allowance, to be managed within pipe • Freeboard (depth between hydraulic grade line and surface) greater than 1.8 m below surface in 5-year design storm • Flag pipes velocities less than 0.6 m/s • Flag pipes velocities greater than 3.0 m/s	
	Upgrade Sizing	• Sized for full flow under post-2051 design peak wet weather flow • Assess 5-year design storm performance to minimize basement flooding risks and overflows	

J.2.1.1 SPS Performance Evaluation and Upgrade Framework

Although it is the Region's design philosophy to size SPS inline with the Region's extraneous flow design allowance, the 2021 MSPU undertook a hybrid evaluation approach to acknowledge that SPS are a major contributor to local wastewater system performance and that many legacy system's exiting wet weather flows exceed the extraneous flow design allowance. The SPS hybrid performance evaluation and upgrade framework is summarized in **Table 4.J.5** and strives to balance the magnitude of capacity upgrades, potential cascading downstream upgrades, and managing the potential risk of local sewer surcharging and system overflows.

Under the hybrid performance evaluation and upgrade framework, the SPS capacity was sized to meet the lesser of peak wet weather flow (PWWF) using the extraneous flow design allowance, referred to as "Design Allowance PWWF" or the estimated 5-year storm PWWF. Further, consideration for the SPS actual performance under the estimated 5-year design storm peak wet weather flow was evaluated to determine if the available system storage including the wet well, storage tanks, and in system capacity was sufficient to manage excess flows while maintaining the system hydraulic grade line (HGL) below the basement flooding level of 1.8 m below grade and/or below the local overflow level.

In instances where the 5-year storm PWWF flow exceeded the available system storage, additional system solutions such as wet weather management, system storage, and/or additional SPS capacity upgrades were incorporated into the servicing solution. The most efficient solution to manage capacity and flow reduction was determined through the assessment of calculated flows from the 2051 design allowance PWWF and modelled 5-year storm PWWF against the operational firm capacity of the station and system storage.

Each SPS with a preferred solution of a capacity upgrade was individually reviewed in detail to determine how capacity upgrades should best be achieved:

- Pump replacement
- Pump upgrades
- Pump additions
- Station replacement
- Existing wet well sizing changes
- FM sizing and capacity.

Due to data quality and availability, a prioritization of upgrade needs, and flow monitoring (data collection) was assigned to each case for the Region implementation plan, discussed later in **Section J.8**.

Table 4.J.5 SPS Assessment Framework

Case	2051 Design PWWF	2051 5 Year Storm PWWF	2051 5-Year Storm Storage Need	Preferred Solution	Upgrade Priority	Flow Monitoring Priority
Case 1	> Firm Capacity	> Firm Capacity	> Available Storage	Upgrade pumps to future design allowance flow with potential storage upgrades or wet weather management	High	Medium
Case 2	< Firm Capacity	> Firm Capacity	> Available Storage	Upgrade storage and/or wet weather management	High	High
Case 3	> Firm Capacity	> Firm Capacity	< Available Storage	Potential upgrade to design allowance flow and/or wet weather management	Medium	High
Case 4	< Firm Capacity	> Firm Capacity	< Available Storage	Potential wet weather management	Low	Medium
Case 5	> Firm Capacity	< Firm Capacity	< Available Storage	No upgrade, use actual peak flows	N/A	Low
Case 6	< Firm Capacity	< Firm Capacity	< Available Storage	No upgrade	N/A	Low

J.2.2 Growth Population Projections and Allocations

Table 4.J.6 outlines the existing and projected serviced population and employment by catchment.

Table 4.J.6 Seaway Wastewater Treatment Plant Existing and Projected Serviced Population by Catchment

Sewage Pumping Station (SPS)	Existing Population & Employment			2051 Population & Employment			Post 2051 Population & Employment			2021-2051 Growth		
	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population Growth	Employment Growth	Total Growth
Seaway WWTP	0	0	0	0	236	235	430	2,203	2,633	0	236	235
└→Industrial SPS	58	47	105	58	192	250	58	194	252	0	145	145
└→Omer SPS	1,935	676	2,611	2,543	887	3,430	3,648	918	4,565	608	210	818
| └→Steele SPS	559	240	799	780	276	1,056	3,129	354	3,484	221	36	256
| └→Oxford SPS	160	129	289	306	147	453	801	152	953	146	18	164
└→East Side SPS	0	0	0	0	0	0	0	0	0	0	0	0
| └→Nickel SPS	606	0	606	680	189	870	751	197	948	74	189	263
| └→Fares SPS	613	105	718	617	119	735	635	141	776	3	14	17
| └→Fretz SPS	1,141	203	1,345	3,466	287	3,752	7,789	625	8,414	2,324	83	2,408
| └→Clarke Street SPS	1,573	371	1,944	1,906	424	2,330	2,573	1,197	3,771	332	53	385
└→Union SPS	1,990	305	2,295	2,000	535	2,534	2,078	555	2,633	10	229	239
| └→Arena SPS	1,287	449	1,736	1,681	540	2,221	5,923	1,354	7,277	394	92	485
| └→Main Street SPS	240	76	316	248	79	327	267	82	349	8	3	11
└→Elm SPS	1,443	819	2,262	1,464	1,132	2,595	1,499	1,165	2,664	21	313	334
| └→City Hall SPS	1,315	1,036	2,351	1,334	1,290	2,624	1,370	1,323	2,693	19	254	273
| └→Sugarloaf SPS	760	86	846	759	99	858	777	113	890	0	13	13
| └→Rosemount North SPS	1,842	121	1,963	1,809	129	1,938	2,911	160	3,071	-33	8	-25
| └→Rosemount South SPS	447	29	476	447	32	478	455	40	495	0	2	2
Total	**15,969**	**4,693**	**20,662**	**20,094**	**6,592**	**26,686**	**35,096**	**10,771**	**45,867**	**4,125**	**1,899**	**6,024**

Note: Population numbers may not sum due to rounding.

J.3 System Performance

J.3.1 Wastewater Treatment Plant

The starting point flow for the Seaway WWTP was calculated using historic SCADA flow data. Ten years of data (2011 to 2020) was reviewed to provide historical context and assess overall long-term trends; however, the most recent five years of data was used to determine the average daily flow. **Table 4.J.7** shows the historical system flows obtained from wastewater treatment plant production data.

Table 4.J.7 Historic Seaway Wastewater Treatment Plant Flows

Year	Average Daily Flow		Peak Daily Flow	
	(MLD)	(L/s)	(MLD)	(L/s)
2011	13.6	157.5	61.0	705.6
2012	10.6	122.7	44.9	519.7
2013	12.8	148.6	74.3	859.8
2014	12.1	139.9	52.8	610.6
2015	11.4	132.0	37.6	435.5
5 Year Average	12.1	140.1	54.1	626.2
5 Year Peak	13.6	157.5	74.3	859.8
2016	9.3	107.9	31.6	365.2
2017	12.1	139.8	43.1	499.0
2018	12.6	145.6	46.4	537.3
2019	13.5	155.9	44.7	517.7
2020	11.3	130.8	39.0	451.5
5-Year Average	11.8	136.0	41.0	474.1
5-Year Peak	13.5	155.9	46.4	537.3
10-Year Average	11.9	138.1	47.5	550.2
10-Year Peak	13.6	157.5	74.3	859.8

The 10-year trend analysis showed that flows to the Seaway WWTP continue to reflect high flows in wetter years. The 5-year average flow has decreased slightly from the 2016 MSP.

The starting point flow used for the Seaway WWTP was 11.8 MLD.

Figure 4.J.3 shows the projected future flows at the Seaway WWTP. The plant has surplus capacity to support growth and will not reach 80% capacity within the 2051-time horizon.

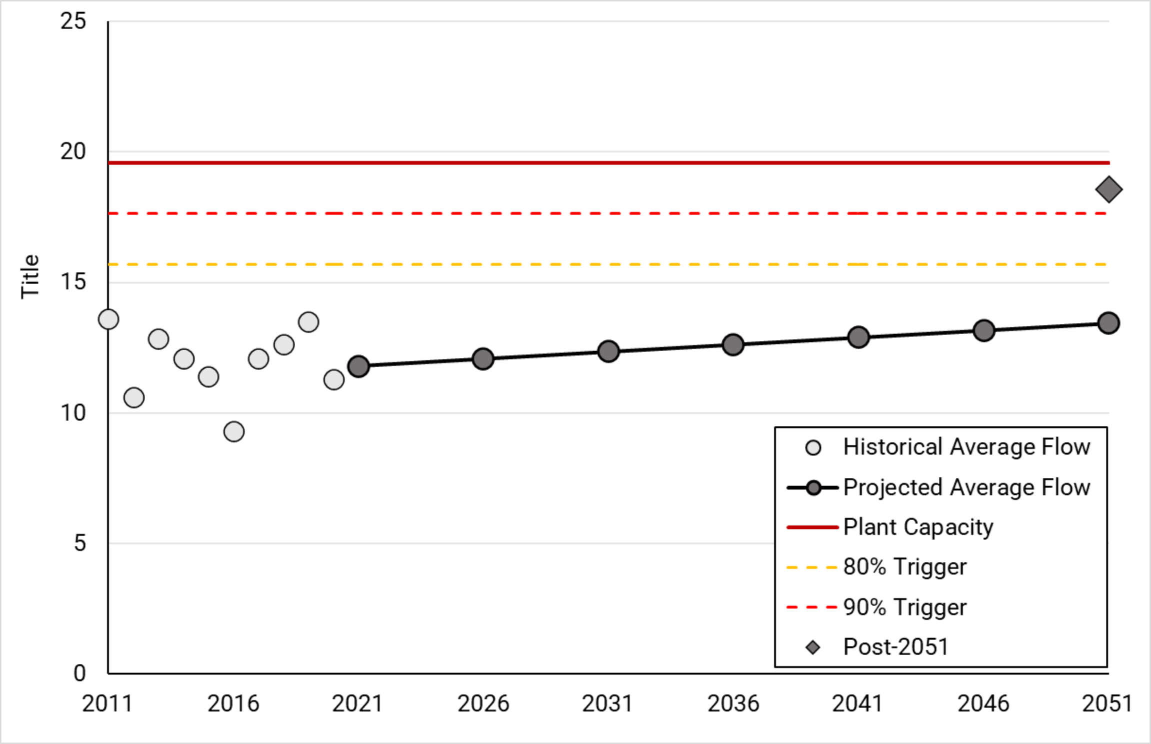


Figure 4.J.3 Projected Sewage Generation at Seaway Wastewater Treatment Plant

J.3.2 Sewage Pumping Station

Table 4.J.8 highlights the sewage pumping station operational firm capacities and the existing and projected flows. The existing average and peak dry weather flows were estimated using the wastewater system model, which was updated using the best available billing, flow monitoring, and SCADA data from 2018 to 2020.

Table 4.J.8 System Sewage Pumping Station Performance

Station Name	Station Capacity	2021 Flows				2051 Flows			Post-2051 Flows		
	Operational Firm Capacity	Average Dry Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow
	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)
└→Industrial SPS	**67.0**	1.4	2.5	29.2	25.0	4.6	31.4	27.2	4.7	31.4	27.2
└→Omer SPS	**108.4**	7.3	11.6	103.6	162.9	25.9	130.0	189.2	62.8	177.3	236.6
| — └→Steele SPS	**25.2**	1.6	4.3	25.3	48.8	7.5	29.4	53.0	32.1	63.7	87.3
| └→Oxford SPS	**6.4**	0.3	0.4	5.4	8.2	2.5	7.5	10.3	8.1	13.1	15.9
└→East Side SPS	**201.9**	27.8	52.4	167.0	260.4	84.2	230.5	323.9	137.1	317.1	410.5
| └→Nickel SPS	**93.8**	3.3	11.6	50.5	62.8	15.3	54.5	66.7	16.2	55.4	67.6
| — └→Fares SPS	**60.7**	4.7	15.9	27.6	21.8	16.1	27.8	22.0	16.7	28.4	22.6
| └→Fretz SPS	**83.2**	5.5	12.6	36.1	21.0	37.8	88.3	73.2	78.2	137.4	122.3
| — └→Clarke Street SPS	**62.3**	6.0	9.9	50.4	154.8	14.6	59.5	163.9	31.3	101.2	205.6
└→Union SPS	**100.9**	7.6	27.2	95.2	256.8	36.3	105.0	266.6	84.7	177.9	339.6
| └→Arena SPS	**75.9**	2.8	2.8	42.1	91.4	8.8	48.8	98.1	57.1	121.6	170.9
| └→Main Street SPS	**17.9**	0.7	0.7	10.4	27.4	0.8	10.6	27.5	1.1	10.9	27.8
└→Elm SPS	**298.0**	58.3	120.4	236.9	339.7	128.9	248.8	351.7	142.4	262.4	365.3
| └→City Hall SPS	**67.7**	18.0	19.6	38.7	111.1	23.5	42.7	115.1	24.4	43.6	115.9
| — └→Sugarloaf SPS	**37.0**	4.9	10.1	26.0	43.4	10.3	26.2	43.6	10.7	26.7	44.0
| └→Rosemount North SPS	**86.9**	9.9	14.3	65.9	130.0	14.0	69.3	133.3	27.0	82.2	146.2
| — — └→Rosemount South SPS	**19.2**	1.5	2.0	13.5	29.8	2.0	13.5	29.9	2.3	13.7	30.1

The following SPS have existing and future deficiencies under both design allowance PWWF and 5-year storm, requiring upgrades to support existing and future flows.

- Steele Street SPS

The following SPS have future deficiencies under design allowance PWWF and 5-year storm, potentially requiring upgrades to support future flows.

- Omer SPS
- Oxford SPS
- East Side SPS
- Union SPS

The following SPS have sufficient capacity to support 2051 flows using the design allowance PWWF, however, the projected 5-year storm PWWF exceeds the operational firm capacity as such potential system or facility upgrades may be required.

- Clarke Street SPS
- Main Street SPS
- Arena SPS
- Elm SPS
- City Hall SPS
- Sugarloaf SPS
- Rosemount North SPS
- Rosemount South SPS

The following SPS have existing and future deficiencies under the design allowance PWWF; however, the existing and projected 5-year storm PWWF is within the station’s capacity, as such, the stations capacity is sufficient to support future flows.

- Fretz SPS

The following stations have surplus capacity to support future flows.

- Industrial SPS
- Nickel SPS
- Fares SPS

J.3.3 Forcemain

Table 4.J.9 highlights the existing and projected forcemain performance. Velocities less than 0.6 m/s were flagged in yellow and velocities exceeding 2.5 m/s were flagged in red. Note, if a pumping deficit was identified in **Table 4.J.8**, then projected forcemain velocities were based on the higher of the station's ECA firm capacity or the governing peak wet weather flow scenario, otherwise if no pumping deficit was identified, the operational firm capacity was used for future capacity assessment.

Table 4.J.9 Forcemain Performance

Station Name	Forcemain Diameter (mm)	Operational Firm Capacity		2051		Post-2051	
		Pumped Flow (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)
└→Industrial SPS	**350**	67.0	0.7	67.0[1]	0.7	67.0[1]	0.7
└→Omer SPS	**311**	108.4	1.4	130.0[3]	1.7	177.3[3]	2.3
| └→Steele SPS	**200**	25.2	0.8	29.4[3]	0.9	63.7[3]	2.0
| └→Oxford SPS	**100**	6.4	0.8	7.5[3]	1.0	13.1[3]	1.7
└→East Side SPS	**500**	201.9	1.0	230.5[3]	1.2	317.1[3]	1.6
| └→Nickel SPS	**300**	93.8	1.3	93.8[1]	1.3	93.8[1]	1.3
| └→Fares SPS	**250**	60.7	1.2	60.7[1]	1.2	60.7[1]	1.2
| └→Fretz SPS	**300**	83.2	1.2	83.2[1]	1.2	83.2[1]	1.2
| └→Clarke Street SPS	**250**	62.3	1.3	62.3[1]	1.3	62.3[1]	1.3
└→Union SPS	**311**	100.9	1.3	105.0[3]	1.4	177.9[3]	2.3
| └→Arena SPS	**300**	75.9	1.1	75.9[1]	1.1	75.9[1]	1.1
| └→Main Street SPS	**150**	17.9	1.0	17.9[1]	1.0	17.9[1]	1.0
└→Elm SPS	**500**	298.0	1.5	298.0[1]	1.5	298.0[1]	1.5
| └→City Hall SPS	**250**	67.7	1.4	67.7[1]	1.4	67.7[1]	1.4
| └→Sugarloaf SPS	**200**	37.0	1.2	37.0[1]	1.2	37.0[1]	1.2
| └→Rosemount North SPS	**356**	86.9	0.9	86.9[1]	0.9	86.9[1]	0.9
| └→Rosemount South SPS	**150**	19.2	1.1	19.2[1]	1.1	19.2[1]	1.1

[1] Operational firm capacity

[2] ECA capacity

[3] Minimum of future design allowance PWWF or 5-year storm PWWF

There are no forcemains with low velocities in the current operating regime.

All forcemains have sufficient capacity to meet future flows.

J.3.4 Trunk Sewer

Figure 4.J.4 and **Figure 4.J.5** highlight the trunk performance in the existing and 2051 projected design allowance peak wet weather flow scenarios, respectively.

- The Seaway system has Region-owned trunk sewers in the Industrial SPS catchment which have capacity to support flows to 2051.
- Note that the Seway WWTP systems has several combined sewer overflows (CSO), that help regulate the hydraulic grade line (HGL) within the trunk system to reduce basement flooding risks.
- Local sewer deficiencies will be identified through the City's planned Pollution Prevention and Control Plan (PPCP) and addressed by the City.

J.3.5 Overflows

Under the design allowance peak flows no overflows are anticipated; however, many of the CSOs become active from 5-year storm peak wet weather flows; however, many of which become active from 5-year storm peak wet weather flows. The adverse risks of wet weather inflows are currently partially managed through CSOs; however, the Region and local area municipalities (LAM) are working together to reduce wet weather inflows to the system to reduce system overflows.

Detailed assessment of system CSO will be addressed jointly by the Region and LAM through future Pollution Prevention Control Plan Studies; which will outlines the proposed wet weather flow management approach to manage CSO volumes.

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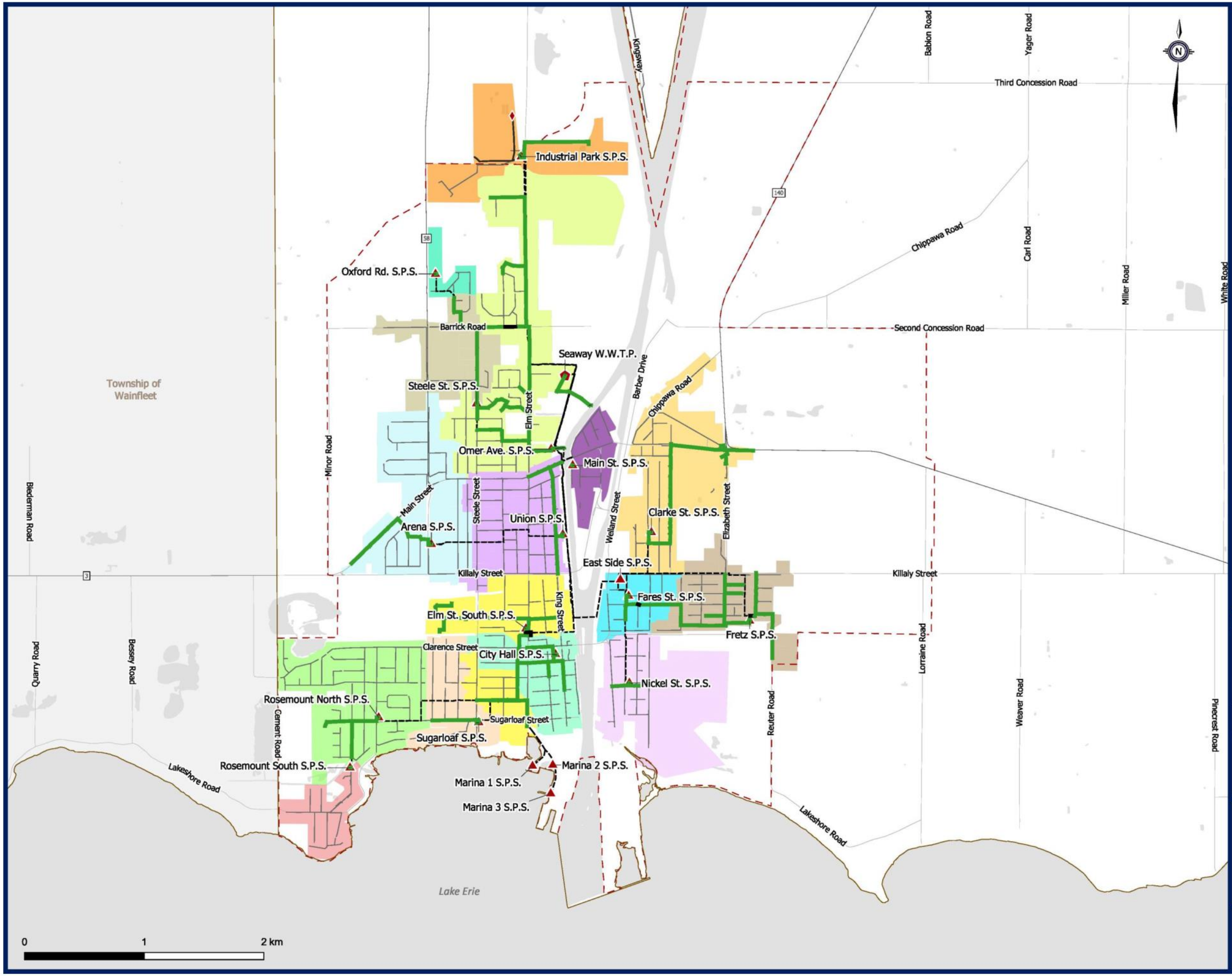

Existing Wastewater Infrastructure
- ● Combined Sewage Detention Facility
- ● Flow Diversion Facility
- ● Flume
- ♦ Leachate Pumping Station
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant

Wastewater Network

- - - Force Mains	— Local Sewers
━ Regional Mains	— Private Sewers

Wastewater Catchments

■ Arena	■ Nickel
■ City Hall	■ Omer
■ Clarke Street	■ Oxford Road
■ Eastside	■ Rosemount North
■ Elm	■ Rosemount South
■ Fretz	■ Steele
■ Industrial	■ Sugarloaf
■ Main Street	■ Union

Other Features
- ▭ Urban Area Boundary
- ▭ Municipal Boundary
- ■ Waterbodies

System Performance
- ━ Surplus Capacity
- ━ Surcharging Sewer
- ━ Surcharging Sewer with Basement Flooding Risk

Figure 4.J.4
Existing Design
Peak Wet Weather Flows
Seaway WWTP

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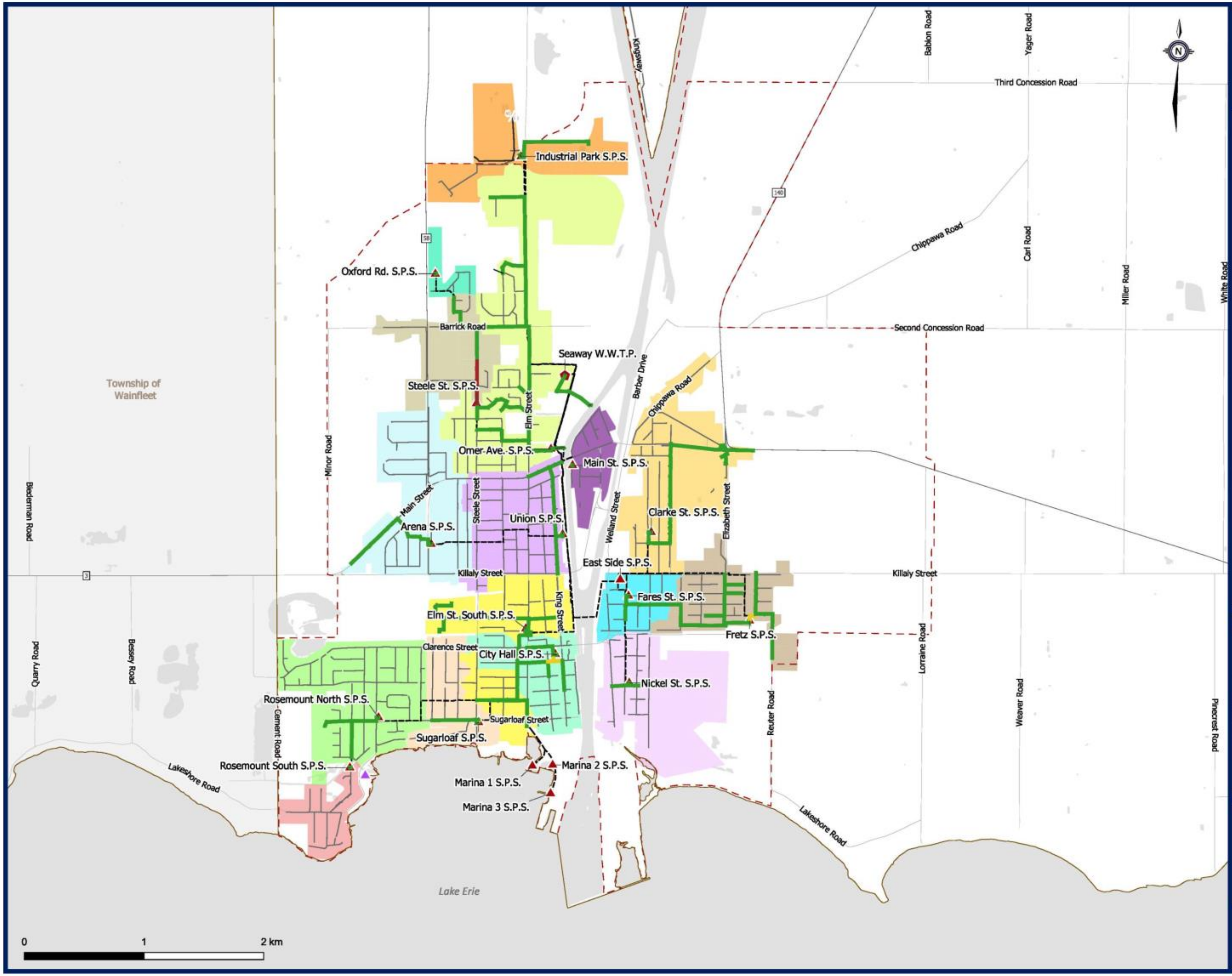

Figure 4.J.5

2051 Design

Peak Wet Weather Flows

Seaway WWTP

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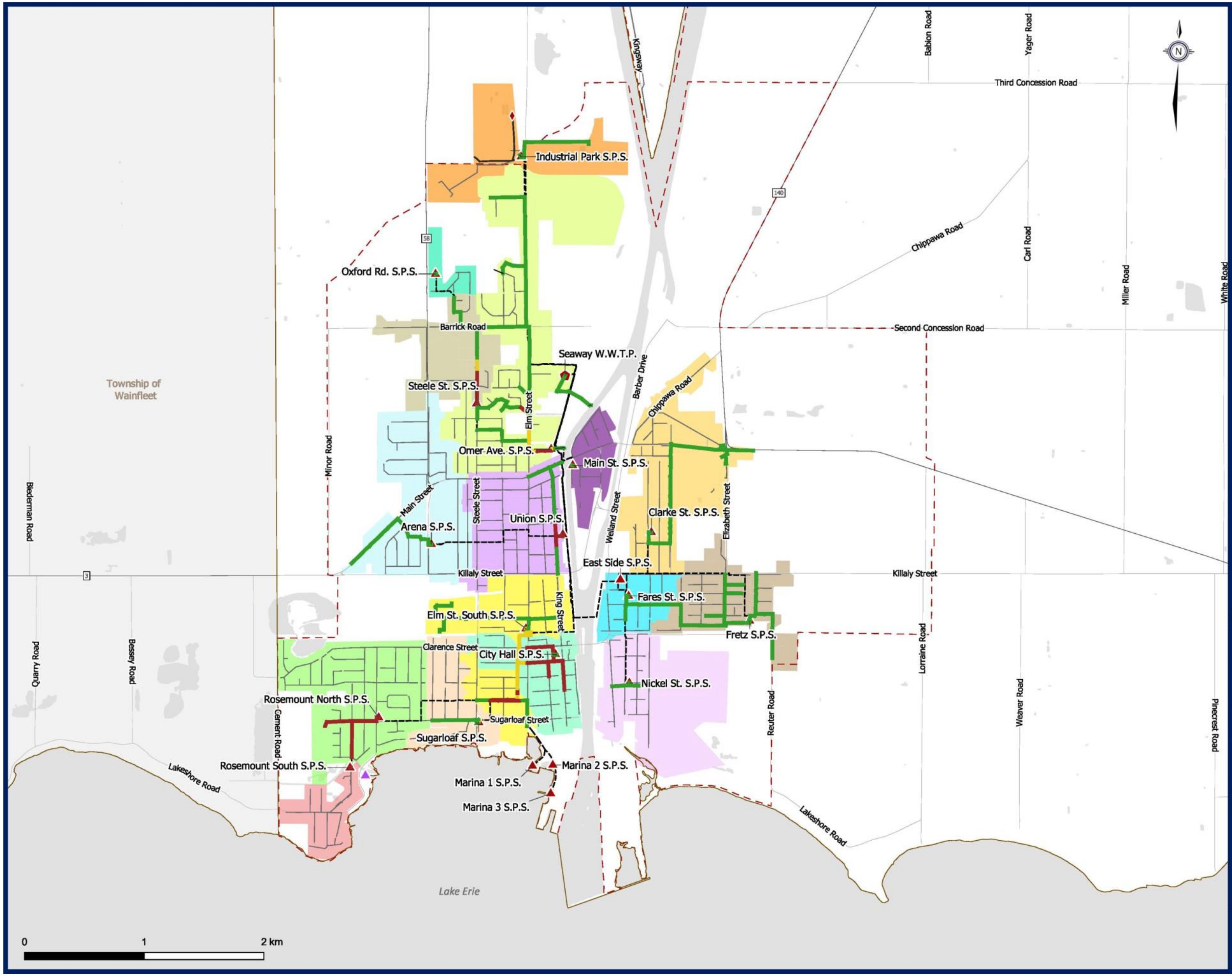

Figure 4.J.6

Existing 5-Year Storm Peak Wet Weather Flows

Seaway WWTP

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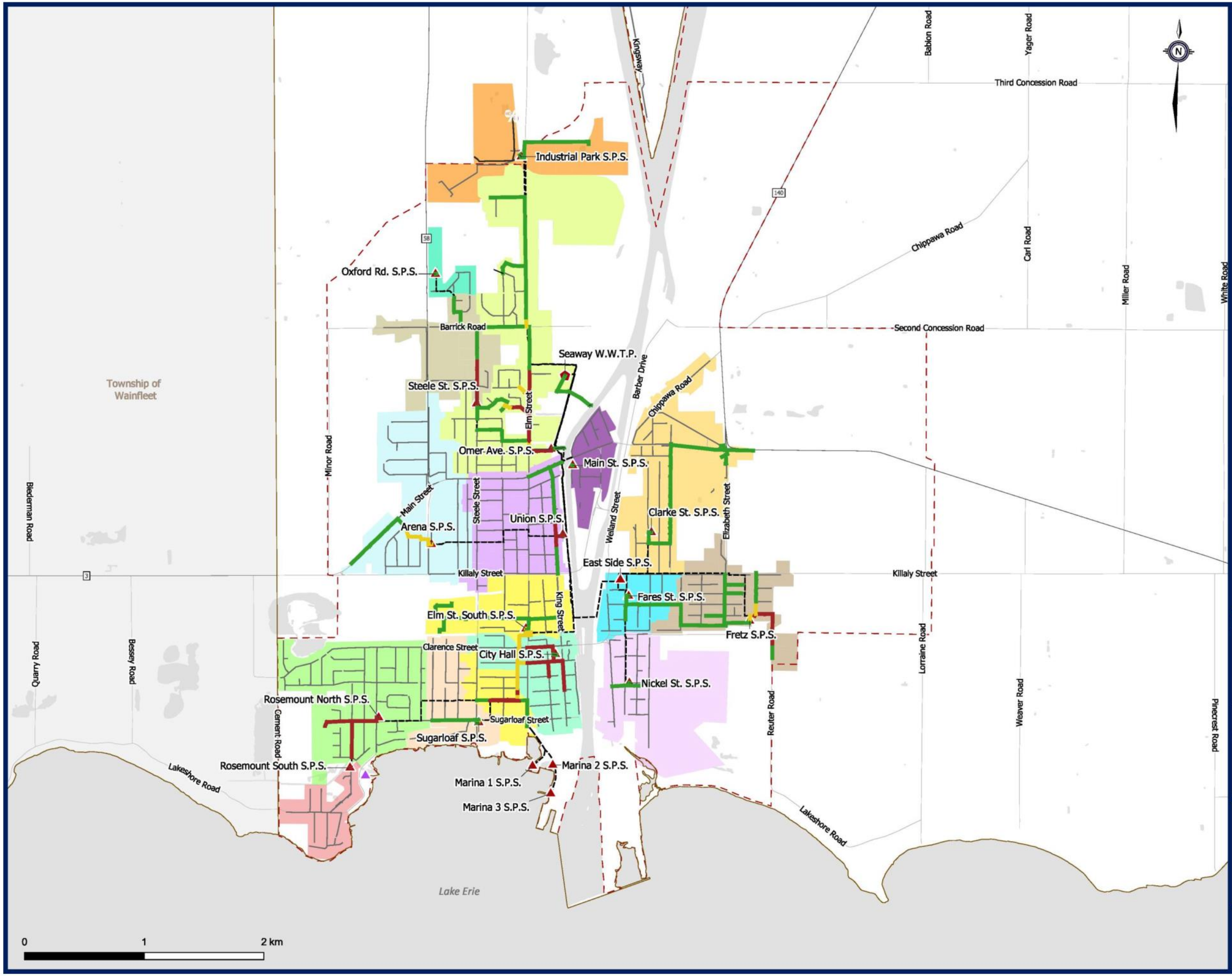

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Existing Wastewater Infrastructure

- ● Combined Sewage Detention Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Local)

Wastewater Network

- Force Mains
- Local Sewers
- Regional Mains
- Private Sewers

Wastewater Catchments

Arena	Nickel
City Hall	Omer
Clarke Street	Oxford Road
Eastside	Rosemount North
Elm	Rosemount South
Fretz	Steele
Industrial	Sugarloaf
Main Street	Union

Other Features

- Municipal Boundary
- Urban Area Boundaries
- Waterbodies

System Performance

- Surplus Capacity
- Surcharging Sewer
- Surcharging Sewer with Basement Flooding Risk

Figure 4.J.7

2051 5-year Storm Peak Wet Weather Flows

Seaway WWTP

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J.4 System Opportunities and Constraints

Figure 4.J.8 Highlights the existing opportunities and constraints.

J.4.1 Seaway WWTP

- The current rated average daily flow capacity of the plant is 19.6 MLD, with an existing flow of 11.8 MLD and a projected 2051 average daily flow of 13.4 MLD, which is below 80% of the wastewater treatment plant rated capacity. As such, the plant has surplus capacity and will not reach 80% capacity within the 2051-time horizon.
- The post-2051 flows are expected to exceed the 80% capacity, at which time a potential upgrade study may be triggered.

J.4.2 Port Colborne

- Several large residential and employment growth areas identified outside existing serviced area. It is anticipated that the local sewers and pump stations required to service the new greenfield areas are anticipated to be built by developers and have not been included in the capital program. Some areas have established studies which have identified servicing strategies such as the East Side Employment Lands.
- Existing and growth-related capacity deficits at Steele SPS
- Growth is expected to trigger a capacity deficit at
    - Omer SPS
    - Oxford SPS
    - Union SPS
- The planned East Side SPS forcemain replacement is anticipated to re-establish the East Side SPS ECA capacity addressing the identified capacity deficits.
- The existing Region-owned sewer network has capacity to support growth to 2051.
- Several areas of high wet weather flows and system overflows, which will need to be managed to allow for growth. The City has initiated a Pollution Prevention and Control Plan (PPCP) Study to improve system understanding including flow monitoring and a model update. The PPCP will further inform the City’s priorities for inflow and infiltration removal and other strategies to reduce overflows.

J.4.3 System Optimization Opportunities

- Significant opportunity to provide capacity for growth through implementation of wet weather flow management within the Seaway system.
- A larger number of in-series pumping stations generates cascading impacts.
- The existing system configuration and local geology provides limited opportunities to optimize the system including system diversions to reduce sewage pumping station upgrades and/or eliminate existing sewage pumping stations.

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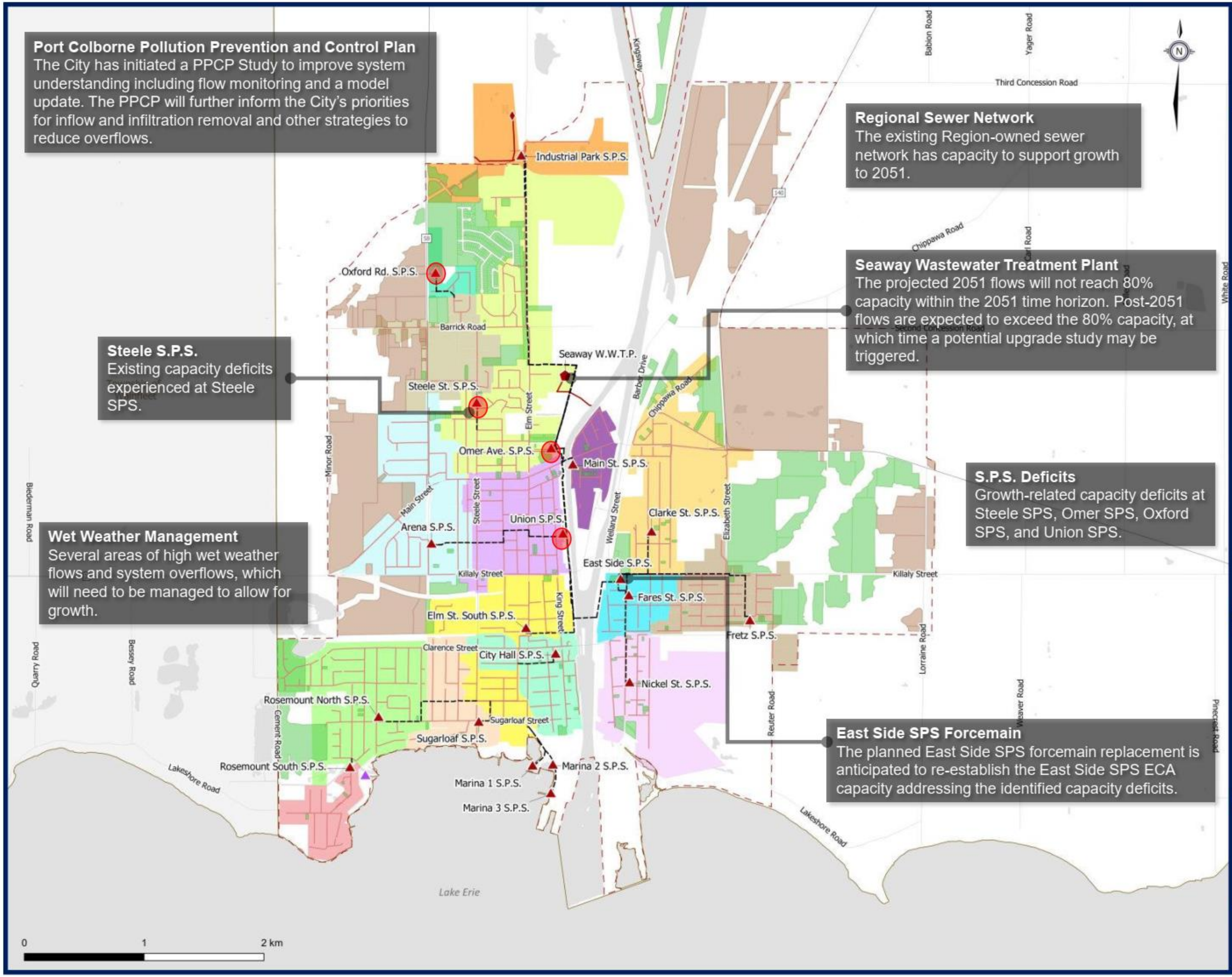
2021 Water and Wastewater Master Servicing Plan Update



Port Colborne Pollution Prevention and Control Plan
The City has initiated a PPCP Study to improve system understanding including flow monitoring and a model update. The PPCP will further inform the City's priorities for inflow and infiltration removal and other strategies to reduce overflows.

Regional Sewer Network
The existing Region-owned sewer network has capacity to support growth to 2051.

Seaway Wastewater Treatment Plant
The projected 2051 flows will not reach 80% capacity within the 2051 time horizon. Post-2051 flows are expected to exceed the 80% capacity, at which time a potential upgrade study may be triggered.

Steele S.P.S.
Existing capacity deficits experienced at Steele SPS.

S.P.S. Deficits
Growth-related capacity deficits at Steele SPS, Omer SPS, Oxford SPS, and Union SPS.

Wet Weather Management
Several areas of high wet weather flows and system overflows, which will need to be managed to allow for growth.

East Side SPS Forcemain
The planned East Side SPS forcemain replacement is anticipated to re-establish the East Side SPS ECA capacity addressing the identified capacity deficits.

Figure 4.J.8

Seaway WWTP

Opportunities and Constraints

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February 2023
6210126-WW-002

J.5 Assessment of Alternatives

Generally, the previously recommended strategies from the 2016 MSP program were carried forward which included upgrades at select stations, and wet weather management strategies in key areas.

While the strategies remained the same, the following details including alignment, sizing, or wet weather areas have been updated to reflect the latest system understanding and reflect updated criteria changed through this iteration of the 2021 MSPU.

- Providing capacity within Region-owned pumping stations and trunk sewers to convey peak wet weather flows up to the lesser of the 5-year design storm or extraneous flow design allowance criteria of 0.4 L/s/ha for existing areas and 0.286 L/s/ha for growth areas, needs to be verified based on the updated flow criteria and actual flows.
- Provide upstream flow management to address high peak flows in the system where peak wet weather flows exceed the extraneous flow design allowance criteria of 0.4 L/s/ha resulting in basement flooding and overflow risks. Upstream flow management can include but is not limited to these options, in the preferred order of implementation:
    - Inflow and infiltration reduction in public right of way
    - Inflow and infiltration reduction from private properties
    - Enhanced system storage
    - Peak flow control using system controls or engineered solutions
- As shown in **Section J.3.2** pump station capacity assessments were completed by reviewing the projected design allowance peak flows and 5-year storm flows against the operational firm capacity of each station.
    - Where the peak storm flows were less than design flows and the operational firm capacity of the station, the storm flows were used as actual flows, and therefore would not have triggered an upgrade.
    - Where the projected peak design allowance flows and 5-year storm flows exceeded the operational firm capacity of the station, a pump upgrade was recommended. Additional storage considerations and wet weather management were also considered.

To address existing and growth-related capacity needs, the following servicing concepts were evaluated:

- Do nothing
- Station capacity upgrade for pumping or storage
- Wet weather management
- Hybrid solution

J.6 Preferred Servicing Strategy

The following is a summary of the Seaway WWTP system as recommended through the 2016 Master Servicing Plan Update and carried forward through this update:

- The Seaway Wastewater Treatment Plant has sufficient capacity to support growth to year 2051. The post-2051 flows are expected to exceed the 80% capacity, at which time a potential upgrade study may be triggered.
- Upgrades to the Oxford SPS and Steele SPS were identified to support growth
- A key strategy for the Seaway system is to provide wet weather management across the system. This will require Regional solutions as well as local municipality solutions including improving the system understanding through flow monitoring data collection.
- Strategies that have changed since the 2016 MSP
  - The following SPS upgrades are no longer required:
    - Rosemount South SPS
  - Upgrades are needed at Union SPS and Omer SPS.

Figure 4.J.10 and **Figure 4.J.11** show the preferred servicing strategy, consisting of:

J.6.1 Treatment Plant Works

- No capacity upgrades are required.

The Region has several Region-wide programs focused on maintaining and enhancing the treatment capacity at the Region’s existing WWTP. The programs applicable to the PNOTL WWTP include:

- WWTP Process Upgrades (WW-TP-005) which funds projects to improve treatment processes to re-establish the ECA capacity at plants.

J.6.2 Pumping Stations

- Increase Oxford SPS capacity from 6 L/s to re-establish 8 L/s ECA capacity.
- Increase Steele SPS capacity from 25 L/s to re-establish 35 L/s ECA capacity.
- Increase Omer SPS capacity from 108 L/s to 131 L/s.
- Increase Union SPS capacity from 100.9 L/s to re-establish 126 L/s ECA capacity.
- Note the East Side SPS forcemain replacement (Sustainability project); is anticipated to re-establish the station’s ECA capacity; which is needed to support growth.

Further to the pump station upgrades, the Region-wide allowance to address odour control needs that are the result of growth-related system upgrades has been included.

- WWTP Process Upgrades (WW-TP-006) which funds in-system and plant upgrades to control odour.

J.6.3 Forcemains

- No forcemains require capacity upgrades.
- Note the East Side SPS forcemain replacement (Sustainability project); is anticipated to re-establish the station's ECA capacity; which is needed to support growth.

J.6.4 Decommissioning of Existing Facilities

- No decommissioning projects are recommended in the Seaway system.

J.6.5 Wet Weather Flow Management Program

A significant element of the Niagara Region wastewater servicing strategy is the wet weather management program. The program is intended to address existing capacity constraints, and to provide for growth-related capacity without expanding/upgrading existing trunk infrastructure, or by minimizing the required expansion/upgrades.

The wet weather management program currently identifies overall preliminary priority, staging of location and target amount of inflow and infiltration reduction across all systems. This program provides for a proactive and targeted approach to addressing wet weather impacts. These wet weather management programs will need to be a joint initiative between the Region and local municipalities.

For the Seaway system, the following priority areas are identified:

- Omer SPS
- Steele SPS
- Oxford SPS
- Clarke Street SPS
- Main Street SPS
- Arena SPS
- Elm SPS
- City Hall SPS
- Sugarloaf SPS
- Rosemount North SPS
- Rosemount South SPS

The City's planned PPCP will further identify catchments and strategies for inflow and infiltration reduction and other wet weather management solutions.

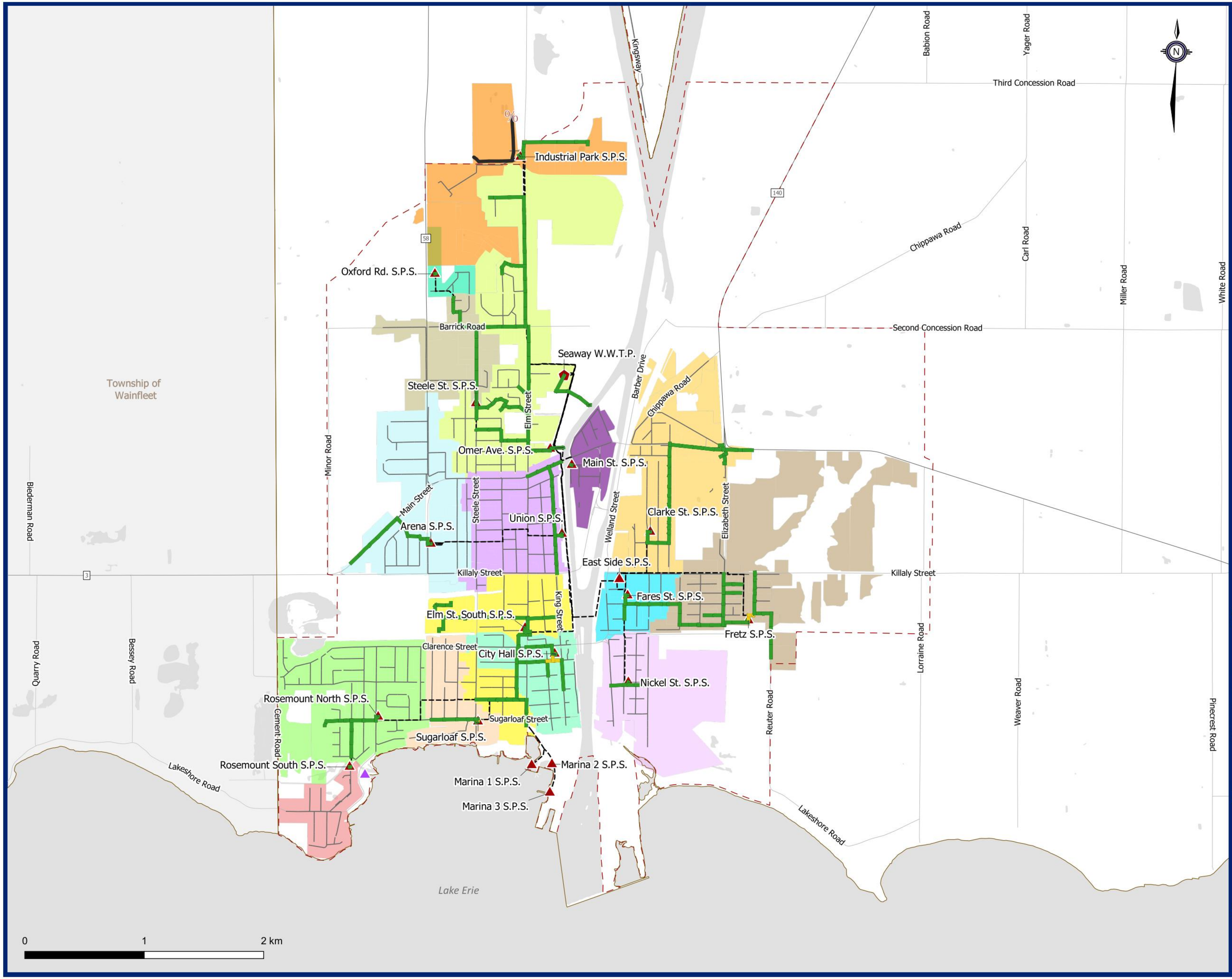
J.6.6 Additional Studies and Investigations

Flow Monitoring Program: Additional flow monitoring data collection will improve the confidence of the system performance results from the model. Best practices for improving understanding of wastewater systems include:

- Monitoring upstream from pump stations to capture peak wet weather flows
- Increasing the density of monitoring in catchments identified for wet weather flow management, where the flows from the 5-year design storm exceed the design flows.

J.6.7 Future System Performance

Figure 4.J.9 presents the future system performance, based on the preferred servicing strategy configuration and capacities; but excludes the potential benefits of the local wet weather flow management program.



Niagara Region

2021 Water and Wastewater
Master Servicing Plan Update

Existing Wastewater Infrastructure

- ● Combined Sewage Detention Facility
- % Leachate Pumping Station
- ● Odour Control Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Private)
- ▲ Sewage Pumping Station (Local)

Wastewater Network

- --- Force Mains
- —— Local Sewers
- ━━ Regional Mains
- —— Private Sewers

Wastewater Catchments

Arena	Nickel
City Hall	Omer
Clarke Street	Oxford Road
Eastside	Rosemount North
Elm	Rosemount South
Fretz	Steele
Industrial	Sugarloaf
Main Street	Union

Other Features

- Urban Area Boundaries
- Waterbodies
- Municipal Boundaries

System Performance

- 🟩 Surplus Capacity
- 🟨 Surcharging Sewer with Basement Flooding Risk
- 🟥 Surcharging Sewer

Figure 4.J.9

Future Capital Program Peak Wet Weather Flow

Seaway WWTP

BluePlan ENGINEERING

May, 2023
620126
Projection EPSG:26917

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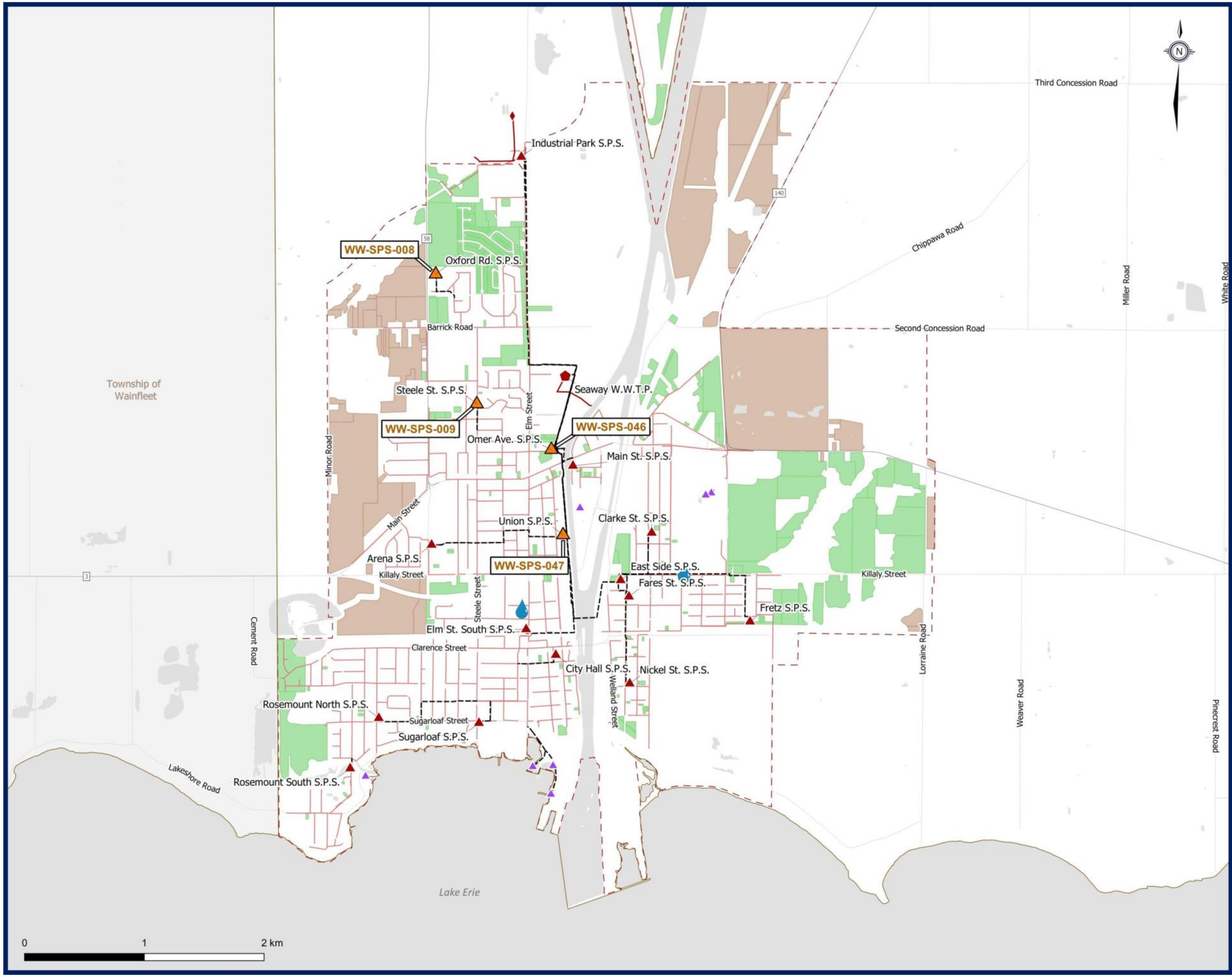
J.7 Capital Program

Figure 4.J.10 and **Figure 4.J.11** present the preferred servicing strategy map and schematic

Table 4.J.10 summarizes the recommended project costing timing and Class EA requirements. Individual detailed costing sheets are presented in **Section J.8.6.**



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2021 Water and Wastewater Master Servicing Plan Update

Capital Program

- ⬟ Treatment Plant
- △ Pumping Station
- 💧 Wet Weather Reduction (WW-II-017)
- ▪▪▪▪ Forcemains
- ━━ Sewers

Wastewater Facilities

- ⬟ Wastewater Treatment Plant
- ■ Biosolids Storage Facility
- ♦ Leachate Pumping Station
- ● Odour Control Facility

Wastewater Network

- ---- Force Mains
- ── Regional Mains
- ── Local Sewers
- ── Private Sewers

Pumping Stations

- ▲ Niagara Region
- ▲ Municipal
- ▲ Private

Other Features

- ⬚ Municipal Boundary
- ▬ Waterbodies
- ⬚ Urban Area Boundary

Development Locations

- ▬ Post-2051
- 🟩 Pre-2051

***Note that additional growth in existing built areas is anticipated**

***Project alignments are preliminary and will be refined through subsequent projects (EA and/or detailed design)**

Figure 4.J.10
Seaway WWTP System

Preferred Wastewater Servicing Strategy

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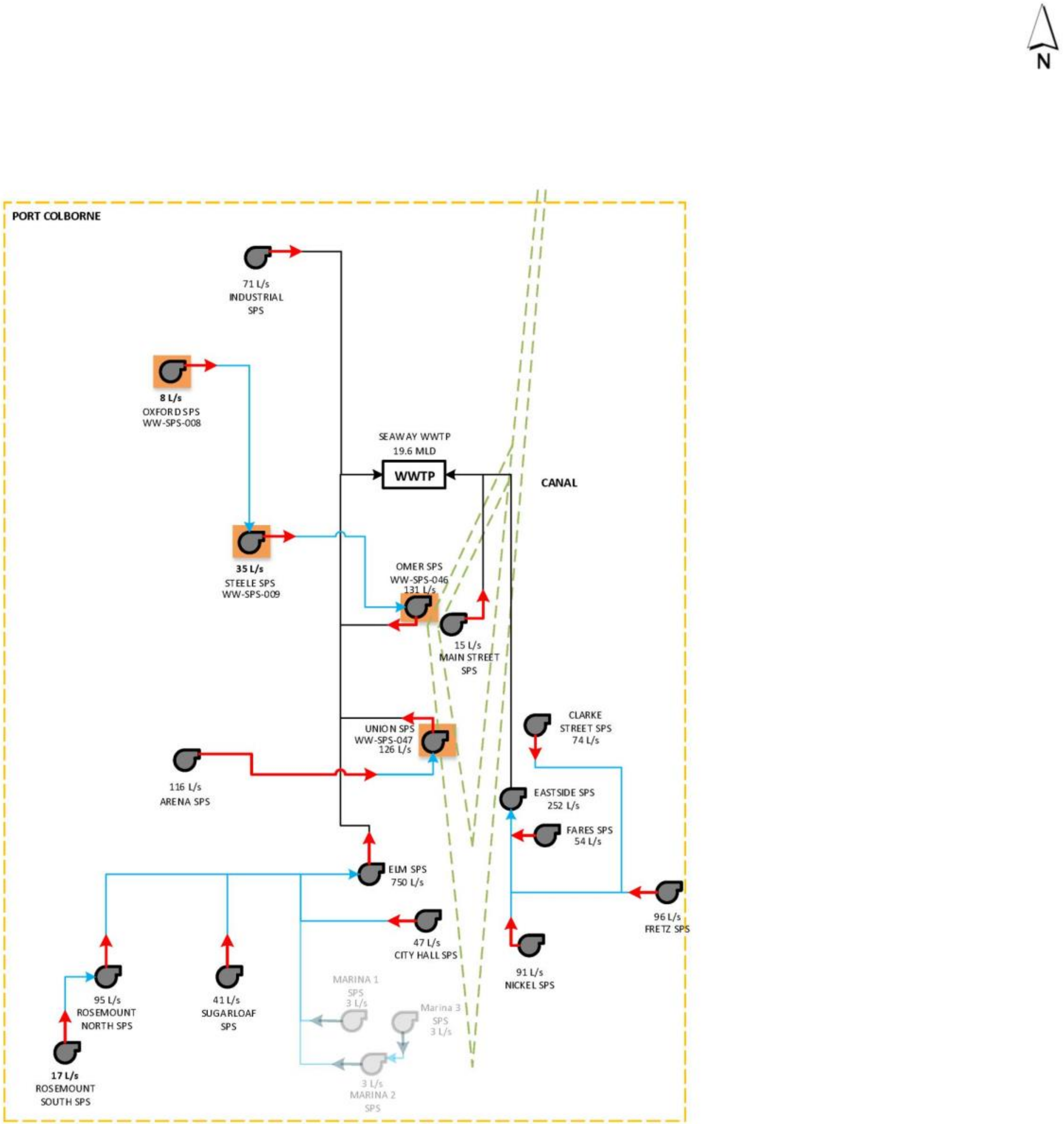
December 2022
620126-WW-006
WKID: 26917



Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

WWTP RATED CAPACITY	Wastewater Treatment Plant
FIRM CAPACITY	Sewage Pumping Station
→	Forcemain
→	Connection from SPS to SPS
→	Connection from SPS to WWTP
🟧	Facility Upgrade
🟩	New Facility
—	Upgrade Forcemain or Sewer
—	New Forcemain or Sewer
⊗	Decommission Project

Figure 4.J.11
Seaway WWTP

Future Wastewater Infrastructure Schematic

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December 2022
621016-W-000
WKID: 26917

Table 4.J.10 Summary of Seaway Wastewater Treatment Plant Capital Program

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost ($)
WW-SPS-008	Oxford SPS Pump Replacement	Increase station capacity from 6 L/s to re-establish 8L/s ECA capacity by replacing the existing two pumps.	8 L/s	2022-2026	Port Colborne	A+	Satisfied	Pumping	$1,213,000
WW-SPS-009	Steele SPS Relocation	Increase station capacity from 25 L/s to re-establish 35 L/s ECA capacity by replacing the station at a new location	35 L/s	2032-2036	Port Colborne	B	Separate EA Required	Pumping	$3,485,000
WW-SPS-046	Omer SPS Pump Replacement	Increase station capacity from 108 L/s to 131 L/s by replacing existing three pumps	131 L/s	2032-2036	Port Colborne	A+	Satisfied	Pumping	$3,621,000
WW-SPS-047	Union SPS Pump Replacement	Increase station capacity from 100.9 L/s to re-establish 126 L/s ECA capacity by replacing the existing three pumps. Use implementation plan prior to upgrade: Flow monitoring, validate wet weather flows, re-evaluate required upgrades	126 L/s	2027-2031	Port Colborne	A+	Satisfied	Pumping	$3,621,000
WW-II-017(1)	Region-Wide Wet weather Reduction	Wet weather reduction program in all systems to be executed from 2022-2051	N/A	Post-2051	Region-Wide		Dependent on outcome of wet weather flow study	Wet Weather Reduction	$225,000,000
WW-ST-001(1)	Region-Wide Flow Monitoring and Data Collection	Funding to support flow monitoring and data collection initiatives	N/A	2022-2051	Region-Wide			Wet Weather Reduction	$12,000,000
WW-TP-005(1)	Region-Wide WWTP Process Upgrades	Process upgrades to re-establish ECA capacity	N/A	2022-2051	Region-Wide			Treatment	$50,000,000
WW-TP-006(1)	Region-Wide WWTP Process Upgrades	Upgrades for odour control across the Region at forcemains, pump stations, and other locations.	N/A	2022-2051	Region-Wide			Treatment	$40,000,000
								Total	**$11,940,000**

(1) Project cost not included in subtotal as it is a Region-wide project

J.8 Project Implementation and Considerations

J.8.1 10-Year Program Sequencing

The recommended year in service for the capital projects is presented in **Section J.7**. Special project implementation and considerations for the preferred servicing strategy consist of:

- The timing for the upgrades of Oxford SPS and Union SPS have flexibility to start after results from the PPCP are available. A combination of improved system data and the implementation of an inflow and infiltration reduction program may extend the timelines required for upgrading these stations.

It is understood that the timing for the recommended projects may be subject to change due to a variety of external factors such as overall balancing of the Region's capital budget, changes to growth projections, and other unforeseen circumstances. As such, **Table 4.J.11** presents the preferred priority of the projects within the first 10-years of the capital program.

Table 4.J.11 Preferred Project Order

Master Plan ID	Name	2021 MSPU Year in Service	Order
WW-SPS-008	Oxford SPS Pump Replacement - Seaway	2022-2026	1
WW-SPS-047	Union SPS Pump Replacement - Seaway	2027-2031	2

J.8.2 EA Requirements and Studies

The following summarizes the status of EA requirements for recommended capital projects which will require Schedule B or C EAs.

- **EA has been satisfied through previous projects:**
    - None.
- **Currently ongoing separate EA studies:**
    - None
- **EA studies to be completed through separate studies:**
    - WW-SPS-009 (Steele SPS Relocation) Schedule B

J.8.3 Region-Wide Projects and Collaboration with Local Area Municipalities

Acknowledging that the overall wastewater systems are jointly owned and operated by the Region and LAM, the continued operation and expansion of the wastewater systems to support existing users and accommodate projected growth relies upon the cooperation of the upper and lower tier municipalities. Major updates and adjustments to planning projections should be continued to be communicated as this may affect project details such as trigger timelines and design capacities, which is discussed further in **Section J.8.5**.

One initiative that will be predominately driven by the LAMs is wet weather management. While wet weather management should be completed in all municipalities, this 2021 MSPU assumes that the catchments where the peak wet weather flows exceed the peak design flows and contribute to increased risk of basement flooding or overflows will put a specific focus on wet weather management. The Region is committed to continuing the joint CSO funding program through which LAMs can apply for funding support for inflow and infiltration reduction programs and projects such as those identified through the PPCP.

Additional flow monitoring and system data collection, in partnership with LAM, is needed to improve system understanding, support proposed wet weather flow reductions, and identify opportunities for system optimization and overflow removals.

J.8.4 Sustainability Projects

It is important to recognize that the 2021 MSPU servicing strategies identify new infrastructure to service the additional growth out to year 2051 but these strategies are built by extending infrastructure from the existing systems and leveraging the existing Region infrastructure in place. It is essential that the existing infrastructure is maintained in good condition and performance to support servicing growth.

The Region continually establishes and implements a sustainability program that addresses priority projects to ensure the existing infrastructure is in a state-of-good-repair and continues to perform and meet the intended level of services. Region-wide programs including but not limited to replacement programs for pipes and manholes, boilers, meters, generators, SCADA upgrades, sludge management programs, laboratory and sampling equipment upgrades, process electrical, process instrumentation. Pump station upgrades through the sustainability capital plan re-establish the SPS ECA capacity.

Independent of the 2021 MSPU, the Region has completed a sustainability program analysis to identify the projects on a yearly basis, with focus on a 10 year program, to address the sustainability needs. This Sustainability Capital Plan is first developed to demonstrate the total investment needs and may identify a level of investment and implementation exceeding Region resources. The next steps for the Sustainability Capital Plan will be the development of the Financial Plan for existing Water and Wastewater assets which is anticipated to be completed in 2024. It should be noted that the Sustainability Capital Plan represents investment required over and above the growth-related 2021 MSPU program.

Seaway system specific projects include:

- SPS Upgrades to
    - Arena SPS
    - City Hall SPS
    - Fares SPS
    - Nickel SPS s
    - Main Street SPS
    - Elm Street SPS
- Forcemain replacements
    - East Side SPS forcemain
    - Fretz SPS forcemain
    - Sugarloaf SPS forcemain
    - Clarke Street SPS forcemain
- Seaway WWTP Upgrades including ferric system, generator, biosolids and digestion processes, electrical, influent channel upgrade.

J.8.5 Project Implementation Flow Chart

The recommended design capacities within the growth capital program are based on the best available information at the time of analysis, including existing system flows, facility capacities, and projected growth. It is understood that this data is not static and often changes over the years between the regular updates of the Region’s Master Plan and between those updates. Design assumptions should be revisited before initiation of all projects to reconfirm the appropriate design capacities, along with identification of any associated or dependent projects which can be combined or staged to optimize implementation efficiency and cost, and/or system operation.

To support the Region's process in implementing all recommended 2021 MSPU capital projects, the following flow chart has been developed for the wastewater system. This flow chart document is intended to be a reference resource for the Region and should be treated as a guideline to support existing internal Region processes in project implementation.

The wastewater implementation flow chart is shown in **Figure 4.J.12.**

WASTEWATER PROJECT IMPLEMENTATION

The intent of this document is to support the Region in confirming the scope of work for wastewater infrastructure projects.

CONFIRM PROJECT SCOPE

To define Terms of Reference

☐ What triggered this project?
- Known development growth
- Forecasted growth
- Sustainability needs

☐ Are there related or dependent projects that should be identified for streamlining opportunities or for project phasing?
- Are there upstream projects with increasing capacity?
- Are there projects within the same alignment or project area that could be combined? (e.g., growth projects, SPS, forcemain, sewer, corridor planning, sustainability projects, water, stormwater, etc.)
- If there are related projects, could the project timing be adjusted to combine or stage projects more efficiently?

☐ What is the project EA Schedule and status?

☐ Are there historic or ongoing operational issues in the project area?
- Confirm with Regional and LAM operations and maintenance groups
- i.e. historic overflows, low flow/odour issues, clogging issues, work order history, etc.

☐ Are there any data gaps that should be incorporated into the Terms of Reference?
- Refer to the Required Data section below for details
- How much does the project timeline and budget need to change to allow for the data collection?

☐ Have the planning projections been updated to the best available information?
- Consultation with Region and LAM planning groups to confirm planning projection
- Are projected needs for the project in place? Is actual growth in line with projected growth?)

☐ Should the project be deferred until identified related works are completed?

REQUIRED DATA

To support terms of reference and detailed design

☐ Recently completed EA or servicing study
(for growth triggered projects)

☐ Historic flow records
- Within the last 3 years
- Ideally one full year of flow monitoring data that covers 80% of the total contributing area
- Can be included in project scope if feasible

☐ Existing pump, flow, and pressure data to identify/verify existing system issues

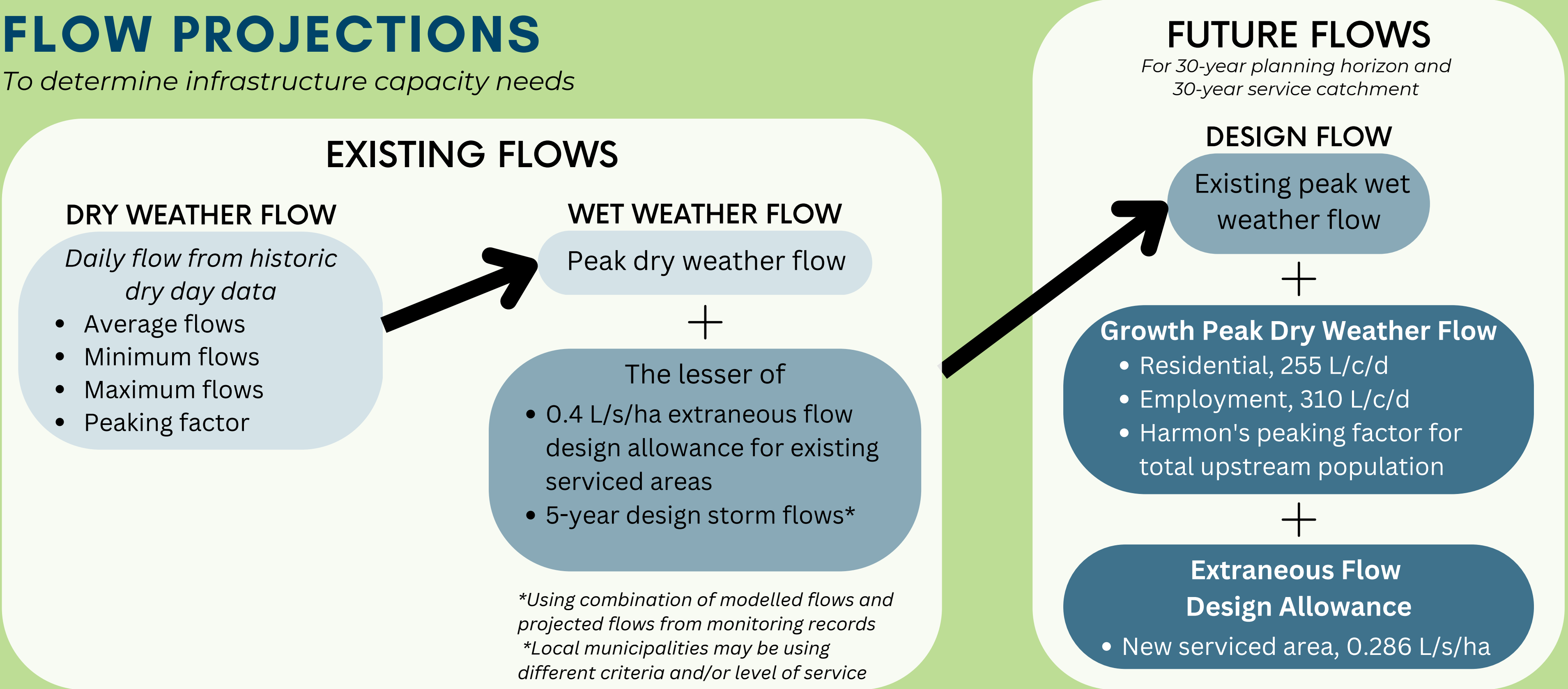
☐ Asset inventory and condition assessment
- All asset classes within the infrastructure type (sewer, forcemain, storage, pumping, or treatment facility)
- Within the last 5 years
- Can be part of project scope if the data is not available and would not significantly alter project scope - to assess need for related works (i.e. electrical, HVAC, structural upgrades at an SPS)

☐ Service area growth potential to confirm projected population and demands
- Consultation with Region and LAM planning groups within the past year
- Growth information for 30-year horizon and beyond (maximum service catchment)
    - Population, jobs, land use, area
    - Current inventory of development areas with associated development status

IF THE REQUIRED DATA IS NOT AVAILABLE AND IF IT HAS THE POTENTIAL TO SIGNIFICANTLY ALTER SCOPE OF THE DESIGN, IT IS STRONGLY RECOMMENDED THAT THE APPROPRIATE DATA COLLECTION AND FIELD INVESTIGATION BE COMPLETED PRIOR TO PROCEEDING WITH DESIGN. ALTERNATIVELY, WHERE FEASIBLE, DATA COLLECTION SHOULD BE INCLUDED IN THE PROJECT SCOPE AND INTEGRATED INTO THE DESIGN PROCESS.

FLOW PROJECTIONS

To determine infrastructure capacity needs



EXISTING FLOWS

DRY WEATHER FLOW

Daily flow from historic dry day data
- Average flows
- Minimum flows
- Maximum flows
- Peaking factor

WET WEATHER FLOW

Peak dry weather flow

+

The lesser of
- 0.4 L/s/ha extraneous flow design allowance for existing serviced areas
- 5-year design storm flows*

**Using combination of modelled flows and projected flows from monitoring records*
**Local municipalities may be using different criteria and/or level of service*

FUTURE FLOWS

For 30-year planning horizon and 30-year service catchment

DESIGN FLOW

Existing peak wet weather flow

+

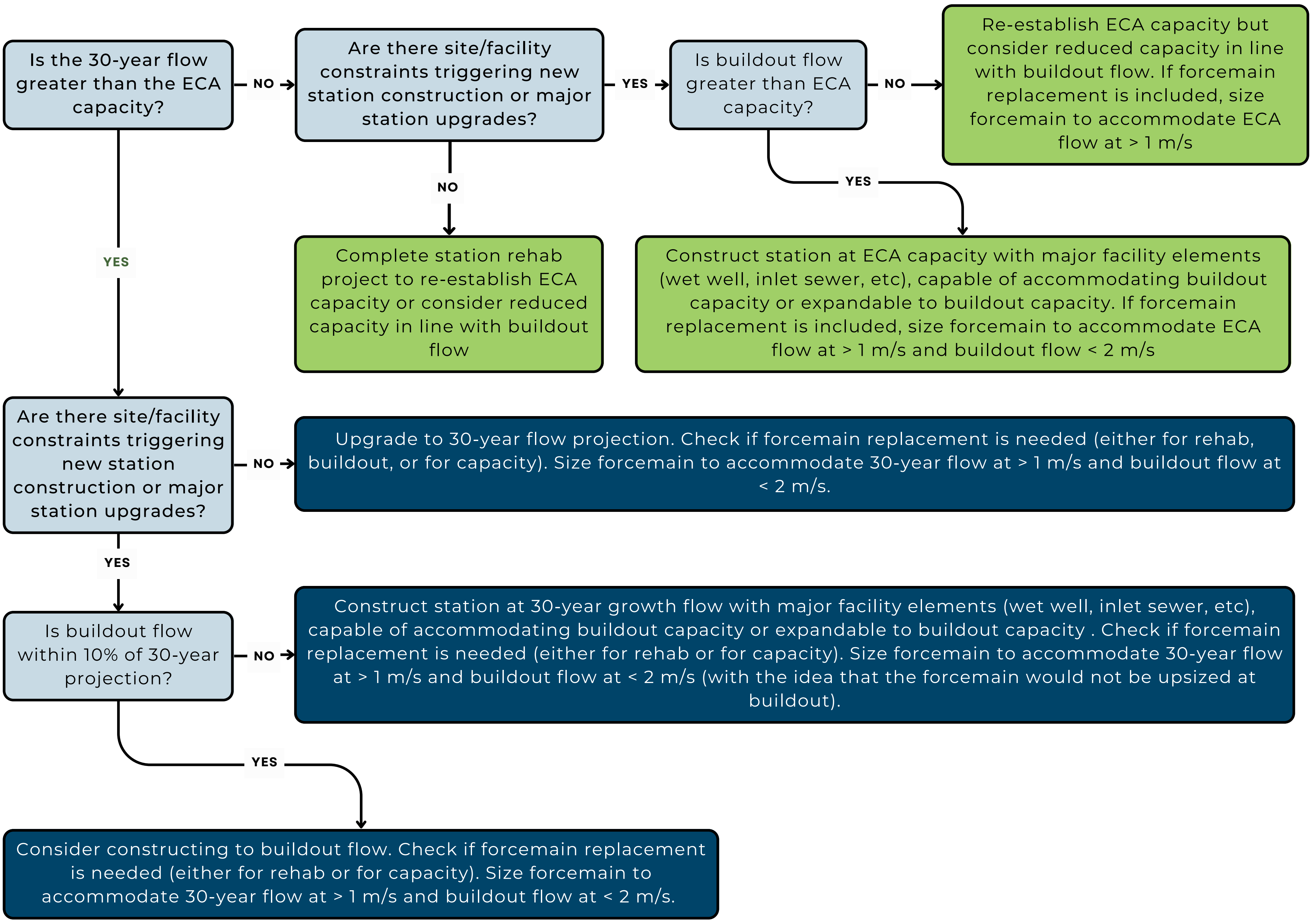
Growth Peak Dry Weather Flow
- Residential, 255 L/c/d
- Employment, 310 L/c/d
- Harmon's peaking factor for total upstream population

+

Extraneous Flow Design Allowance
- New serviced area, 0.286 L/s/ha

The design criteria presented in this document are based on the 2021 Master Servicing Plan Update Study

SEWAGE PUMPING STATIONS



Is the 30-year flow greater than the ECA capacity?

Are there site/facility constraints triggering new station construction or major station upgrades?

Is buildout flow greater than ECA capacity?

Re-establish ECA capacity but consider reduced capacity in line with buildout flow. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s

Complete station rehab project to re-establish ECA capacity or consider reduced capacity in line with buildout flow

Construct station at ECA capacity with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s and buildout flow < 2 m/s

Are there site/facility constraints triggering new station construction or major station upgrades?

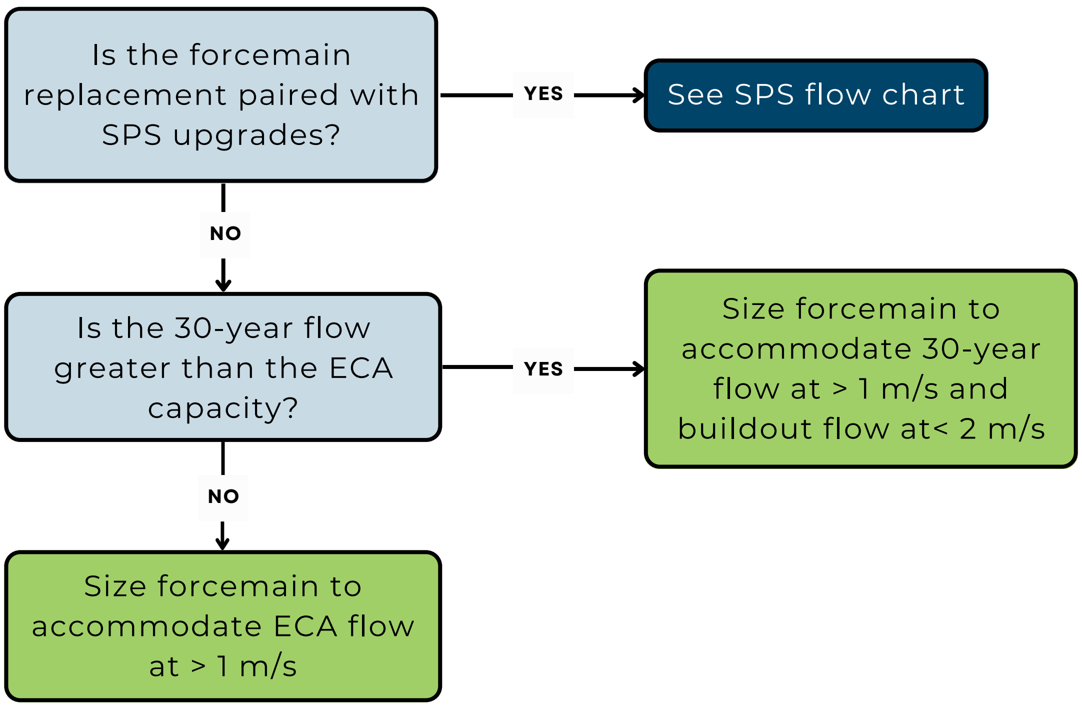
Upgrade to 30-year flow projection. Check if forcemain replacement is needed (either for rehab, buildout, or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

Is buildout flow within 10% of 30-year projection?

Construct station at 30-year growth flow with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity . Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s (with the idea that the forcemain would not be upsized at buildout).

Consider constructing to buildout flow. Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

FORCEMAINS



Is the forcemain replacement paired with SPS upgrades?

See SPS flow chart

Is the 30-year flow greater than the ECA capacity?

Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at< 2 m/s

Size forcemain to accommodate ECA flow at > 1 m/s

J.8.6 Detailed Project Costing Sheets

The detailed project costing sheets for the recommended 2021 MSPU capital projects within the Seaway WWTP system are presented below.

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SPS-008**
PROJECT NAME:	**Oxford SPS Pump Replacement**
PROJECT DESCRIPTION:	Increase station capacity from 6 L/s to re-establish 8L/s ECA capacity by replacing the existing two pumps.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-008**

	L/s
ECA	7.6
Operational	6.4

PROPOSED CAPACITY		8 L/s	Firm Capacity
Design PWWF	**Existing**	5 L/s	8 L/s
	2051	7 L/s	10 L/s
	Buildout	13 L/s	16 L/s
		RDII	**5Y Design**

capacity difference between 2051 and buildout, but small

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	7	8
2	7	8

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	8 L/s	$27,983	$500,000	$250k per pump, replace 2 existing pumps
Related Upgrades	30%					$150,000	
Bypass Pumping Allowance	6%					$35,750	
Additional Construction Costs	15%		ea.			$102,863	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$78,861	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$867,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 130,100	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$130,100**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	15%					$156,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$156,000**	
Non-Refundable HST	1.76%					$20,300	
Non-Refundable HST Sub-Total						**$20,300**	
Total (2022 Dollars)						**$1,213,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$1,213,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$24,260		
Design	Design fees, Town fees for design, contract admin	13%	$157,690		
Construction	Town fees, base costs and project contingency	85%	$1,031,050		
TOTAL			**$1,213,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-009**

PROJECT NAME: **Steele SPS Relocation**

PROJECT DESCRIPTION: Increase station capacity from 25 L/s to re-establish 35 L/s ECA capacity by replacing the station at a new location

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-009**

	L/s
ECA	35.0
Operational	25.2

PROPOSED CAPACITY	35 L/s	Firm Capacity
Design PWWF Existing	25 L/s	49 L/s
2051	29 L/s	53 L/s
Buildout	64 L/s	87 L/s
	RDII	**5Y Design**

CLASS EA REQUIREMENTS:	B
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)*
1	25	35
2	25	35

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	35 L/s	$27,983	$979,406	Full pump station replacement as per sustainability upgrades, based on unit cost.
Related Upgrades	30%						
Decommissioning of Existing Station				1	$350,000	$350,000	
Bypass Pumping Allowance	7%					$93,058	
Additional Construction Costs	20%		ea.			$284,493	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$170,696	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$1,878,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$37,560	
Geotechnical Sub-Total Cost						**$37,560**	
Property Requirements	5.0%					$ 250,000	Region Special Uplift
Property Requirements Sub-Total						**$250,000**	
Consultant Engineering/Design	15%					$ 500,000	includes planning, pre-design, detailed design, training, CA, commissioning. Region Special
Engineering/Design Sub-Total						**$500,000**	
In House Labour/Engineering/Wages/CA	4.0%					$ 75,120	
In-house Labour/Wages Sub-Total						**$75,120**	
Project Contingency	25%					$685,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$685,000**	
Non-Refundable HST	1.76%					$59,000	
Non-Refundable HST Sub-Total						**$59,000**	
Total (2022 Dollars)						**$3,485,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$3,485,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$69,700		
Design	Design fees, Town fees for design, contract admin	13%	$453,050		
Construction	Town fees, base costs and project contingency	85%	$2,962,250		
TOTAL			**$3,485,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-046**

PROJECT NAME: **Omer SPS Pump Replacement**

PROJECT DESCRIPTION: Increase station capacity from 108 L/s to 131 L/s by replacing existing three pumps

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-046**

	L/s
ECA	107.0
Operational	108.4

PROPOSED CAPACITY		131 L/s	Firm Capacity
Design PWWF	**Existing**	104 L/s	163 L/s
	2051	131 L/s	190 L/s
	Buildout	177 L/s	237 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	54	65
2	54	65
3	54	65

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	23 L/s	$27,983	$1,500,000	$500k per pump, replace existing three pumps
Related Upgrades	30%					$450,000	
Bypass Pumping Allowance	6%					$107,250	
Additional Construction Costs	15%		ea.			$308,588	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$236,584	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$2,602,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 390,300	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$390,300**	
In House Labour/Engineering/Wages/CA	4.0%					$ 104,080	
In-house Labour/Wages Sub-Total						**$104,080**	
Project Contingency	15%					$464,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$464,000**	
Non-Refundable HST	1.76%					$60,800	
Non-Refundable HST Sub-Total						**$60,800**	
Total (2022 Dollars)						**$3,621,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$3,621,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$72,420		
Design	Design fees, Town fees for design, contract admin	13%	$470,730		
Construction	Town fees, base costs and project contingency	85%	$3,077,850		
TOTAL			**$3,621,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-047**

PROJECT NAME: **Union SPS Pump Replacement**

PROJECT DESCRIPTION: Increase station capacity from 100.9 L/s to re-establish 126 L/s ECA capacity by replacing the existing three pumps.
Use implementation plan prior to upgrade: Flow monitoring, validate wet weather flows, re-evaluate required upgrades

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-047**

	L/s
ECA	126.2
Operational	100.9

PROPOSED CAPACITY		126 L/s	Firm capacity
Design PWWF	**Existing**	96 L/s	257 L/s
	2051	105 L/s	267 L/s
	Buildout	178 L/s	340 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	50.4	63.1
2	50.4	63.1
3	50.4	63.1

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	25 L/s	$27,983	$1,500,000	$500k per pump, replace existing 3 pumps
Related Upgrades	30%					$450,000	
Bypass Pumping Allowance	6%					$107,250	
Additional Construction Costs	15%		ea.			$308,588	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$236,584	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$2,602,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 390,300	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$390,300**	
In House Labour/Engineering/Wages/CA	4.0%					$ 104,080	
In-house Labour/Wages Sub-Total						**$104,080**	
Project Contingency	15%					$464,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$464,000**	
Non-Refundable HST	1.76%					$60,800	
Non-Refundable HST Sub-Total						**$60,800**	
Total (2022 Dollars)						**$3,621,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$3,621,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$72,420		
Design	Design fees, Town fees for design, contract admin	13%	$470,730		
Construction	Town fees, base costs and project contingency	85%	$3,077,850		
TOTAL			**$3,621,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-TP-005**
PROJECT NAME:	**Region-wide WWTP Process Upgrades**
PROJECT DESCRIPTION:	Process upgrades to re-establish ECA capacity

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$50,000,000**	Placeholder Costs
Chosen Estimate						**$50,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$1,000,000		
Design	Design fees, Town fees for design, contract admin	13%	$6,500,000		
Construction	Town fees, base costs and project contingency	85%	$42,500,000		
TOTAL			**$50,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: WW-TP-005

PROJECT NAME: Region-wide WWTP Process Upgrades

PROJECT DESCRIPTION: Upgrades for odour control across the Region at forcemains, pump stations, and other locations.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-TP-005

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$40,000,000**	Placeholder Costs
Chosen Estimate						**$40,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$800,000		
Design	Design fees, Town fees for design, contract admin	13%	$5,200,000		
Construction	Town fees, base costs and project contingency	85%	$34,000,000		
TOTAL			**$40,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-ST-001**
PROJECT NAME:	**Region Wide Flow Monitoring and Data Collection**
PROJECT DESCRIPTION:	Funding to support flow monitoring and data collection initiatives

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-ST-001**

PROPOSED CAPACITY	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction							
Additional Construction Costs	10%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ -	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$0**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	10%					$4,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$4,000**	
Non-Refundable HST	1.76%					$100	
Non-Refundable HST Sub-Total						**$100**	
Total (2022 Dollars)						**$44,000**	Rounded to nearest $1,000
Other Estimate						**$12,000,000**	Assumes 400k/year for 30 y
Chosen Estimate						**$12,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$240,000		
Design	Design fees, Town fees for design, contract admin	13%	$1,560,000		
Construction	Town fees, base costs and project contingency	85%	$10,200,000		
TOTAL			$12,000,000		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PL
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-II-017**

PROJECT NAME: **Region Wide Wet weather Reduction**

PROJECT DESCRIPTION: Wet weather reduction program in all systems to be executed from 2022-2051

Old ID		**Focus Areas**	Amount
_WW-II-001	Anger Ave WWTP	Lakeshore Road, Catharine Street, Dominion Road, Rose Avenue SPS, Anger Ave WWTP Catchments	
_WW-II-002	Crystal Beach WWTP	Nigh Road SPS and Crystal Beach WWTP Catchments	
_WW-II-003	Stevensville Douglastown	Stevensville, Douglastown catchments	
_WW-II-004	Welland WWTP	Feeder Road, Seaway Heights, Ontario Road SPS, Dain City, and Welland WWTP Catchments	
_WW-II-005	Baker - Grimsby	Woodsview, Biggar Lagoon, Old Orchard SPS Catchments	
_WW-II-006	Baker - Lincoln Beamsville	Ontario Street SPS Catchment	
_WW-II-007	Baker - Lincoln Vineland	Wet weather reduction in Jordan Valley***	
_WW-II-008	Port Dalhousie	Eastchester, Lakeside, Argyle, Renown SPS and Port Dalhousie WWTP Catchments	
_WW-II-009	Port Weller/Port Dalhousie	Wet weather reduction in North Thorold	
_WW-II-010	Port Weller	Haulage Road, Carlton Street SPS, and Port Weller WWTP Catchments	
_WW-II-011	Seaway WWTP	Union, Clarke Street, Arena, Elm Street, City Hall, Sugarloaf, Rosemount North and South SPS Catchments	
_WW-II-012	Niagara Falls WWTP	Central, Muddy Run, Seneca, Meadowvale, Drummond, Kalar Road SPS Catchments	
_WW-II-013	South Niagara Falls WWTP	South Side High Lift and South Side Low Lift SPS Catchments	
_WW-II-014	NOTL	Wet weather reduction in Northeast Niagara-on-the-Lake	
_WW-II-015	NOTL	Wet weather reduction in Virgil - NOTL	
_WW-II-016	Baker - West Lincoln	Wet weather reduction in West Lincoln - Baker	

K

Regional Municipality of Niagara

Part K

WELLAND WASTEWATER SYSTEM

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K. WELLAND WASTEWATER TREATMENT PLANT

K.1 Existing System Infrastructure

The Welland wastewater system services the City of Welland, Town of Pelham, and the Port Robinson area of City of Thorold. The system services an existing population of 74,085 residents and 21,484 employees. Note that this population and employment total is based on the Region's 2021 allocation of Traffic Area Zones planning data and has been processed through the allocation methodology presented in **Volume 2** to refine the data to include only serviced populations. As such, the population and employment total may not directly match the system totals using the Region's unprocessed planning data.

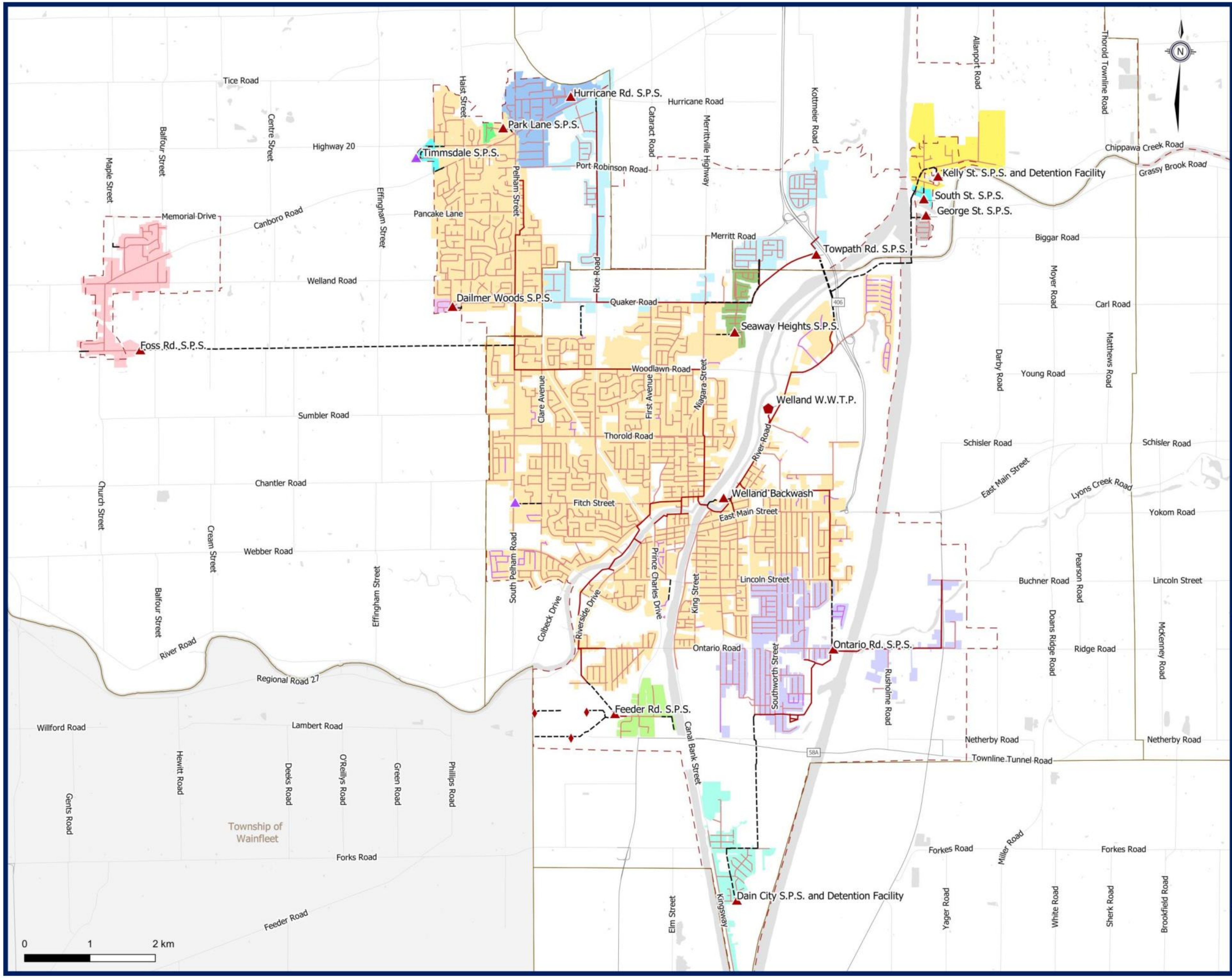
The system is serviced by the Welland Wastewater Treatment Plant, located on 505 River Road, R.R. #1, Welland City. The Welland Wastewater Treatment Plant has conventional activated sludge treatment, grit removal, effluent disinfection, and tertiary filtration. Welland Wastewater Treatment Plant has a current rated capacity of 54.6 MLD and a peak flow capacity of 118.0 MLD.

System flows are conveyed to the treatment plant via a network of local and Regionally owned sewer, and Regionally owned pump stations and forcemains.

Figure 4.K.1 presents an overview of the wastewater system, and Figure 4.K.2 shows a schematic of the wastewater system.

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



Existing Wastewater Infrastructure

⬟ Wastewater Treatment Plant (WWTP)	♦ Leachate Pumping Station
■ Biosolids Storage Facility	**Sanitary Pumping Stations (SPS)**
✳ Odour Control Facility	▲ Regional
	▲ Municipal
	▲ Private

Wastewater Network

Force Mains	Local Sewers
Regional Mains	Private Sewers

Wastewater Catchments

Daimler Woods	Park Lane
Dain City	Rice Road Flume
Feeder Road	Seaway Heights
Foss Road	South Street
George Street	Timmsdale
Hurricane Road	Towpath Road
Kelly Street	Welland WWTP
Ontario Road	

Other Features

Municipal Boundary	Waterbodies
Urban Area Boundary	

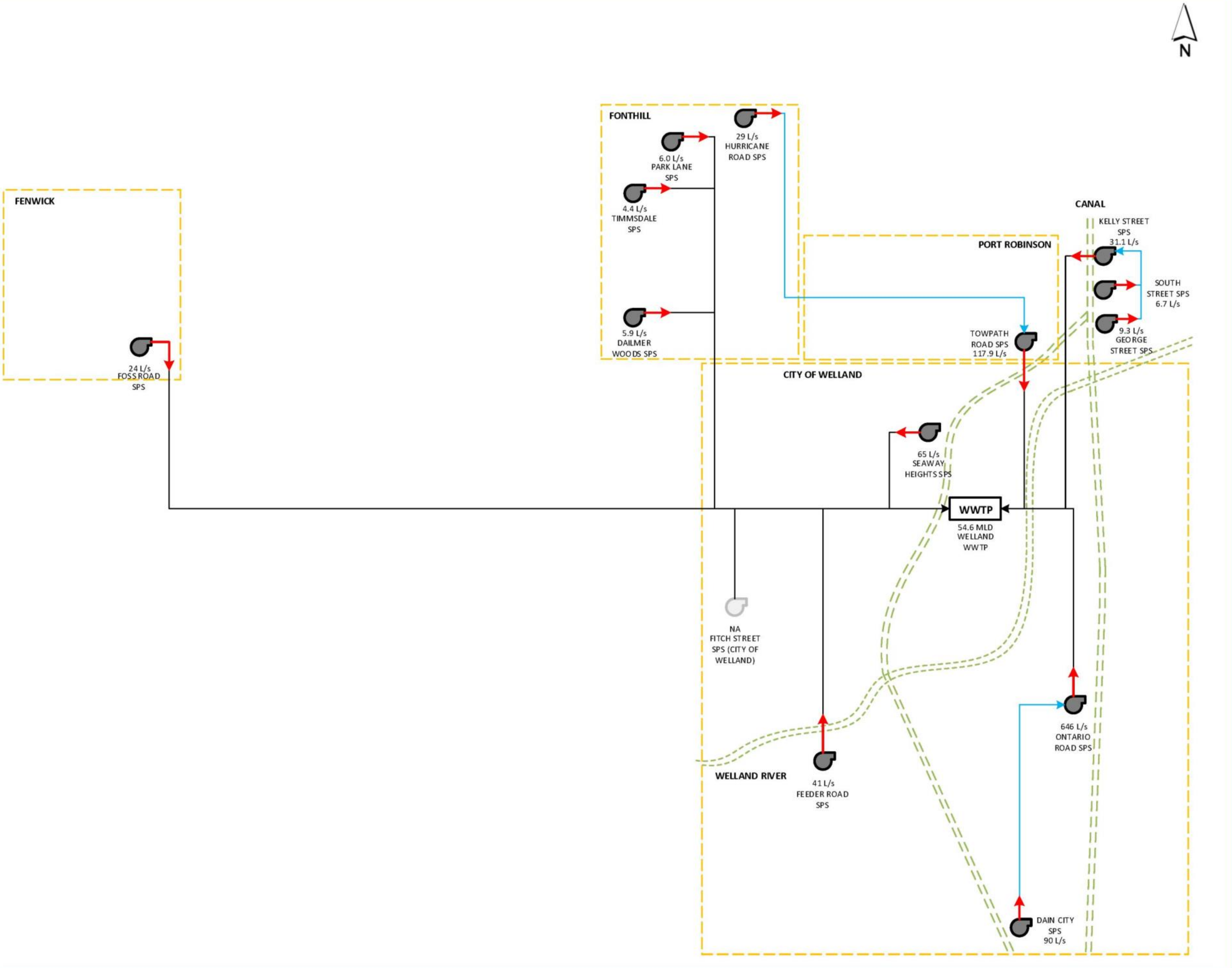
Figure 4.K.1
Welland WWTP System
Existing Wastewater Infrastructure

GM BluePlan ENGINEERING

March 2023
620126-WW-001
WKID: 26917

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



WWTP — Wastewater Treatment Plant
RATED CAPACITY

Sewage Pumping Station
FIRM CAPACITY

Forcemain

Connection from SPS to SPS

Connection from SPS to WWTP

Figure 4.K.2
Welland WWTP

Existing Wastewater Infrastructure Schematic

GM BluePlan ENGINEERING

December 2022
621016-W-000
WKID: 26917

K.1.1 Facility Overview

Table 4.K.1 to **Table 4.K.2** present a summary of the environmental compliance approval (ECA) for the Queenston wastewater treatment plant (WWTP) usage, operation, and effluent concentration objectives.

Table 4.K.1 Wastewater Treatment Plant Overview

Plant Name	Welland Wastewater Treatment Plant
ECA	5599-9VTGG2
Address	505 River Road, R.R. #1, Welland
Discharge Water	Welland River
Rated Capacity: Average Daily Flow	54.6 MLD
Rated Capacity: Peak Flow Rate (Dry Weather)	Not available
Rated Capacity: Peak Flow Rate (Wet Weather)	118.0 MLD
Key Processes	• Conventional activated sludge treatment with screening • Grit removal • Effluent disinfection • Tertiary filtration

Table 4.K.2 Wastewater Treatment Plant Effluent Objectives

Effluent Parameter	Objective Concentration
CBOD5	15.0 mg/L
TSS	15.0 mg/L
Total Phosphorus	0.4 mg/L
Total Ammonia Nitrogen	
November – April	*10 mg/L*
May – December	*5 mg/L*
E. Coli	100 organisms/100 mL
Total Chlorine Residual	Non-detect

Table 4.K.3 lists each sewage pumping station's (SPS) ECA firm capacity as well as the station's existing operational firm capacity (the current operating capacity of the pumps station based on performance testing and/or supervisory control and data acquisition (SCADA) trending). As identified in Volume 4, the operational firm capacity was used as the basis of assessment for the 2021 MSPU. In some cases where the operational firm capacity was larger than the ECA firm capacity; the registered ECA capacity was used.

Table 4.K.3 Pumping Station and Forcemain Overview

Station Name	Location	Catchment Details		Pump Station Details			Forcemain Details		
		Area Exclusive of Upstream Catchments (ha)	Area Inclusive of Upstream Catchments (ha)	Number of Pumps	ECA Firm Capacity (L/s)	Operational Firm Capacity (L/s)	Single or Twinned Forcemain	Forcemain Diameter (mm)	Length (m)
└→**Timmsdale SPS**	Timmsdale Estates, Pelham	10.0	10.0	2	4.4	4.4	Single	100	573
└→**Towpath Road SPS**	Towpath Road, Thorold	227.5	329.6	2	150.0	117.9	Single	400	647
| └→**Hurricane Road SPS**	92 Hurricane Road, Pelham	102.1	102.1	2	39.4	29.0	Single	250	670
└→**Foss Road SPS**	736 Foss Road, Pelham	128.7	128.7	2	27.0	24.0	Single	192	5,718
└→**Feeder Road SPS**	Feeder Road, Welland	41.5	41.5	2	44.0	41.0	Single	250	677
└→**Seaway Heights SPS**	Lancaster Drive, Welland	30.8	30.8	2	60.0	65.0	Single	300	291
└→**Ontario Road SPS**	1200 Ontario Road, Welland	268.4	351.8	3	600.0	646.0	Single	600	1,122
| └→**Dain City SPS**	144 Logan Avenue, Welland	83.5	83.5	3	115.0	90.0	Single	300	3,030
└→**Kelly Street SPS**	51 Kelly Street, Thorold	117.2	131.0	2	24.6	31.1	Single	200	3,813
| └→**South Street SPS**	George Street, Thorold	5.1	5.1	2	8.2	6.7	Single	100	643
| └→**George Street SPS**	South Street, Thorold	8.6	8.6	2	8.2	9.3	Single	100	180
└→**Park Lane SPS**	Park Lane, Pelham	4.7	4.7	2	6.0	6.0	Single	100	165
└→**Daimler Woods SPS**	Haist Street, Pelham	6.1	6.1	2	9.2	5.9	Single	100	176

[1] Towpath SPS forcemain has a constructed 600 mm forcemain which has not yet been commissioned

K.2 Basis for Analysis

K.2.1 Flow Criteria, System Performance, and Sizing Methodology

The Niagara Region Traffic Area Zone planning data was used to estimate growth related flow generation within the wastewater system and to spatially allocate growth flows within each individual system. **Table 4.K.4** presents a summary of the flow criteria, performance, and sizing methodology that was utilized. Refer to **Volume 4 - Introduction** for additional information.

The Region's per capita wastewater flows criteria were updated based on a historic review of the previous 3-year period for local billing meter and flow monitoring records. Given that more granular data was available to complete this analysis compared to previous master plan updates, the population and employment per capita rates were differentiated. The data showed a slight reduction in the population criteria and slight increase in the employment criteria, which more closely reflect existing flow generation trends compared to the Region's previous per capita rate. Further detail regarding the per capita flow generation is presented in **Volume 4 – Introduction.**

The Region's extraneous flow allowance criteria was also reviewed against historic flow monitoring and pump station performance records where available. The review of historic wet weather flows found that typically 2-year design storm peak flows within existing built systems exceeded the Region's existing extraneous flow design allowance of 0.286 L/s/ha; however, that a 2-year design storm peak flow below 0.286 L/s/ha was achievable as demonstrated in multiple catchment areas. Based on the analysis and an industry review, for the purpose of future planning, the extraneous flow design allowance for existing areas was increased to 0.4 L/s/ha but was maintained at 0.286 L/s/ha for new greenfield development areas to better reflect the existing high wet weather flows, while minimizing the magnitude of system upgrades with wet weather flow management as a critical priority. In areas where available historic flow monitoring and modelling results identify existing peak 5 year design flows below the 0.4 L/s/ha criteria, the lower 5 year design flows should be utilized. Further details regarding the extraneous flow design allowance are presented in **Volume 4 – Introduction**

Table 4.K.4 Flow Criteria, Scenarios, System Performance, and Sizing Methodology

	Component	Criteria	
Flow Criteria	Existing System Flows	Starting Point Methodology • Based on local billing meter records and flow monitoring data to establish existing dry and wet weather flows • Growth flows are added to the existing system baseline using design criteria	
	Flow Generation	Residential	255 L/c/d
		Employment	310 L/e/d

	Component	Criteria	
	Peaking Factor	Peak Dry Weather Flow	Harmon’s Peaking Factor
	Extraneous Flow Design Allowance	• 0.4 L/s/ha for existing areas • 0.286 L/s/ha for new developments	
WWTP	System Performance and Triggers	• MECP Procedure F-5-1 • Trigger upgrade study at 80% capacity • Trigger upgrade construction at 90% capacity	
	Upgrade Sizing	• Average daily flow plus growth based on population design flows	

Pump Station	System Performance and Triggers Sizing	• Refer to **Section K.2.1.1**
		• Two flow scenarios considered
		  • **Design Allowance**: Peak wet weather flow using the peaked dry weather flow plus the extraneous flow design allowance
		  • **5-Year Storm**: Modelled peak wet weather flow using the 5-year design storm
		• Peak flow capacity to meet design peak wet weather flow using the extraneous flow design allowance
		• Wet well and system storage considerations under 5-year storm to minimize basement flooding and overflow risks	

Forcemain	System Performance and Triggers	• Flag velocities less than 0.6 m/s • Flag velocities greater than 2 m/s • Upgrade when velocities exceed 2.5 m/s and considering condition and age	
	Upgrade Sizing	• Design velocity target between 1 m/s and 2 m/s • Forcemain twinning to increase capacity where feasible	
Trunk	System Performance and Triggers	• Design allowance peak wet weather flows, using the extraneous flow design allowance, to be managed within pipe • Freeboard (depth between hydraulic grade line and surface) greater than 1.8 m below surface in 5-year design storm • Flag pipes velocities less than 0.6 m/s • Flag pipes velocities greater than 3.0 m/s	
	Upgrade Sizing	• Sized for full flow under post-2051 design peak wet weather flow • Assess 5-year design storm performance to minimize basement flooding risks and overflows	

K.2.1.1 SPS Performance Evaluation and Upgrade Framework

Although it is the Region's design philosophy to size SPS inline with the Region's extraneous flow design allowance, the 2021 MSPU undertook a hybrid evaluation approach to acknowledge that SPS are a major contributor to local wastewater system performance and that many legacy system's exiting wet weather flows exceed the extraneous flow design allowance. The SPS hybrid performance evaluation and upgrade framework are summarized in **Table 4.K.5** and strives to balance the magnitude of capacity upgrades, potential cascading downstream upgrades, and managing the potential risk of local sewer surcharging and system overflows.

Under the hybrid performance evaluation and upgrade framework, the SPS capacity was sized to meet the lesser of peak wet weather flow (PWWF) using the extraneous flow design allowance, referred to as "Design Allowance PWWF" or the estimated 5-year storm PWWF. Further, consideration for the SPS actual performance under the estimated 5-year design storm peak wet weather flow was evaluated to determine if the available system storage including the wet well, storage tanks, and in system capacity was sufficient to manage excess flows while maintaining the system hydraulic grade line (HGL) below the basement flooding level of 1.8 m below grade and/or below the local overflow level.

In instances where the 5-year storm PWWF flow exceeded the available system storage, additional system solutions such as wet weather management, system storage, and/or additional SPS capacity upgrades were incorporated into the servicing solution. The most efficient solution to manage capacity and flow reduction was determined through the assessment of calculated flows from the 2051 design allowance PWWF and modelled 5-year storm PWWF against the operational firm capacity of the station and system storage.

Each SPS with a preferred solution of a capacity upgrade was individually reviewed in detail to determine how capacity upgrades should best be achieved:

- Pump replacement
- Pump upgrades
- Pump additions
- Station replacement
- Existing wet well sizing changes
- FM sizing and capacity

Due to data quality and availability, a prioritization of upgrade needs, and flow monitoring (data collection) was assigned to each case for the Region implementation plan, discussed later in **Section K.8**.

Table 4.K.5 SPS Assessment Framework

Case	2051 Design PWWF	2051 5 Year Storm PWWF	2051 5-Year Storm Storage Need	Preferred Solution	Upgrade Priority	Flow Monitoring Priority
Case 1	> Firm Capacity	> Firm Capacity	> Available Storage	Upgrade pumps to future design allowance flow with potential storage upgrades or wet weather management	High	Medium
Case 2	< Firm Capacity	> Firm Capacity	> Available Storage	Upgrade storage and/or wet weather management	High	High
Case 3	> Firm Capacity	> Firm Capacity	< Available Storage	Potential upgrade to design allowance flow and/or wet weather management	Medium	High
Case 4	< Firm Capacity	> Firm Capacity	< Available Storage	Potential wet weather management	Low	Medium
Case 5	> Firm Capacity	< Firm Capacity	< Available Storage	No upgrade, use actual peak flows	N/A	Low
Case 6	< Firm Capacity	< Firm Capacity	< Available Storage	No upgrade	N/A	Low

K.2.2 Growth Population Projections and Allocations

Table 4.K.6 outlines the existing and projected serviced population and employment by catchment.

Table 4.K.6 Welland Wastewater Treatment Plant Existing and Projected Serviced Population by Catchment

Sewage Pumping Station (SPS)	Existing Population & Employment			2051 Population & Employment			Post 2051 Population & Employment			2021-2051 Growth		
	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population	Employment	Population & Employment	Population Growth	Employment Growth	Total Growth
WWTP												
└→**Timmsdale SPS**	144	36	180	176	42	218	183	43	227	32	6	38
└→**Towpath Road SPS**	4,241	1,081	5,322	22,453	1,865	24,318	28,370	3,322	31,692	18,211	784	18,996
└→**Hurricane Road SPS**	1,552	626	2,177	1,854	1,442	3,296	1,961	1,491	3,451	303	816	1,119
└→**Foss Road SPS**	2,974	821	3,795	4,795	1,113	5,909	5,491	1,158	6,649	1,821	292	2,113
└→**Feeder Road SPS**	3	981	984	-10	1,227	1,217	3	1,280	1,283	-13	246	233
└→**Seaway Heights SPS**	1,326	1,155	2,482	3,056	1,776	4,832	8,725	2,870	11,595	1,730	620	2,351
└→**Ontario Road SPS**	7,103	1,154	8,257	9,614	4,775	14,389	13,342	5,538	18,880	2,511	3,621	6,132
└→**Dain City SPS**	1,230	68	1,298	6,842	1,051	7,893	8,246	1,316	9,562	5,612	983	6,595
└→**Kelly Street SPS**	511	292	803	512	407	919	605	407	1,012	1	116	116
└→**South Street SPS**	58	33	92	58	47	105	69	47	116	0	13	13
└→**George Street SPS**	146	83	229	146	117	262	172	117	289	0	33	33
└→**Park Lane SPS**	49	10	59	53	19	71	55	20	74	3	9	12
└→**Daimler Woods SPS**	285	17	302	285	22	307	293	23	315	0	5	5
Total	**74,085**	**21,484**	**95,569**	**115,719**	**34,554**	**150,273**	**145,874**	**42,810**	**188,683**	**41,634**	**13,070**	**54,704**

Note: Population numbers may not sum due to rounding.

K.3 System Performance

K.3.1 Wastewater Treatment Plant

The starting point flow for the Welland WWTP was calculated using historic SCADA flow data. Ten years of data (2011 to 2020) was reviewed to provide historical context and assess overall long-term trends; however, the most recent five years of data was used to determine the average daily flow. **Table 4.K.7** shows the historical system flows obtained from wastewater treatment plant production data.

Table 4.K.7 Historic Welland Wastewater Treatment Plant Flows

Year	Average Daily Flow		Peak Daily Flow	
	(MLD)	(L/s)	(MLD)	(L/s)
2011	41.7	482.7	111.7	1292.7
2012	35.5	411.0	111.2	1286.7
2013	40.6	469.9	144.6	1674.0
2014	35.0	405.6	105.7	1223.4
2015	24.9	288.6	0.0	0.0
5 Year Average	35.6	411.6	94.6	1095.4
5 Year Peak	41.7	482.7	144.6	1674.0
2016	29.9	346.2	92.1	1066.4
2017	35.4	409.8	104.2	1205.8
2018	34.6	401.0	97.7	1131.1
2019	37.1	429.8	98.6	1140.9
2020	33.6	389.1	102.6	1187.2
5-Year Average	34.1	395.2	99.0	1146.3
5-Year Peak	37.1	429.8	104.2	1205.8
10-Year Average	34.9	403.4	96.8	1120.8
10-Year Peak	41.7	482.7	144.6	1674.0

The 10-year trend analysis showed that flows to the Welland WWTP continue to reflect high flows in wetter years. The 5-year average flow has decreased 4% from the 2016 MSP starting point.

The starting point flow used for the Welland WWTP was 34.1 MLD.

Figure 4.K.3 shows the projected future flows at the Welland WWTP.

The plant will reach the 80% study trigger capacity around 2041. The post-2051 flows are expected to exceed the plant capacity; however, the plant can accommodate flows to 2051.

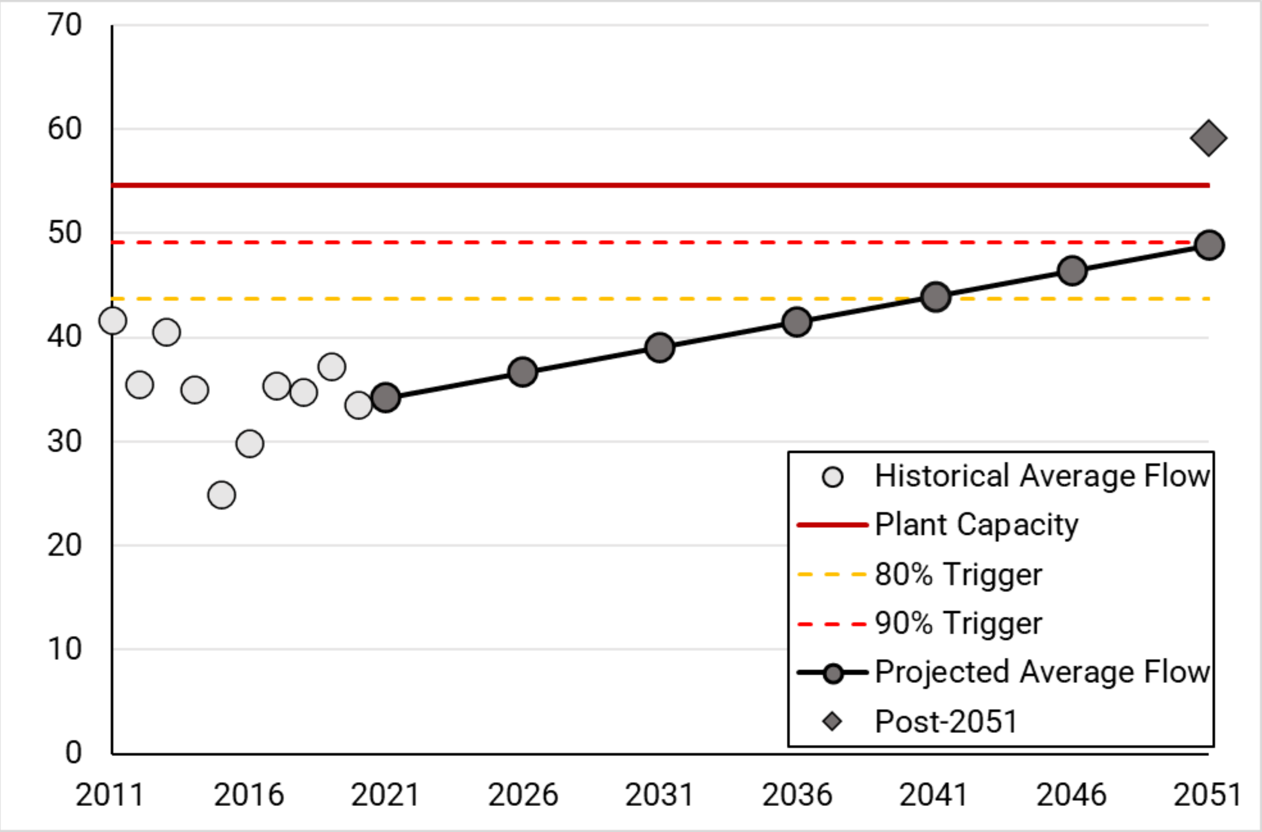


Figure 4.K.3 Projected Sewage Generation at Welland Wastewater Treatment Plant

K.3.2 Sewage Pumping Station

Table 4.K.8 highlights the sewage pumping station operational firm capacities and the existing and projected flows. The existing average and peak dry weather flows were estimated using the wastewater system model, which was updated using the best available billing, flow monitoring, and SCADA data from 2018 to 2020.

Table 4.K.8 System Sewage Pumping Station Performance

Station Name	Station Capacity	2021 Flows				2051 Flows			Post-2051 Flows		
	Operational Firm Capacity	Average Dry Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow	Peak Dry Weather Flow	Design Allowance Peak Wet Weather Flow	5-Year Storm Peak Wet Weather Flow
	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)
└→Timmsdale SPS	**4.4**	0.7	0.6	4.6	1.0	1.1	5.1	1.5	1.6	5.5	1.7
└→Towpath Road SPS	**117.9**	11.3	13.0	144.8	218.2	173.0	438.8	512.1	229.1	494.9	851.3
| └→Hurricane Road SPS	**29.0**	7.4	7.7	48.6	61.5	22.1	63.1	76.0	25.7	66.6	75.2
└→Foss Road SPS	**24.0**	4.6	6.5	57.9	17.9	29.4	91.5	51.4	36.9	99.0	55.9
└→Feeder Road SPS	**41.0**	2.5	2.5	19.1	91.4	6.0	24.7	97.0	9.4	28.1	118.2
└→Seaway Heights SPS	**65.0**	2.9	3.3	15.6	33.0	29.1	41.5	58.9	88.2	100.6	160.9
└→Ontario Road SPS	**646.0**	37.7	82.4	223.1	827.2	197.8	439.8	1,043.8	214.3	456.3	1,084.2
| └→Dain City SPS	**90.0**	9.0	5.8	39.2	170.1	68.7	147.0	277.9	85.8	164.1	407.9
└→Kelly Street SPS	**31.1**	3.3	10.2	62.6	42.8	12.7	65.1	45.2	9.5	61.8	50.4
| └→South Street SPS	**6.7**	1.1	4.7	6.8	6.8	4.9	7.0	7.0	1.8	3.9	5.7
| └→George Street SPS	**9.3**	0.2	0.3	3.8	1.2	0.8	4.3	1.8	1.1	4.6	1.1
└→Park Lane SPS	**6.0**	0.2	0.2	2.1	1.0	0.4	2.3	1.2	0.5	2.3	1.1
└→Daimler Woods SPS	**5.9**	0.5	0.5	3.0	1.6	0.6	3.1	1.7	0.9	3.3	2.0

The following SPS have existing and future deficiencies under both design allowance PWWF and 5-year storm, requiring upgrades to support existing and future flows.

- Towpath Road SPS
- Hurricane Road SPS
- Kelly Street SPS
- South Street SPS

The following SPS have future deficiencies under design allowance PWWF and 5-year storm, requiring upgrades to support future flows.

- Dain City SPS
- Foss Road SPS

The following SPS have sufficient capacity to support 2051 flows using the design allowance PWWF, however, the projected 5-year storm PWWF exceeds the operational firm capacity as such potential system or facility upgrades may be required.

- Feeder Road SPS
- Ontario Road SPS

The following SPS have existing and future deficiencies under the design allowance PWWF; however, the existing and projected 5-year storm PWWF is withing the station’s capacity, as such, the stations capacity is sufficient to support future flows.

- Timmsdale SPS

The following stations have surplus capacity to support future flows.

- Seaway Heights SPS
- George Street SPS
- Park Lane SPS
- Daimler Woods SPS

K.3.3 Forcemain

Table 4.K.9 highlights the existing and projected forcemain performance. Velocities less than 0.6 m/s were flagged in yellow and velocities exceeding 2.5 m/s were flagged in red. Note, if a pumping deficit was identified in **Table 4.K.8**, then projected forcemain velocities were based on the higher of the station's ECA firm capacity or the governing peak wet weather flow scenario, otherwise if no pumping deficit was identified, the operational firm capacity was used for future capacity assessment.

Table 4.K.9 Forcemain Performance

Station Name	Forcemain Diameter (mm)	Operational Firm Capacity		2051		Post-2051	
		Pumped Flow (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)	Pumping Needs (L/s)	Velocity (m/s)
└→Timmsdale SPS	**100**	4.4	0.6	4.4[1]	0.6	4.4[1]	0.6
└→Towpath Road SPS	**400**	117.9	0.9	438.8[3]	3.5	488.7[3]	3.9
| └→Hurricane Road SPS	**250**	29.0	0.6	63.1[3]	1.3	64.7[3]	1.3
└→Foss Road SPS	**192**	24.0	0.8	51.4[3]	1.8	58.4[3]	2.0
└→Feeder Road SPS	**250**	41.0	0.8	41.0[1]	0.8	41.0[1]	0.8
└→Seaway Heights SPS	**300**	65.0	0.9	65.0[1]	0.9	65.0[1]	0.9
└→Ontario Road SPS	**600**	646.0	2.3	646.0[1]	2.3	646.0[1]	2.3
| └→Dain City SPS	**300**	90.0	1.3	147.0[3]	2.1	160.6[3]	2.3
└→Kelly Street SPS	**200**	31.1	1.0	45.2[3]	1.4	46.7[3]	1.5
| └→South Street SPS	**100**	6.7	0.9	8.2[2]	1.0	8.2[2]	1.0
| └→George Street SPS	**100**	9.3	1.2	9.3[1]	1.2	9.3[1]	1.2
└→Park Lane SPS	**100**	6.0	0.8	6.0[1]	0.8	6.0[1]	0.8
└→Daimler Woods SPS	**100**	5.9	0.7	5.9[1]	0.8	5.9[1]	0.8

[1] Operational firm capacity

[2] ECA capacity

[3] Minimum of future design allowance PWWF or 5-year storm PWWF

The existing Timmsdale SPS, Park Lane SPS, and Hurricane Road SPS forcemains were flagged for low velocities in the existing operating regime. Growth flows are anticipated to improve the velocity for Hurricane Road SPS in the future. Timmsdale SPS and Park Lane SPS do not have significant growth planned and will continue to have low velocities.

The following forcemains had a projected forcemain capacity deficit in the 2051 growth scenario:

- Towpath Road SPS

The following forcemains had a projected forcemain capacity deficit in the 2051 growth under the design allowance PWWF; however, the projected 5-year storm PWWF is within the FM capacity:

- Foss Road SPS

The following stations' forcemain have sufficient capacity to meet future flows:

- Hurricane Road SPS
- Kelly Street SPS
- Feeder Road SPS
- Ontario Road SPS
- Seaway Heights SPS
- South Street SPS
- George Street SPS
- Daimler Woods SPS

K.3.4 Trunk Sewer

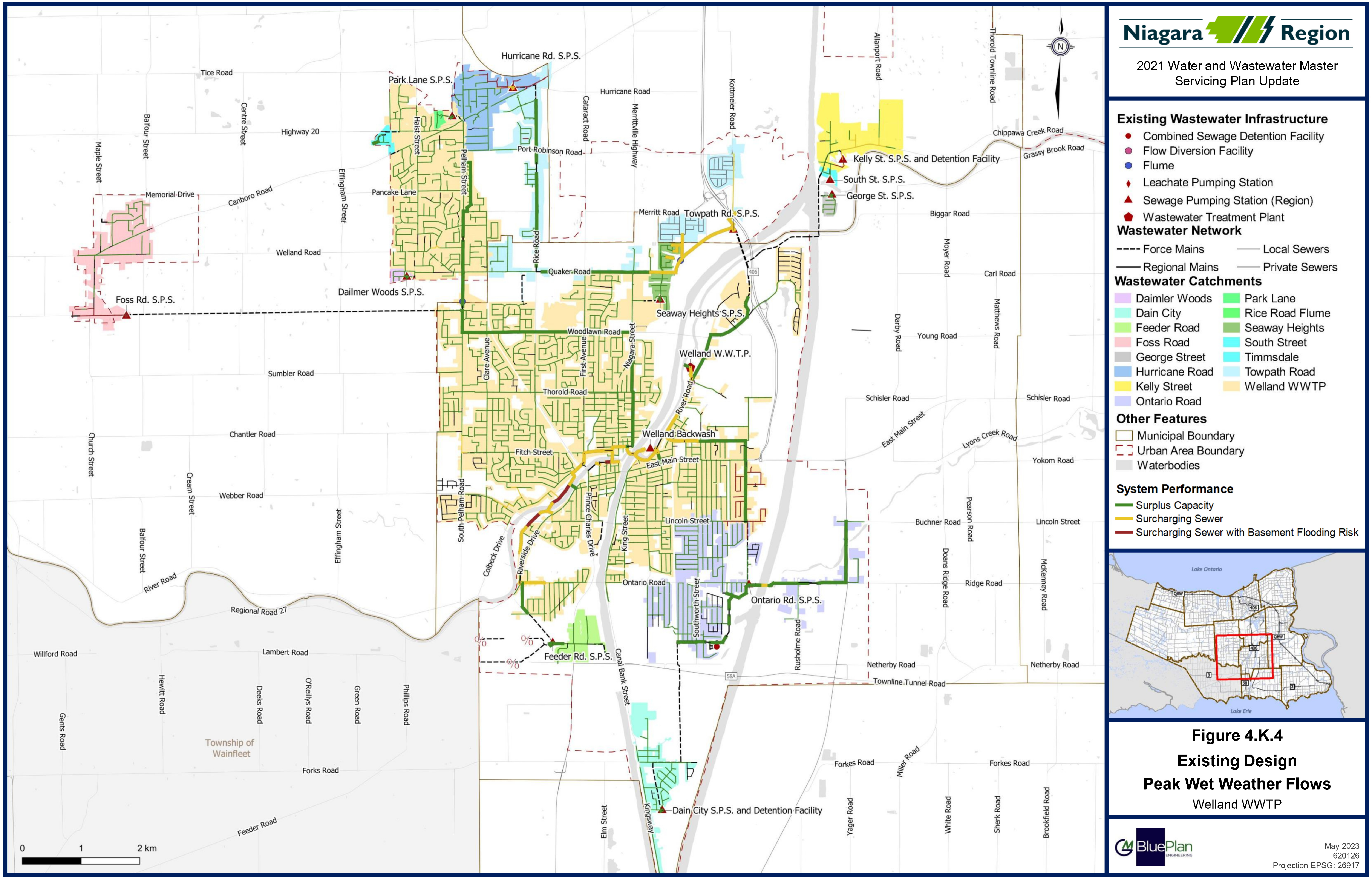
Figure 4.K.4 and **Figure 4.K.5** highlight the trunk performance in the existing and 2051 projected design allowance peak wet weather flow scenarios, respectively.

- There are no Region-owned trunk sewer capacity deficits under the 2051 design allowance peak wet weather flows. While the Welland interceptor currently experiences surcharging under wet weather events, the interceptor surcharging is primarily due to the Region utilizing the trunk sewer as balancing storage to minimize peak flows to the Welland WWTP.
- There are some sewers surcharging above the basement flooding freeboard from the existing and future 5-year storm peak wet weather flows.
    - Ontario Road Lift SPS Road SPS shows surcharging in Region trunks and local sewers due to SPS capacity and high wet weather inflows in the existing and future scenarios.
    - Towpath Road SPS Road shows surcharging in Region trunks and local sewers due to SPS capacity and high growth in the future scenarios.
- Note that the Welland WWTP system has several combined sewer overflows (CSO), that help regulate the hydraulic grade line (HGL) within the trunk system to reduce basement flooding risks.
- Local surcharging above the basement flooding freeboard was identified in the Welland Pollution Prevention and Control Plan (PPCP) based on the City's identified target level of service. The PPCP identified sewers which required upgrades for local sewers; those projects were not carried forward into the MSP as they will be funded and implemented by the local area municipalities (LAMs).
- Quaker Road trunk sewer have capacity to accommodate additional flows, opportunity to divert Pelham flows to Quaker Road, combined with Towpath Road SPS upgrades to divert flows from the existing surcharged Welland interceptor to the Woodlawn Road and River Road trunk sewer, which have surplus capacity.

K.3.5 Overflows

Under the design allowance peak flows no overflows are anticipated; however, many of the CSOs become active from 5-year storm peak wet weather flows. The adverse risks of wet weather inflows are currently partially managed through CSOs; however, the Region and LAMs are working together to reduce wet weather inflows to the system in order to reduce system overflows.

Detailed assessment of system CSO are addressed in the Welland PPCP; which outlines the proposed wet weather flow management approach to manage CSO volumes.



Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

Existing Wastewater Infrastructure

- ● Combined Sewage Detention Facility
- ● Flow Diversion Facility
- ● Flume
- ♦ Leachate Pumping Station
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant

Wastewater Network

- Force Mains
- Local Sewers
- Regional Mains
- Private Sewers

Wastewater Catchments

- Daimler Woods
- Dain City
- Feeder Road
- Foss Road
- George Street
- Hurricane Road
- Kelly Street
- Ontario Road
- Park Lane
- Rice Road Flume
- Seaway Heights
- South Street
- Timmsdale
- Towpath Road
- Welland WWTP

Other Features

- Municipal Boundary
- Urban Area Boundary
- Waterbodies

System Performance

- Surplus Capacity
- Surcharging Sewer
- Surcharging Sewer with Basement Flooding Risk

Figure 4.K.4
Existing Design Peak Wet Weather Flows

Welland WWTP

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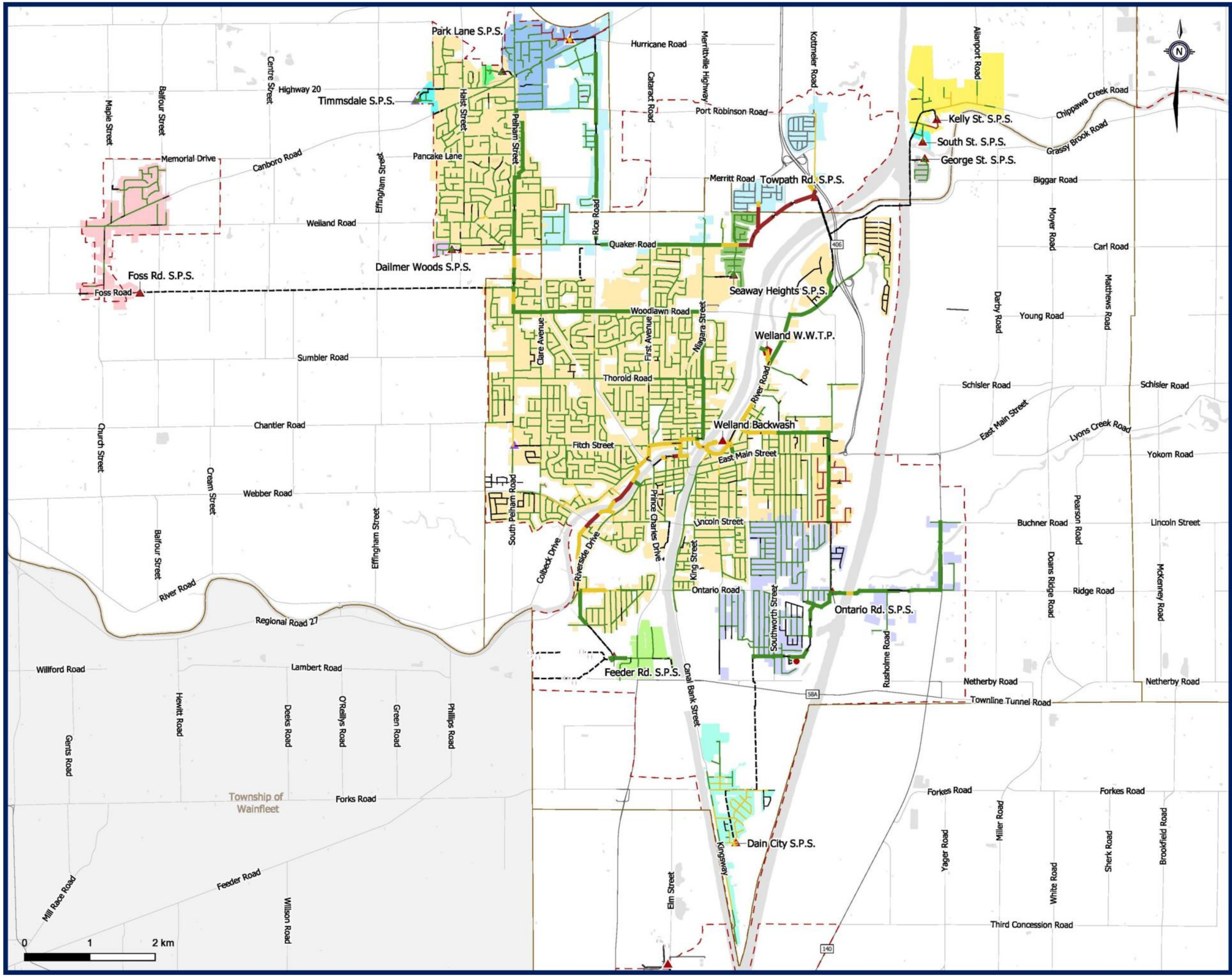

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

Existing Wastewater Infrastructure

- ● Combined Sewage Detention Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Local)

Wastewater Network

- Force Mains
- Local Sewers
- Regional Mains
- Private Sewers

Wastewater Catchments

- Daimler Woods
- Dain City
- Feeder Road
- Foss Road
- George Street
- Hurricane Road
- Kelly Street
- Ontario Road
- Park Lane
- Rice Road Flume
- Seaway Heights
- South Street
- Timmsdale
- Towpath Road
- Welland WWTP

Other Features

- Municipal Boundary
- Urban Area Boundaries
- Waterbodies

System Performance

- Surplus Capacity
- Surcharging Sewer
- Surcharging Sewer with Basement Flooding Risk

Figure 4.K.5

2051 Design

Peak Wet Weather Flows

Welland WWTP

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Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

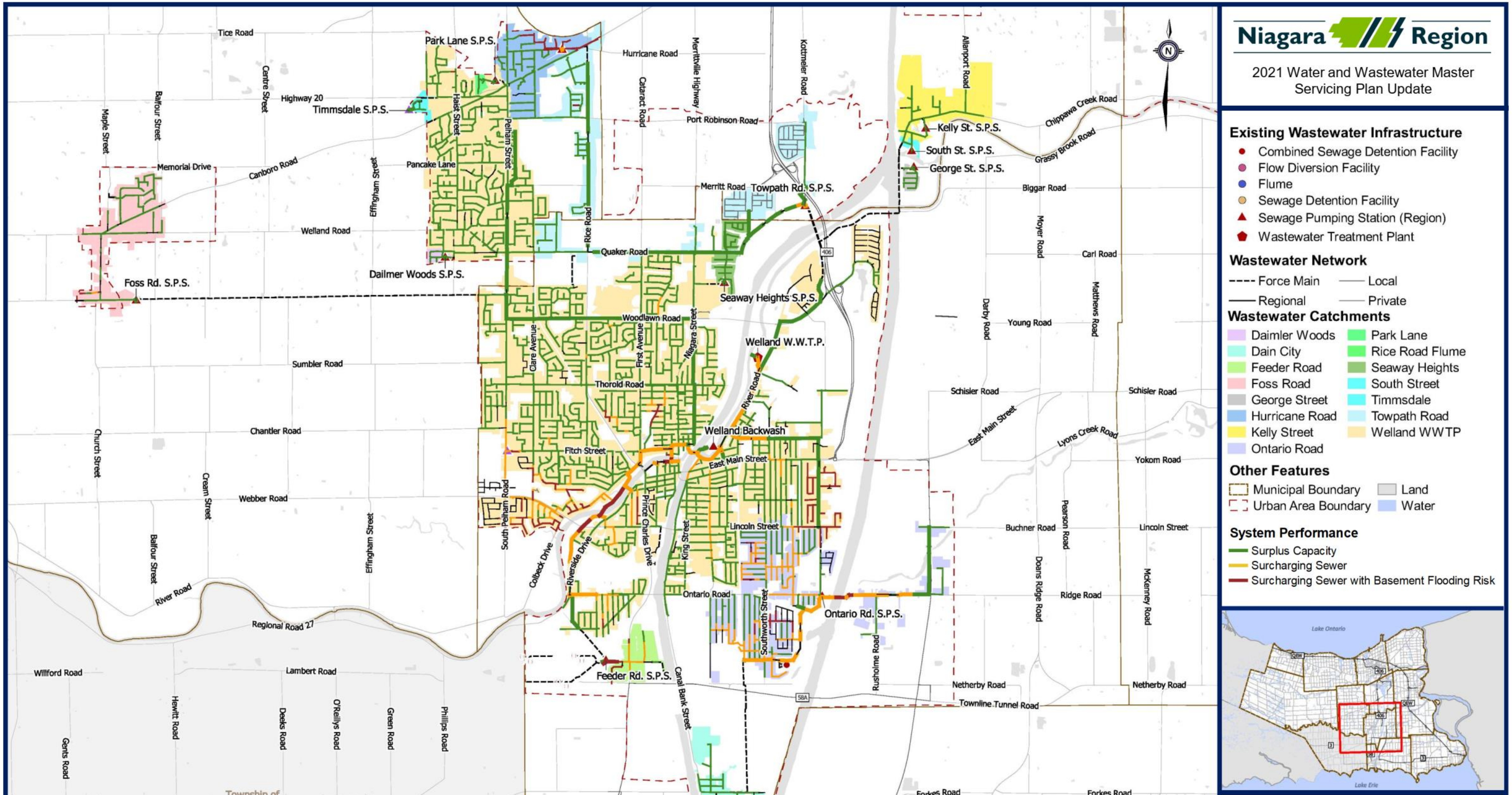

Figure 4.K.6

Existing 5-Year Storm Peak Wet Weather Flows

Welland WWTP

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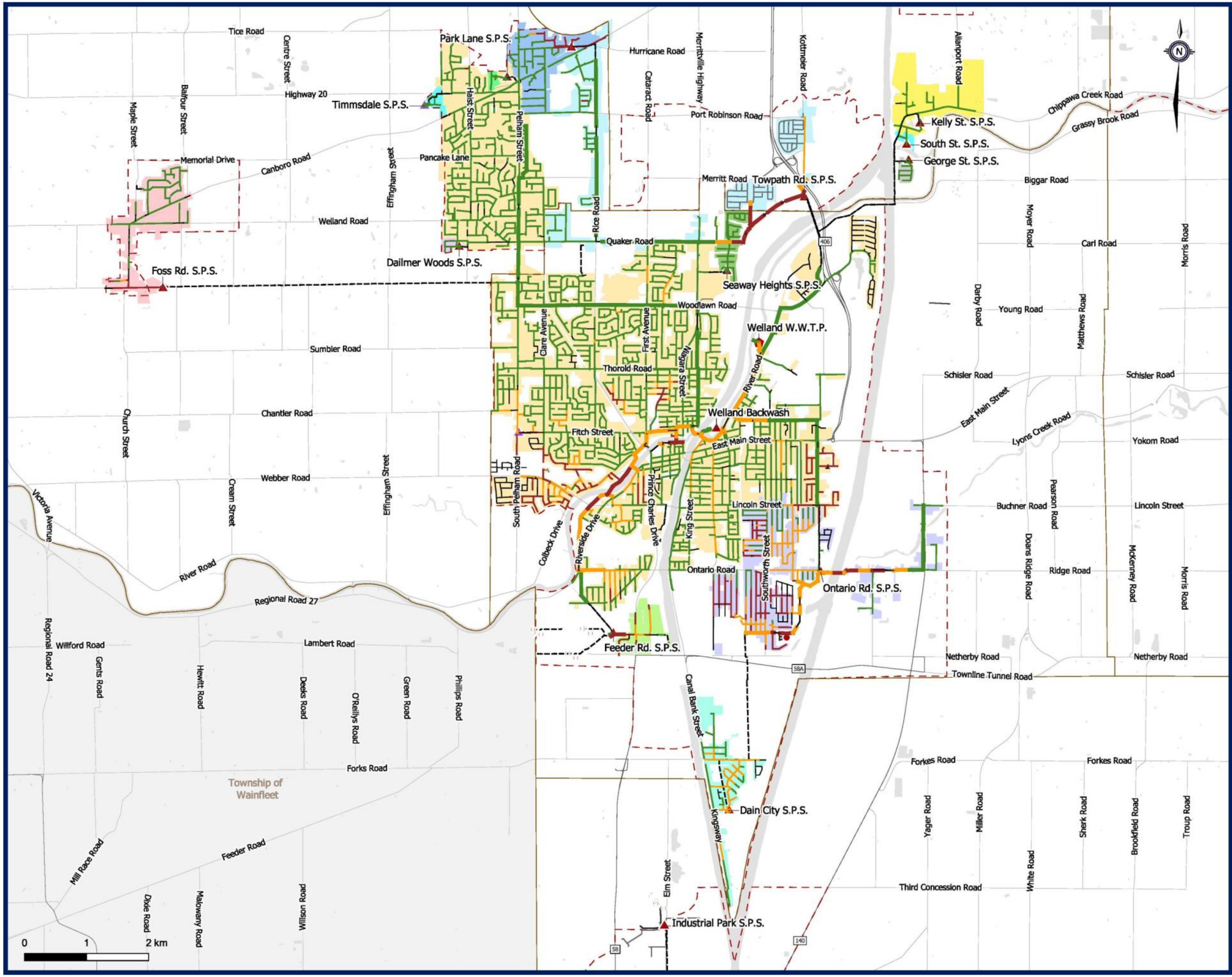

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

Existing Wastewater Infrastructure

- ● Combined Sewage Detention Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Local)

Wastewater Network

- Force Mains
- Regional Mains
- Local Sewers
- Private Sewers

Wastewater Catchments

- Daimler Woods
- Dain City
- Feeder Road
- Foss Road
- George Street
- Hurricane Road
- Kelly Street
- Ontario Road
- Park Lane
- Rice Road Flume
- Seaway Heights
- South Street
- Timmsdale
- Towpath Road
- Welland WWTP

Other Features

- Municipal Boundary
- Urban Area Boundaries
- Waterbodies

System Performance

- Surplus Capacity
- Surcharging Sewer
- Surcharging Sewer with Basement Flooding Risk

Figure 4.K.7

2051 5-year Storm Peak Wet Weather Flows

Welland WWTP

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Projection EPSG: 26917

K.4 System Opportunities and Constraints

Figure 4.K.8 Highlights the existing opportunities and constraints.

K.4.1 Welland Wastewater Treatment Plant

- The current rated average daily flow capacity of the plant is 54.6 MLD, with an existing flow of 34.2 MLD and a projected 2051 average daily flow of 48.9 MLD, which is below 90% of the wastewater treatment plant rated capacity.
- The plant will reach the 80% study trigger capacity around 2041. The post-2051 flows are expected to exceed the plant capacity; however, the plant can accommodate flows to 2051.

K.4.2 Welland

- Significant areas with high wet weather flows and system overflows, which will need to be managed to allow for growth The City is currently undertaking works to manage existing wet weather flow issues.
- Majority of existing sewer network has capacity to meet design criteria wet weather flows; however actual wet weather flows exceed sewer capacity in several areas.
- Welland River and Welland Canal siphon crossings present ongoing operational issues.
- Additional trunk capacity in the Quaker Road sewer to support existing and growth flows from the Pelham system.

K.4.3 Pelham

- Residential and employment growth consisting of infill and greenfield development within the existing urban boundary.
- Low to moderate wet weather flows.
- Growth related capacity deficits at Hurricane Road SPS and Foss Road SPS.
- Existing sewer network has capacity to meet design allowance wet weather flows
- Foss Road FM is approaching capacity; due to the age, length of the forcemain, and magnitude of anticipated growth the replacement or twinning of the forcemain will provide additional operational security.

K.4.4 Thorold (Port Robinson)

- Significant residential and employment growth consisting of infill and greenfield development within the Port Robinson area.
- Growth related and wet weather capacity deficits at the Towpath Road SPS, Kelly Street SPS, and South Street SPS.
    - There is limited historic flow data for the Kelly Street SPS and South Street SPS to confirm operational capacity; however, the catchments have limited growth and no historic reports of performance and/or capacity issues.

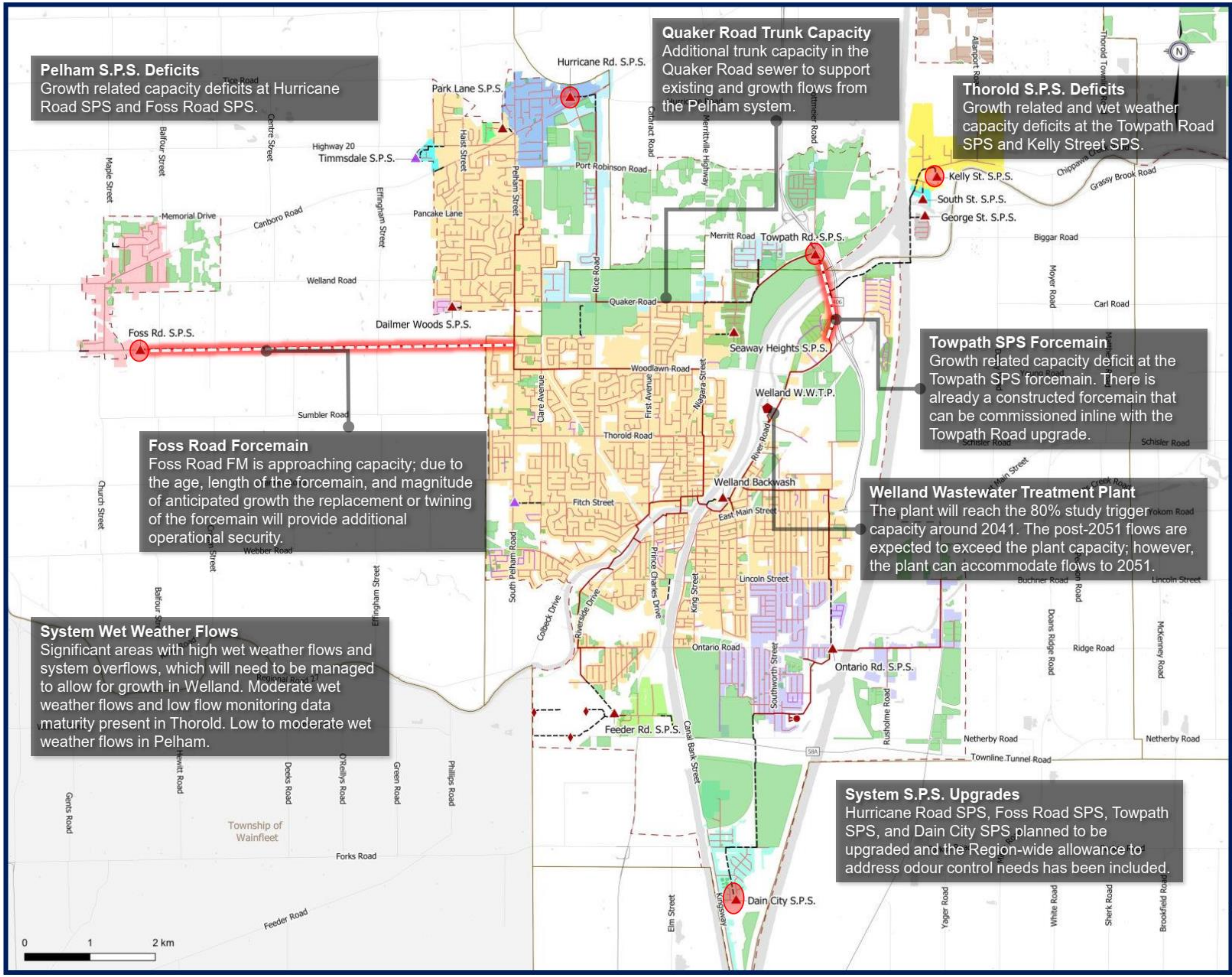
- Growth related capacity deficit at the Towpath SPS forcemain. There is already a constructed 600 mm forcemain that can be assessed and commissioned inline with the Towpath Road upgrade.
- Areas with moderate wet weather flows and low flow monitoring data maturity.

K.4.5 System Optimization Opportunities

- Implementation of the Quaker Road trunk sewer, which is a diversion for roughly 100 L/s of flows from Pelham to be redirected to the Towpath SPS catchment to support existing and growth flows from Pelham.
- Significant opportunity to provide capacity for growth through implementation of wet weather flow management within Welland system.

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



Pelham S.P.S. Deficits
Growth related capacity deficits at Hurricane Road SPS and Foss Road SPS.

Quaker Road Trunk Capacity
Additional trunk capacity in the Quaker Road sewer to support existing and growth flows from the Pelham system.

Thorold S.P.S. Deficits
Growth related and wet weather capacity deficits at the Towpath Road SPS and Kelly Street SPS.

Towpath SPS Forcemain
Growth related capacity deficit at the Towpath SPS forcemain. There is already a constructed forcemain that can be commissioned inline with the Towpath Road upgrade.

Foss Road Forcemain
Foss Road FM is approaching capacity; due to the age, length of the forcemain, and magnitude of anticipated growth the replacement or twining of the forcemain will provide additional operational security.

Welland Wastewater Treatment Plant
The plant will reach the 80% study trigger capacity around 2041. The post-2051 flows are expected to exceed the plant capacity; however, the plant can accommodate flows to 2051.

System Wet Weather Flows
Significant areas with high wet weather flows and system overflows, which will need to be managed to allow for growth in Welland. Moderate wet weather flows and low flow monitoring data maturity present in Thorold. Low to moderate wet weather flows in Pelham.

System S.P.S. Upgrades
Hurricane Road SPS, Foss Road SPS, Towpath SPS, and Dain City SPS planned to be upgraded and the Region-wide allowance to address odour control needs has been included.

Existing Wastewater Infrastructure

- ⬟ Wastewater Treatment Plant (WWTP)
- ● Combined Sewage Detention Facility
- ■ Biosolids Storage Facility
- ✳ Odour Control Facility
- ♦ Leachate Pumping Station

Sanitary Pumping Stations (SPS)

- ▲ Regional
- ▲ Municipal
- ▲ Private

Wastewater Network

- ---- Force Mains
- —— Regional Mains
- —— Local Sewers
- —— Private Sewers

Wastewater Catchments

🟪 Daimler Woods	🟩 Park Lane
🟦 Dain City	🟩 Rice Road Flume
🟩 Feeder Road	🟩 Seaway Heights
🟥 Foss Road	🟦 South Street
⬜ George Street	🟦 Timmsdale
🟦 Hurricane Road	🟦 Towpath Road
🟨 Kelly Street	🟧 Welland WWTP
🟪 Ontario Road	

Other Features

- ☐ Municipal Boundary
- ⬚ Urban Area Boundary
- ⬜ Waterbodies

Development Locations

- 🟫 Post-2051
- 🟩 Pre-2051

Figure 4.K.8
Welland WWTP
Opportunities and Constraints

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February 2023
6210126-WW-002

K.5 Assessment of Alternatives

Generally, the previously recommended strategies from the 2016 MSP program were carried forward which included capacity upgrades at select SPS, and wet weather management strategies in key areas.

While the strategies remained the same, the following details including alignment, sizing, or wet weather areas have been updated to reflect the latest system understanding and reflect updated criteria changed through this iteration of the 2021 MSPU.

- Providing capacity within Region-owned pumping stations and trunk sewers to convey peak wet weather flows up to the lesser of the 5-year design storm or extraneous flow design allowance criteria of 0.4 L/s/ha for existing areas and 0.286 L/s/ha for growth areas, needs to be verified based on the updated flow criteria and actual flows.
- Provide upstream flow management to address high peak flows in the system where peak wet weather flows exceed the extraneous flow design allowance criteria of 0.4 L/s/ha resulting in basement flooding and overflow risks. Upstream flow management can include but is not limited to these options, in the preferred order of implementation:
    - Inflow and infiltration reduction in public right of way
    - Inflow and infiltration reduction from private properties
    - Enhanced system storage
    - Peak flow control using system controls or engineered solutions
- As shown in **Section K.3.2**, pump station capacity assessments were completed by reviewing the projected design allowance peak flows and 5-year storm flows against the operational firm capacity of each station.
    - Where the peak storm flows were less than design flows and the operational firm capacity of the station, the storm flows were used as actual flows, and therefore would not have triggered an upgrade.
    - Where the projected peak design allowance flows and 5-year storm flows exceeded the operational firm capacity of the station, a pump upgrade was recommended. Additional storage considerations and wet weather management were also considered.

To address existing and growth-related capacity needs, the following servicing concepts were evaluated:

- Do nothing
- Station capacity upgrade for pumping or storage
- Wet weather management
- Hybrid solution

K.6 Preferred Servicing Strategy

The following is a summary of Welland WWTP system as recommended through the 2016 Master Servicing Plan Update and carried forward through this update:

- The Welland Wastewater Treatment Plant has sufficient capacity to support growth to year 2051, however the projected 2051 flows will pass the 80% capacity around 2041, at which time a study may be triggered.
- A key strategy for the Welland system is to provide wet weather management across the system to support growth. This will require Regional solutions as well as local municipality solutions, especially in the City Welland.
- Upgrades to several sewage pumping stations in the system due to high growth and existing deficiencies.
- Quaker Road trunk sewer to provide servicing flexibility for Pelham growth flows.

Strategies that were added since the 2016 MSP were the addition of:

- Upgrade to the Dain City SPS,
- Commissioning of the Towpath Road SPS forcemain.

Figure 4.K.10 and **Figure 4.K.11** show the preferred servicing strategy, consisting of:

K.6.1 Treatment Plant Works

- No capacity upgrades are required.

The Region has several Region-wide programs focused on maintaining and enhancing the treatment capacity at the Region’s existing WWTP. The programs applicable to the PNOTL WWTP include:

- WWTP Process Upgrades (WW-TP-005) which funds projects to improve treatment processes to re-establish the ECA capacity at plants.

K.6.2 Pumping Stations

- Increase Foss Road SPS capacity from 25 L/s to 52 L/s.
- Increase Towpath Road SPS capacity from 118 L/s to 600 L/s.
- Increase Hurricane Road SPS capacity from 39 L/s to 67 L/s.
- Increase Dain City SPS capacity from 90 L/s to 164 L/s.

Due to the limited growth and no historic reports of performance and/or capacity issues at the Kelly Street SPS and South Street SPS, no upgrades were recommended. However, flow monitoring is needed to confirm operational capacity.

Further to the pump station upgrades, the Region-wide allowance to address odour control needs that are the result of growth-related system upgrades has been included.

- WWTP Process Upgrades (WW-TP-006) which funds in-system and plant upgrades to control odour.

K.6.3 Forcemains

- Bring constructed 600 mm Towpath SPS forcemain into service.
- Replace existing 200 mm Foss Road SPS forcemain with new single 250 mm forcemain in Welland to address operational security concerns.

K.6.4 Trunk Sewers

- New 600 mm trunk sewer on Quaker Road between Pelham Street trunk and Rice Road trunk sewers.

K.6.5 Decommissioning of Existing Facilities

- No decommissioning projects are recommended in the Welland WWTP system.

K.6.6 Wet Weather Flow Management Program

A significant element of the Niagara Region wastewater servicing strategy is the wet weather management program. The program is intended to address existing capacity constraints, and to provide for growth-related capacity without expanding/upgrading existing trunk infrastructure, or by minimizing the required expansion/upgrades.

The wet weather management program currently identifies overall preliminary priority, staging of location and target amount of inflow and infiltration reduction across all systems. This program provides for a proactive and targeted approach to addressing wet weather impacts. These wet weather management programs will need to be a joint initiative between the Region and local municipalities.

For the Welland WWTP system, the following priority areas are identified:

- Welland area consisting of:
    - Ontario Road SPS
    - Dain City SPS
    - Feeder Road SPS
    - Welland WWTP catchment.
- Pelham area, consisting of:
    - Hurricane Road SPS
    - the Fonthill area that is part of the broader Welland WWTP catchment.
- Thorold area, consisting of:
    - Towpath Road SPS
    - Kelly Street SPS
    - South Street SPS (to confirm operational capacity).

K.6.7 Additional Studies and Investigations

Flow Monitoring Program: Additional flow monitoring data collection will improve the confidence of the system performance results from the model. Best practices for improving understanding of wastewater systems include:

- Monitoring upstream from pump stations to capture peak wet weather flows
- Increasing the density of monitoring in catchments identified for wet weather flow management, where the flows from the 5-year design storm exceed the design flows.

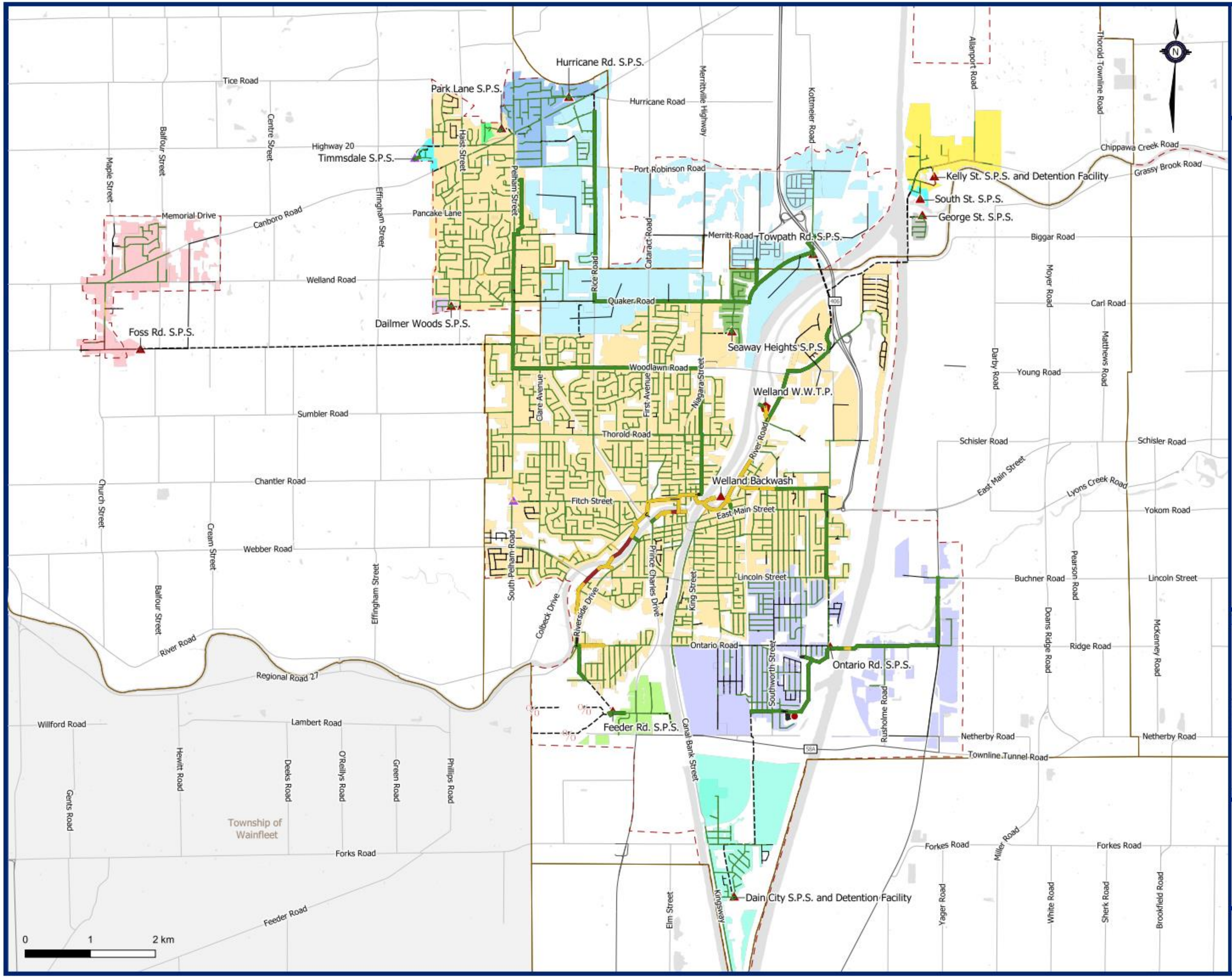
Due to the work recently completed for the PPCP, data in the City of Welland system is generally quite mature. The PPCP identified areas for additional data collection and the City has undertaken next steps in the flagged areas including more extensive flow monitoring and field investigations such as smoke and dye testing and other fieldwork. The City is expected to continue with the inflow and infiltration reduction studies and action programs to address sources of inflow and infiltration.

K.6.8 Future System Performance

Figure 4.K.9 presents the future system performance, based on the preferred servicing strategy configuration and capacities; but excludes the potential benefits of the local wet weather flow management program.

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update



Existing Wastewater Infrastructure
- ● Combined Sewage Detention Facility
- % Leachate Pumping Station
- ● Odour Control Facility
- ▲ Sewage Pumping Station (Region)
- ⬟ Wastewater Treatment Plant
- ▲ Sewage Pumping Station (Private)
- ▲ Sewage Pumping Station (Local)

Wastewater Network
- Force Mains
- Local Sewers
- Regional Mains
- Private Sewers

Wastewater Catchments

Daimler Woods	Park Lane
Dain City	Rice Road Flume
Feeder Road	Seaway Heights
Foss Road	South Street
George Street	Timmsdale
Hurricane Road	Towpath Road
Kelly Street	Welland WWTP
Ontario Road	

Other Features
- Municipal Boundary
- Urban Area Boundaries
- Waterbodies

System Performance
- Surplus Capacity
- Surcharging Sewer
- Surcharging Sewer with Basement Flooding Risk

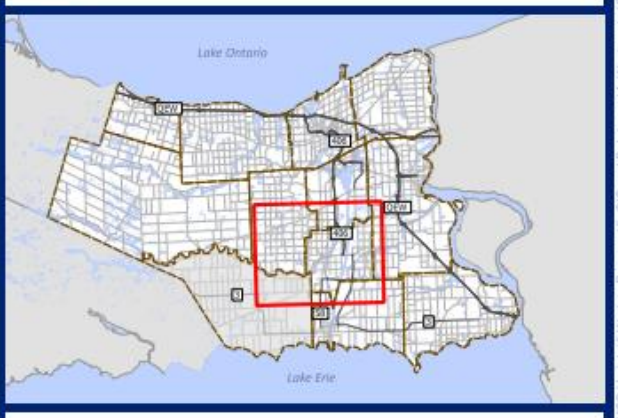


Figure 4.K.9

Future Capital Program Peak Wet Weather Flow

Welland WWTP

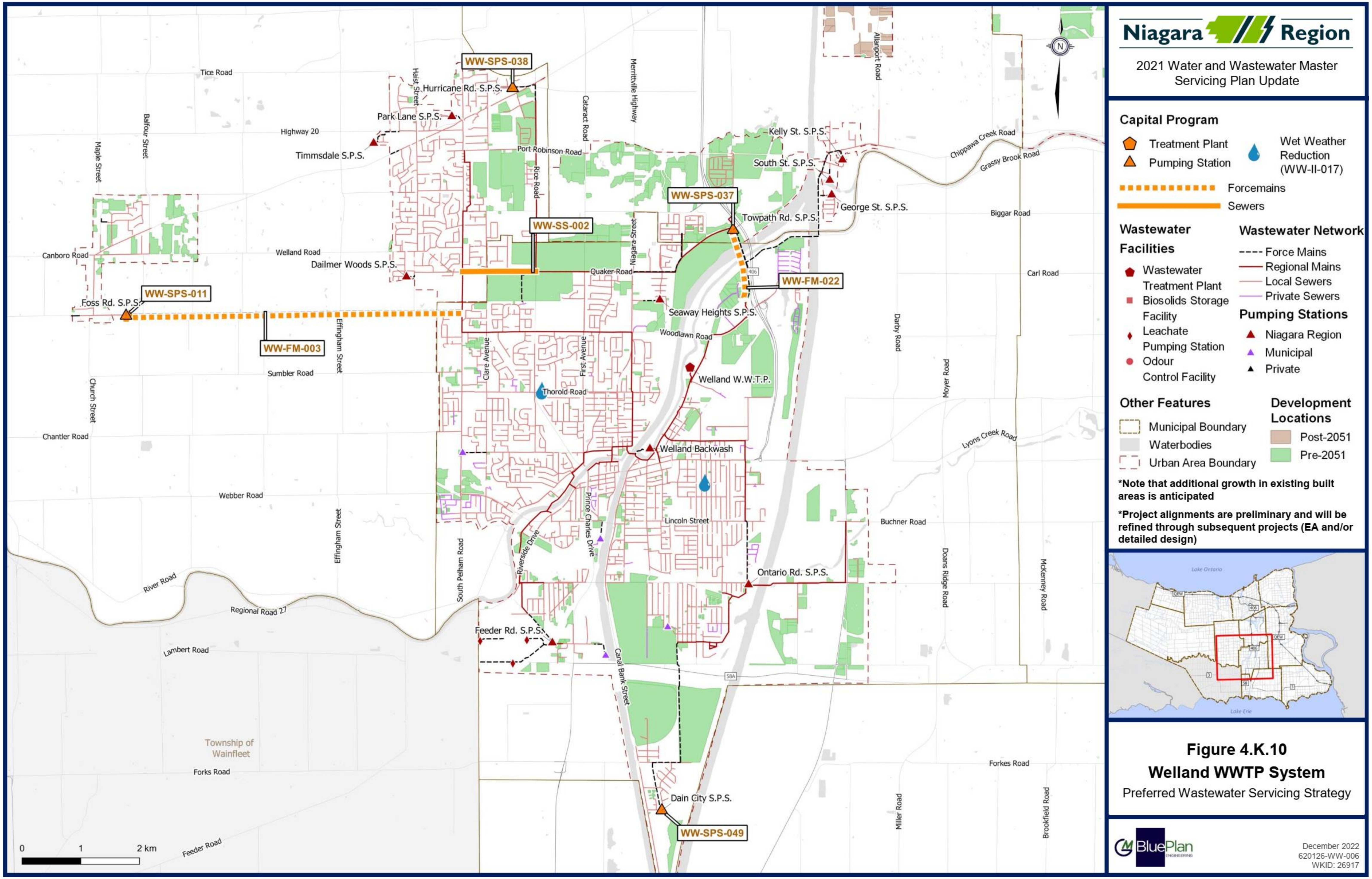
BluePlan

May, 2023
620126
Projection EPSG:26917

K.7 Capital Program

Figure 4.K.10 and **Figure 4.K.11** present the preferred servicing strategy map and schematic

Table 4.K.10 summarizes the recommended project costing timing and Class EA requirements. Individual detailed costing sheets are presented in **Section K.8.6**.



Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

*Note that additional growth in existing built areas is anticipated

*Project alignments are preliminary and will be refined through subsequent projects (EA and/or detailed design)

Figure 4.K.10
Welland WWTP System
Preferred Wastewater Servicing Strategy

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December 2022
620126-WW-006
WKID: 26917

Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

WWTP RATED CAPACITY	Wastewater Treatment Plant
FIRM CAPACITY	Sewage Pumping Station
→	Forcemain
→	Connection from SPS to SPS
→	Connection from SPS to WWTP
🟧	Facility Upgrade
🟩	New Facility
—	Upgrade Forcemain or Sewer
—	New Forcemain or Sewer
⊗	Decommission Project
FIRM CAPACITY	Decommission Project by External Party

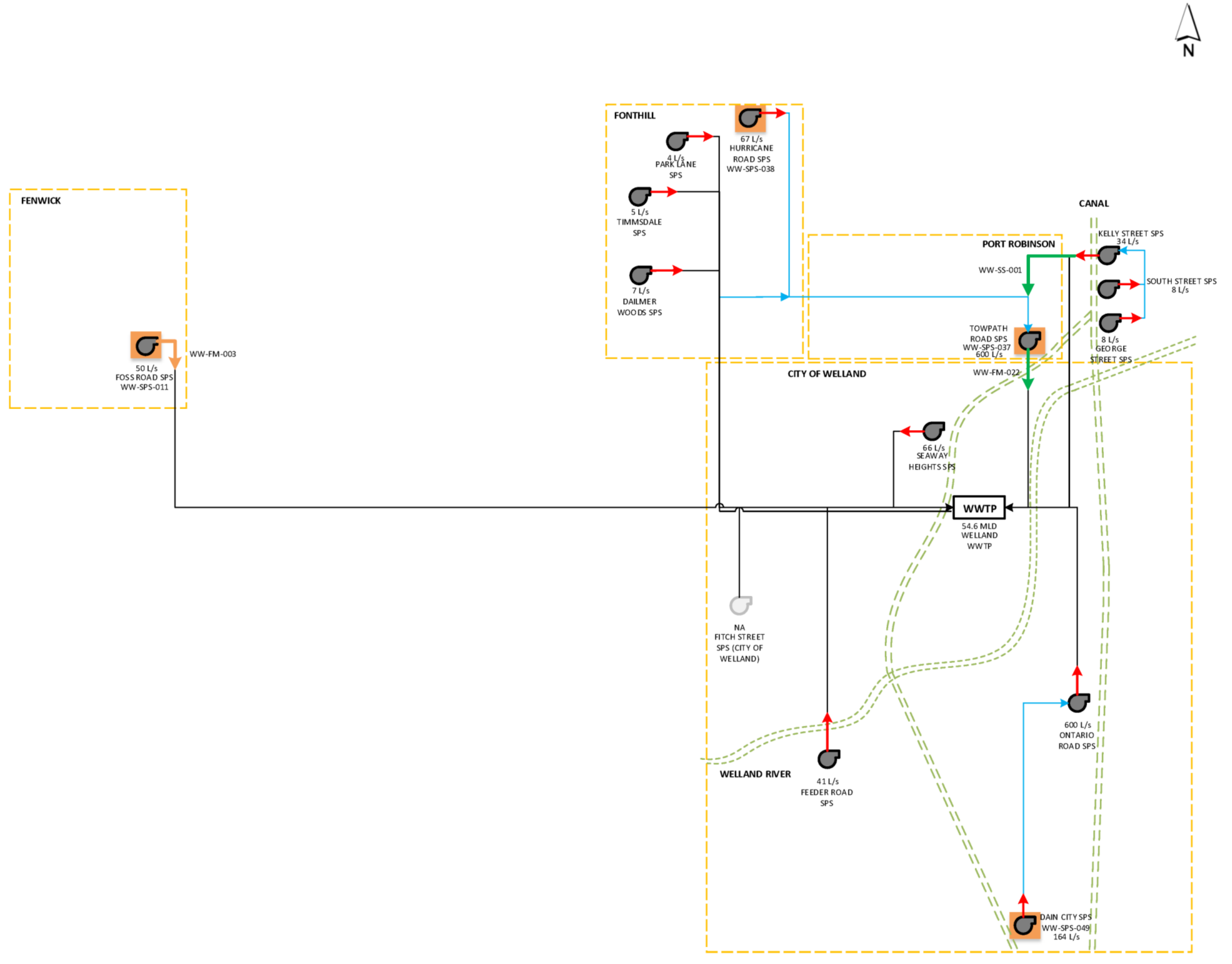

Figure 4.K.11
Welland WWTP

Future Wastewater Infrastructure Schematic

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December 2022
621016-W-000
WKID: 26917

Table 4.K.10 Summary of Queenston Wastewater Treatment Plant Capital Program

Master Plan ID	Name	Description	Size / Capacity	Year in Service	Municipality	Class EA Schedule	Class EA Status	Project Type	Total Component Estimated Cost ($)
WW-FM-003	Upgrade Foss Road SPS Forcemain	Replace existing 200 mm Foss Road SPS Forcemain with new single 250 mm forcemain in Welland.	250 mm	2027-2031	Pelham	A+	Satisfied	Forcemain	$9,883,000
WW-FM-022	Commission 600 mm Towpath Road Forcemain	Bring constructed 600 mm Towpath SPS forcemain into service	600 mm	2032-2036	Welland	A+	Satisfied	Forcemain	$250,000
WW-SPS-011	Foss Road SPS Upgrade	Increase station capacity from 25 L/s to 52 L/s by replacing the existing two pumps.	52 L/s	2027-2031	Pelham	A+	Satisfied	Pumping	$2,778,000
WW-SPS-037	Towpath SPS Upgrade	Increase station capacity from 118 L/s to 600 L/s. Scope includes pump upgrades and one additional pump.	600 L/s	2022-2026	Thorold	A+	Satisfied	Pumping	$6,519,000
WW-SPS-038	Hurricane Road SPS Pump Replacement	Increase station capacity from 39 L/s to 67 L/s by replacing existing two pumps.	67 L/s	2022-2026	Pelham	A+	Satisfied	Pumping	$2,415,000
WW-SPS-049	Dain City SPS Pump Replacement	Increase station capacity from 90 L/s to 164 L/s by replacing existing three pumps.	164 L/s	2037-2041	Welland	A+	Satisfied	Pumping	$4,346,000
WW-SS-002	Quaker Road Trunk Sewer	New 600 mm trunk sewer on Quaker Rd. between Pelham Street trunk and Rice Road trunk sewers.	600 mm	2022-2026	Welland	A+	Satisfied	Sewer	$3,106,000
WW-II-017(1)	Region-Wide Wet weather Reduction	Wet weather reduction program in all systems to be executed from 2022-2051	N/A	Post-2051	Region-Wide		Dependent on outcome of wet weather flow study	Wet Weather Reduction	$225,000,000
WW-ST-001(1)	Region-Wide Flow Monitoring and Data Collection	Funding to support flow monitoring and data collection initiatives	N/A	2022-2051	Region-Wide			Wet Weather Reduction	$12,000,000
WW-TP-005(1)	Region-Wide WWTP Process Upgrades	Process upgrades to re-establish ECA capacity	N/A	2022-2051	Region-Wide			Treatment	$50,000,000
WW-TP-006(1)	Region-Wide WWTP Process Upgrades	Upgrades for odour control across the Region at forcemains, pump stations, and other locations.	N/A	2022-2051	Region-Wide			Treatment	$40,000,000
								Total	**$29,297,000**

(1) Project cost not included in subtotal as it is a Region-wide project

K.8 Project Implementation and Considerations

K.8.1 10-Year Program Sequencing

The recommended year in service for the capital projects is presented in **Section K.6.7**. Special project implementation and considerations for the preferred servicing strategy consist of:

- The timing of the Towpath Road SPS and Hurricane Road SPS upgrades were prioritized due to existing deficiencies.
- The Quaker Road trunk sewer is currently in the design phase.
- The Foss Road SPS and forcemain upgrade timing will be governed by growth within the upstream catchment, so there may be flexibility to delay the project based on the rate of growth in the catchment.

It is understood that the timing for the recommended projects may be subject to change due to a variety of external factors such as overall balancing of the Region's capital budget, changes to growth projections, and other unforeseen circumstances. As such, **Table 4.K.11** presents the preferred priority of the projects within the first 10-years of the capital program.

Table 4.K.11 Preferred Project Order

Master Plan ID	Name	2021 MSPU Year in Service	Order
WW-SPS-037	Towpath SPS Upgrade	2022-2026	1
WW-SPS-038	Hurricane Road SPS Pump Replacement	2022-2026	1
WW-SS-002	Quaker Road Trunk Sewer	2022-2026	1
WW-FM-003	Upgrade Foss Road SPS Forcemain	2027-2031	2
WW-SPS-011	Foss Road SPS Upgrade	2027-2031	2

K.8.2 EA Requirements and Studies

The following summarizes the status of EA requirements for recommended capital projects which will require Schedule B or C EAs.

- **EA has been satisfied through previous projects:**
  - None.
- **Currently ongoing separate EA studies:**
  - None.
- **EA studies to be completed through separate studies:**
  - None.

K.8.3 Region-Wide Projects and Collaboration with Local Area Municipalities

Acknowledging that the overall wastewater systems are jointly owned and operated by the Region and LAM, the continued operation and expansion of the wastewater systems to support existing users and accommodate projected growth relies upon the cooperation of the upper and lower tier municipalities. Major updates and adjustments to planning projections should be continued to be communicated as this may affect project details such as trigger timelines and design capacities, which is discussed further in **Section K.8.5**.

One initiative that will be predominately driven by the LAMs is wet weather management. While wet weather management should be completed in all municipalities, this 2021 MSPU assumes that the catchments where the peak wet weather flows exceed the peak design flows and contribute to increased risk of basement flooding or overflows will put a specific focus on wet weather management. The Region is committed to continuing the joint CSO funding program through which LAMs can apply for funding support for inflow and infiltration reduction programs and projects such as those identified through the PPCP.

Additional flow monitoring and system data collection, in partnership with LAM, is needed to improve system understanding, support proposed wet weather flow reductions, and identify opportunities for system optimization and overflow removals.

K.8.4 Sustainability Projects

It is important to recognize that the 2021 MSPU servicing strategies identify new infrastructure to service the additional growth out to year 2051 but these strategies are built by extending infrastructure from the existing systems and leveraging the existing Region infrastructure in place. It is essential that the existing infrastructure is maintained in good condition and performance to support servicing growth.

The Region continually establishes and implements a sustainability program that addresses priority projects to ensure the existing infrastructure is in a state-of-good-repair and continues to perform and meet the intended level of services. Region-wide programs including but not limited to replacement programs for pipes and manholes, boilers, meters, generators, SCADA upgrades, sludge management programs, laboratory and sampling equipment upgrades, process electrical, process instrumentation. Pump station upgrades through the sustainability capital plan re-establish the SPS ECA capacity.

Independent of the 2021 MSPU, the Region has completed a sustainability program analysis to identify the projects on a yearly basis, with focus on a 10 year program, to address the sustainability needs. This Sustainability Capital Plan is first developed to demonstrate the total investment needs and may identify a level of investment and implementation exceeding Region resources. The next steps for the Sustainability Capital Plan will be the development of the Financial Plan for existing Water and Wastewater assets which is anticipated to be completed in 2024. It should be noted that the Sustainability Capital Plan represents investment required over and above the growth-related 2021 MSPU program.

Welland system specific projects include:

- Daimler Woods SPS and forcemain upgrade
- South Street SPS upgrade
- Seaway Heights SPS upgrade
- Broadway trunk sewer
- SCADA server hardware refresh
- Welland WWTP upgrades
- Lyons Creek CSO decommissioning

K.8.5 Project Implementation Flow Chart

The recommended design capacities within the growth capital program are based on the best available information at the time of analysis, including existing system flows, facility capacities, and projected growth. It is understood that this data is not static and often changes over the years between the regular updates of the Region's Master Plan and between those updates. Design assumptions should be revisited before initiation of all projects to reconfirm the appropriate design capacities, along with identification of any associated or dependent projects which can be combined or staged to optimize implementation efficiency and cost, and/or system operation.

To support the Region's process in implementing all recommended 2021 MSPU capital projects, the following flow chart has been developed for the wastewater system. This flow chart document is intended to be a reference resource for the Region and should be treated as a guideline to support existing internal Region processes in project implementation.

The wastewater implementation flow chart is shown in **Figure 4.K.12.**

Niagara Region

WASTEWATER PROJECT IMPLEMENTATION

The intent of this document is to support the Region in confirming the scope of work for wastewater infrastructure projects.

CONFIRM PROJECT SCOPE

To define Terms of Reference

☐ **What triggered this project?**
- Known development growth
- Forecasted growth
- Sustainability needs

☐ **Are there related or dependent projects that should be identified for streamlining opportunities or for project phasing?**
- Are there upstream projects with increasing capacity?
- Are there projects within the same alignment or project area that could be combined? (e.g., growth projects, SPS, forcemain, sewer, corridor planning, sustainability projects, water, stormwater, etc.)
- If there are related projects, could the project timing be adjusted to combine or stage projects more efficiently?

☐ **What is the project EA Schedule and status?**

☐ **Are there historic or ongoing operational issues in the project area?**
- Confirm with Regional and LAM operations and maintenance groups
- i.e. historic overflows, low flow/odour issues, clogging issues, work order history, etc.

☐ **Are there any data gaps that should be incorporated into the Terms of Reference?**
- Refer to the Required Data section below for details
- How much does the project timeline and budget need to change to allow for the data collection?

☐ **Have the planning projections been updated to the best available information?**
- Consultation with Region and LAM planning groups to confirm planning projection
- Are projected needs for the project in place? Is actual growth in line with projected growth?)

☐ **Should the project be deferred until identified related works are completed?**

REQUIRED DATA

To support terms of reference and detailed design

☐ **Recently completed EA or servicing study**
(for growth triggered projects)

☐ **Historic flow records**
- Within the last 3 years
- Ideally one full year of flow monitoring data that covers 80% of the total contributing area
- Can be included in project scope if feasible

☐ **Existing pump, flow, and pressure data to identify/verify existing system issues**

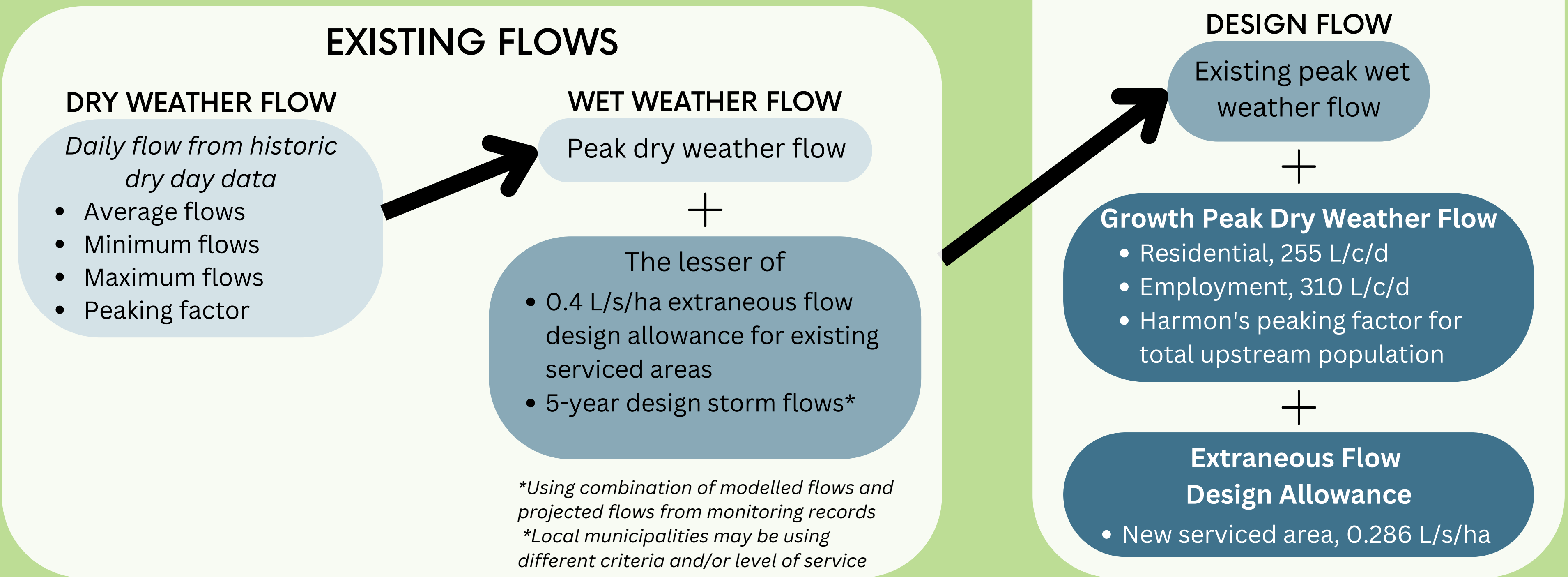
☐ **Asset inventory and condition assessment**
- All asset classes within the infrastructure type (sewer, forcemain, storage, pumping, or treatment facility)
- Within the last 5 years
- Can be part of project scope if the data is not available and would not significantly alter project scope - to assess need for related works (i.e. electrical, HVAC, structural upgrades at an SPS)

☐ **Service area growth potential to confirm projected population and demands**
- Consultation with Region and LAM planning groups within the past year
- Growth information for 30-year horizon and beyond (maximum service catchment)
  - Population, jobs, land use, area
  - Current inventory of development areas with associated development status

! IF THE REQUIRED DATA IS NOT AVAILABLE AND IF IT HAS THE POTENTIAL TO SIGNIFICANTLY ALTER SCOPE OF THE DESIGN, IT IS STRONGLY RECOMMENDED THAT THE APPROPRIATE DATA COLLECTION AND FIELD INVESTIGATION BE COMPLETED PRIOR TO PROCEEDING WITH DESIGN. ALTERNATIVELY, WHERE FEASIBLE, DATA COLLECTION SHOULD BE INCLUDED IN THE PROJECT SCOPE AND INTEGRATED INTO THE DESIGN PROCESS.

FLOW PROJECTIONS

To determine infrastructure capacity needs



EXISTING FLOWS

DRY WEATHER FLOW

Daily flow from historic dry day data
- Average flows
- Minimum flows
- Maximum flows
- Peaking factor

WET WEATHER FLOW

Peak dry weather flow

+

The lesser of
- 0.4 L/s/ha extraneous flow design allowance for existing serviced areas
- 5-year design storm flows*

**Using combination of modelled flows and projected flows from monitoring records*
**Local municipalities may be using different criteria and/or level of service*

FUTURE FLOWS

For 30-year planning horizon and 30-year service catchment

DESIGN FLOW

Existing peak wet weather flow

+

Growth Peak Dry Weather Flow
- Residential, 255 L/c/d
- Employment, 310 L/c/d
- Harmon's peaking factor for total upstream population

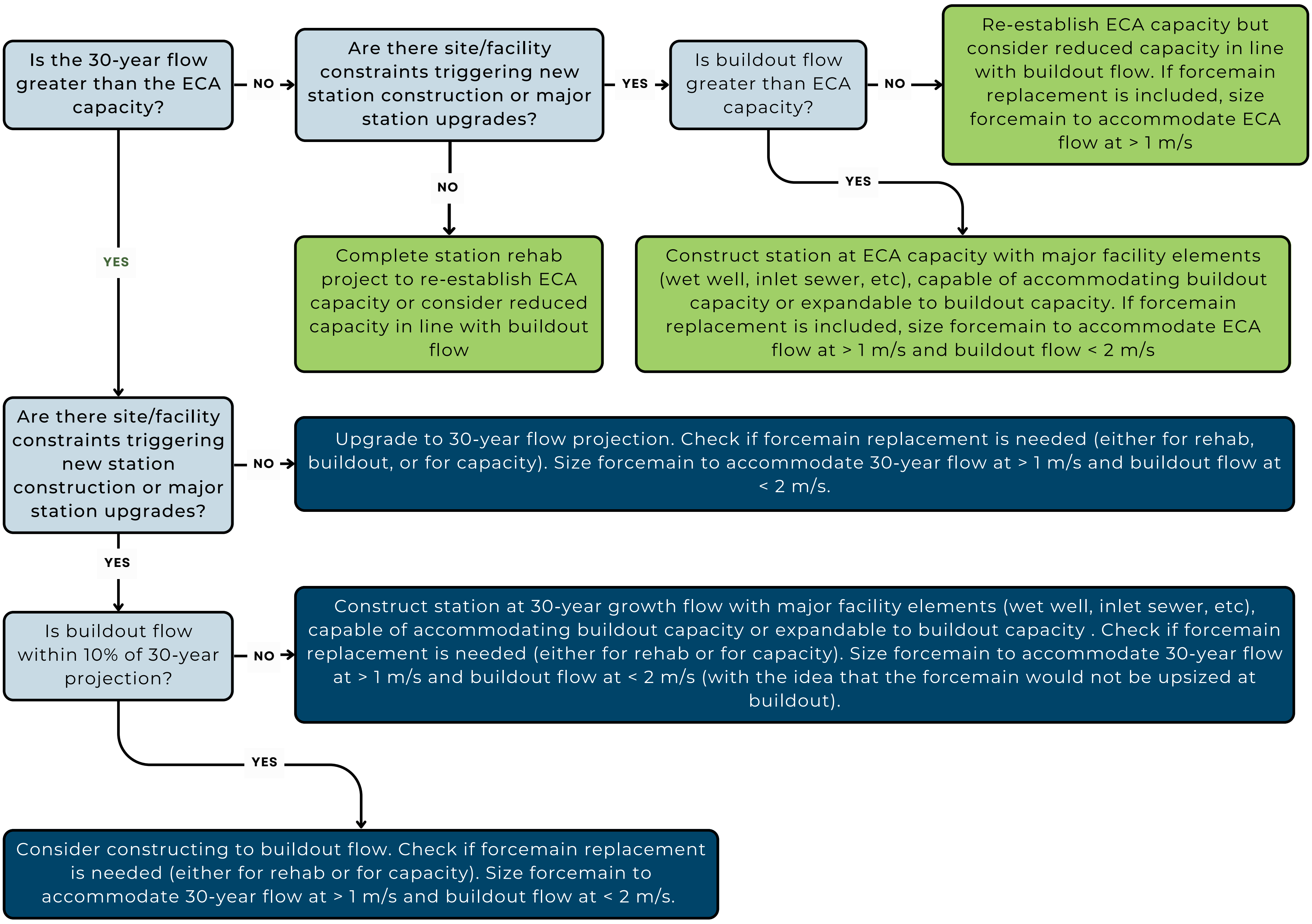
+

Extraneous Flow Design Allowance
- New serviced area, 0.286 L/s/ha

The design criteria presented in this document are based on the 2021 Master Servicing Plan Update Study

BluePlan ENGINEERING

SEWAGE PUMPING STATIONS



Is the 30-year flow greater than the ECA capacity?

NO

Are there site/facility constraints triggering new station construction or major station upgrades?

YES

Is buildout flow greater than ECA capacity?

NO

Re-establish ECA capacity but consider reduced capacity in line with buildout flow. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s

YES

Construct station at ECA capacity with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity. If forcemain replacement is included, size forcemain to accommodate ECA flow at > 1 m/s and buildout flow < 2 m/s

NO

Complete station rehab project to re-establish ECA capacity or consider reduced capacity in line with buildout flow

YES

Are there site/facility constraints triggering new station construction or major station upgrades?

NO

Upgrade to 30-year flow projection. Check if forcemain replacement is needed (either for rehab, buildout, or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

YES

Is buildout flow within 10% of 30-year projection?

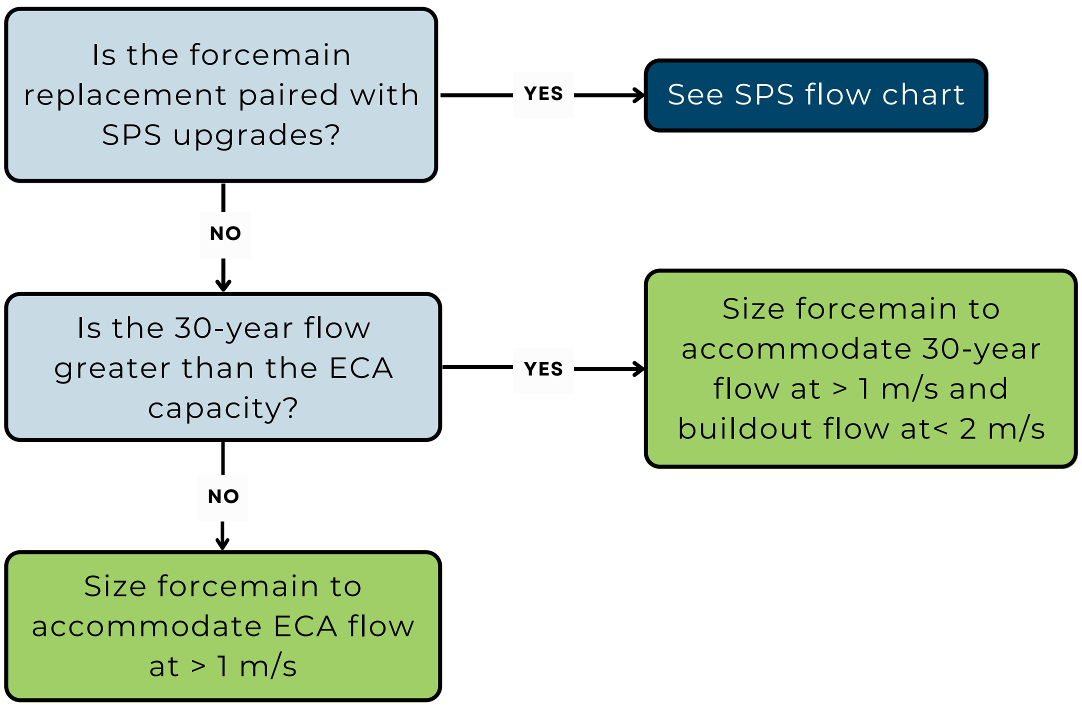
NO

Construct station at 30-year growth flow with major facility elements (wet well, inlet sewer, etc), capable of accommodating buildout capacity or expandable to buildout capacity . Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s (with the idea that the forcemain would not be upsized at buildout).

YES

Consider constructing to buildout flow. Check if forcemain replacement is needed (either for rehab or for capacity). Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at < 2 m/s.

FORCEMAINS



Is the forcemain replacement paired with SPS upgrades?

YES

See SPS flow chart

NO

Is the 30-year flow greater than the ECA capacity?

YES

Size forcemain to accommodate 30-year flow at > 1 m/s and buildout flow at< 2 m/s

NO

Size forcemain to accommodate ECA flow at > 1 m/s

K.8.6 Detailed Project Costing Sheets

The detailed project costing sheets for the recommended 2021 MSPU capital projects within the Welland WWTP system are presented below.

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-FM-003**
PROJECT NAME:	**Upgrade Foss Road SPS Forcemain**
PROJECT DESCRIPTION:	Replace existing 200 mm Foss Road SPS Forcemain with new single 250 mm forcemain in Welland.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Rural	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-FM-003**

Pump Station	**WW-SPS-011**	
ECA	27	0.55
Proposed	52	1.06
Buildout	56	1.14
Number of Pumps	2	1.06

PROPOSED DIAMETER:	250 mm	
TOTAL LENGTH:	5720 m	
Tunnelled		0%
Open Cut	5720 m	100%

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Forcemain

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	5720 m	$965	$5,518,109	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$1,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	0%					$0	
Minor Creek Crossings			ea.	12	$31,000	$372,000	
Major Creek Crossings			ea.	0	$200,000	$0	
Road Crossings			ea.	1	$83,000	$83,000	Rail
Major Road Crossings (Highway)			ea.	0	$200,000	$0	
Utility Crossings			ea.	0	$83,000	$0	
Updated Soils Regulation Uplift	2%					$110,362	
Additional Construction Costs	10%		ea.			$608,347	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$669,182	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$7,361,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$73,600	
Geotechnical Sub-Total Cost						**$73,600**	
Property Requirements	1.0%					$ 73,600	
Property Requirements Sub-Total						**$73,600**	
Consultant Engineering/Design	15%					$ 1,104,200	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$1,104,200**	
In House Labour/Engineering/Wages/CA	3.0%					$ 220,830	
In-house Labour/Wages Sub-Total						**$220,830**	
Project Contingency	10%					$883,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$883,000**	
Non-Refundable HST	1.76%					$167,100	
Non-Refundable HST Sub-Total						**$167,100**	
Total (2022 Dollars)						**$9,883,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$9,883,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$197,660		
Design	Design fees, Town fees for design, contract admin	13%	$1,284,790		
Construction	Town fees, base costs and project contingency	85%	$8,400,550		
TOTAL			**$9,883,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-FM-022**
PROJECT NAME: **Commission 600 mm Towpath Road Forcemain**
PROJECT DESCRIPTION: Bring constructed 600 mm Towpath SPS forcemain into service

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Rural	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-FM-022**

Pump Station	**WW-SPS-037**	
ECA	150	0.53
Proposed	600	2.12
Buildout	494	1.75
Number of Pumps	3	1.06

PROPOSED DIAMETER:	600 mm	
TOTAL LENGTH:	0 m	
Tunnelled		
Open Cut	0 m	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Forcemain

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	0 m	$1,433	$0	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$6,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	0%					$0	
Minor Creek Crossings			ea.	0	$261,000	$0	
Major Creek Crossings			ea.	0	$1,080,000	$0	Crossing already constructed
Road Crossings			ea.	0	$513,000	$0	
Major Road Crossings (Highway)			ea.	0	$1,080,000	$0	
Utility Crossings			ea.	0	$513,000	$0	
Updated Soils Regulation Uplift	2%					$0	
Additional Construction Costs	10%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	1.0%					$0	
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%					$ -	
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ -	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$0**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	10%					$4,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$4,000**	
Non-Refundable HST	1.76%					$100	
Non-Refundable HST Sub-Total						**$100**	
Total (2022 Dollars)						**$44,000**	Rounded to nearest $1,000
Other Estimate						**$250,000**	Override estimate
Chosen Estimate						**$250,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$5,000		
Design	Design fees, Town fees for design, contract admin	13%	$32,500		
Construction	Town fees, base costs and project contingency	85%	$212,500		
TOTAL			**$250,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SS-002**
PROJECT NAME: **Quaker Road Trunk Sewer**
PROJECT DESCRIPTION: New 600 mm trunk sewer on Quaker Rd. between Pelham Street trunk and Rice Road trunk sewers.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SS-002**

PROPOSED DIAMETER:	600 mm	
TOTAL LENGTH:	1250 m	
Tunnelled		0%
Open Cut	1250 m	100%

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Sewer 5m

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Pipe Construction - Open Cut			m	1250 m	$1,133	$1,416,207	Existing road ROW
Pipe Construction - Tunneling			m	0 m	$6,300	$0	
Pipe Construction Uplift (Based on Area Conditions)	20%					$283,241	
Minor Creek Crossings			ea.	0	$196,000	$0	
Major Creek Crossings			ea.	0	$1,015,000	$0	
Road Crossings			ea.	0	$448,000	$0	
Major Road Crossings (Highway)			ea.	0	$1,015,000	$0	
Utility Crossings			ea.	0	$448,000	$0	
Updated Soils Regulation Uplift	2%					$28,324	
Additional Construction Costs	15%		ea.			$259,166	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$198,694	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$2,186,000**	
Geotechnical / Hydrogeological / Materials	1.0%					$21,900	
Geotechnical Sub-Total Cost						**$21,900**	
Property Requirements	1.5%					$ 32,800	
Property Requirements Sub-Total						**$32,800**	
Consultant Engineering/Design	15%					$ 327,900	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$327,900**	
In House Labour/Engineering/Wages/CA	4.0%					$ 87,440	
In-house Labour/Wages Sub-Total						**$87,440**	
Project Contingency	15%					$398,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$398,000**	
Non-Refundable HST	1.76%					$52,200	
Non-Refundable HST Sub-Total						**$52,200**	
Total (2022 Dollars)						**$3,106,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$3,106,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$62,120		
Design	Design fees, Town fees for design, contract admin	13%	$403,780		
Construction	Town fees, base costs and project contingency	85%	$2,640,100		
TOTAL			**$3,106,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PL
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-II-017**
PROJECT NAME:	**Region Wide Wet weather Reduction**
PROJECT DESCRIPTION:	Wet weather reduction program in all systems to be executed from 2022-2051

Old ID		**Focus Areas**	Amount
_WW-II-001	Anger Ave WWTP	Lakeshore Road, Catharine Street, Dominion Road, Rose Avenue SPS, Anger Ave WWTP Catchments	
_WW-II-002	Crystal Beach WWTP	Nigh Road SPS and Crystal Beach WWTP Catchments	
_WW-II-003	Stevensville Douglastown	Stevensville, Douglastown catchments	
_WW-II-004	Welland WWTP	Feeder Road, Seaway Heights, Ontario Road SPS, Dain City, and Welland WWTP Catchments	
_WW-II-005	Baker - Grimsby	Woodsview, Biggar Lagoon, Old Orchard SPS Catchments	
_WW-II-006	Baker - Lincoln Beamsville	Ontario Street SPS Catchment	
_WW-II-007	Baker - Lincoln Vineland	Wet weather reduction in Jordan Valley***	
_WW-II-008	Port Dalhousie	Eastchester, Lakeside, Argyle, Renown SPS and Port Dalhousie WWTP Catchments	
_WW-II-009	Port Weller/Port Dalhousie	Wet weather reduction in North Thorold	
_WW-II-010	Port Weller	Haulage Road, Carlton Street SPS, and Port Weller WWTP Catchments	
_WW-II-011	Seaway WWTP	Union, Clarke Street, Arena, Elm Street, City Hall, Sugarloaf, Rosemount North and South SPS Catchments	
_WW-II-012	Niagara Falls WWTP	Central, Muddy Run, Seneca, Meadowvale, Drummond, Kalar Road SPS Catchments	
_WW-II-013	South Niagara Falls WWTP	South Side High Lift and South Side Low Lift SPS Catchments	
_WW-II-014	NOTL	Wet weather reduction in Northeast Niagara-on-the-Lake	
_WW-II-015	NOTL	Wet weather reduction in Virgil - NOTL	
_WW-II-016	Baker - West Lincoln	Wet weather reduction in West Lincoln - Baker	

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-011**

PROJECT NAME: **Foss Road SPS Upgrade**

PROJECT DESCRIPTION: Increase station capacity from 25 L/s to 50 L/s ECA capacity by replacing the existing two pumps.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	High	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	50%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-011**

	L/s
ECA	27.0
Operational Firm (2021)	24.0

PROPOSED CAPACITY		52 L/s	Firm Capacity
Design PWWF	**Existing**	58 L/s	18 L/s
	2051	92 L/s	52 L/s
	Buildout	99 L/s	56 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)*
1	27	52 L/s
2	27	52 L/s
3		

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	28 L/s	$27,983	$1,000,000	$500k per pump, replace 2 existing pumps
Related Upgrades	30%					$300,000	
Bypass Pumping Allowance	7%					$91,000	
Additional Construction Costs	20%		ea.			$278,200	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$166,920	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$1,836,000**	
Geotechnical / Hydrogeological / Materials	2.0%					$ -	
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%					$ -	
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 275,400	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$275,400**	
In House Labour/Engineering/Wages/CA	4.0%					$ 73,440	
In-house Labour/Wages Sub-Total						**$73,440**	
Project Contingency	25%					$546,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$546,000**	
Non-Refundable HST	1.76%					$46,800	
Non-Refundable HST Sub-Total						**$46,800**	
Total (2022 Dollars)						**$2,778,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$2,778,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$55,560		
Design	Design fees, Town fees for design, contract admin	13%	$361,140		
Construction	Town fees, base costs and project contingency	85%	$2,361,300		
TOTAL			**$2,778,000**		

PROJECT NO.: WW-SPS-037

PROJECT NAME: Towpath SPS Upgrade

PROJECT DESCRIPTION: Increase station capacity from 118 L/s to 600 L/s. Scope includes pump upgrades and one additional pump.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: WW-SPS-037

	L/s
ECA	150.0
Operational	117.9

PROPOSED CAPACITY		600 L/s	Firm Capacity	With Quaker Road	
Design PWWF	**Existing**	145 L/s	218 L/s	245 L/s	
	2051	439 L/s	512 L/s	539 L/s	
	Buildout	494 L/s	851 L/s	594 L/s	
		RDII	5Y Design	RDII	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	150	300.0
2	150	300.0
3	NA	300.0

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s			$2,700,000	$900k per pump, replace two existing pumps and add one pump
Related Upgrades	30%					$810,000	
Bypass Pumping Allowance	6%					$193,050	
Additional Construction Costs	15%		ea.			$555,458	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$425,851	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$4,684,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 702,600	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$702,600**	
In House Labour/Engineering/Wages/CA	4.0%					$ 187,360	
In-house Labour/Wages Sub-Total						**$187,360**	
Project Contingency	15%					$836,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$836,000**	
Non-Refundable HST	1.76%					$109,500	
Non-Refundable HST Sub-Total						**$109,500**	
Total (2022 Dollars)						**$6,519,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$6,519,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$130,380		
Design	Design fees, Town fees for design, contract admin	13%	$847,470		
Construction	Town fees, base costs and project contingency	85%	$5,541,150		
TOTAL			**$6,519,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-SPS-038**

PROJECT NAME: **Hurricane Road SPS Pump Replacement**

PROJECT DESCRIPTION: Increase station capacity from 39 L/s to 67 L/s by replacing existing two pumps.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-038**

	L/s
ECA	39.4
Operational	29.0

PROPOSED CAPACITY		67 L/s	Firm Capacity
Design PWWF	**Existing**	49 L/s	62 L/s
	2051	63 L/s	76 L/s
	Buildout	67 L/s	75 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	39	67
2	39	67

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s			$1,000,000	$500k per pump, replace 2 existing pumps
Related Upgrades	30%					$300,000	
Bypass Pumping Allowance	6%					$71,500	
Additional Construction Costs	15%		ea.			$205,725	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$157,723	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$1,735,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 260,300	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$260,300**	
In House Labour/Engineering/Wages/CA	4.0%					$ 69,400	
In-house Labour/Wages Sub-Total						**$69,400**	
Project Contingency	15%					$310,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$310,000**	
Non-Refundable HST	1.76%					$40,600	
Non-Refundable HST Sub-Total						**$40,600**	
Total (2022 Dollars)						**$2,415,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$2,415,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$48,300		
Design	Design fees, Town fees for design, contract admin	13%	$313,950		
Construction	Town fees, base costs and project contingency	85%	$2,052,750		
TOTAL			**$2,415,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-SPS-049**
PROJECT NAME:	**Dain City SPS Pump Replacement**
PROJECT DESCRIPTION:	Increase station capacity from 90 L/s to 164 L/s by replacing existing three pumps.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Suburban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-SPS-049**

	L/s
ECA	115.0
Operational	90.0

PROPOSED CAPACITY		164 L/s	Firm capacity
Design PWWF	**Existing**	39 L/s	170 L/s
	2051	147 L/s	278 L/s
	Buildout	164 L/s	408 L/s
		RDII	**5Y Design**

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

Pump	Existing (L/s)	Future (L/s)
1	45	82.0
2	45	82.0
3	45	82.0

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			L/s	164 L/s	$15,816	$1,800,000	$600k per pump, replace existing 3 pumps
Related Upgrades	30%					$540,000	
Bypass Pumping Allowance	6%					$128,700	
Additional Construction Costs	15%		ea.			$370,305	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$283,901	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$3,123,000**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	5.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ 468,500	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$468,500**	
In House Labour/Engineering/Wages/CA	4.0%					$ 124,920	
In-house Labour/Wages Sub-Total						**$124,920**	
Project Contingency	15%					$557,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$557,000**	
Non-Refundable HST	1.76%					$73,000	
Non-Refundable HST Sub-Total						**$73,000**	
Total (2022 Dollars)						**$4,346,000**	Rounded to nearest $1,000
Other Estimate							
Chosen Estimate						**$4,346,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$86,920		
Design	Design fees, Town fees for design, contract admin	13%	$564,980		
Construction	Town fees, base costs and project contingency	85%	$3,694,100		
TOTAL			**$4,346,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-TP-005**
PROJECT NAME: **Region-wide WWTP Process Upgrades**
PROJECT DESCRIPTION: Process upgrades to re-establish ECA capacity

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$50,000,000**	Placeholder Costs
Chosen Estimate						**$50,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$1,000,000		
Design	Design fees, Town fees for design, contract admin	13%	$6,500,000		
Construction	Town fees, base costs and project contingency	85%	$42,500,000		
TOTAL			**$50,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.: **WW-TP-005**

PROJECT NAME: **Region-wide WWTP Process Upgrades**

PROJECT DESCRIPTION: Upgrades for odour control across the Region at forcemains, pump stations, and other locations.

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Med	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	40%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-TP-005**

PROPOSED CAPACITY	NA

CLASS EA REQUIREMENTS:	
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction			MLD	NA	$2,500,000	#VALUE!	
Additional Construction Costs	15%		ea.			#VALUE!	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			#VALUE!	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**#VALUE!**	
Geotechnical / Hydrogeological / Materials	1.0%					#VALUE!	
Geotechnical Sub-Total Cost						**#VALUE!**	
Property Requirements	1.5%					#VALUE!	
Property Requirements Sub-Total						**#VALUE!**	
Consultant Engineering/Design	#VALUE!					#VALUE!	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**#VALUE!**	
In House Labour/Engineering/Wages/CA	#VALUE!					#VALUE!	
In-house Labour/Wages Sub-Total						**#VALUE!**	
Project Contingency	15%					#VALUE!	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**#VALUE!**	
Non-Refundable HST	1.76%					#VALUE!	
Non-Refundable HST Sub-Total						**#VALUE!**	
Total (2022 Dollars)						**#VALUE!**	Rounded to nearest $1,000
Other Estimate						**$40,000,000**	Placeholder Costs
Chosen Estimate						**$40,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$800,000		
Design	Design fees, Town fees for design, contract admin	13%	$5,200,000		
Construction	Town fees, base costs and project contingency	85%	$34,000,000		
TOTAL			**$40,000,000**		

NIAGARA REGION
WATER AND WASTEWATER MASTER SERVICING PLAN
PROJECT TRACKING AND COSTING SHEET

PROJECT NO.:	**WW-ST-001**
PROJECT NAME:	**Region Wide Flow Monitoring and Data Collection**
PROJECT DESCRIPTION:	Funding to support flow monitoring and data collection initiatives

Class Estimate Type:	Class 4	Class adjusts Construction Contingency and expected accuracy
Project Complexity	Low	Complexity adjusts Construction Contingency, and expected accuracy
Accuracy Range:	30%	
Area Condition:	Urban	Area Condition uplifts unit cost and restoration

PROJECT NO.: **WW-ST-001**

PROPOSED CAPACITY	

CLASS EA REQUIREMENTS:	A+
CONSTRUCTION ASSUMPTION:	Other

COST ESTIMATION SPREADSHEET

COMPONENT	RATE (%)	RATE ($)	UNIT	ESTIMATED QUANTITY	COST PER UNIT	SUB-TOTAL	COMMENTS
Construction Cost							
Facility Construction							
Additional Construction Costs	10%		ea.			$0	Includes Mod/Demob,connections, inspection, hydrants, signage, traffic management, bonding, insurance
Provisional & Allowance	10%		ea.			$0	Provisional Labour and Materials in addition to base construction cost
Sub-Total Construction Base Costs						**$0**	
Geotechnical / Hydrogeological / Materials	1.0%						
Geotechnical Sub-Total Cost						**$0**	
Property Requirements	1.0%						
Property Requirements Sub-Total						**$0**	
Consultant Engineering/Design	15%					$ -	includes planning, pre-design, detailed design, training, CA, commissioning
Engineering/Design Sub-Total						**$0**	
In House Labour/Engineering/Wages/CA	4.0%					$ 40,000	
In-house Labour/Wages Sub-Total						**$40,000**	
Project Contingency	10%					$4,000	Construction Contingency is dependent on Cost Estimate Class and Project Complexity
Project Contingency Sub-Total						**$4,000**	
Non-Refundable HST	1.76%					$100	
Non-Refundable HST Sub-Total						**$100**	
Total (2022 Dollars)						**$44,000**	Rounded to nearest $1,000
Other Estimate						**$12,000,000**	Assumes 400k/year for 30 y
Chosen Estimate						**$12,000,000**	**2022 Estimate**

COST ESTIMATE SUMMARY - FOR PHASING ESTIMATING ONLY

PROJECT COMPONENT	PROJECT COMPONENT DESCRIPTION	PERCENTAGE	TOTAL	YEAR	COMMENTS
Study	Feasibility study, EA	2%	$240,000		
Design	Design fees, Town fees for design, contract admin	13%	$1,560,000		
Construction	Town fees, base costs and project contingency	85%	$10,200,000		
TOTAL			**$12,000,000**		