

GEI Consultants



Existing Conditions Report

Northwest Secondary Plan Area

City of Niagara Falls, Ontario

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Project No. 2402620



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Acronyms and Abbreviations

Acronym / Abbreviation	Definition
ADD	Average Daily Demand
ADF	Average Daily Flow
BDSC	Beaver Dam Schiner's Creek
CNF	City of Niagara Falls
DC	Development Charge
EA	Environmental Assessment
ECA	Environmental Conservation Area
ET	Elevated Tank
FF	Fire Flow
FSS	Functional Servicing Study
GGH	Greater Golden Horseshoe
ha	hectare
km	kilometre
l/c/d	Litres per Capita per Day
L/s	Litres per Second
m/s	Metre per Second
masl	meters above sea level
MCR	Municipal Comprehensive Review
MDD	Maximum Day Demand
MSP	Master Servicing Plan
MSPU	Master Servicing Plan Update
NPCA	Niagara Peninsula Conservation Authority
NOTL	Niagara-on-the-Lake
NWSPA	Northwest Secondary Plan Area
OP	Official Plan
PDWF	Peak Dry Weather Flow
PHD	Peak Hour Demand
PPH	Persons per Hectare
PSI	Pounds per Square Inch
PSW	Provincially Significant Wetland
PWWF	Peak Wet Weather Flow
SNFWWS	South Niagara Falls Wastewater Solutions
SPS	Sanitary Pumping Station
SWM	Stormwater Management
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

1. Introduction

The City of Niagara Falls (CNF) is a lower-tier municipality located in southwestern Ontario within Niagara Region. The CNF is located on the Canadian border with the state of New York and is located north of Stevensville, east of Welland and Thorold, southeast of St. Catherines, and south of Niagara-on-the-Lake (NOTL). The CNF is located in the Greater Golden Horseshoe (GGH) which is one of the fastest growing regions in North America. The CNF is anticipated to experience population growth over the next 30 years and the Northwest Secondary Plan Area (NWSPA) was identified as an urban expansion area through the completion of a Municipal Comprehensive Review (MCR) and new Official Plan (OP) by the CNF.

GEI Consultants Canada Ltd. has been retained to complete the Functional Servicing Study (FSS) in support of the Northwest Secondary Plan. The FSS will include the following components:

- Phase 1: Existing Conditions Report
- Phase 2: Land Use Options Assessment
- Phase 3: Preferred Land Use Plan (Functional Servicing Study)

The Existing Conditions Report is being completed to summarize the existing conditions within and adjacent to the Study Area; specifically physical constraints to servicing, relevant design criteria, existing water, wastewater, and stormwater infrastructure, hydraulic modelling of the existing system, and recommendations for Phase 2. The goal of Phase 1 is to gain an understanding of the current infrastructure's capacity and identify any physical constraints that could pose an issue with providing servicing to the proposed population growth within the NWSPA.

1.1. Study Area

The NWSPA is approximately 101 hectares (ha) with an estimated 70 ha of net developable land, generally bound by Mountain Road to the north, Montrose Road to the east, a Hydro One corridor to the south, and Kalar Road to the west. The QEW runs north to south, east of the Study Area. The Study Area is located entirely within the CNF's urban boundary and currently contains agricultural, commercial, and rural residential uses, along with several environmental features. The Study Area is show in **Figure 1-1**.

1.2. Report Objectives

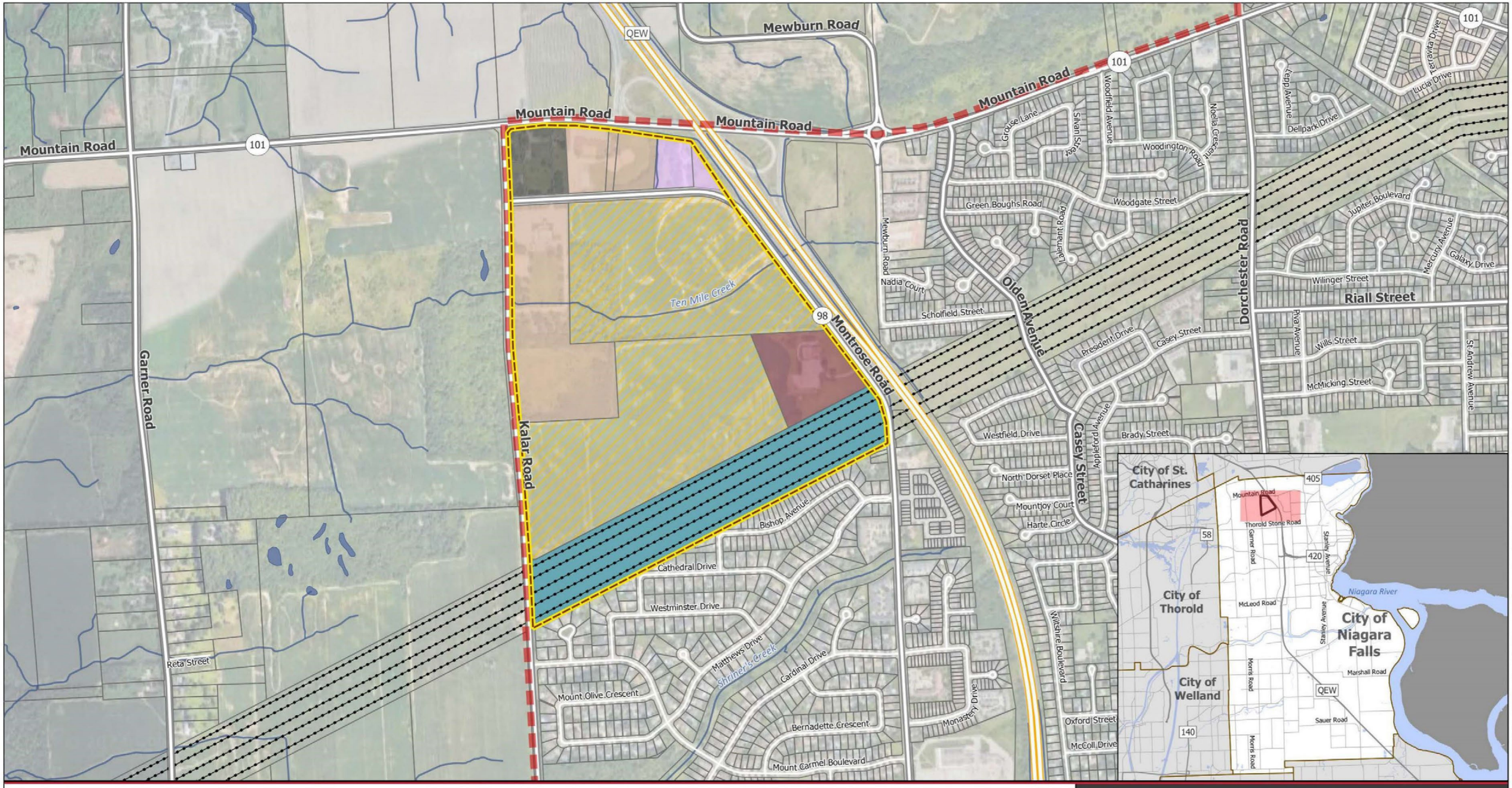
The following objectives have been defined to guide the completion of the Existing Conditions Report:

1. Summarize existing water and wastewater systems, including key network topology, major facilities and any currently known constraints.

2. Review both the City and Region of Niagara's policies and standards associated with water and wastewater services to identify key requirements for future development within the NWSPA.

3. Summarize planned improvements to the existing systems, triggered by existing constraints or by future growth demands.

4. Provide high-level commentary on opportunities and constraints that may impact overall development as well as opportunities for phased development.



Northwest Secondary Plan Area
Hydro Line
Parcel
Urban Area Boundary
Municipal Boundary
Waterbody, Watercourse

Major Land Use

Agriculture
Church
Hotel/Mobile Park
Private
Event/Recreation Complex
Hydro One Corridor

N

Reference(s)
1. Projection EPSG:26917
2. Base Data: City of Niagara Falls, 2024; Google Satellite, 2024

0 250 500 m

Figure 1-1
Map Title: Study Area

Project Name:
Northwest Secondary Plan Area Functional Servicing Study

Client Name:
City of Niagara Falls (Ontario, Canada)

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2. Physical Constraints to Study Area

Identifying physical constraints to servicing the Study Area is a key component of Phase 1. These physical constraints can include topographical challenges, sensitive environmental areas, geotechnical conditions, and/or factors that could limit access to servicing. The following sub-sections will identify various physical and natural environmental constraints specific to the NWSPA, along with the assumptions carried for each constraint.

2.1. Topography

Topography refers to the physical features of the Earth's surface, including its elevation, slope, and landforms such as depressions or mounds. It dictates drainage patterns within the Study Area and is an important factor to consider for infrastructure development.

A review of the topography within and adjacent to the Northwest Study Area was completed and it was found that the land surface elevations within the Study Area ranges from 184 meters above sea level (masl) to 196 masl. The surface elevation is approximately 196 masl where the Hydro One corridor meets Montrose Road in the southeast corner of the NWSPA and the surface grade falls quickly to level out in the range of 184 – 185 masl adjacent to the tributary of Ten Mile Creek that flows through the NWSPA. The creek flows east to west with the low point of the NWSPA being at the west limits of the site where the creek crosses Kalar Road. Moving northward, there is a gradual increase in elevation, with heights ranging from 185 masl to 187 masl for the properties fronting Mountain Road at the north limits of the NWSPA. The topography of the NWSPA is detailed in**Figure 2-1**.

Study Area
Parcel
Waterbody, Watercourse
Major Overland Flow Route

5m Contour
1m Contour
5m Digital Elevation Model
200m
180m

Reference(s)
1. Projection EPSG:26917
2. Base Data: City of Niagara Falls, 2024; Google Satellite, 2024

0 250 500 m

Figure 2-1
Map Title: Local Topography

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2.2. Subwatershed Analysis

A watershed, also referred to as a catchment basin, is an area of land from which surface runoff (water, sediments, nutrients, and contaminants) drain into a common water body or watercourse. Watersheds include all of the water and water-dependent features such as wetlands, forests, urban areas, and agricultural areas.

The CNF lies within the South Niagara Falls watershed. It is an important watershed on the Niagara Peninsula because it is primarily agricultural and is not located within the Greenbelt Plan area. This watershed is also located in the Niagara River Area of Concern, meaning it has been determined that the aquatic environment has been severely affected.

A subwatershed refers to a smaller geographical area within a larger watershed, delineated by natural drainage patterns where runoff converges to a common outlet, such as a stream or river. By analyzing and incorporating the subwatershed data into the Secondary Plan process, the CNF can minimize environmental impacts and promote responsible land use practices within the NWSPA.

A subwatershed analysis is being completed by Aquafor Beech in support of the Secondary Plan, in parallel with the Functional Servicing Study (FSS). The subwatershed analysis will complete in-depth investigations of the terrestrial habitat, fish habitat, water resources, fluvial geomorphology, and hydrogeology of the NWSPA and surrounding areas. Four seasons of monitoring and field surveys must be completed to support the recommendations of the subwatershed study so information from the subwatershed study will be incorporated into the FSS as it becomes available.

For the purposes of the FSS, the results of the subwatershed study will refine the high-level desktop analysis completed within this report to identify constraints related to terrestrial habitat, fish habitat, water resources, fluvial geomorphology, and hydrogeology. For example, The Niagara Peninsula Conservation Authority (NPCA) has mapped the location of known Provincially Significant Wetlands (PSWs) within its jurisdiction which will be overlaid onto the NWSPA mapping. These areas will be identified as a constraint to development and/or servicing and therefore water, wastewater, and stormwater servicing will not be proposed within these areas. The subwatershed study will refine the limits of these constraining features through the monitoring and field surveys and any updates to the location or sizing of constraining features will be reflected in the location of proposed servicing infrastructure.

The majority of the NWSPA is located in the Beaver Dam Schiner's Creek (BDSC) Ten Mile Creek subwatershed. A small portion of the properties fronting Mountain Road, near Kalar Road, are located in the BDSC Six Mile Creek subwatershed and a small portion of the Hydro One Corridor at the southeast corner of the Study Area is located in the BDSC Shriners Creek.

As shown in **Figure 2-4**, there are several key environmental features that must be considered for infrastructure planning purposes. The NWSPA includes a NPCA-regulated watercourse (tributary to Ten Mile Creek) that flows east to west through the Study Area along with a second NPCA-regulated watercourse that flows north to south and discharges into this tributary. A third NPCA-regulated stream has been identified along the west lot line of 2600 Montrose Road. Several wooded area have been identified fronting Kalar Road, along with some areas of Significant Woodland. An Environmental

Conservation Area (ECA) has been identified, along with a Locally Significant Wetland, in line with the tributary to Ten Mile Creek. These environmental features will be further investigated as part of the subwatershed study by Aquafor Beech but for the purposes of the FSS, they will be considered constraints to servicing.

2.3. Stormwater Management Facilities

A desktop review of storm water management (SWM) facilities was completed by reviewing maps and background reports pertaining to the Study Area. No existing stormwater management facilities were identified within the Study Area.

2.4. Easements or Linkages

The south end of the Study Area features a Hydro One easement extending approximately 1.1km in length and spanning approximately 170 meters in width. This easement runs along the entire southern boundary of the Study Area.

During the desktop review, no significant ecological linkages were identified within the Study Area.

2.5. Transportation (Road and Rail) Networks

Kalar Road is located on the west limits of the NWSPA. This road is under the ownership of two entities: the CNF and Niagara Region. The CNF owns approximately 1200 metres of Kalar Road, from the Hydro One corridor to Montrose Road, while Niagara Region owns approximately 230 metres, from Montrose Road to Mountain Road. The right of way (ROW) width for Kalar Road is 26 metres.

Montrose Road follows the east limits of the NWSPA before running east-west through the NWSPA near the north boundary. Several properties are located between Montrose Road and Mountain Road which forms the north limit of the NWSPA. Montrose Road is owned by Niagara Region and has a ROW width of 26 metres.

Mountain Road is the north limit of the NWSPA and is owned by Niagara Region. The ROW width for Mountain Road is approximately 28 metres. Mountain Road has an on-ramp to the adjacent QEW which is a Provincially-owned highway with a varying ROW width. The QEW is located parallel to Montrose Road along the east limits of the NWSPA and will be a major transportation route for the Study Area.

In addition to the existing road network, there is a CN railway located approximately one kilometre north of the Study Area. The proximity of the railway is not anticipated to affect the servicing layout for this Secondary Plan.

2.6. Wellhead Protection Areas, Highly Vulnerable Aquifers, and Significant Groundwater Recharge Areas

A desktop review was completed to identify Wellhead Protection Areas, Highly Vulnerable Aquifers, and Significant Groundwater Recharge Areas with respect to potential impacts on the proposed servicing layout. It was found that the NWSPA is not located within these areas. Per Figure 3.6 from the CNF

Master Drainage Plan Update Study, the NWSPA is not located within an area classified as a Highly Vulnerable Aquifer or a Surface Water Intake Protection Zone.

2.7. Areas of Environmental Sensitivity

A high level desktop review was completed to identify Areas of Environmental Sensitivity within the NWSPA. It was found that a locally significant wetland, Significant Woodlands, Non-significant Woodlands, and an Environmental Conservation Area (ECA) are present.

A tributary to Ten Mile Creek extends through the NWSPA which has been deemed Important to fish habitat per Figure 3.4 from the CNF Master Drainage Plan Update Study. This tributary, along with another north-south tributary, the ECA, and Significant Woodlands are located within the regulation limits of the NPCA.

These Areas of Environmental Sensitivity will be avoided during the design of the proposed servicing layout and will be investigated in-depth and refined by the subwatershed consultant, Aquafor Beech.

2.8. Regulated Areas

A desktop review was completed to identify areas within the NWSPA that were regulated by the following:

- Niagara Peninsula Conservation Authority (NPCA)
- Provincial Natural Heritage System (NHS) or Greenbelt
- Niagara Escarpment
- Oak Ridges Moraine Conservation Plan

The NWSPA is not located within the Greenbelt, Niagara Escarpment, or the Oak Ridges Moraine Conservation Plan. Several areas of environmental sensitivity are located within the regulation limits of the NPCA as detailed in Section 2.7.

The NPCA-regulated areas will be avoided during the design of the proposed servicing layout and will be investigated in-depth and refined by the subwatershed consultant, Aquafor Beech.

2.9. Geotechnical Considerations

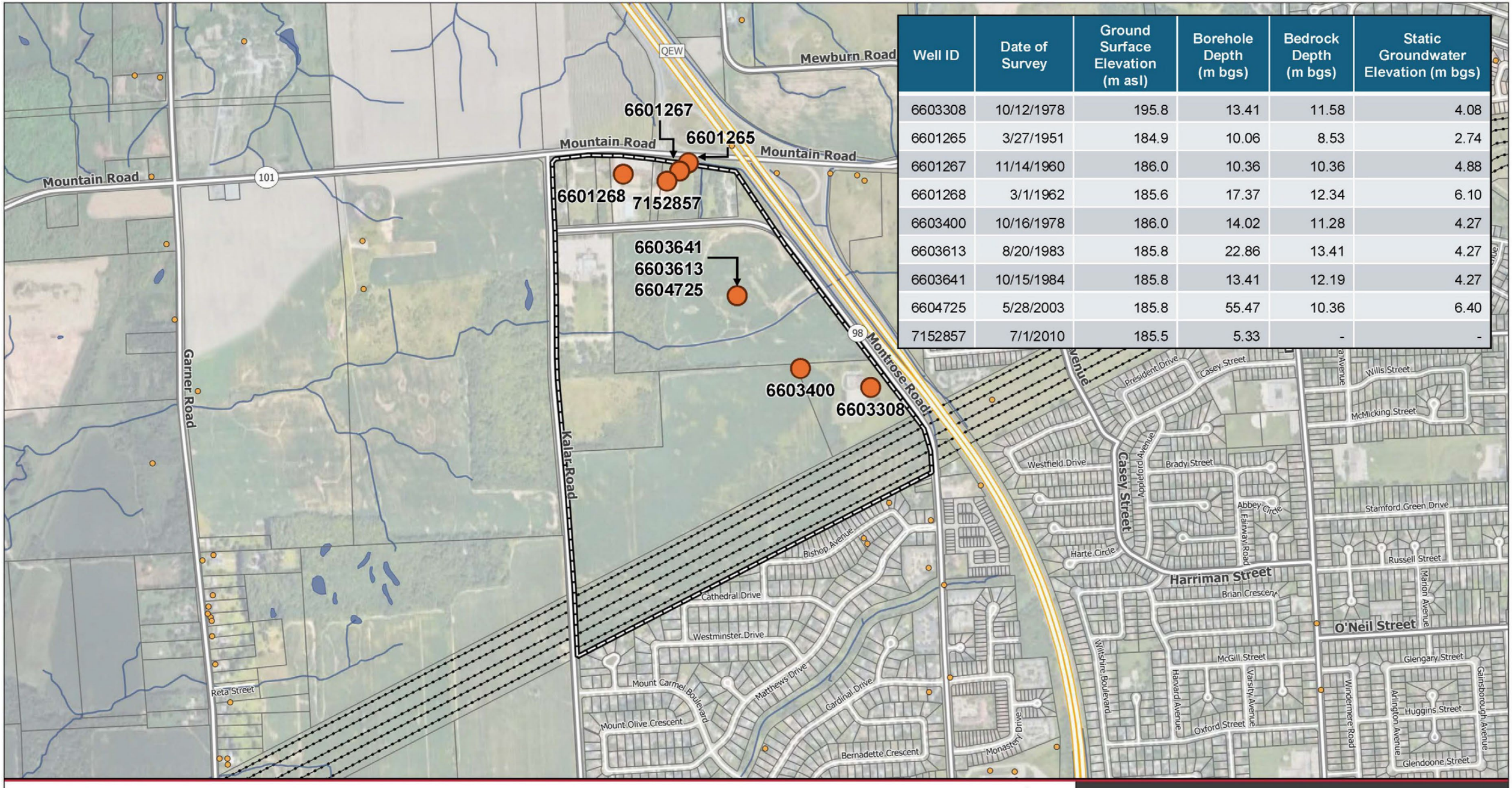
Borehole logs were reviewed from the Ontario Well Records and nine (9) monitoring wells (MWs) were identified within the NWSPA. The locations of the MWs is shown in **Figure 2-2** with a summary of geotechnical information related to the nine MWs provided in a table included on the figure. Four (4) of the MWs (Well IDs 6601268, 6604725, 6603400, and 6603308) were chosen within the NWSPA to create a historic geotechnical profile as shown in **Figure 2-3** which illustrates the surface elevations, depth of overburden & bedrock, and groundwater levels. The geotechnical information from these MWs is summarized in **Table 2-1.**

Table 2-1 Borehole Log Summary

Well ID	Top of Grade (masl)	Groundwater Level (masl)	Soil Conditions by Depth (m)	Bedrock Level (masl)
6601268	185.6	179.5	Hard Brown Clay: 0 – 3.0 Soft Brown Clay: 3.0 – 10.5 Soft Brown Clay & Stone: 10.5 – 12.3 Limestone Rock: 12.3 – 17.4	173.3
6604725	185.8	179.4	Brown Sand Loam: 0 – 1.8 Grey Clay: 1.8 – 8.8 Grey Clay Boulders: 8.8 – 10.4 Grey Limestone: 10.4 – 55.5	175.4
6603400	186.0	181.7	Brown Clay: 0 – 2.1 Red Clay Loam: 2.1 – 6.4 Red Sand + Clay: 6.4 – 9.1 Grey Clay + Gravel: 9.1 – 11.3 Grey Rock: 11.3 – 14.0	174.7
6603308	195.8	191.7	Brown Clay: 0 – 1.8 Red Sand + Clay: 1.8 – 7.6 Red Clay + Gravel: 7.6 – 11.6 Red Rock: 11.6 – 13.4	184.2

The borehole information is fairly consistent throughout the Study Area and indicates that silty clay is the predominant native soil condition, with bedrock being typically encountered between 11 to 12 metres below grade. The groundwater levels within the boreholes generally ranged from 4 to 6 metres below grade. This geotechnical information will be considered during the infrastructure planning stage as it can impact the practicality of constructing deep sewers or using certain infiltration practices for stormwater management.

Well ID	Date of Survey	Ground Surface Elevation (m asl)	Borehole Depth (m bgs)	Bedrock Depth (m bgs)	Static Groundwater Elevation (m bgs)
6603308	10/12/1978	195.8	13.41	11.58	4.08
6601265	3/27/1951	184.9	10.06	8.53	2.74
6601267	11/14/1960	186.0	10.36	10.36	4.88
6601268	3/1/1962	185.6	17.37	12.34	6.10
6603400	10/16/1978	186.0	14.02	11.28	4.27
6603613	8/20/1983	185.8	22.86	13.41	4.27
6603641	10/15/1984	185.8	13.41	12.19	4.27
6604725	5/28/2003	185.8	55.47	10.36	6.40
7152857	7/1/2010	185.5	5.33	-	-



- Study Area
- Historic Water Wells in Study Area
- Other Historic Water Well
- Hydro Line
- Parcel
- Municipal Boundary
- Waterbody, Watercourse

Reference(s)
1. Projection EPSG:26917
2. Base Data: City of Niagara Falls, 2024; Google Satellite, 2024

0 250 500 m

Figure 2-2
Map Title: Historic Borehole Logs in Study Area

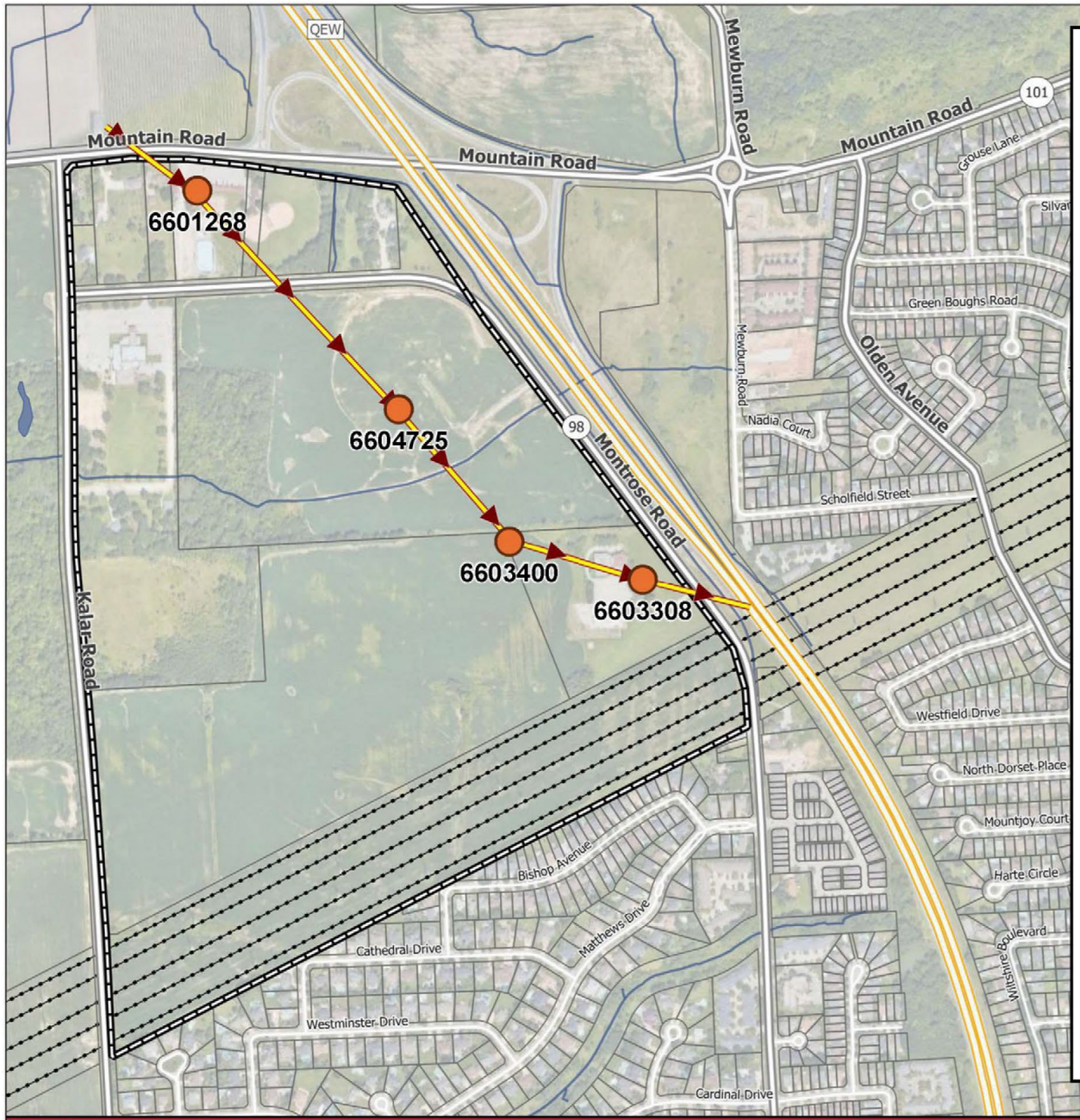
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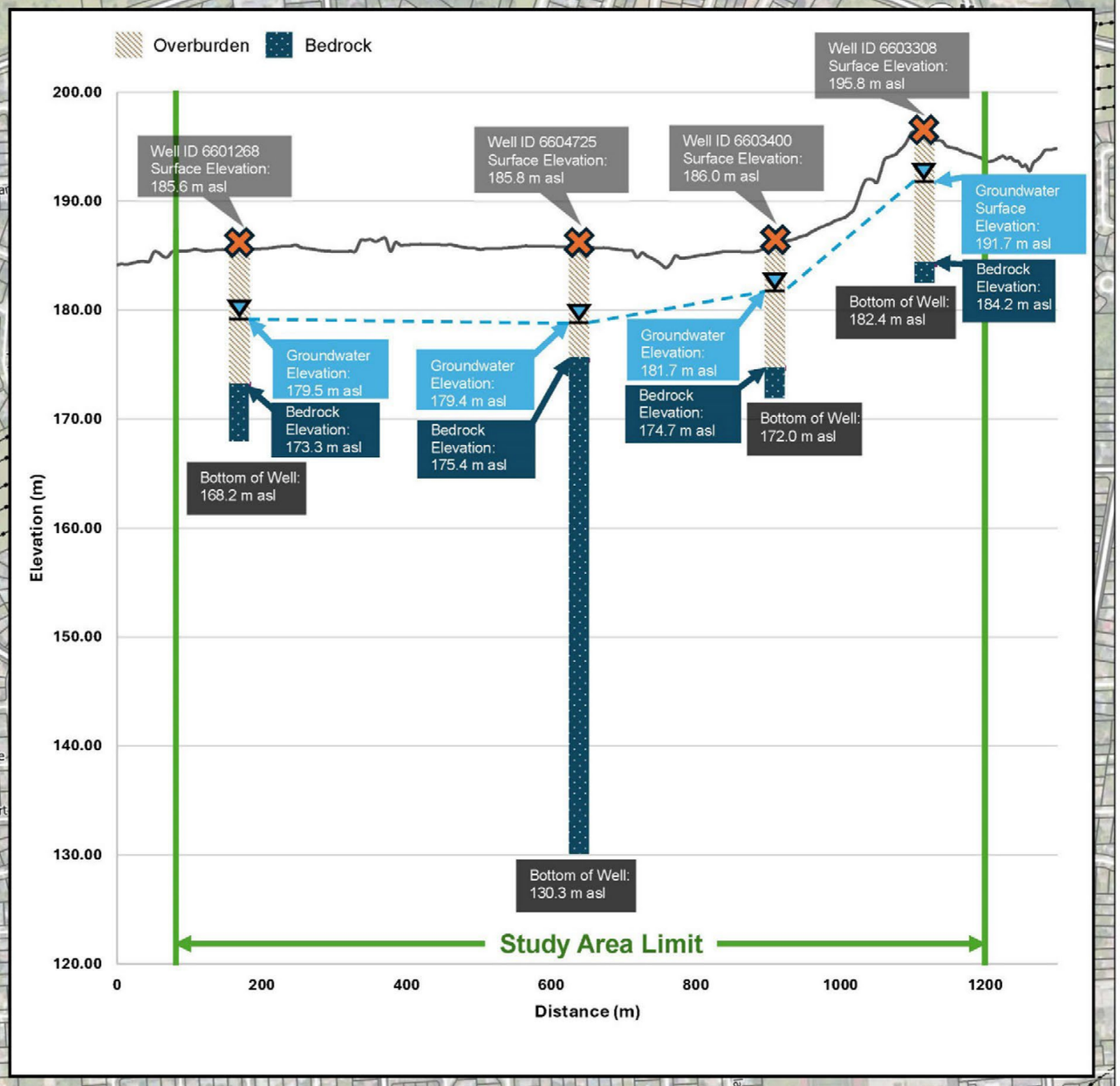
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Study Area
Historic Water Well
Hydro Line
Parcel
Municipal Boundary
Waterbody, Watercourse

Well ID	Date of Survey	Borehole Depth (m bgs)	Bedrock Depth (m bgs)	Static Groundwater Elevation (m bgs)
6601268	3/1/1962	168.2	173.3	179.5
6604725	5/28/2003	130.3	175.4	179.4
6603400	10/16/1978	172.0	174.7	181.7
6603308	10/12/1978	182.4	184.2	191.7

Reference(s)
1. Projection EPSG:26917
2. Base Data: City of Niagara Falls, 2024; Google Satellite, 2024

0 250 500 m

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Figure 2-3
Map Title: Borehole Log Profile in Study Area

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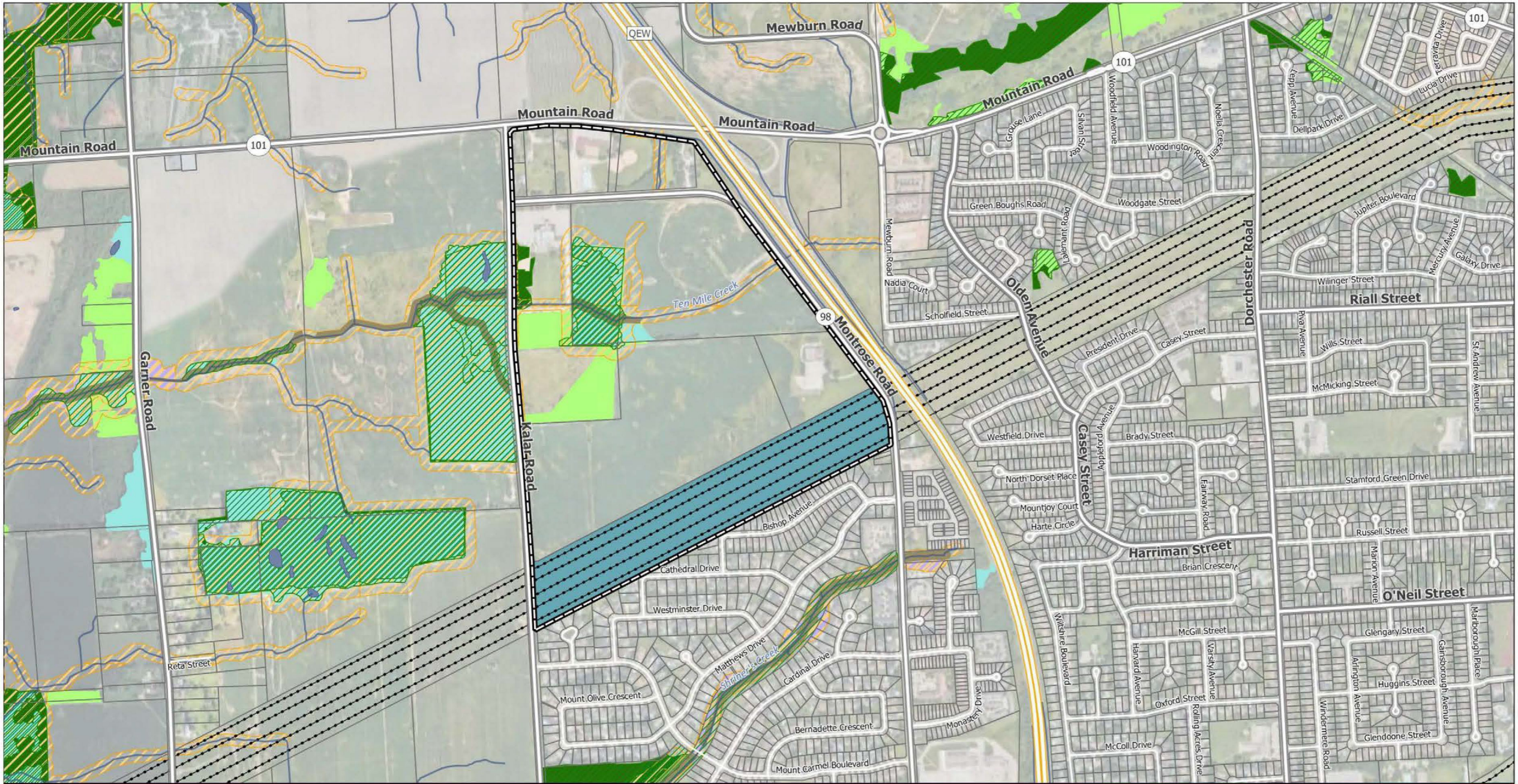
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2.10. Summary of Physical Constraints to Servicing

Through the desktop review completed of the potential physical constraints to servicing, several constraints were identified and are as follows:

- A NPCA-regulated watercourse (tributary to Ten Mile Creek) that flows east to west through the Study Area along with a second NPCA-regulated watercourse that flows north to south and discharges into this tributary. A third NPCA-regulated stream has been identified along the west lot line of 2600 Montrose Road;
- Several wooded area have been identified fronting Kalar Road, along with some areas of Significant Woodland;
- An Environmental Conservation Area (ECA) has been identified;
- A Locally Significant Wetland, in line with the tributary to Ten Mile Creek;
- A Hydro one easement spanning 170 metres in width and 1,100 metres in length that runs along the south limits of the NWSPA.
- Historic geotechnical records identify typical bedrock at 11 to 12 metres in depth, groundwater at 4 to 6 metres in depth, and silty clay as the predominant native soil condition.

The proposed servicing layout will avoid these constraints by minimizing crossings, maintaining appropriate setbacks per regulating bodies, and maintaining suitable depth of cover. This will ensure compliance with regulatory standards and preserve ecological integrity. **Figure 2-4** illustrates the identified physical constraints to servicing within the NWSPA.



Study Area
Hydro Line
Parcel
Hydro One Corridor

Natural Heritage Protections

Potential Natural Heritage Corridor
NPCA Approximate Regulation Lands
Environmental Conservation Area
Significant Woodland

Natural Heritage Feature

Shoreline Area
Other Woodlands
Other Evaluated Wetlands
Non-Provincially Significant Wetland
Waterbody, Watercourse

Reference(s)
1. Projection EPSG:26917
2. Base Data: City of Niagara Falls, 2024; Google Satellite, 2024

0 250 500 m

Figure 2-4
Map Title: Constraints Map

Project Name:
Northwest Secondary Plan Area Functional Servicing Study

Client Name:
City of Niagara Falls (Ontario, Canada)

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3. Servicing Design Criteria

3.1. Water

3.1.1. Treatment Plant

Treatment plants are designed to treat the maximum day demand. The following criteria were confirmed through the Region's Master Servicing Plan (MSP) to assess when water treatment plants require expansion, as agreed upon with the Region:

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

3.1.2. Pumping Station

Per the Region MSP, water pumping stations are sized to provide maximum day demands, assuming there is sufficient storage in the pressure zone. When sufficient storage in the pressure zone is not provided, the pumping requirement is:

- Peak hour demands when there is insufficient balancing storage; or,
- Maximum day demand plus equivalent fire storage deficit flow transfer.

The following criteria is used to assess when a pumping station requires expansion:

- When flows reach 80% of the facility's firm capacity, the planning process for station expansion should be flagged; and,
- When 90% of facility firm capacity has been reached, expansion should be completed.

3.1.3. Storage

The required water storage capacity for a pressure zone was estimated in the Region MSP using the standard MECP criteria (A + B + C):

- Fire storage volume (A) is calculated based on equivalent population in accordance with the MECP Guideline for the Design of Water Distribution System;
- Equalization storage volume (B) is 25% of the maximum day demand; and,
- Emergency storage volume (C) is 25% of the equalization volume plus fire storage (C = 25% of A+B).

3.1.4. Watermains

Per the Region's MSP, watermains are sized based on flow demands and pressure requirements, which include the following:

- Maintain local system pressure between 40 and 100 psi;
    - Preferred pressure range of 50 to 80 psi for Regional transmission mains (exceptions being watermains that feed at-grade facilities, such as in-ground reservoirs, where low-pressures are expected and cannot be increased).
- Pipe velocity and headloss in the system, including:
    - Target headloss of 2.5 m/km or less to reduce pumping costs; and,
    - Target velocity less than 2.0 m/s under normal operating conditions.
- Minimum fire flow target of 250 L/s at a residual pressure of 30 psi within Regional transmission mains which service local distribution watermains.

3.1.5. Flow Criteria, Performance, and Sizing Methodology (Region MSP)

Per the Region's MSP, **Table 3-1** presents a summary of the flow criteria, performance, and sizing methodology that was utilized.

Table 3-1: Flow Criteria, Performance, and Sizing Methodology (Region MSP)

Description			Criteria
Flow Criteria	Water Demand	Residential	240 L/capita/day
		Employment	270 L/employee/day
	Peaking Factor	Maximum Day	Based on historic average of maximum day peaking factors from 2016 - 2020
		Peak Hour Factor	Based on system mass balance using hourly SCADA data from 2018 - 2020
	Existing System Demands		Starting Point Methodology • Based on local billing meter records and production records to establish existing system demands • Growth demands are added to the existing system baseline using design criteria
System Performance Criteria	System Pressures		Acceptable pressure range of 40 – 100 psi • Regional objective of maximizing areas within the preferred range of 50 – 80 psi on Regional watermains
	Fire Flow		250 L/s on Regional watermains at residual pressure of 30 psi
	Velocity	Average Day	Flag areas less than 0.6 m/s minimum velocity
		MDD+FF or PHD	Flag areas greater than 1.5 m/s Trigger upgrades when greater than 2 m/s
Sizing and Triggers	Plant and Facility Upgrade Triggers		• 80% trigger for plant and facility planning process (time-based trigger on a case-by-case basis) • Complete plant and facility expansions before 90% capacity is reached
	Treatment Plant Sizing		Maximum day demand
	Pumping Station Sizing		Various potential demand scenarios: • Maximum day demand (MDD) • MDD + fire flow (250 L/s or MECP) • Peak Hour Demand (PHD)

Description		Criteria
	Watermain Sizing	Regional transmission main system for PHD and MDD + fire flow demands
	Storage Sizing	MECP methodology (A+B+C)

3.2. Wastewater

3.2.1. Wastewater Treatment Plant

Treatment plants are designed to treat the average daily flows. The following criteria were confirmed through the Region MSP to assess when wastewater treatment facilities require expansion.

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

3.2.2. Pumping Station

The Region's design philosophy is to size sanitary pumping stations (SPS) in line with the Region's extraneous flow design criteria, but as per the Region MSP a hybrid evaluation approach is to be undertaken in an effort to acknowledge that SPSs 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. Two flow scenarios and evaluation criterions were agreed upon in the Region MSP to measure performance and/or flag triggers for a SPS:

- System Performance - Two flow scenarios considered
    - **Design Allowance**: Peak wet weather flow (PWWF) using the peaked dry weather flow (PDWF) plus the extraneous flow design allowance
    - **5-Year Storm**: Modelled PWWF using the 5-year design storm
- Trigger Sizing - Two criterions considered
    - Peak flow capacity to meet the design PWWF using the extraneous flow design allowance
    - Wet well and system storage considerations under 5-year storm to minimize basement flooding and overflow risks.

3.2.2.1. Sewage Pumping Station and Forcemain Policy Amendments

Niagara Region council has adopted a Sewage Pumping Stations and Forcemains Policy regarding upper-tier and lower-tier ownership and responsibilities. The Proposed Policy Amendments require the following key considerations for the recommendation of pumping station and forcemain infrastructure as part of a Functional Servicing Plan for a Secondary Plan:

- Need for any new pumping station recommendations to be documented for approval by Niagara Region;
- Funding of new pumping stations to be identified for inclusion as part of the respective Region and/or Town Development Charges Background Studies, if Regional DC criteria are met; and,

- Documentation of evaluation of pumping station recommendations compared against the option of servicing by gravity sewer (including life-cycle cost analysis for both options).

Region policy maintains that:

- Gravity sewers are the most reliable method of transferring sewage from the sanitary collection system to wastewater treatment facilities;
- There are limitations to the practical depth of gravity sewers such that new pumping stations will only be allowed where it can be shown that pumping is a more cost effective and feasible option than gravity sewers;
- The need for a new pumping station, as well as an assessment of capacity of the downstream infrastructure, must be documented in engineering and/or planning studies (including Functional Servicing Plans); and,
- The cost for a new pumping station required to accommodate growth is to be included in the applicable Region/Town Development Charges (DC) by-law if Regional DC criteria are met.

3.2.3. Forcemain

As per the Region MSP, 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 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 forcemain will target the following criteria:

- Design velocity between 1.0 m/s and 2.0 m/s
- Where presently feasible, capacity requirements will be achieved by twinning of an existing forcemain with the same size as existing.

3.2.4. Trunk Sewers

As per the Region MSP, 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. 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 ground surface) greater than 1.8m below ground surface during a 5-year design storm.
- Flag velocities less than 0.6 m/s for operational uses.
- Flag velocities greater than 3.0 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 risk and overflows.

3.2.5. Flow Criteria, Scenarios, System Performance, and Sizing Methodology (Region MSP)

Per the Region MSP, **Table 3-2** presents a summary of the flow criteria, scenarios, performance, and sizing methodology that was utilized.

Table 3-2: Flow Criteria, Scenarios, System Performance, and Sizing Methodology

Description			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 • 0.286 L/s/ha for new developments
Wastewater Treatment Plant	System Performance and Triggers		• MECP Procedure F-5-1 • Trigger upgrade planning 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 Triggers and Sizing		• Two flow scenarios considered
			  ○ **Design Allowance:** Peak wet weather flow using the peak 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 2.0 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

Description		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 ground surface) greater than 1.8 m below ground 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

3.3. Stormwater

3.3.1. Quantity

The Subwatershed Study will include hydrologic analysis of the Study Area to establish stormwater management criteria for quantity controls required of future development within the Study Area. Sizing of the conceptual stormwater management (SWM) facilities will be completed during Phase 3 of the FSS with recommendations provided on the required level of quantity and erosion controls for the entire Study Area, on-site quantity controls, and required conveyance (storm sewer) measures.

3.3.2. Quality

The Subwatershed Study will provide stormwater management (SWM) criteria for quality controls required of future development within the Study Area based on constraints identified in the receiving watercourses and any applicable SWM criteria & guidelines. Sizing of the conceptual stormwater management (SWM) facilities will be completed during Phase 3 of the FSS with recommendations provided on the required level of quality control for the entire Study Area and potential on-site quality controls that can be further defined at the development application stage.

4. Planning & Growth Projections

4.1. Growth Projections

Population and employment growth projections were identified for the City of Niagara Falls in the 'City Traffic Zone ID, Intensification Polygon ID, and Prorated Yield to 2051' (November, 2023) figure. The Northwest Secondary Plan area is identified as an urban expansion area with a targeted growth density of 60 persons per hectare (pph). The Region OP identified several 'Strategic Growth Areas' where a target density of 100 to 150 pph was identified however the Northwest Secondary Plan area was not identified as one of these areas. **Table 4-1** provides a summary of the projected population and employment growth for the Northwest Secondary Plan area.

Table 4-1: Growth Projections for Study Area

Study Area	Gross Expansion Area (ha)	Net Developable (ha)	Population Estimate (persons)	Employment Estimate (employees)	Total Growth Estimate
Northwest Secondary Plan	101	70	4,200	-	4,200

4.2. Flow Projection Methodology

4.2.1. Water Demand Projection Methodology

Per the Region's MSP, the future water system's average daily demand (ADD) was developed using a starting point methodology (5-year rolling average of average daily demands and maximum day demands) incorporating a 25% reduction for non-revenue water for systems that are currently over 25% non-revenue water. Expected flows due to growth were added to the starting point flows to establish future flows.

For this secondary plan the total growth estimate (persons) was strictly residential, and no 25% reduction was accounted for non-revenue water. A sample calculation for the ADD is provided below.



4.2.2. Wastewater Flow Projection Methodology

Per the Region's MSP, the future wastewater system's average daily flow (ADF) was developed using a starting point methodology (5-year rolling average of average daily flows) incorporating a 25% reduction for non-revenue water. Expected flows due to growth were added to the starting point flows to establish future flows.

For this secondary plan the total growth estimate (persons) was strictly residential, and no 25% reduction was accounted for non-revenue water. A sample calculation for the ADF is provided below.



4.3. Projected Water Demand

Projected water demands and storage requirements using the flow criteria and storage sizing methodology from the Region MSP are summarized below in **Table 4-2**. The maximum daily demand (MDD) and peak hourly flow (PHF) factors were 1.6 and 2.1, respectively.

Table 4-2: Projected Water Demand and Storage Requirements

Study Area	Average Day Flow (L/s)	Maximum Daily Demand (L/s)	Peak Hourly Flow (L/s)	Total Storage Required (m^3)
Northwest Secondary Plan	11.7	18.7	24.5	1,665

4.4. Projected Wastewater Flows

Projected wastewater flows and extraneous flows using the flow criteria and methodology from the Region MSP are summarized below in **Table 4-3**. The calculated Harmon peaking factor was 3.31 based on the anticipated population growth.

Table 4-3: Projected Wastewater Flows

Study Area	Total Average Dry Weather Flow (L/s)	Peak Dry Weather Flow (L/s)	Total Extraneous Flow (L/s)	Total Peak Wet Weather Flow (L/s)
Northwest Secondary Plan	12.4	41.1	20.02	61.1

5. Water Infrastructure

5.1. Existing Infrastructure

The Niagara Falls water system servicing the City of Niagara Falls is interconnected with the DeCew water system to provide additional supply and storage capacity to the City of Thorold and the Town of Niagara-on-the-Lake (NOTL). The following sections describe the existing water infrastructure associated with treatment, pumping, storage, and transmission.

5.1.1. Water Treatment

The Niagara Falls water system is supplied by the Niagara Falls Water Treatment Plant (WTP), which is located on 3599 Macklem Street in the City of Niagara Falls. The plant is a conventional surface water treatment plant with zebra mussel control, travelling screens, coagulation, flocculation, sedimentation, filtration, and disinfection. The plant's intake is 5.5 metres deep and located on the west bank of the Welland River, just south of the Niagara River. Although located in the Welland River, the intake actually receives raw water from the Niagara River as the Chippawa/Queenston power canal draws water from the Welland River to fill its reservoirs thereby reversing flow in the Welland River.

The plant has a rated capacity of 145.5 MLD (1,684 L/s). As outlined in the Region's 2023 Summary Report, the average treated water ranged from 37.4 MLD (26% of rated capacity) to 50.9 MLD (35% of rated capacity) in 2023. The maximum treated water ranged from 42.0 MLD (29% of rated capacity) to 60.6 MLD (42% of rated capacity) in 2023. The Region's 2021 MP identified that the Niagara Falls WTP had sufficient existing capacity to provided treated water to support population growth to 2051, based on the population growth estimates carried within that study. The location of the Niagara Falls WTP is shown in **Figure 5-1**.

5.1.2. Booster Stations

The City of Niagara Falls operates within a single pressure zone with a hydraulic grade line (HGL) of 250 metres above sea level (masl). As previously stated, there is interconnectivity with the Thorold system (HGL = 227 masl) and the St. Davids and Queenston systems (HGL = 168 masl). Water pressure is maintained throughout the Niagara Falls system via a series of booster pumping stations (BPS) and storage reservoirs. Details related to the BPSs within the Niagara Falls water system are provided in **Table 5-1**.

Table 5-1: Summary of Booster Pumping Stations

Facility Information	Niagara Falls WTP High Lift Station	Kent Avenue BPS
Address	3599 Macklem Street, Niagara Falls	4281 Kent Avenue, Niagara Falls
Inlet Source (Pressure Zone & Facility)	Water Treatment Plant (WTP)	250 (via Kent Avenue Reservoir)
Discharge (Pressure Zone)	250	250
Pressure Zones Supplied	168, 189 (NOTL), 227 (Thorold), 250	168, 189 (NOTL), 227 (Thorold), 250

Facility Information	Niagara Falls WTP High Lift Station	Kent Avenue BPS
Number of Pumps (Total/Firm)	5/4	3/2
Installed Capacity (MLD)	200.5	91.0
Firm Capacity (MLD)	146.0	46.0
Total Dynamic Head (m)	83.2	57.9

5.1.3. Storage

Details related to the water storage facilities within the Niagara Falls WTP service area are provided in **Table 5-2**. The Region's 2021 MP identified that the Lundy's Lane Elevated Tank (ET) will be decommissioned with a new tank location to be determined through a separate study.

Table 5-2: Summary of Storage Facilities

Storage Facility	Niagara Falls WTP Reservoir	Kent Avenue Reservoir	Lundy's Lane Elevated Tank
Address	3599 Macklem Street, Niagara Falls	4281 Kent Avenue, Niagara Falls	6280 Lundy's Lane, Niagara Falls
Storage Type	Pumped Reservoir	Pumped Reservoir	Elevated Tank
Volume (ML)	14[1]	20.9	2.5
Top Water Level (m)	174.3	196.9	249.6
Fire Supply Zones	250 Pumped	250 Pumped	250 Floating
Maximum Day Demand Supply Zones	All	168 Pumped 227 Pumped 250 Pumped	168 Pumped 227 Pumped 250 Pumped

Note 1: Total WTP storage volume is 14 ML however due to MECP contact time requirements, the actual useable volume at the Niagara Falls WTP is 5.7 ML under 2051 MDD.

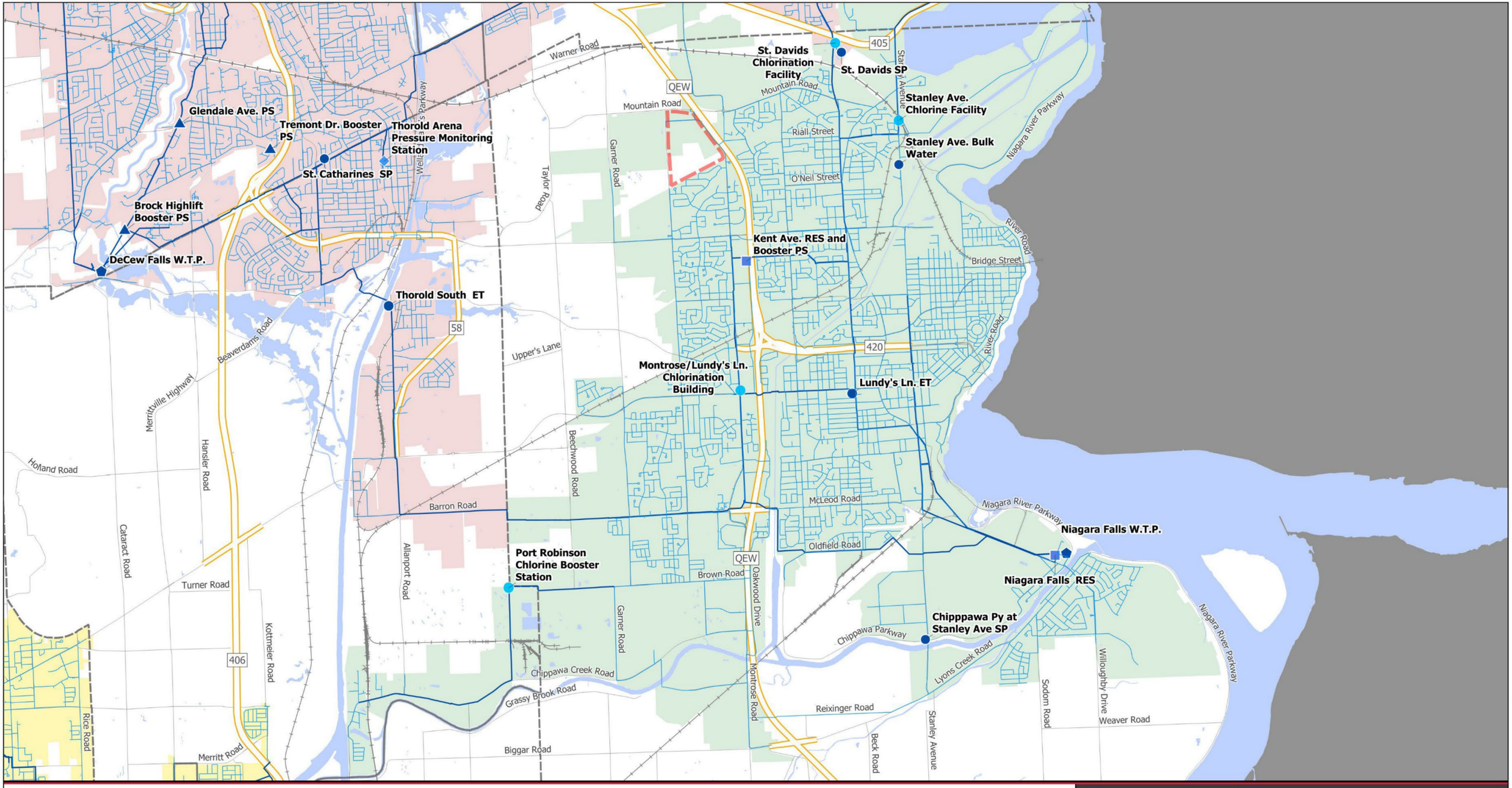
5.1.4. Trunk Distribution Network

The Regional trunk water distribution system, along with the local watermain networks, are shown in **Figure 5-1**. The transmission mains consist of 400mmø – 1050mmø watermains which distribute treated water throughout the Niagara Falls water system. The local watermain networks consist of 150mmø – 350mmø watermains which conveys treated water from the transmission mains to local residents and businesses.

The boundary road network around the NWSPA contains the following water distribution network:

- 250mmø – 300mmø watermain on Montrose Road (Kalar Road to limit of Study Area)
- 300mmø watermain on Kalar Road at southwest limits of Study Area

Refer to **Figure 5-2** for the location of the water distribution network adjacent to the Study Area.



Study Area
Railway
Waterbody, Watercourse
Municipal Boundary

Existing Water Infrastructure
- Water Treatment Plant (WTP)
- Pumping Station (PS)
- Elevated Tank (ET), Stand Pipe (SP)
- Reservoir (RES)
- Fluoride Station
- Chlorine Facility
- Transmission Mains
- Distribution Mains

WTP Administrative Area
- DeCew Falls WTP
- Niagara Falls WTP
- Welland WTP

Reference(s)
1. Projection EPSG:26917
2. Base Data: City of Niagara Falls, 2024

0 1 2 km

Figure 5-1
Map Title: Existing Water Infrastructure in Niagara Falls

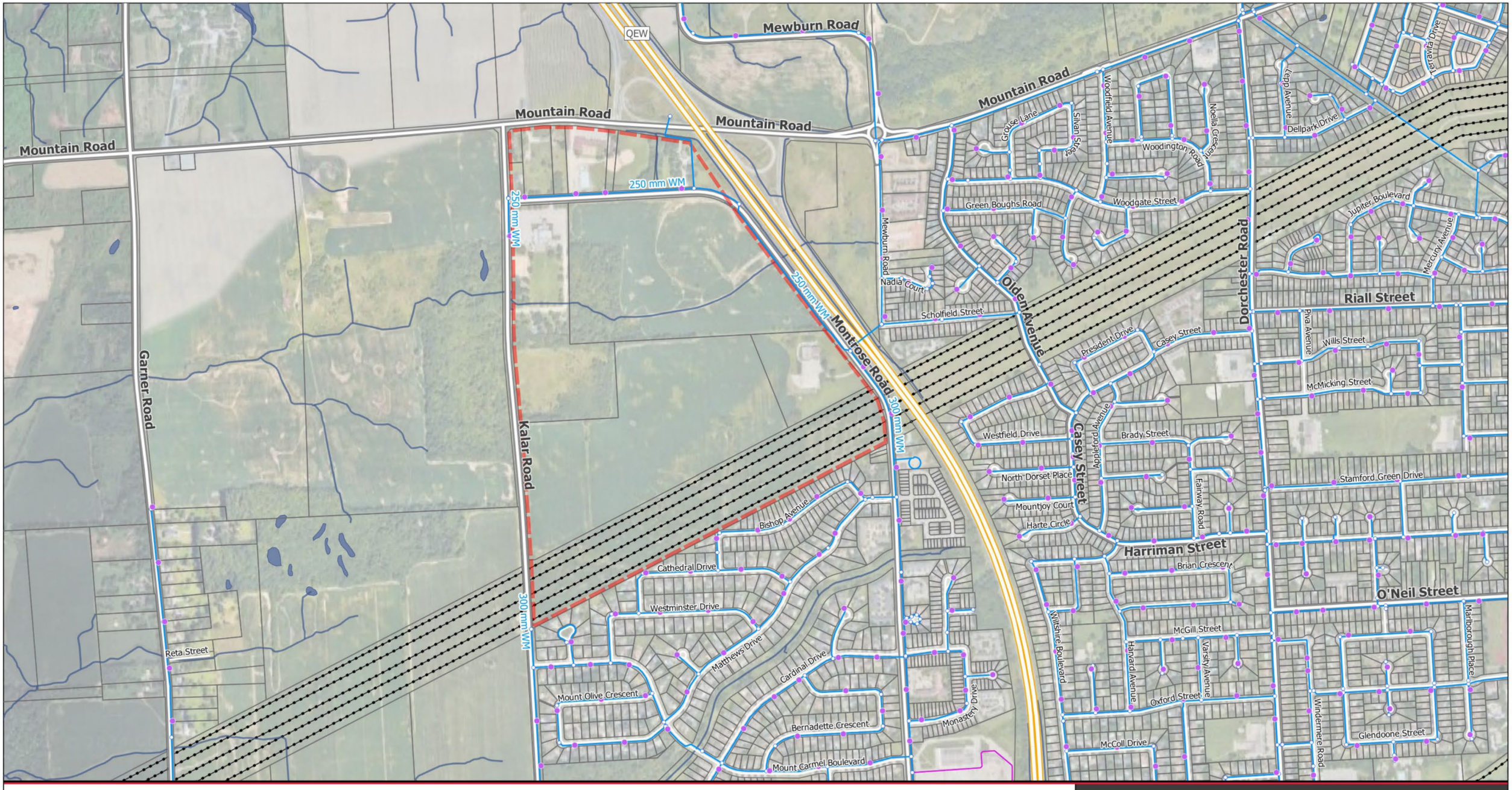
Project Name:
Northwest Secondary Plan Area Functional Servicing Study

Client Name:
City of Niagara Falls (Ontario, Canada)

GEI Consultants

Last Updated: September 2024
Document ID: 2402620-002

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Study Area
Hydro Line
Parcel
Waterbody, Watercourse

Existing Water Infrastructure

Hydrant
Junction
Distribution Mains
Private

Reference(s)
1. Projection EPSG:26917
2. Base Data: City of Niagara Falls, 2024; Google Satellite, 2024

0 250 500 m

Figure 5-2
Map Title: Existing Water Infrastructure in Study Area

Project Name:
Northwest Secondary Plan Area Functional Servicing Study

Client Name:
City of Niagara Falls (Ontario, Canada)

GEI

Last Updated: September 2024
Document ID: 2402620-002

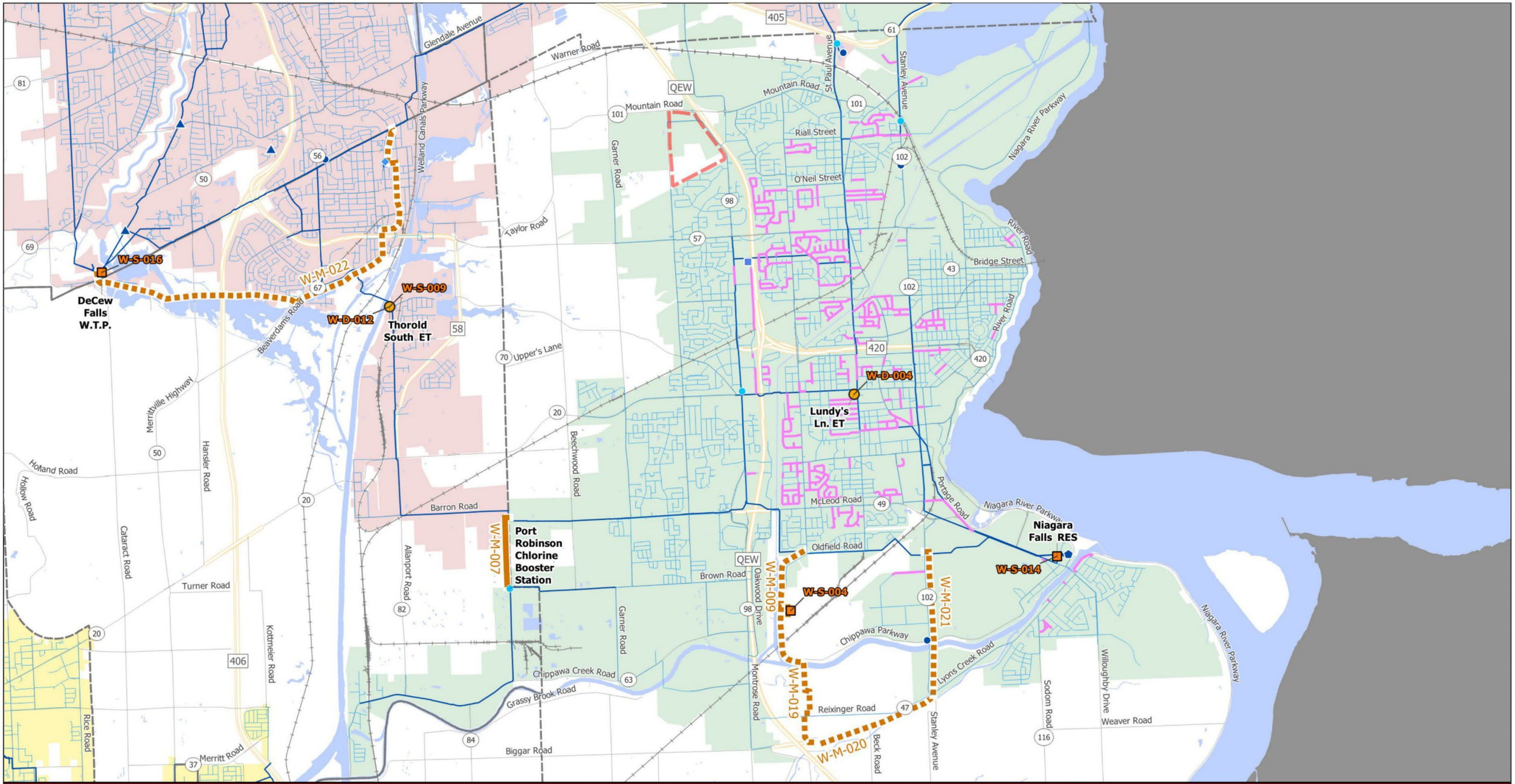
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5.2. Planned Capital Projects

The Region's 2021 MSP identified several capital projects to support the planned growth within the DeCew WTP & Niagara Falls WTP system service areas to 2051, which includes the NWSPA. **Table 5-3** and **Figure 5-3** identify and describe the planned Regional water capital projects potentially impacting growth in the NWSPA. Water projects included within the City of Niagara Falls' 10-year capital program are also identified in **Figure 5-3**.

Table 5-3: Planned Water Capital Projects

Master Plan ID	Name	Description	Size / Capacity	Estimated Year in Service	Project Type
W-S-004	New South Niagara Falls ET	New South Niagara Falls ET to replace the Lundy's Lane ET and provide additional storage	12.0 ML	2022 – 2026	Storage
W-S-014	In-ground reservoir expansion at Niagara Falls WTP	In-ground reservoir expansion at Niagara Falls WTP to support buildout growth and CT volume requirements	10.0 ML	Post 2051	Storage
W-D-004	Decommissioning of Lundy's Lane Elevated Tank (ET)	Lundy's Lane ET to be decommissioned and replaced by New South Niagara Falls ET.	N/A	2027-2031	Decom
W-M-007	New transmission main in South Niagara Falls	New transmission main from Pressure Reducing Valve (PRV) to Port Robinson Chlorine BPS in Niagara Falls	450 mm	2022 – 2026	Watermain
W-M-009	New Niagara Falls South transmission main to New ET	New Niagara Falls South transmission main to provide additional supply to new growth areas.	750 mm	2022 - 2026	Watermain
W-M-019	New Niagara Falls South feedermain from Dorchester Road to Lyon's Creek Road	New Niagara Falls South feedermain to provide additional supply to new growth areas.	600 mm	2032 - 2051	Watermain
W-M-020	New Niagara Falls South feedermain along Lyon's Creek Road	New Niagara Falls South feedermain to provide additional supply to new growth areas.	600 mm	2042 – 2051	Watermain
W-M-021	New Niagara Falls South Feedermain along Stanely Avenue	New Niagara Falls South feedermain to provide additional supply to new growth areas	N/A	2032 - 2051	Watermain



Study Area
Railway
Waterbody, Watercourse
Municipal Boundary

City of Niagara Falls 10-Year W Capital Project

2020 Niagara Region Capital Program
- Elevated Tank
- Reservoir
- Transmission
- Distribution

Existing Water Infrastructure
- Water Treatment Plant (WTP)
- Pumping Station (PS)
- Elevated Tank (ET), Stand Pipe (SP)
- Chlorine Facility
- Fluoride Station
- Reservoir (RES)
- Transmission Mains
- Distribution Mains

WTP Administrative Area
- DeCew Falls WTP
- Niagara Falls WTP
- Welland WTP

Reference(s)
1. Projection EPSG:26917
2. Base Data: City of Niagara Falls, 2024

0 1 2 km

Figure 5-3
Map Title: Planned Water Capital Projects in Niagara Falls

Project Name:
Northwest Secondary Plan Area Functional Servicing Study

Client Name:
City of Niagara Falls (Ontario, Canada)

GEI

Last Updated: September 2024
Document ID: 2402620-002

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5.3. Potential Connection Points

As previously noted, the NWSPA has existing watermains located along the majority of the boundary roads surrounding the Study Area. Montrose Road has a local watermain ranging in size from 250mmø – 300mmø and Kalar Road has a 300mmø watermain located at the southern limits of the Study Area. A significant section of Kalar Road (~1,100 metres) does not currently contain a local watermain. Refer to **Figure 5-2** for the location of the existing watermains.

Potential connection points for the NWSPA could involve extending local watermains throughout the Study Area off of these existing watermains. Connecting the existing 250mmø watermain on Kalar Road to the 300mmø watermain on Kalar Road by extending a watermain along Kalar for approximately 1,100 metre could improve water quality, system resiliency, and redundancy of supply. Looping the existing watermains could also be accomplished through watermain installed within internal subdivision roads.

Section 7 will review the hydraulic modelling completed as part of Phase 1, specifically looking at how the existing water system will respond to the increased demand from the NWSPA and potential system improvements to facilitate the growth.

6. Wastewater Infrastructure

6.1. Existing Infrastructure

The Niagara Falls wastewater system services the CNF and the Town of Niagara-on-the-Lake (NOTL). A map of the existing wastewater system in the CNF is provided in **Figure 6-2**. The following sections describe the existing wastewater infrastructure associated with treatment, pumping, and collection.

6.1.1. Wastewater Treatment

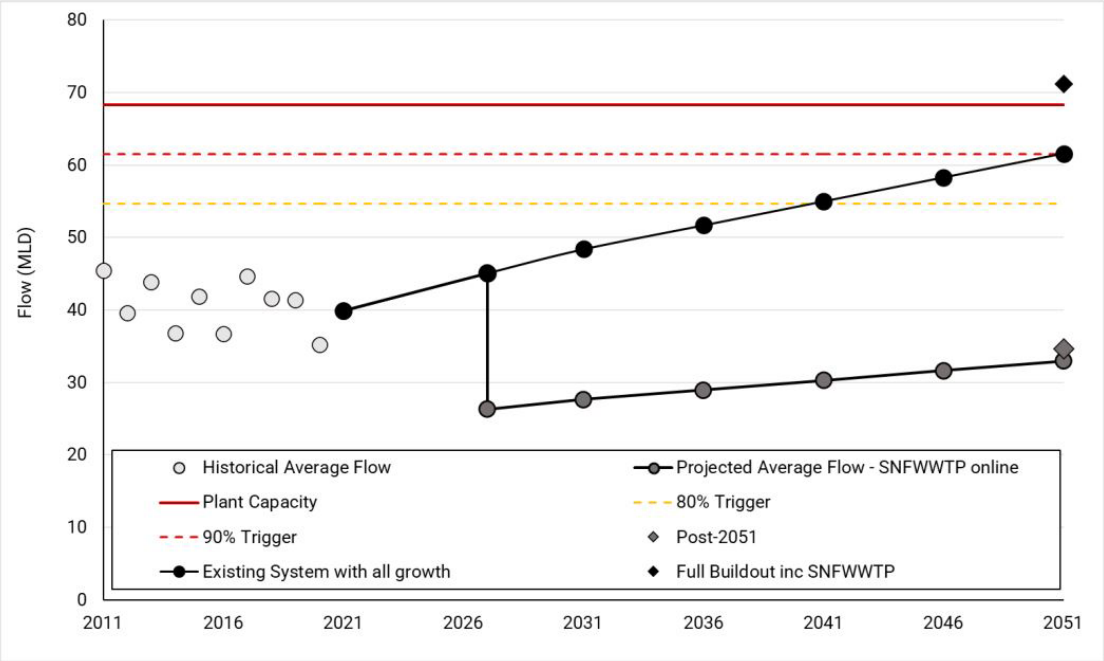
Wastewater treatment within the system is provided by the Niagara Falls Wastewater Treatment Plant (WWTP), which is located at 3450 Stanley Avenue in the City of Niagara Falls. The plant is a rotating biological contacting plant with a current rated capacity of 68.3 MLD, a peak dry weather flow capacity of 136.3 MLD, and a peak wet weather flow capacity of 205.0 MLD. The plant uses ferric chloride addition for phosphorus removal.

Five (5) years of recent flow data was used by the 2021 Niagara Region Water and Wastewater Master Servicing Plan Update (MSPU) to calculate an average daily flow at the plant of 39.9 Megalitres per day (MLD). It was projected that by 2051 the average daily flow will be 61.6 MLD which exceeds 90% of the existing wastewater treatment plant capacity (which is a trigger for expansion). The projected post-2051 average daily flow is 71.2 MLD, which exceeds the plant's rated capacity. Based on these anticipated capacity limitations at the Niagara Falls WWTP, Niagara Falls completed the South Niagara Falls Wastewater Solutions Schedule 'C' Class EA; the recommendations of which are detailed below in Section 6.1.1.1.

6.1.1.1. South Niagara Falls Wastewater Solutions Class EA

Niagara Region undertook the South Niagara Falls Wastewater Solutions (SNFWWS) study to identify, develop, and implement a wastewater servicing strategy and conceptual design of a new WWTP and associated collection and conveyance infrastructure in South Niagara Falls. The study identified a preferred location for the future WWTP at 6811 & 7047 Reixinger Road with an outfall into Chippawa Creek. The collection and conveyance system identified within the preferred strategy included a trunk sewer along Reixinger Road & Montrose Road; potentially involving the decommissioning of several existing sewage pumping stations (Grassy Brook SPS, Oakwood Drive SPS, Garner Road South West SPS, and South Side High Lift SPS). In addition, it included a trunk sewer along Brown Road, Beechwood Road, McLeod Road, and Barron Road to provide wastewater servicing to Thorold via a New Black Horse SPS with a forcemain along Allanport Road to discharge flows to the new trunk sewer terminating at the intersection of Barron Road & Allanport Road.

Figure 6-1: Projected Future ADF at Niagara Falls WWTP (2021 Region MSP)



With the implementation of the South Niagara Falls WWTP, the 2051 flows to the Niagara Falls WWTP will be reduced to 33.0 MLD and the post-2051 flow to 34.6 MLD. As such, the Niagara Falls WWTP has surplus capacity and will not reach 80% capacity within the 2051 planning period. The South Niagara Falls WWTP is anticipated to be online by 2027 per the projected flows graphed in **Figure 6-1** which was extracted from the Region's 2021 MSPU. The timeline identified for the implementation of the South Niagara Falls WWTP is subject to Provincial and Federal funding and requires Regional Council approval.

6.1.2. Sewage Pumping Stations

The Region operates 21 sewage pumping stations throughout the CNF; the locations of which, along with their respective sewersheds, are shown in **Figure 6-3**. The Kalar Road SPS and Meyburn SPS service areas are in close proximity to the NWSPA and their details are provided in **Table 6-1**.

Table 6-1: Summary of Relevant SPS Details

Facility Details	Station Name	Kalar Road SPS	Mewburn SPS
Location		4254 Kalar Road	2617 Meyburn Road
Pump Station Details	**ECA Firm Capacity (L/s)**	510	23.3
	Operational Firm Capacity (L/s)	463	17.1
	Number of Pumps	4	2
Forcemain Details	**No. of Forcemains**	Single[1]	Single
	Forcemain Diameter (mm)	600	200
	Forcemain Length (m)	2,448	685
Catchment Details	**Sewershed (ha)**	500.1	8.9
	Sewershed Inclusive of Upstream Catchments (ha)	500.1	8.9

Facility Details	Station Name	Kalar Road SPS	Mewburn SPS
Peak Dry Weather Flow (L/s)	2021 Flows	91.7	0.9
	2051 Flows	126.7	2.3
	Post-2051 Flows	138.3	5.1
Design Allowance - Peak Wet Weather Flow (L/s)	2021 Flows	291.7	4.5
	2051 Flows	350.8	8.5
	Post-2051 Flows	362.5	11.3
5-Year Storm – Peak Wet Weather Flow (L/s)	2021 Flows	670.9	7.2
	2051 Flows	730.0	11.2
	Post-2051 Flows	741.6	14.0

Note 1: Kalar Road SPS has an additional 350mmø forcemain as emergency standby that is approximately 1,269 metres in length along the existing hydro ROW and south along Montrose Road, discharging to a 600mmø trunk sanitary sewer. The 600mmø forcemain noted in this table is operated as a single forcemain.

As shown in **Figure 6-3**, the Kalar Road SPS is located approximately 1.3 kilometres south of the southern limits of the NWSPA. Its' service area is approximately 500 hectares and abuts the south and east limits of the Study Area. The Kalar Road SPS pumps flows via a 600mmø forcemain east to a 750mmø gravity trunk sewer located within a hydro corridor that eventually discharges directly to the Niagara Falls WWTP. There are networks of local & trunk sewers that drain to the Kalar Road SPS; several of which are in close proximity to the Study Area and could serve as potential connection points which will be explored further in Section 6.3.

The Mewburn SPS is located approximately 500 metres east of the eastern limits of the NWSPA. Its' service area is approximately 9 hectares and is localized around the station. This station pumps flows via a 200mmø forcemain east to a 300mmø gravity sewer on Woodfield Avenue that is located within the Niagara Falls WWTP catchment area. Flows are conveyed east via local & trunk sewers directly to the Niagara Falls WWTP. There are several local sewers that drain to the Mewburn SPS that could function as connection points for the Study Area however the QEW is located between the Study Area and the Mewburn SPS service area. These potential connection points will be explored further in Section 6.3. Mewburn SPS is currently being considered for expansion pending the results of a separate ongoing study.

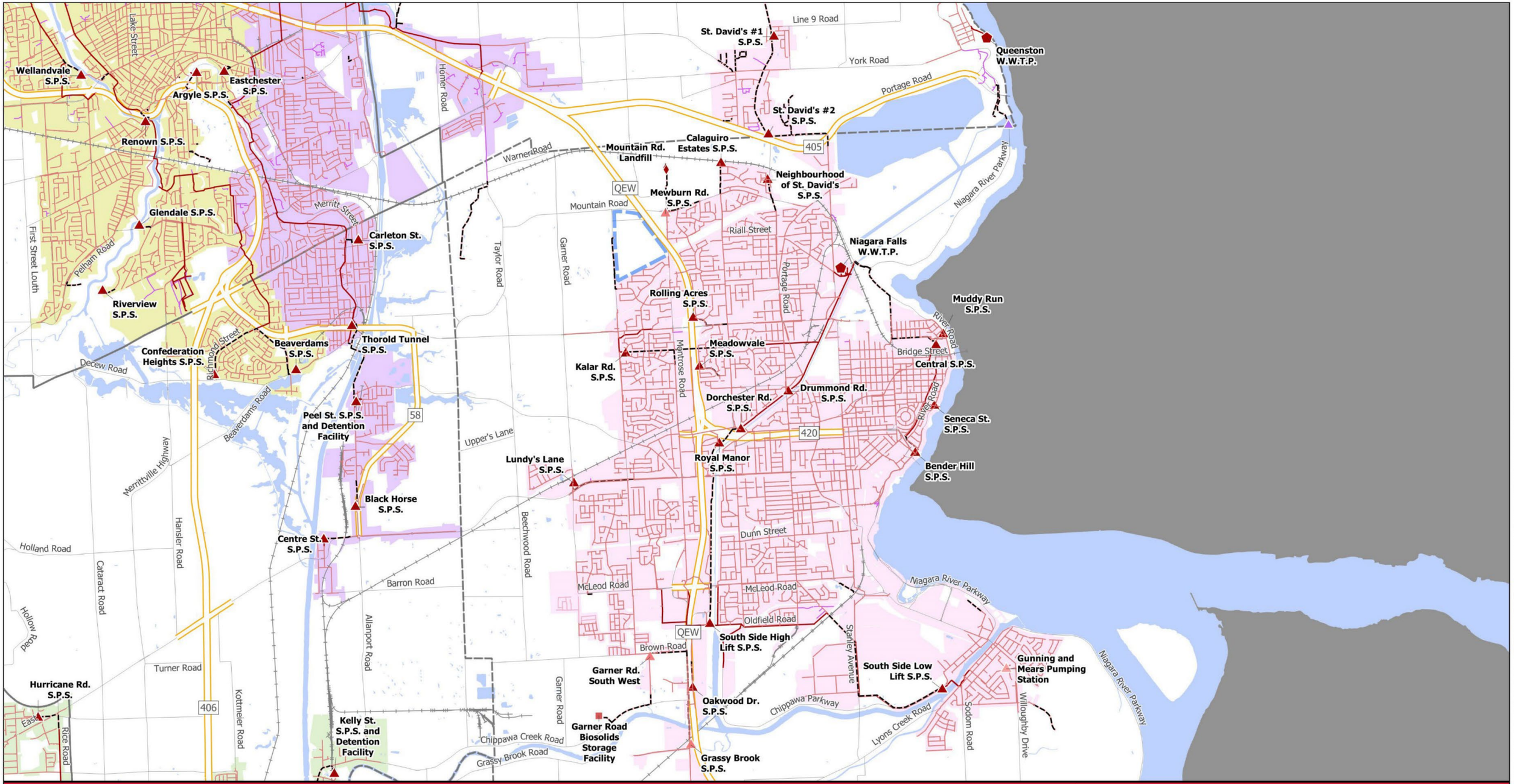
The anticipated flows experienced at the Kalar SPS and Mewburn SPS were extracted from the 2021 Region MSP and indicate that both stations operate within their firm capacity for peak dry weather flow (PDWF) events and design-based peak wet weather flow (PWWF) events. However, the Kalar SPS experiences an exceedance of its firm capacity during the 5-year PWWF event whereas the Mewburn SPS does not. As the NWSPA is anticipated to contribute approximately 61 L/s of PWWF, the Mewburn SPS is significantly undersized whereas the Kalar Road SPS has spare capacity.

6.1.2.1. Private Sewage Pumping Station

The existing commercial property within the Study Area known as Club Italia, which is located at the southeast corner of Kalar Road and Montrose Road, is currently serviced by a private sewage pumping station (SPS). An internal network of 200mmø sewers convey sewage flow from the facility to the private SPS which is located adjacent to Kalar Road, approximately 315 metres south of Montrose Road. The private SPS pumps sewage flow from Club Italia to the 250mmø gravity sewer on Mount Carmel Boulevard via a 100mmø PVC forcemain located on Kalar Road. It is anticipated that this private SPS will continue to operate until such time as the property re-develops and incorporates the sanitary servicing strategy identified for the Study Area through this study. The location of the private SPS is identified on **Figure 6-4**.

6.1.3. Trunk Collection Network

As previously noted, sewage flows from the Niagara Falls WWTP service area are conveyed to the plant via a network of local and Regionally owned sewers, and Regionally owned sewage pumping stations and forcemains. As shown in **Figure 6-4**, the majority of the sewers in close proximity to the Study Area are local sewers which are typically designed to convey flows from the neighbourhoods they were installed within. The closest trunk sewer is a 500mmø trunk sewer located approximately 1,050 metres south of the Study Area which is tributary to the Kalar SPS. A local sewer extends from this trunk sewer to a distance of 550 metres from the Study Area however the viability of using this as a connection point will be explored further in Section 6.3.



Existing Wastewater Infrastructure

- Wastewater Treatment Plant
- Sewage Pumping Station (Region)
- Sewage Pumping Station (Local)
- Leachate Pumping Station
- Force Main
- Regional
- Local

Wastewater Catchment

- Niagara Falls WWTP
- Port Dalhousie WWTP
- Port Weller WWTP
- Welland WWTP

- Study Area
- Railway
- Municipal Boundary
- Waterbody, Watercourse

Reference(s)
1. Projection EPSG:26917
2. Base Data: City of Niagara Falls, 2024

0 1 2 km

Figure 6-2
Map Title: Existing Wastewater Infrastructure in Niagara Falls

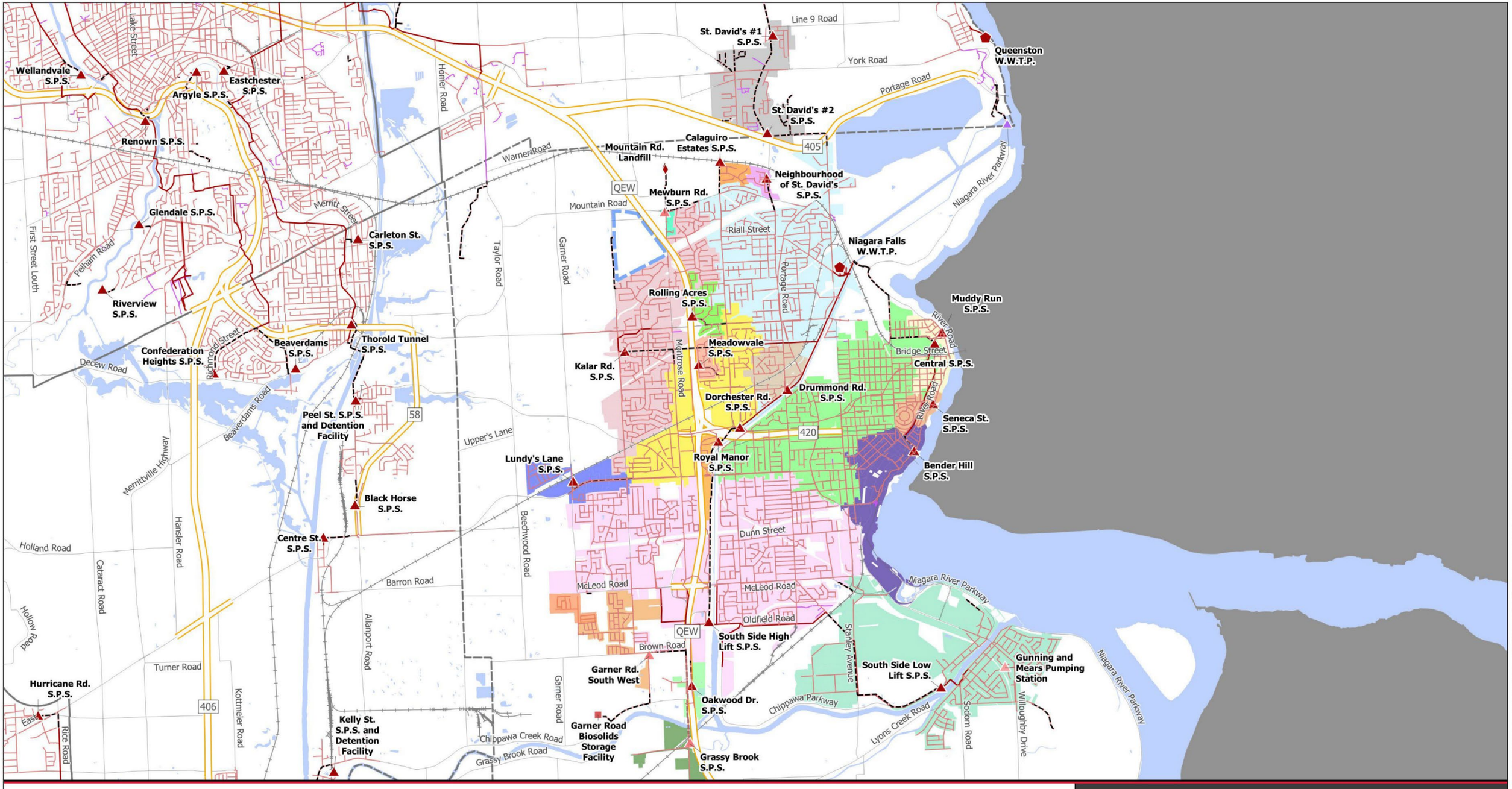
Project Name:
Northwest Secondary Plan Area Functional Servicing Study

Client Name:
City of Niagara Falls (Ontario, Canada)

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Study Area
Railway
Municipal Boundary
Waterbody, Watercourse

Existing Wastewater Infrastructure

- Wastewater Treatment Plant
- Sewage Pumping Station (Region)
- Sewage Pumping Station (Local)
- Leachate Pumping Station
- Force Main
- Regional
- Local

Wastewater Catchment by SPS

- 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

Reference(s)
1. Projection EPSG:26917
2. Base Data: City of Niagara Falls, 2024

0 1 2 km

Figure 6-3
Existing Wastewater Catchments by Sewage Pumping Station

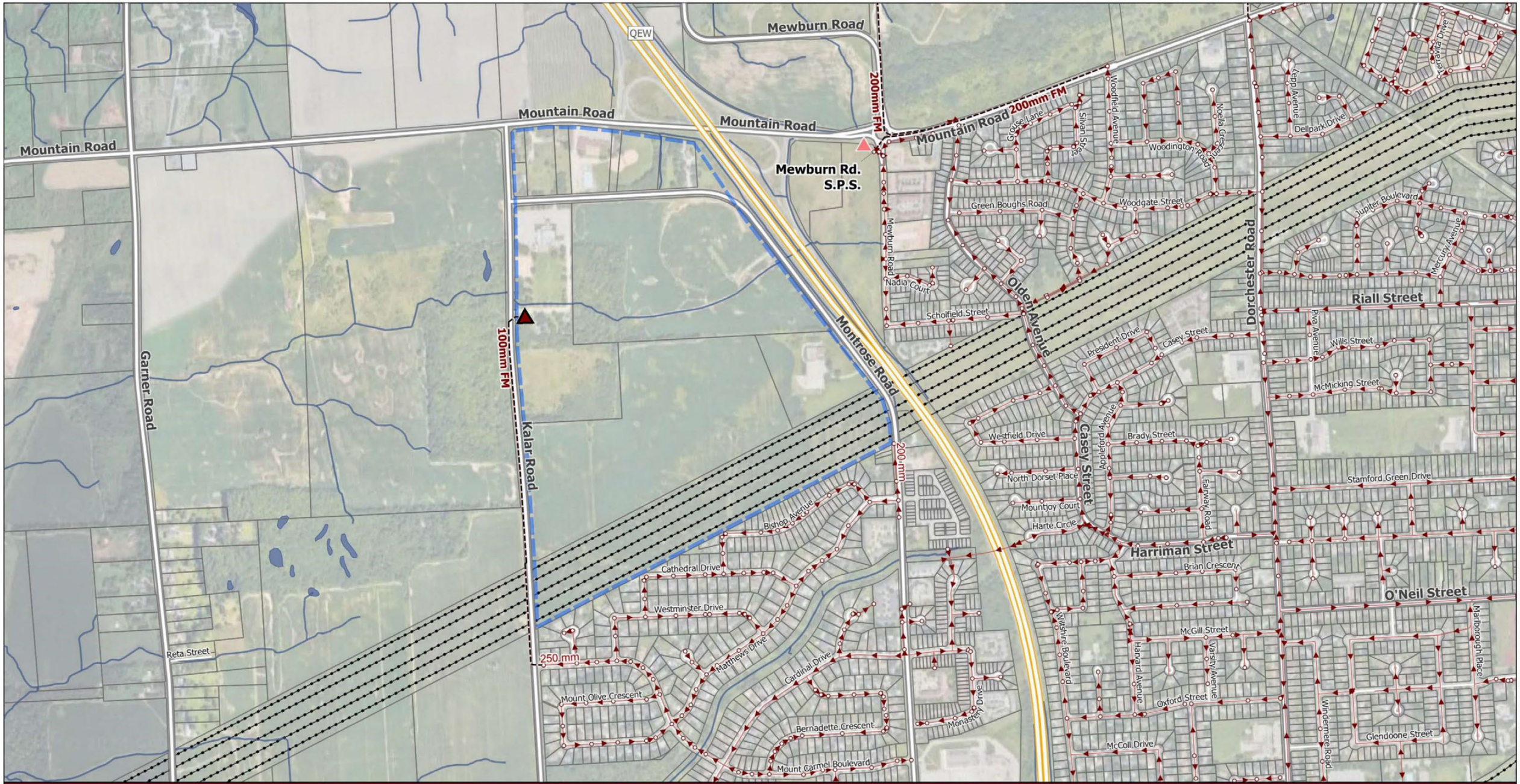
Project Name:
Northwest Secondary Plan Area Functional Servicing Study

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Study Area
Hydro Line
Parcel
Waterbody, Watercourse

Existing Wastewater Infrastructure

Sewage Pumping Station (Local)
Sanitary Access Chamber
Force Main
Sanitary Gravity Main
Private Sewage Pumping Station

Reference(s)
1. Projection EPSG:26917
2. Base Data: City of Niagara Falls, 2024; Google Satellite, 2024

0 250 500 m

Figure 6-4
Map Title: Existing Wastewater Infrastructure in Study Area

Project Name:
Northwest Secondary Plan Area Functional Servicing Study

Client Name:
City of Niagara Falls (Ontario, Canada)

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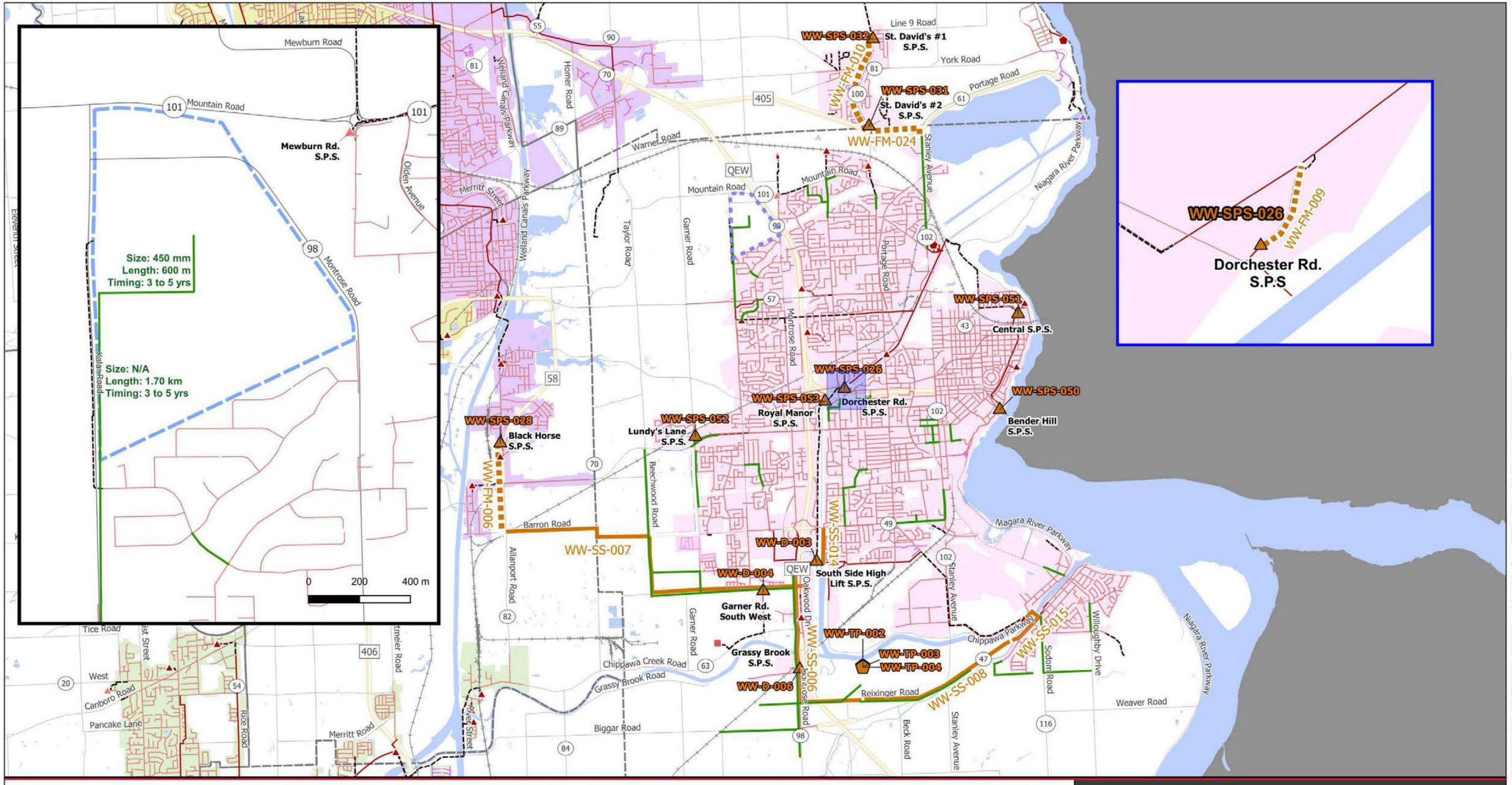
6.2. Planned Capital Projects

The Region's 2021 Master Plan identified several capital projects to support the planned growth within the DeCew WTP & Niagara Falls WTP system service areas to 2051, which includes the NWSPA. **Table 6-2** and **Figure 6-5** identify and describe the planned Regional wastewater capital projects potentially impacting growth in the NWSPA. Wastewater projects included within the City of Niagara Falls' 10-year capital program are also identified in **Figure 6-5.**

Table 6-2: Planned Wastewater Capital Projects

Master Plan ID	Name	Description	Size / Capacity	Estimated Year in Service	Project Type
WW-TP-002	South Niagara Falls WWTP – Phase 1	New South Niagara Falls WWTP Phase 1 with 30 MLD capacity	30 MLD	2022-2026	Treatment
WW-TP-003	South Niagara Falls WWTP	New South Niagara Falls WWTP upgrade from 30 MLD to 60 MLD	30 MLD	2037-2041	Treatment
WW-TP-004	South Niagara Falls WWTP Outfall Structure	New South Niagara Falls WWTP Outfall Structure	1800 mm	2022-2026	Treatment
WW-SPS-026	Dorchester SPS Pump Replacement	Increase station capacity from 185 L/s to 345 L/s by replacing the existing three pumps	345 L/s	2027 - 2031	Pumping
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	Pumping
WW-SPS-031	St. David's #2 SPS Upgrade	Increase station capacity from 42 L/s to 202 L/s with a full reconstruction	202 L/s	2027 - 2031	Pumping
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	2032 - 2051	Pumping
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	Pumping
WW-SPS-051	Central SPS Pump Replacement	Increase station capacity from 800 L/s to re-establish 1,000 L/s ECA capacity by replacing the existing five pumps	1,000 L/s	2037-2041	Pumping
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	Pumping
WW-SPS-053	Royal Manor SPS Pump Replacement	Increase station capacity from 9 L/s to 16 L/s by replacing the existing two pumps	16 L/s	2022 – 2026	Pumping

Master Plan ID	Name	Description	Size / Capacity	Estimated Year in Service	Project Type
WW-FM-006	New Black Horse Forcemain to Niagara Falls	New Black Horse Forcemain to New South Niagara Falls Trunk on Barron Road to Montrose	400 mm	2027 – 2031	Forcemain
WW-FM-009	Dorchester Forcemain Upgrade	Replace ex. 350mm Dorchester SPS Forcemain with new single 500mm forcemain in Niagara Falls	500 mm	2027-2031	Forcemain
WW-FM-010	St David's #1 Forcemain Upgrade	Replace ex. 200mm St. Davids #1 Forcemain with new single 400 mm in Niagara-on-the-Lake (NOTL)	400 mm	2027-2031	Forcemain
WW-FM-024	St. David's #2 Forcemain Upgrade	Replace ex. 250mm St. David's #2 SPS forcemain with new single 400mm in Niagara Falls	400 mm	2027-2031	Forcemain
WW-D-003	Decommissioning of South Side High Lift (SSHL) SPS	Decommissioning of SSHL SPS, to be replaced by gravity trunk sewer to SNF WWTP	N/A	2037-2041	Decom
WW-D-004	Decommissioning of Garner SPS	Decommissioning of Garner SPS to be replaced by gravity trunk sewer to SNF WWTP	N/A	2032-2036	Decom
WW-D-006	Decommissioning of Grassy Brook SPS	Decommissioning of Grassy Brook SPS to be replaced by gravity trunk sewer to SNF WWTP	N/A	2032-2037	Decom
WW-SS-06	New Montrose Trunk Sewer	New tunnelled trunk sewer on Montrose conveying flows from SSHL SPS to new SNF WWTP	1500mm	2027-2031	Sewer
WW-SS-07	New Brown Road Trunk Sewer	Shallow trunk sewer from South Thorold to Garner SPS-South Niagara Falls trunk connection	600mm	2027-2031	Sewer
WW-SS-008	Chippawa Trunk Sewer Phase 1	New tunneled 1200mm trunk sewer from west of Lyon's Creek to South Niagara Falls WWTP	1200 mm	2032 – 2036	Sewer
WW-SS-014	South Niagara Falls SSO Trunk	New sewer to eliminate overflows upstream of South Side High Lift SPS	1050 mm	2022-2026	Sewer
WW-SS-015	Chippawa Trunk Sewer Phase 2	New tunneled 1200mm trunk sewer from South Side Low Lift to west of Lyon's creek	1200 mm	2037 - 2041	Sewer



Study Area
Railway
Municipal Boundary
Waterbody, Watercourse

City of Niagara Falls Capital Project

2020 Niagara Region Capital Program

Wastewater Treatment Plant
Sanitary Pumping Station
Forcemain
Trunk Sewer

Existing Wastewater Infrastructure

Wastewater Treatment Plant
Sewage Pumping Station (Region)
Sewage Pumping Station (Local)
Leachate Pumping Station
Force Main
Regional
Local

Wastewater Catchment

Niagara Falls WWTP
Port Dalhousie WWTP
Port Weller WWTP
Welland WWTP

Reference(s)
1. Projection EPSG:26917
2. Base Data: City of Niagara Falls, 2024

0 1 2 km

Figure 6-5
Planned Wastewater Capital Projects in Niagara Falls

Project Name:
Northwest Secondary Plan Area Functional Servicing Study

Client Name:
City of Niagara Falls (Ontario, Canada)

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6.3. Potential Connection Points

As shown in **Figure 7-4**, there are several potential connection points for future sewers within the NWSPA which are detailed in **Table 6-3**. Section 7.2 will review the hydraulic modelling completed as part of Phase 1, specifically looking at how the existing wastewater system will respond to the increased demand from the NWSPA and potential system improvements to facilitate the growth.

Table 6-3: Summary of Potential Connection Points for NWSPA Wastewater System

Potential Connection Point No.	Location / Description	Comments
1	Connect to inlet of Mewburn Road SPS	• Inlet sewer invert is ~185.20 masl (Study Area would require local SPS to convey flows to this SPS). • Mewburn Road SPS has firm capacity of 17 L/s; Study Area will generate PWWF of 61 L/s meaning station expansion would be required. • QEW crossing would be required.
2	Connect to 200mmø local sewer at 3151 Montrose Road	• Sewer invert is ~191.30 masl (Study Area would require local SPS to convey flows to this sewer). • Potential for capacity constraints & required local upgrades as downstream sewers are small diameter. • Drains to the Kalar SPS which has a firm capacity of 463 L/s and a 2051 anticipated PWWF of 351 L/s (design) & 730 L/s (5-year). As Study Area is anticipated to generate a PWWF of 61 L/s, the existing station may not require expansion to accommodate flows.
3	Connect to 250mmø local sewer at Mount Carmel Blvd & Kalar Road	• Sewer invert is ~187.25 masl (Study Area would require local SPS to convey flows to this sewer). • Potential for capacity constraints & required local upgrades as downstream sewers are small diameter. • Drains to the Kalar SPS which has a firm capacity of 463 L/s and a 2051 anticipated PWWF of 351 L/s (design) & 730 L/s (5-year). As Study Area is anticipated to generate a PWWF of 61 L/s, the existing station may not require expansion to accommodate flows.
4	Connect to 200mmø local sewer at 3724 Kalar Road	• Sewer invert is ~186.55 masl (Study Area would require local SPS to convey flows to this sewer). • Potential for capacity constraints & required local upgrades as downstream sewers are small diameter. • Drains to the Kalar SPS which has a firm capacity of 463 L/s and a 2051 anticipated PWWF of 351 L/s (design) & 730 L/s (5-year). As Study Area is anticipated to generate a PWWF of 61 L/s, the existing station may not require expansion to accommodate flows.
5	Connect to 500mmø trunk sewer at 4075 Kalar Road	• Sewer invert is ~181.05 masl (Study Area would require local SPS to convey flows to this sewer). • Drains to the Kalar SPS which has a firm capacity of 463 L/s and a 2051 anticipated PWWF of 351 L/s (design) & 730 L/s (5-year). As Study Area is anticipated to generate a PWWF of 61 L/s, the existing station may not require expansion to accommodate flows.

7. Hydraulic Modelling

The hydraulic modelling for this study was completed using the Region's water and wastewater models. The goal was to review the impact of the increased water demand and wastewater flows on the existing systems in order to identify constraints within the existing networks. These constraints, along with the potential servicing strategies available for the NWSPA, will guide the development of potential servicing strategies for the NWSPA that will be further refined in Phases 2 and 3 of the study.

7.1. Water Model

Water modelling was completed for the NWSPA to identify deficiencies and/or required upgrades within the existing water system to facilitate the development of the Study Area. The various components of the Regional water system relevant to development of the Study Area are detailed below:

Treatment: As noted in Section 5.1.1, the Study Area will be supplied treated drinking water by the Niagara Falls WTP which has a rated capacity of 145.5 MLD (1,684 L/s). The Region's 2021 MP identified that the Niagara Falls WTP had sufficient existing capacity to provide treated water to support population growth to 2051, based on the population growth estimates carried within that study. As shown in **Table 7-1**, the growth estimates for the NWSPA were updated and it was confirmed that the Niagara Falls WTP will have sufficient treatment capacity for the build-out of the NWSPA.

Table 7-1: Water Treatment Plant Demands to Build-out

Demand Details		Region MSP	Region MSP (including NWSPA)
Population Identified for Study Area		3,497	4,200
Existing (MLD)	Average Day Demand (ADD)	43.0	43.0
	Maximum Day Demand (MDD)	64.5	64.5
2051 (MLD)	Average Day Demand (ADD)	59.5	59.6
	Maximum Day Demand (MDD)	90.9	91.1
Build-out (MLD)	Average Day Demand (ADD)	66.1	66.3
	Maximum Day Demand (MDD)	101.4	101.9

Pumping: As detailed in Section 5.1.2, water pressure is maintained throughout the Niagara Falls water system via a series of booster pumping stations (BPS) and storage facilities. The pumping stations include the Niagara Falls WTP High Lift Station and the Kent Avenue Booster Station. A summary of the pumping stations' performance as outlined in the 2021 Region MSP, along with a scenario considering the addition of the NWSPA, is outlined in **Table 7-2**.

Table 7-2: Summary of Water Booster Station Performance Details

Performance Details		Region MSP	Region MSP (including NWSPA)
Pump Station Firm Capacity (MLD)	Niagara Falls WTP / High Lift PS	146.0	
	Kent Avenue BPS	46.0	
Pressure Zone Supplied		250	
Total Effective Capacity (MLD)		146.0	

Performance Details		Region MSP	Region MSP (including NWSPA)
Existing (MLD)	Maximum Day Demand	64.5	64.5
	Surplus / Deficit	81.5	81.5
2051 (MLD)	Maximum Day Demand	90.9	91.1
	Surplus / Deficit	55.1	54.9
Build-out (MLD)	Maximum Day Demand	101.4	101.9
	Surplus / Deficit	44.6	44.2

As shown in **Table 7-2**, there is sufficient pumping capacity at the Region's existing water pumping stations to provide adequate water conveyance throughout the NWSPA.

Storage: As detailed in Section 5.1.3, there are three water storage facilities within the Niagara Falls WTP service area which are the Niagara Falls Reservoir, the Kent Avenue Reservoir, and Lundy's Lane Elevated Tank (ET). A summary of the storage facilities' performance details as outlined in the 2021 Region MSP, along with a scenario considering the addition of the NWSPA, is outlined in **Table 7-3.**

Table 7-3: Summary of Water Storage Performance Details

Facility	2021 Rated Capacity (ML)	2051 Rated Capacity (ML)	Buildout Rated Capacity (ML)
Niagara Falls WTP Reservoir (250 Pumped)	6.27	6.27	5.37
Kent Avenue Reservoir (250 Pumped)	20.91	20.91	20.91
Lundy's Lane ET (250 Floating)	2.46	12.00	12.00

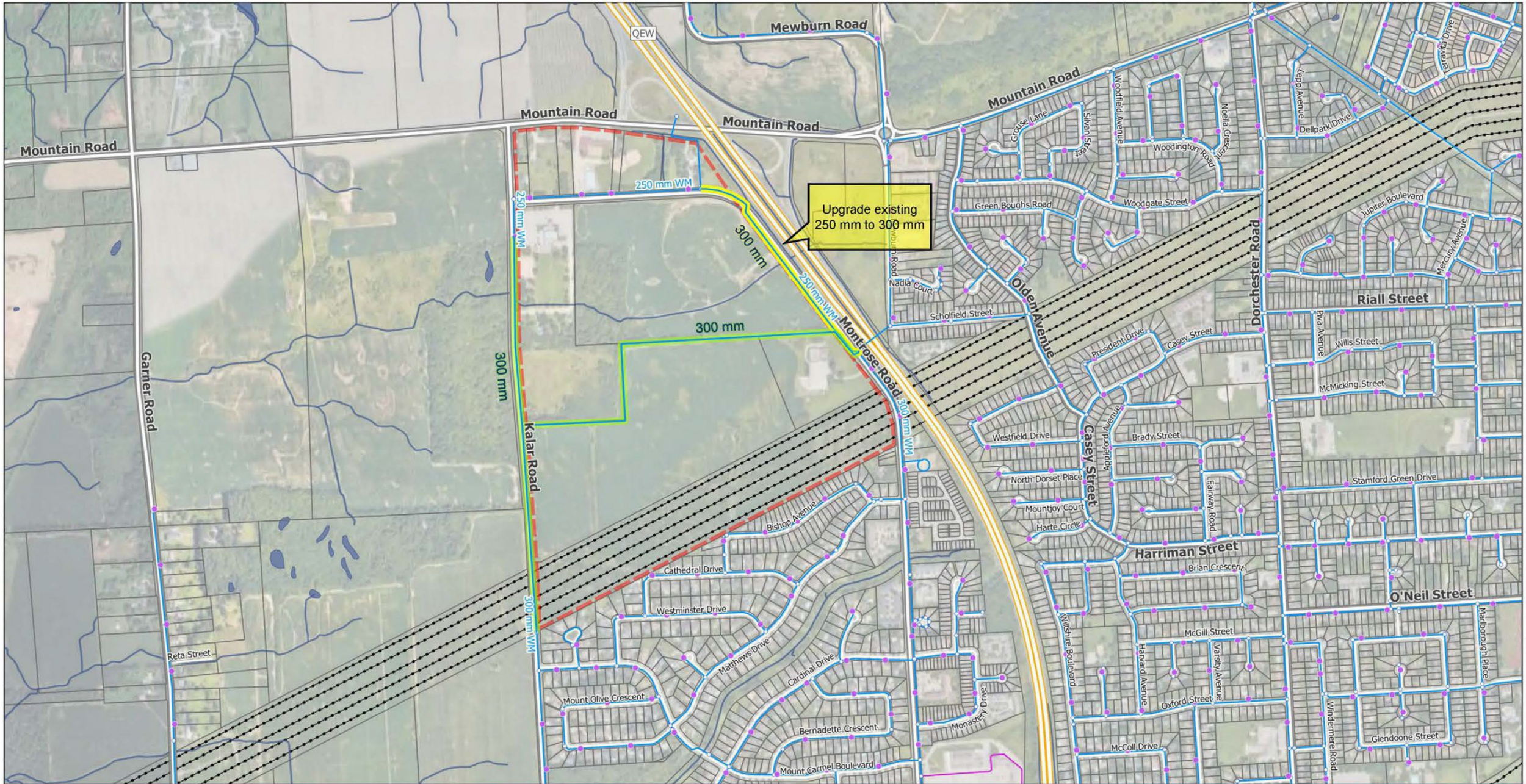
Table 7-4 Summary of the Water Storage Performance Details

Projection Year	Storage	Region MSP	Region MSP (including GWPSA)
2021	Available Storage (ML)	29.64	29.64
	Required Storage (ML)	31.33	31.33
	Surplus / Deficit (ML)	-1.69	-1.69
2051	Available Storage (ML)	39.18	39.18
	Required Storage (ML)	40.23	40.31
	Surplus / Deficit (ML)	-1.05	-1.13
Build-out	Available Storage (ML)	38.29	38.29
	Required Storage (ML)	44.06	44.20
	Surplus / Deficit (ML)	-5.77	-5.91

As shown in **Table 7-4**, there is a storage deficit within the Region's water system during the existing, 2051, and build-out scenarios with the addition of growth within the NWSPA having a minor impact.

System Improvements: As shown in **Figure 7-1**, a potential servicing strategy for the NWSPA includes the extension of local 300mmø watermain along Kalar Road and through the Study Area via a future subdivision road, along with upsizing of the existing 250mmø watermain on Montrose Road to a 300mmø watermain. Local service extensions to the development parcels can be made from these local watermains. This scenario will ensure that water pressure within the Study Area is maintained between

40-100 psi and available fire flow above 250 L/s under the 2051 and build-out conditions. As demonstrated in Section 7.1, water treatment and pumping are not constraints to development of the NWSPA however there is a storage deficit within the Region (refer to **Table 7-3** for details) that will need to be reviewed and addressed in future MSP updates.



Study Area
Hydro Line
Parcel
Waterbody, Watercourse

Proposed Infrastructure
Upgraded Local Distribution Main
New Local Distribution Main

Existing Water Infrastructure
Hydrant
Junction
Distribution Mains
Private

Reference(s)
1. Projection EPSG:26917
2. Base Data: City of Niagara Falls, 2024; Google Satellite, 2024

0 250 500 m

Figure 7-1
Map Title: Modelling Recommendations and Potential Connection Points for Water Infrastructure

Project Name:
Northwest Secondary Plan Area Functional Servicing Study

Client Name:
City of Niagara Falls (Ontario, Canada)

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7.2. Wastewater Model

Wastewater hydraulic modelling was completed to identify constraints within the existing system to development of the Secondary Plan Area. The constraints were considered within the context of developing a potential wastewater servicing strategy to discharge sewage flows from the NWSPA to the existing system with minimal impacts. The various components of the Regional and local wastewater system relevant to development of the Study Area are detailed below:

Treatment: Based on the location of the NWSPA, the Niagara Falls WWTP is the receiving treatment facility for flows from the Study Area. A desktop review of the average daily flows anticipated from the NWSPA vs. the available treatment capacity at the Niagara Falls WWTP to 2051 identified sufficient capacity assuming the South Niagara Falls WWTP is brought on-line as planned.

Sewer Conveyance: There were several locations at which the NWSPA's wastewater system could discharge flows to the existing network as detailed in Section 6.3. The review identified the following considerations for each outlet point:

- Potential Connection Point #1 (Inlet Sewer Invert = 185.20 masl; refer to **Figure 7-4**): A significant station expansion would be needed at the Mewburn Road SPS to accommodate flows from the Study Area, along with potentially an upgraded forcemain to address velocity issues, along with a QEW crossing.
- Potential Connection Points #2, #3, & #4 (Inlet Sewer Inverts = 191.92 masl, 187.26 masl, & 187.74 masl; refer to **Figure 7-4**): Local sewers did not have sufficient capacity and significant sections of sewer upsizing would be needed.
- Potential Connection Point #5 (Inlet Sewer Invert = 181.05 masl; refer to **Figure 7-4**): Modelling indicated surcharging within the downstream 500mmø & 900mmø trunk sewers however a planned Inflow & Infiltration (I/I) program could potentially reduce this surcharging. For the purposes of this study, it is assumed that these sewers would require upsizing to accommodate the flows from the Study Area (refer to **Figure 7-2**). This option appears to present the least number of obstacles to providing wastewater servicing to the Study Area.

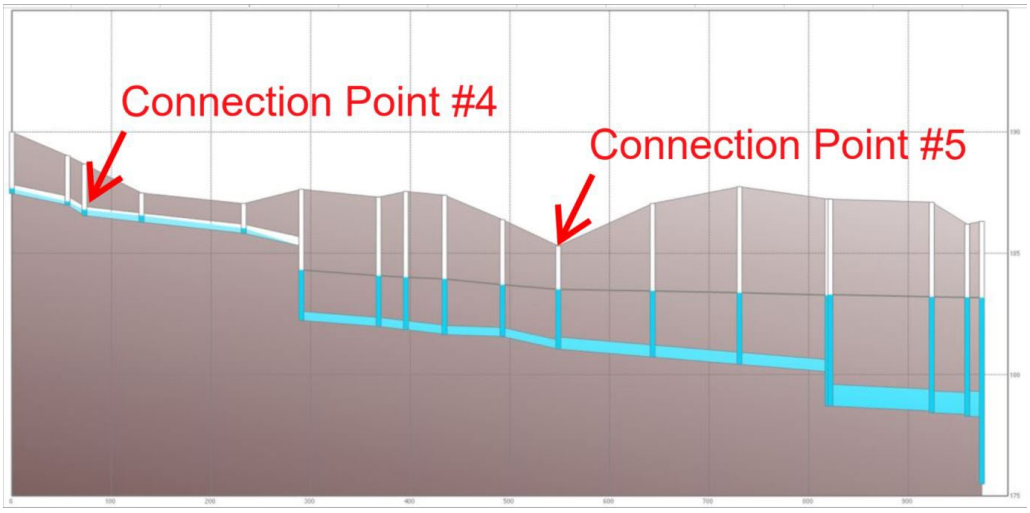


Figure 7-2: Modelling Outputs for Connection Points 4 & 5

Pumped Conveyance: As detailed in Section 6.1.2, Kalar SPS is downstream of Connection Point #5 and the modelling identified that it has the capacity to support the growth within the NWSPA and does not have recommendations for pump upgrades, however flows are backing up under the 10-year storm event into the upstream gravity sewers. The Kalar Road SPS pumps flows via a 2,500 metre length 600mmø forcemain to downstream receiving trunk sewers that flow by gravity to the Niagara Falls WWTP. The modelling indicated that surcharging is not anticipated from the Kalar Road SPS to the Niagara Falls WWTP (refer to **Figure 7-3**).

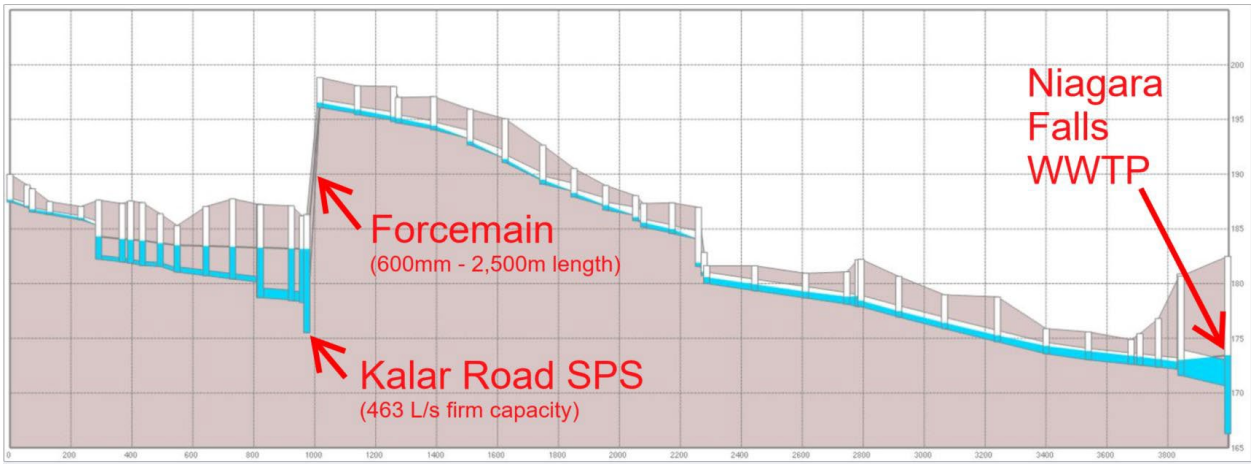
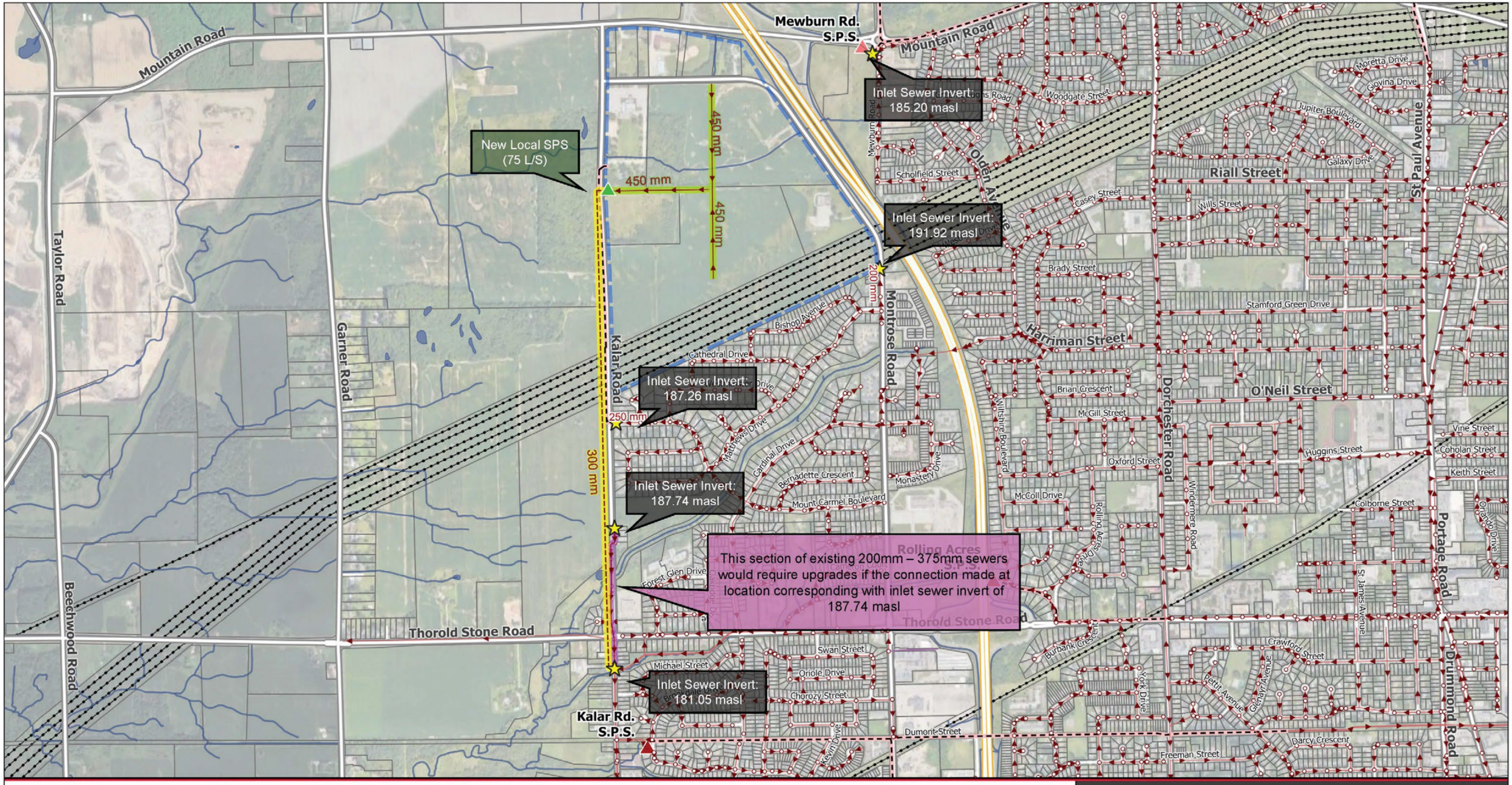


Figure 7-3: Modelling Outputs for Kalar SPS to Niagara Falls WWTP

System Improvements: As shown in **Figure 7-4**, a potential servicing strategy for the NWSPA includes the extension of local 450mmø gravity sewers throughout the Study Area along internal subdivision roads that discharge to a local sewage pumping station (SPS) located adjacent to Kalar Road. The local SPS (approximately sized for a firm capacity of 75 L/s) would pump south via a 300mmø forcemain installed along Kalar Road to the existing 500mmø trunk gravity sewer that discharges to the Kalar Road SPS. Sewer upgrades of the existing 500mmø and 900mmø sewers would be required to eliminate potential surcharging unless the planned I/I program removes this surcharging. The NWSPA sewage flows would then be pumped by the Kalar Road SPS, eventually discharging to the Niagara Falls WWTP which has sufficient capacity to treat flows from the Study Area.

It is noted that the 'Niagara Region Sewage Pumping Stations and Forcemains Policy' dictates that the CNF would be responsible for the cost of any new pumping stations with a design capacity of less than 170 L/s of peak dry weather flow. As the local SPS proposed for the NWSPA is approximately 75 L/s for peak wet weather flow it would be below the Regional threshold and therefore the responsibility of the Town.



Study Area
Hydro Line
Parcel
Waterbody, Watercourse

Proposed Infrastructure

- Potential Connection Point
- New Sanitary Pumping Station
- New Gravity Main
- New Force Main

Existing Wastewater Infrastructure

- Sewage Pumping Station (Region)
- Sewage Pumping Station (Local)
- Sanitary Access Chamber
- Force Main
- Sanitary Gravity Main
- Private

Reference(s)
1. Projection EPSG:26917
2. Base Data: City of Niagara Falls, 2024; Google Satellite, 2024

0 250 500 m

Figure 7-4
Map Title: Modelling Recommendations and Potential Connection Points for Wastewater Infrastructure

Project Name:
Northwest Secondary Plan Area Functional Servicing Study

Client Name:
City of Niagara Falls (Ontario, Canada)

GEI

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8. Recommendations for Phase 2

Phase 2 of the Functional Servicing Study will build upon the information within the Existing Conditions Report to evaluate servicing alternatives for alternative land use options for the NWSPA. The goal will be to evaluate the land use options from a servicing perspective, given the potential impacts to scheduling, phasing, ease of construction, and infrastructure costs. The following recommendations for Phase 2 are provided based on the information gathered during Phase 1:

- The preferred land use option should allow an infrastructure layout that protects or avoids the physical constraints identified in Section 2 of the Existing Conditions Report;
- The servicing design criteria identified in Section 3 of the Existing Conditions Report should be considered during Phase 2 and implemented into the recommended servicing layout identified in Phase 3;
- The timing identified in Sections 5.2 and 6.2 of the Existing Conditions Report for the planned water and wastewater capital projects should be considered when reviewing potential servicing and phasing strategies during Phases 2 and 3; and,
- The water and wastewater system constraints, along with the potential servicing strategies for the NWSPA, as identified in Section 7 of the Existing Conditions Report, should be considered when evaluating the alternative land use options in Phase 2.

GEI will continue to work closely with the project team, City, Region, and stakeholders throughout Phases 2 and 3 to develop a detailed and effective servicing plan for the Northwest Secondary Plan Area.