REGIONAL MUNICIPALITY OF NIAGARA
SOUTH NIAGARA FALLS WASTEWATER SOLUTIONS

V3.7 – Planning

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 new.treatment.plant@niagararegion.ca

LIST OF APPENDICES

BluePlan ENGINEERING

V3.7.1

REGIONAL MUNICIPALITY OF NIAGARA
SOUTH NIAGARA FALLS WASTEWATER SOLUTIONS

Planning

Growth and Flow Projections

Regional Municipality of Niagara
South Niagara Falls Wastewater Solutions Schedule C Class EA

Planning Projection Technical Memorandum

July 2022

Table of Contents

Figures

Tables

1 BACKGROUND

The population and employment projections and the background information for the South Niagara Falls Wastewater Solutions Class Environmental Assessment (SNFWWS Class EA) are based on the following sources:

1. Fundamental planning information is provided by the Province through the Provincial Policy Statement (PPS, 2014). The PPS considers 100-year needs and outlines planning data for Municipalities in the Greater Golden Horseshoe for a 2041 planning horizon.
2. The Niagara Region Municipal Comprehensive Review (MCR) was completed to take the PPS information and develop the preferred growth plan for the Region. The MCR planning information was the key input used in the 2017 Water and Wastewater Master Servicing Plan Update (MSPU).
3. The MSPU outlined the 2041 planning projections across the Region. These projections in combination with established design criteria were used to develop the flow projections and capacity requirements for the water and wastewater infrastructure for each system.

Region-wide projections as identified in the MSPU are provided in the following tables.

Table 1. MCR Population Growth by Municipality

MCR Strategic Growth Option Forecast Total Population by Local Municipality								
Municipality	**Total Population Including Net Undercoverage**							
	2011	**2014 ***	**2016**	**2021**	**2026**	**2031**	**2036**	**2041**
Fort Erie	30,760	31,216	31,520	32,310	34,720	37,780	41,220	43,940
Grimsby	26,000	27,224	28,040	29,430	31,400	33,200	35,140	37,150
Lincoln	23,080	23,884	24,420	24,990	26,230	28,060	30,030	31,590
Niagara Falls	85,200	88,326	90,410	92,830	99,990	108,770	117,670	124,580
NOTL	15,810	17,112	17,980	19,750	21,420	22,850	24,700	26,580
Pelham	17,040	17,352	17,560	17,900	19,410	21,560	23,720	25,260
Port Colborne	18,910	18,838	18,790	18,600	19,210	20,080	21,050	21,820
St. Catharines	134,890	135,940	136,640	136,930	142,560	150,590	160,040	167,480
Thorold	18,410	18,944	19,300	19,680	21,500	23,850	26,470	28,470
Wainfleet	6,520	6,532	6,540	6,590	6,760	6,990	7,260	7,480
Welland	51,980	53,000	53,680	54,130	56,540	59,600	63,160	66,180
West Lincoln	14,200	14,608	14,880	16,170	18,930	22,630	26,530	29,460
Niagara Region	**442,800**	**452,976**	**459,760**	**469,310**	**498,670**	**535,960**	**576,990**	**609,990**

Table 2. MCR Employment Growth by Municipality

MCR Strategic Growth Option Forecast Employment by Local Municipality								
Municipality	**Total Place of Work Employment**							
	2011	**2014 ***	**2016**	**2021**	**2026**	**2031**	**2036**	**2041**
Fort Erie	11,290	11,992	12,460	13,270	13,960	14,920	15,940	17,240
Grimsby	7,720	9,010	9,870	10,780	11,440	12,380	13,310	14,630
Lincoln	9,740	10,664	11,280	11,870	12,300	13,040	13,710	14,600
Niagara Falls	41,030	43,628	45,360	47,790	49,630	52,060	54,570	57,720
NOTL	10,650	12,066	13,010	13,720	14,150	14,660	15,230	16,030
Pelham	4,090	4,360	4,540	4,880	5,220	5,750	6,280	6,930
Port Colborne	5,860	5,806	5,770	5,900	6,080	6,350	6,640	7,000
St. Catharines	60,180	61,668	62,660	65,530	67,820	71,480	75,240	80,240
Thorold	7,360	7,786	8,070	8,480	8,870	9,390	9,960	10,660
Wainfleet	1,160	1,244	1,300	1,350	1,400	1,470	1,550	1,650
Welland	22,090	22,990	23,590	24,490	25,170	26,220	27,300	28,760
West Lincoln	4,280	4,802	5,150	5,770	6,370	7,270	8,280	9,560
Niagara Region	**185,450**	**196,016**	**203,060**	**213,830**	**222,410**	**234,990**	**248,010**	**265,020**

* Note: The Master Servicing Plan Update has an established baseline condition of year 2014. 2014 represents the best available system information and system calibration data for the water and wastewater models at the time of study initiation. The Master Servicing Plan Update has projected growth from year 2014 to establish the 2041 infrastructure needs.

2 SNF WWTP POPULATION AND EMPLOYMENT PROJECTIONS

2.1 SNF WWTP Service Area

In general, the new SNF WWTP will service areas of Niagara Falls south of Lundy's Lane and areas of Thorold South. The 2041 projections are based on growth within the approved urban boundaries of Niagara Falls and Thorold. Post period growth beyond 2041 will be considered in areas within the urban boundaries as well as potential growth in the vicinity of the 2041 service area.

2.2 SNF WWTP Growth Areas

To support the growth projection review for the new WWTP, further analysis has been undertaken on the following growth areas within the overall service area:

- **GA1** SNF, west of the Hydro Electric Power Canal (HEPC) and north of Welland River West
- **GA2** SNF, east of the HEPC and north of Chippawa Creek (Welland River East)
- **GA3** SNF, west of QEW and south of Welland River West
- **GA4** SNF, east of QEW and south of Chippawa Creek
- **GA5** Thorold South
- **GA6** SNF, potential future growth areas
- **GA7** Other potential areas that could be connected to the new SNF WWTP (no specific geographic boundary)

2.3 Additional Planning Review

As part of the projections and design basis review, additional discussions with the Niagara Region Planning Team were undertaken to determine if there were any further revisions or more recent information on growth needs within the SNF WWTP service area.

The Niagara Region Planning Team provided additional information for the South Niagara Falls area on a short, medium and longer-term basis, based on different key drivers for growth. Short term needs (estimated growth out to 2025) were based on current planning information including status of development plans including permitting, land approvals and available servicing. Medium term needs (estimated growth between 2025 and 2035) is based on known needs, infill, and anticipated timing of secondary plans. Long term needs (2035 – 2041) are based on rounding out of the growth plan numbers. Potential post 2041 growth was identified based on vacant lands and knowledge of potential growth ideas.

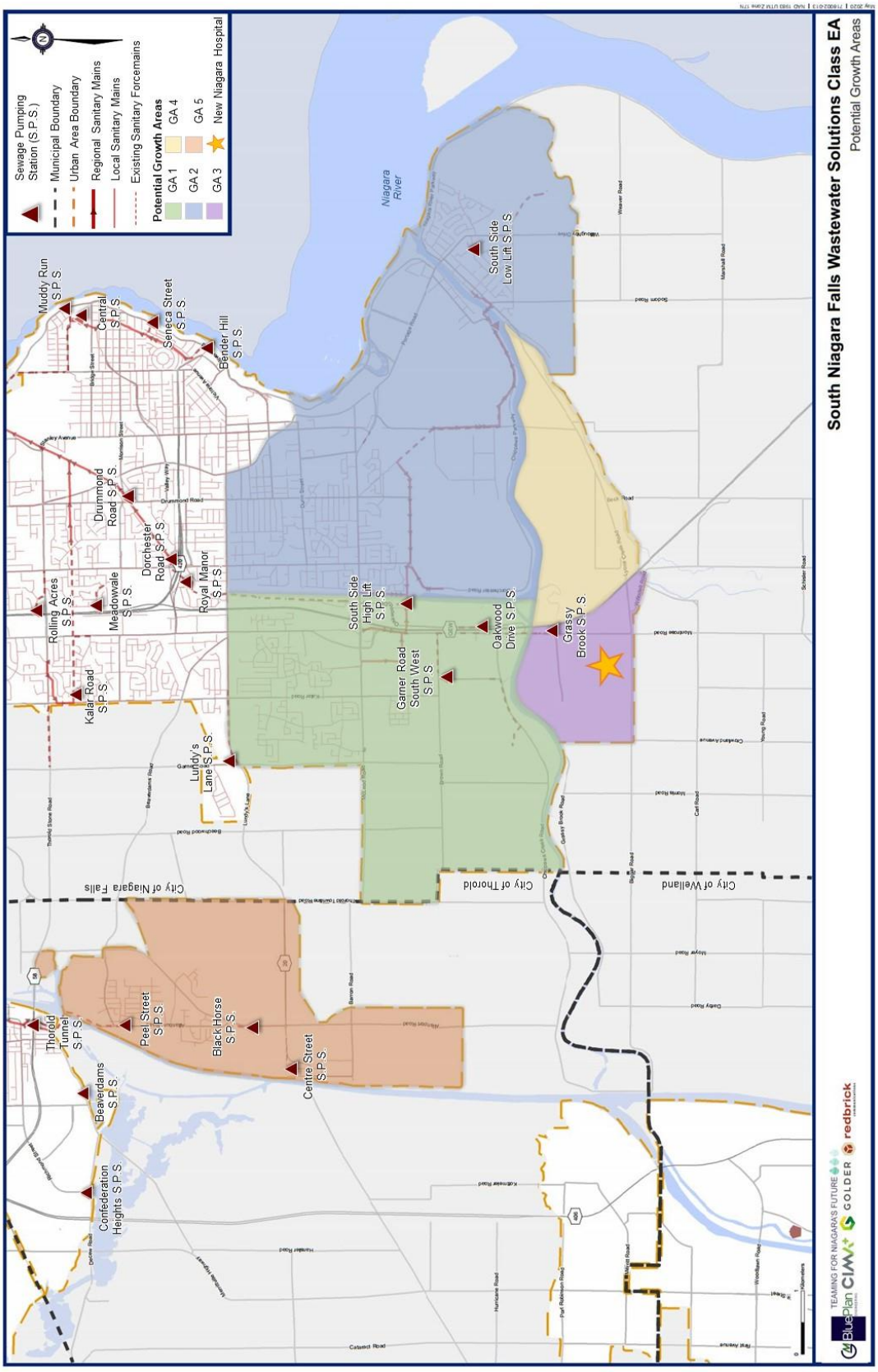


Figure 1. Growth Area Map

2.4 Growth Needs

An overview of the growth needs within each SNF WWTP Growth Area is provided below.

Table 3. Potential Growth Areas with Associated TAZ Identification

GA1	• Infill within existing built boundary • Greenfield residential and employment • Mostly north of Garner Road
	TAZ ID: 7259, 7356, 7357, 7358, 7360, 7361, 7362, 7363, 7364, 7378, 7379, 7380, 7381, 7382
GA2	• Infill within existing built boundary • Greenfield residential and employment • Thundering Waters redevelopment • Veda Land development • Post 2041 – potential Marineland redevelopment
	TAZ ID: 7365, 7366, 7367, 7368, 7369, 7371, 7373, 7374, 7375, 7376, 7377, 7383, 7384, 7385, 7386, 7387, 7388, 7389, 7390
GA3	• Greenfield residential and employment • New Hospital • Limited post 2041 growth identified at this time
	TAZ ID: 7392
GA4	• Primarily greenfield employment • Post 2041 – development of the Oakland Golf Course
	TAZ ID: 7391
GA5	• Greenfield residential and employment growth in Thorold South • Primarily located in Rolling Meadows area
	City of Thorold TAZ ID: 7666, 7667, 7668, 7669
GA6	• Post 2041 potential growth areas include potential developable land identified by Niagara Falls • Focused on QEW frontage and supporting the Economic Gateway to the US Border
	TAZ ID: 7393, 7395, 7396, 7397, 7398
GA7	• Based on the location of the new SNF WWTP, there may be other areas outside the primary service area that could connect to the plant. • Stevensville/Douglastown Lagoons service area could be considered
	Town of Fort Erie TAZ ID: 7396, 7397, 7801, 7813, 7814

2.5 Growth Projections

In order to identify the potential service areas for both the existing Stanley Ave WWTP and the new SNF WWTP, the growth projections were reviewed for the City of Niagara Falls as well as the SNF WWTP Growth Areas (GAs).

The Master Servicing Plan Update (MSPU) and the Municipal Comprehensive Review (MCR) data was reviewed. Additional discussion with Region planning team was also undertaken to understand any local planning updates.

The goal is to identify the Growth Projections for both plants at key milestones including:

- Existing conditions;
- In service date for the SNF WWTP;
- 2041 needs; and,
- Potential Post 2041 needs

Utilizing the MSPU information and planning data by Traffic Allocation Zone (TAZ), the growth projections for the SNF WWTP GAs are summarized in Tables 4 and 5.

The overall growth projections for both the Stanley Ave WWTP and the new SNF WWTP, based on timing of the new plant implementation are summarized in Tables 6 to 8.

2.5.1 SNF GA Growth Projections

Table 4. Projected Residential Population within Identified Growth Areas

Area	2016	2021	2025 [1]	2027 [2]	2031	2041	Post 2041
GA1	10,243	11,263	13,670	13,957	14,558	17,264	17,264
GA2	23,583	25,808	28,754	30,161	33,384	37,101	56,981
GA3	306	726	1,748	2,259	3,277	4,764	4,764
GA4	263	593	1,564	2,022	2,963	3,373	9,963
GA5	2,560	2,568	2,834	3,059	3,694	3,901	10,000 [3]
GA6	-	-	-	-	-	-	31,250
GA7	-	-	-	-	-	-	5,058
Total	**36,955**	**40,958**	**48,570**	**51,458**	**57,876**	**66,403**	**135,280**

Note: 1) Based on short term planning information
2) Based on in-service date for the new SNF WWTP. Interpolated from 2025 and 2031 data
3) Estimated based on potential development plans

Table 5. Projected Employment Population within Identified Growth Areas

Area	2016	2021	2025 [1]	2027 [2]	2031	2041	Post 2041
GA1	5,423	5,832	5,971	6,060	6,275	6,823	6,823
GA2	7,512	8,007	8,140	8,225	8,432	9,039	10,926
GA3	0	0	1,803	2,120	2,869	5,000	5,000
GA4	0	0	0	0	0	107	107
GA5	1,285	1,384	1,447	1,491	1,602	1,929	5,000
GA6	-	-	-	-	-	-	31,250
GA7	-	-	-	-	-	-	919
Total	**14,220**	**15,223**	**17,361**	**17,896**	**19,178**	**22,898**	**60,025**

Note: 1) Based on short term planning information
2) Based on in-service date for the new SNF WWTP. Interpolated from 2025 and 2031 data
3) Estimated based on potential development plans

2.5.2 Overall Stanley Ave WWTP and SNF WWTP Growth Projections

Table 6. WWTP Residential Growth Projections

Population							
Area	2016	2021	2025	2027	2031	2041	Post 2041
Stanley Ave WWTP (NF)	90,784	97,935	104,258	64,705	64,963	67,137	134,274
Stanley Ave WWTP (NOTL)	1,366	1,810	2,299	2,543	3,032	4,384	4,384
Stanley Ave WWTP (Total)	92,150	99,745	106,557	67,248	67,995	71,521	138,658
SNF WWTP GA1 (NF)				13,957	16,122	20,644	21,655
SNF WWTP GA2 (NF)				24,477	28,130	35,783	56,981
SNF WWTP GA3 (NF)				2,259	2,433	5,039	4,764
SNF WWTP GA4 (NF)				2,022	2,095	3,907	9,963
SNF WWTP GA5 (TH)				3,663	4,542	6,412	10,000
SNF WWTP GA6 (Other)							31,250
SNF WWTP GA7 (Other)							5,058
SNF WWTP (Total)				46,378	53,322	75,622	139,671

Niagara Falls Total	90,784	97,935	104,258	107,420	113,743	131,037	227,637
NOTL Total	1,366	1,810	2,299	2,543	3,032	4,384	4,384
Thorold Total	-	-	-	3,059	3,694	3,901	10,000
Other Total	-	-	-	-	-	-	36,308

Table 7. WWTP Employment Growth Projections

Employment							
Area	2016	2021	2025	2027	2031	2041	Post 2041
Stanley Ave WWTP (NF)	42,180	37,979	41,431	29,674	30,509	33,432	73,602
Stanley Ave WWTP (NOTL)	348	397	405	409	417	436	436
Stanley Ave WWTP (Total)	42,528	38,376	41,836	30,083	30,926	33,868	74,038
SNF WWTP GA1 (NF)				5,067	5,552	5,839	6,823
SNF WWTP GA2 (NF)				6,297	7,152	7,656	10,926
SNF WWTP GA3 (NF)				2,120	2,404	3,258	5,000
SNF WWTP GA4 (NF)				-	993	1,525	3,000
SNF WWTP GA5 (TH)				1,275	1,756	2,236	5,000
SNF WWTP GA6 (Other)							31,250
SNF WWTP GA7 (Other)							919
SNF WWTP (Total)				14,759	17,857	20,514	62,918

Niagara Falls Total	42,180	37,979	41,431	43,158	46,610	51,710	96,351
NOTL Total	348	397	405	409	417	436	436
Thorold Total	-	-	-	1,275	1,756	2,236	5,000
Other Total	-	-	-	-	-	-	32,169

Table 8. WWTP Population and Jobs Growth Projections

Population and Employment (people and jobs)							
Area	2016	2021	2025	2027	2031	2041	Post 2041
Stanley Ave WWTP (NF)	132,964	135,914	145,690	94,738	95,472	100,569	207,876
Stanley Ave WWTP (NOTL)	1,714	2,207	2,704	2,952	3,449	4,820	4,820
Stanley Ave WWTP (Total)	134,678	138,121	148,393	97,331	98,921	105,389	212,696
SNF WWTP GA1 (NF)				19,024	21,674	26,483	28,478
SNF WWTP GA2 (NF)				30,774	35,282	43,439	67,907
SNF WWTP GA3 (NF)				4,379	4,837	7,428	9,764
SNF WWTP GA4 (NF)				2,022	3,088	4,828	12,963
SNF WWTP GA5 (TH)				4,938	6,298	7,713	15,000
SNF WWTP GA6 (Other)							62,500
SNF WWTP GA7 (Other)							5,977
SNF WWTP (Total)				61,137	71,179	89,891	202,589

Niagara Falls Total	132,964	135,914	145,690	150,577	160,353	182,747	326,988
NOTL Total	1,714	2,207	2,704	2,952	3,449	4,820	4,820
Thorold Total	-	-	-	4,938	6,298	7,713	15,000
Other Total	-	-	-	-	-	-	68,477

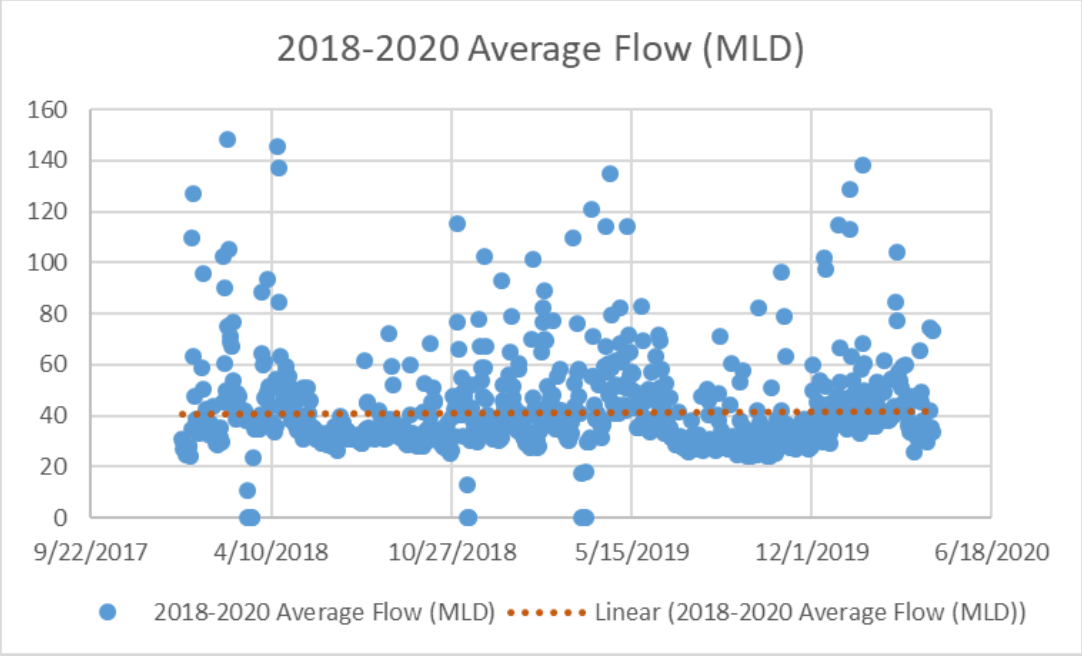
For both the Stanley Ave WWTP and SNF WWTP, the Post 2041 growth projections have been estimated primarily to establish a long-term potential capacity requirement at the plants. They do not represent an estimate vetted through Regional or Local planning processes. They also do not represent a target year for growth but simply a potential long-term need.

For the SNF WWTP, the Post 2041 growth projections have been estimated based on potential land use in the identified Growth Areas. For Stanley Ave WWTP, the Post 2041 growth projections reflect a near doubling of the 2041 population and jobs similar to the SNF WWTP service area.

3 WASTEWATER FLOW AND DESIGN CRITERIA REVIEW

The flow data for the existing Stanley Ave. WWTP was reviewed for the last 3 years: end of 2017 - early 2020. The average daily flows to the plant are shown in the Figure below.

Figure 2. Stanley Ave WWTP Average Daily Flows



From recent data, the average flow to the plant is approximately 40 MLD.

The existing population and employment within the Stanley Ave WWTP during this period is approximately 140,000 people and jobs.

This equates to approximately 285 Lpcd. Under the MSPU, the design criteria for future growth was established at 275 Lpcd. The flow data review of existing flows to the plant generally validates the Region design criteria of 275 Lpcd for new growth.

4 WWTP FLOW PROJECTIONS

The methodology to estimate flow projections for both the Stanley Ave WWTP and the new SNF WWTP is similar to that completed under the MSPU.

The existing conditions and current flows are established through review of existing plant records. This review establishes a "starting point". The growth projections are added to the starting point using population and jobs with wastewater flow design criteria.

Consistent with the MSPU, the wastewater design criteria is 275 Lpcd for both future population and jobs to estimate wastewater average day flows.

All growth in Niagara Falls will continue to convey flows to the existing Stanley Ave WWTP until the new SNF WWTP is online. At time, the SNF WWTP service area will receive flows to the new plant from a combination of existing flows and new growth moving forward.

The existing service area generally south of Lundy's Lane currently conveying flows to the Stanley Ave WWTP will switch to convey flows to the new SNF WWTP once in service. The Stanley Ave WWTP flow projections will reflect a drop in flows at that time.

Based on the estimated in-service timing for the new SNF WWTP in 2027, the flow projections for both plants in year 2027 will show this switch in service area.

Table 9. WWTP Flow Projections

Average Day Flows (MLD)							
Area	2016	2021	2025	2027	2031	2041	Post 2041
Stanley Ave WWTP (NF) *	40.3	41.1	43.8	29.7	30.0	31.4	60.9
Stanley Ave WWTP (NOTL)	0.5	0.6	0.7	0.8	0.9	1.3	1.3
Stanley Ave WWTP (Total)	40.8	41.7	44.5	30.5	30.9	32.7	62.2
SNF WWTP GA1 (NF)				5.2	6.0	7.3	7.8
SNF WWTP GA2 (NF)				8.5	9.7	11.9	18.7
SNF WWTP GA3 (NF)				1.2	1.3	2.0	2.7
SNF WWTP GA4 (NF)				0.6	0.8	1.3	3.6
SNF WWTP GA5 (TH)				1.4	1.7	2.1	4.1
SNF WWTP GA6 (Other)							17.2
SNF WWTP GA7 (Other)							1.6
SNF WWTP (Total)				16.8	19.6	24.7	55.7
Niagara Falls Total	40.3	41.1	43.8	45.1	47.8	54.0	93.6
NOTL Total	0.5	0.6	0.7	0.8	0.9	1.3	1.3
Thorold Total	-	-	-	1.4	1.7	2.1	4.1
Other Total	-	-	-	-	-	-	18.8

**2016 Flow adjustment to reflect actual plant recorded flows and starting point*

Figure 3. Stanley Ave WWTP Flow Projections

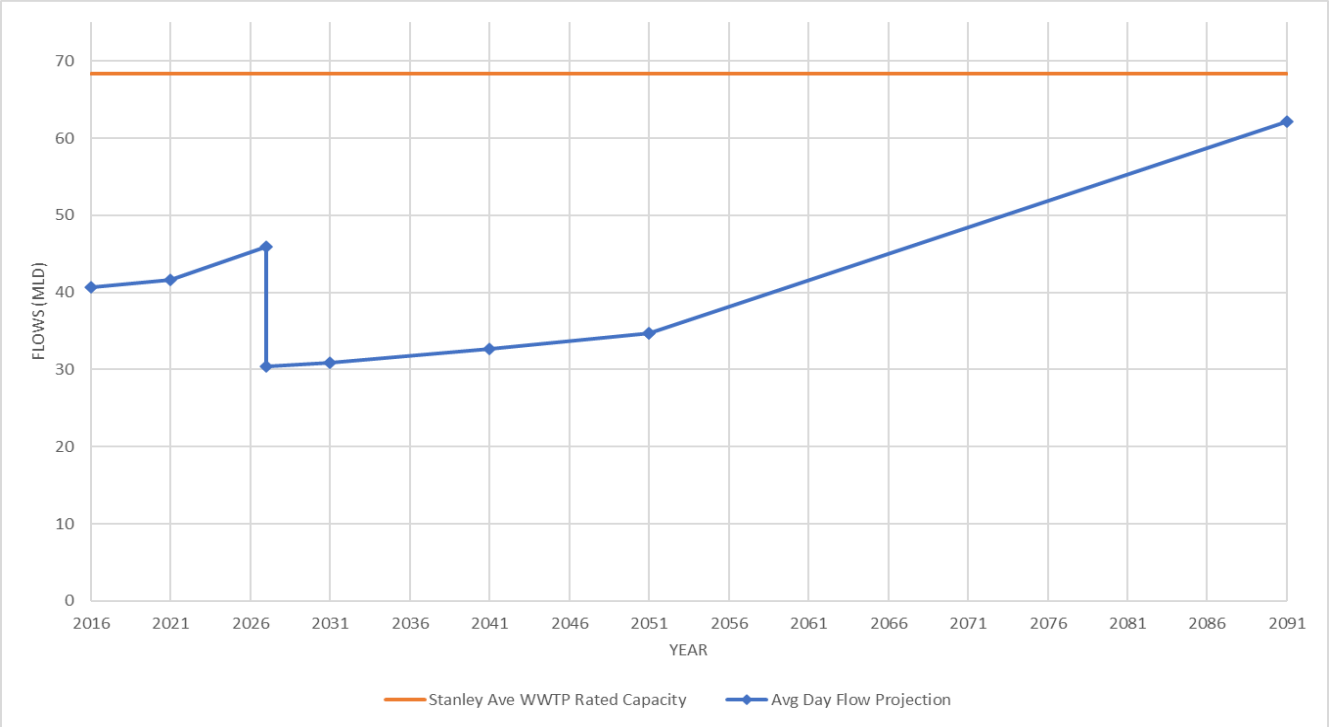
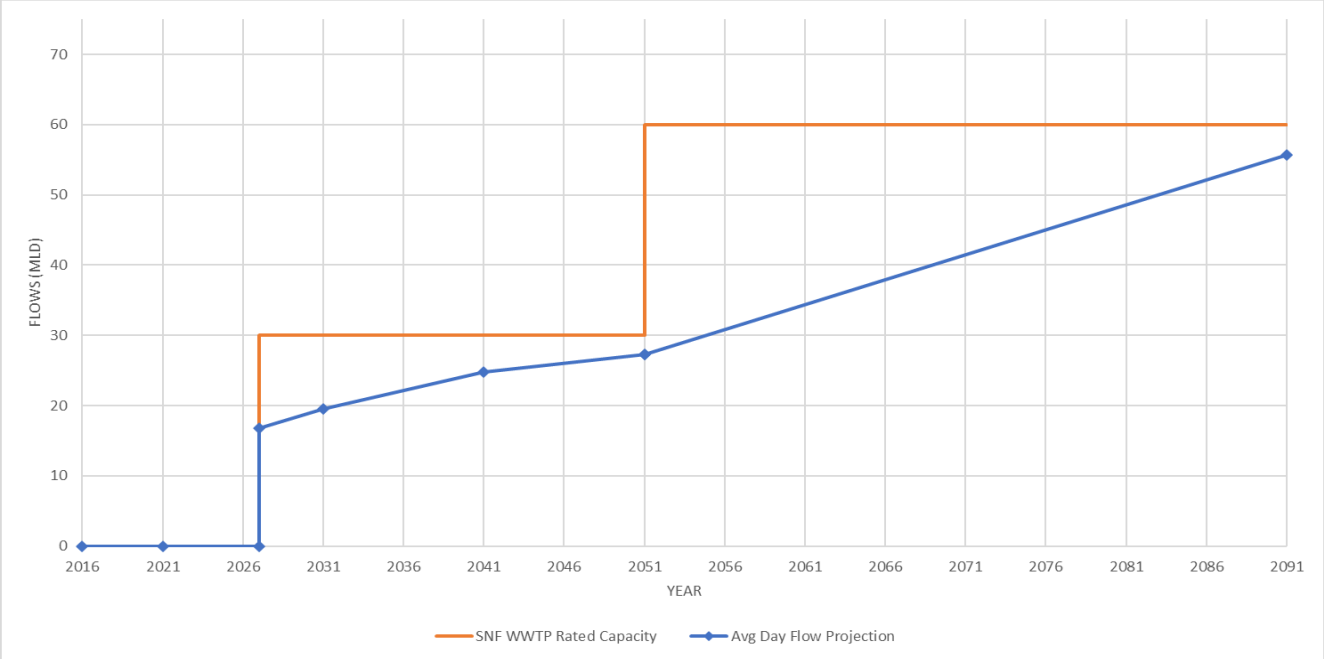


Figure 4. SNF WWTP Flow Projections



BluePlan ENGINEERING

V3.7.2

REGIONAL MUNICIPALITY OF NIAGARA
SOUTH NIAGARA FALLS WASTEWATER SOLUTIONS

Planning

Wet Weather Flow Management

Regional Municipality of Niagara
South Niagara Falls Wastewater Solutions Schedule C Class EA

Wet Weather Flow Management Technical Memorandum

July 2022

Table of Contents

Figures

Tables

1 BACKGROUND

A fundamental element of the SNFWWS Class EA Problem and Opportunity statement is to develop a preferred solution and design concept that not only identifies the new SNF WWTP and outfall location but also integrates the wastewater network to address growth, make the system as efficient as possible, and manage wet weather. In addition, a key study objective is to protect the environment through reducing pollution into the rivers and the environment as well as minimize flooding.

The capacity and site planning for the new SNF WWTP and the conveyance strategy, location, size, and depth of the new SNF trunk sewer, are critical infrastructure as part of the overall wet weather flow management program in the broader study area.

2 EXISTING NIAGARA FALLS SYSTEM

The existing Niagara Falls wastewater system consists of a trunk network of pumping stations, sub-trunk sewers, and trunk wastewater interceptor that convey flows generally north to the existing Stanley Ave WWTP.

There are a number of wastewater outfalls or sanitary sewer overflows (SSOs) that discharge to the Hydro Electric Power Canal (HEPC) that ultimately flows to Lake Ontario. The outfalls are primarily related to overflow pipes from the many sewage pumping stations in the network. In particular, the SSHLPS is a large facility with high peak wastewater flows that represent a significant portion of discharges to the HEPC. The key outfall locations in Niagara Falls are summarized below and depicted in the following figure:

- Chippawa Overflow,
- Overflow Downstream of the SSLLPS Forcemain,
- SSHLPS Overflow to Hydro Canal,
- McLeod Road Overflow,
- Royal Manor SPS,
- Dorchester Road SPS,
- Bellevue Street Overflow,
- Drummond Road SPS, and,
- Sinnicks Avenue Overflow.

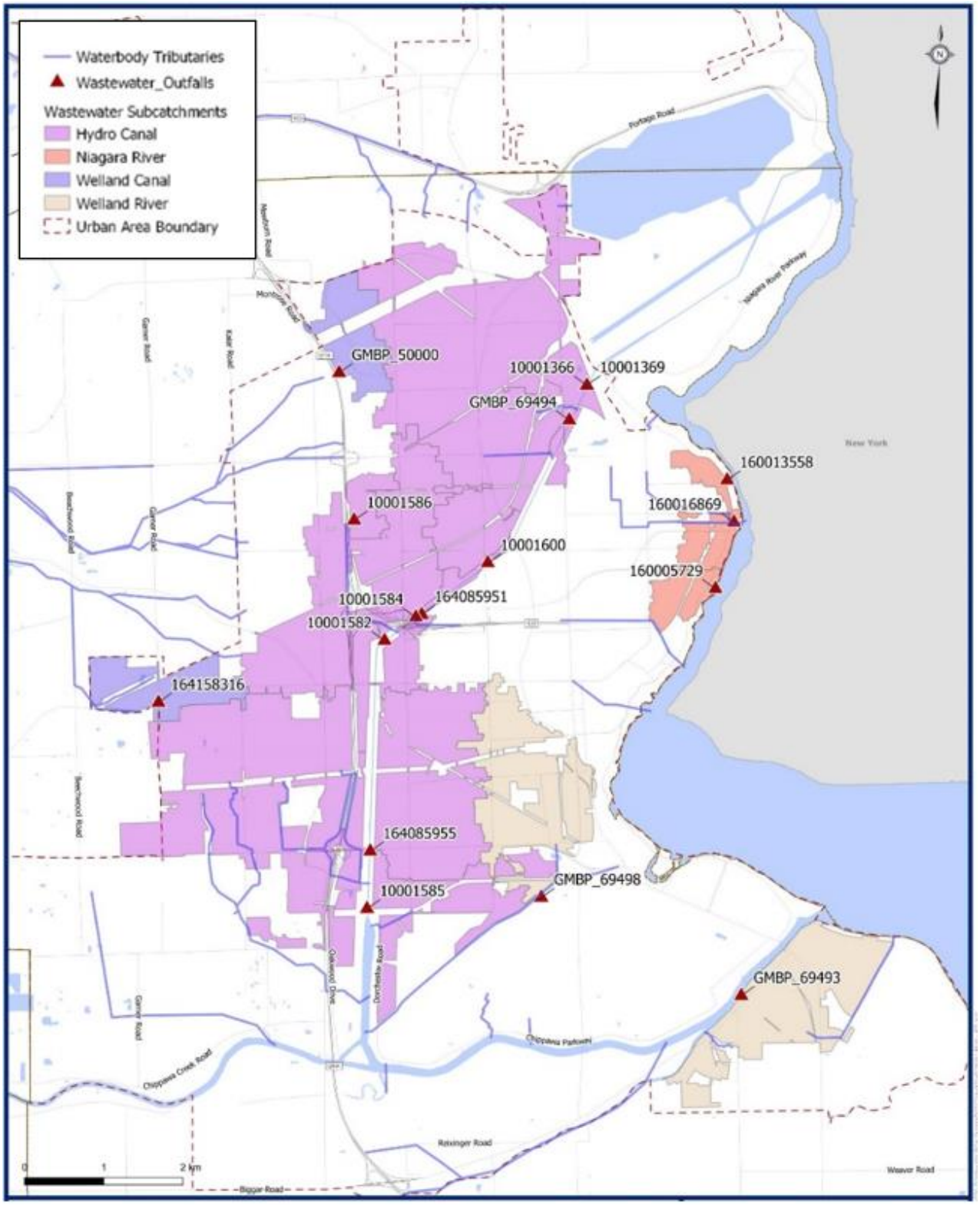


Figure 1. Wastewater Outfall Locations within the City of Niagara Falls

3 CONVEYANCE STRATEGY

The new SNF trunk sewer will receive flows at the SSHLPS location and convey all flows to the new SNF WWTP. The SNF trunk sewer is recommended to have a minimum diameter of 1500 mm to 1800 mm and will be installed at depths reaching approximately 20 metres at the SNF WWTP inlet.

This sewer provides not only capacity for future growth in the area, it will also redirect existing flows currently being pumped north through the SSHLPS and convey all these flows, including peak flows, south to the SNF WWTP. The SNF trunk sewer is sized and at a depth to provide conveyance and storage as required to manage the peak flows in the area. Redirection of these flows significantly reduces the flows entering the Stamford Interceptor relieving capacity constraints on the existing trunk infrastructure and allowing less constrained pumping to the Interceptor from the pumping stations further north.

The depth of the new SNF trunk sewer at the inlet to the new SNF WWTP also provides flexibility for future gravity servicing of existing and future growth areas in South Niagara Falls. In particular, the inlet depth has been selected to support potential gravity servicing of the Chippawa area in South Niagara Falls. Chippawa continues to implement wet weather management programs to minimize extraneous flows and overflow occurrences. The Chippawa area is serviced by the SSLLPS and forcemain which have limited capacity to address the full potential peak flows from this area. Providing a trunk sewer gravity feed from Chippawa directly to the new SNF WWTP would eliminate overflows from the trunk system in this area.

4 HYDRAULIC ANALYSIS

In order to determine the level of wet weather management and net environmental benefit, the current Niagara Region full pipe wastewater model for Niagara Falls was used for the hydraulic analysis. The system was modelled under dry weather and wet weather conditions with 2-year and 5-year design storms under existing conditions and future conditions with the SNF trunk infrastructure in place.

Detailed results are presented in the following table.

Table 1. Wet Weather Modelling Results

		Overflow Volumes (m3)								
	Scenario	Existing Conditions			Re-direction of South Side High Lift SPS to the new SNFWWTP via a new trunk sewer			Re-direction of South Side High Lift SPS to the new SNFWWTP via a new trunk sewer and accounting for ongoing extraneous flow reduction program		Comments
Area Servicing	All Overflows (m3)	Typical Dry Weather Flows	2 Year Design Storm Event	5 Year Design Storm Event	Typical Dry Weather Flows	2 Year Design Storm Event	5 Year Design Storm Event	2 Year Design Storm Event	5 Year Design Storm Event	
Tributary to South Side High Lift SPS	Chippawa Overflow	0	568	858	0	569	858	210	369	Located in South Side Low Lift SPS catchment, not impacted High Lift SPS flow reductions Within extraneous flow reduction area
	Overflow Downstream of Low Lift SPS Forcemain	0	0	322	0	0	2	0	0	Local capacity current restricted by High Lift SPS Within extraneous flow reduction area Note: Revised to reflect latest flow monitoring data. Values differ from Hydro Canal Memo.
	High Lift PS Overflow to Hydro Canal	0	11,559	16,399	0	0	0	0	0	Note: Revised to reflect latest flow monitoring data. Values differ from Hydro Canal Memo.
	McLeod Rd Overflow	0	1,075	1,842	0	935	1,536	779	1,272	Local capacity current restricted by High Lift SPS Within extraneous flow reduction area Note: Revised to reflect latest flow monitoring data. Values differ from Hydro Canal Memo.
Downstream of the South Side High Lift SPS	Royal Manor PS	0	383	584	0	383	584	383	584	No change
	Dorchester Rd PS	0	2,921	4,790	0	2,921	4,790	2,921	4,790	No change
	Bellevue St Overflow	0	0	0	0	0	0	0	0	No overflows, Past analysis shows overflows in under 10 year design storm or greater
	Drummond Rd PS	0	0	97	0	0	97	0	97	No change
	Sinnicks Ave Overflow	0	0	0	0	0	0	0	0	No overflows, no change. Past analysis shows no overflows.
	WWTP Bypass (WWTP Flow Rate = 136.9)	0	30,969	37,445	0	12,592	16,650	12,592	16,650	Bypassing reduced due South Side High Lift SPS re-direction Current extraneous flow reduction program targeted with South Side High Lift SPS catchment
	WWTP Bypass Considering Peak WWF Capacity (205 MLD)									
	Total Overflow Volume excluding Bypass (m3)	**0**	**16,506**	**24,891**	**0**	**4,808**	**7,865**	**4,292**	**7,111**	
	Total Overflow Volume including Bypass (m3)	**0**	**47,476**	**62,336**	**0**	**17,400**	**24,515**	**16,884**	**23,761**	
	Net Reduction Total Overflow Volume excluding Bypass (%)				0%	71%	68%	74%	71%	
	Net Reduction Total Overflow Volume including Bypass (%)				0%	63%	61%	64%	62%	

Interpretation of Table 1 and the modelling results is summarized as follows:

- The overflows listed are the key existing locations along the HEPC that demonstrate overflows under wet weather conditions. They are primarily located at SPSs.
- The existing conditions column show results at each overflow under a 2-year storm and 5-year storm. The overflow volume (m^3) is the total volume discharging to the environment under the typical storm period.
- The most significant reductions in overflows are located at the HLPS and Stanley Ave WWTP bypass. With the new SNF infrastructure in place, the overflows would be reduced as follows:
    - HLPS from 11,559 m^3 to 0 m^3 under a 2-year storm and 16,399 m^3 to 0 m^3 under a 5-year storm
    - WWTP bypass from 30,969 m^3 to 12,592 m^3 under a 2-year storm and 37,445 m^3 to 16,650 m^3 under a 5-year storm
- The overflow reduction equates to 63% under a 2-year storm including the benefit at the WWTP and 61% under a 5-year storm including the benefit at the WWTP.
- There are no dry weather overflows under current or future conditions.
- The depth of the SNF trunk sewer at the incoming SPS at the SNF WWTP provides for future gravity connection of the broader SNF study area including Chippawa. Should Chippawa be connected directly to the new plant and not require pumping through the SSLLPS, additional wet weather overflow reduction would be achieved.
- Reducing flows heading “north” to the Stanley Ave WWTP has direct benefit to the environment and provides the existing plant with flexibility to manage flows and reduce bypassing.

5 WET WEATHER SUMMARY

The SNFWWS design concept and recommendations provide significant wet weather management and net environmental benefit to the study area.

It has been demonstrated through modelling that the system overflows once the new SNFWWS program infrastructure is in place, shown in the summary table below are significantly lower than the overflows under current conditions.

Table 2. Wet Weather Modelling Results Summary

Existing Conditions	Dry Weather	2-year Storm	5-year Storm
Total Overflow Volume (m^3) During Storm (excluding Stanley Ave WWTP bypass)	0	16,505	24,891
Total Overflow Volume (m^3) During Storm (including Stanley Ave WWTP bypass)	0	47,476	62,336

Future Conditions with the new SNF trunk infrastructure	Dry Weather	2-year Storm	5-year Storm
Total Overflow Volume (m^3) During Storm (excluding Stanley Ave WWTP bypass)	0	4,808	7,865
Total Overflow Volume (m^3) During Storm (including Stanley Ave WWTP bypass)	0	17,400	24,515

The new SNF trunk sewer and new SNF WWTP will be capable of capturing and reducing wet weather overflows to the environment by over 60% under the 2-year and 5-year storm events and is anticipated to capture a similar level for most events. (17,400/47,476 = 37%, 24,515/62,336 = 39%). The servicing strategy will also fully capture all overflows under a minimum 5-year storm and under more severe wet weather conditions from the SSHLPS location which is one of the most significant contributors to overflow in the existing system. The location and depth of the infrastructure also provides opportunity for additional peak flow capture and overflow reduction through future servicing planning.

BluePlan ENGINEERING

V3.7.3

REGIONAL MUNICIPALITY OF NIAGARA
SOUTH NIAGARA FALLS WASTEWATER SOLUTIONS

Planning

Grassy Brook Service Area Review

Regional Municipality of Niagara
South Niagara Falls Wastewater Solutions Schedule C Class EA

Grassy Brook SPS Service Area Review

Technical Memorandum

July 2022

Table of Contents

1 BACKGROUND

The SNFWWS Class EA has identified a long term trunk wastewater servicing strategy to service areas of South Niagara Falls as well as areas of Thorold South. The key components of the SNFWWS program include the new SNF WWTP located at Reixinger Road and the new SNF Trunk Sewer located on Montrose Road.

Once the new SNF WWTP and Trunk Sewer are constructed and in service, this new infrastructure will provide flexibility to update local servicing. The new SNF Trunk Sewer will also provide opportunity to decommission existing sewage pumping stations including the Grassy Brook SPS on Montrose Road.

With the completion of construction for the SNFWWS infrastructure anticipated at the end of 2027, the existing servicing in the area will need to continue and remain in service. Of particular note, the Grassy Brook SPS service catchment includes the proposed South Niagara Hospital located at the corner of Montrose Road and Biggar Road. The hospital construction is underway, and the hospital is anticipated to be functional and utilizing municipal services prior to 2027 and the commissioning of the new SNFWWS infrastructure. There also remains continued development interest in the Grassy Brook SPS catchment area.

This Technical Memorandum is intended to provide comment and recommendations regarding the interim servicing conditions at the Grassy Brook SPS until the SNFWWS infrastructure is in place.

The results contained within this memo are based on preliminary analysis utilizing historic flow data at the Grassy Brook SPS, supplied pump station and sewer drawings, and past reports. It is noted that the 2021 MSP Update is currently underway and will have more detailed system hydraulic modelling and analysis available which may supersede these results.

2 GRASSY BROOK SPS OVERVIEW

The Grassy Brook SPS is a 2 pump (1 duty and 1 standby) pump station with an option for a third pump. The pump station has a rated capacity of 19.9 L/s and an operational capacity of approximately 17.8 L/s, as provided by the Region's operations staff.

The assessment of the existing Grassy Brook sewer system indicates that there is approximately 200 m^3 of wet well storage and 200 m^3 of network storage. This equates to approximately 400 m^3 of effective storage for the facility to manage peak flows and help maintain the peak system hydraulic grade line 1.8 m below ground elevations, the typical target used within the Niagara Region as a measure against basement flooding. This estimated effective storage does not account for any new sewers being constructed, including any new sewers from the new South Niagara Hospital if proposed.

It is our understanding that the Region currently sizes the peak flow capacity of pump stations to provide pumping of peak wet weather flows using the (long-term) extraneous flow rate of 0.286 L/s/ha, with an additional consideration to provide sufficient effective storage volume to manage 5-year design storm flows and volumes.

Through the Region's 2016 MSP, the existing design flow of the Grassy Brook SPS utilizing the 0.286 L/s/ha allowance was 19.4 L/s.

Utilizing the historic flow records (2018-2020), the station had a typical dry weather flow of approximately 1.9 L/s. There are high baseflows in the spring corresponding to snowmelt, and when compounded with rainfall, flow rates as high as 25 L/s have been observed (April 2019). In the summer months, higher intensity storms also lead to high flow rate responses, where frequent short-term peak flows ranging from 4-12 L/s were typically observed from 2018 - 2020. Under both spring and summer high flow events, the flow exceedance ranges from hours to days indicating high infiltration rates.

Summer events were used as the basis for estimating the 2-year and 5-year design flows. Based on the historic events analysis, the expected peak 2-year and 5-year flows to the station are 16 L/s and 20 L/s, respectively. For the purposes of this analysis, the 25 L/s peak observed flow will be used as a conservative estimate.

Based on the existing station capacity, the station capacity with 2 pumps is currently undersized to meet both the design flow and existing peak 5-year flow. However, when considering the ~400 m^3 of storage, which provides approximately 111 L/s of additional flow equivalency over a 1-hour period, the existing station is not expected to overflow under the estimated 5-year design flows, nor the conservative 25 L/s peak flow.

In summary, the Grassy Brook SPS has more than sufficient capacity for dry weather flows however, the station experiences wet weather peak flows greater than the rated capacity of the station with 2 pumps.

3 FUTURE FLOW CONSIDERATIONS

There are designated growth areas, such as the Grand Niagara Secondary Plan, within the current Grassy Brook SPS catchment with identified growth within the 2041 planning horizon, and beyond. There is also existing sewers extending down to Barron Road to the location of the proposed South Niagara Hospital.

It is our understanding that Niagara Region has committed to "zero interruption" to the servicing needs of the new hospital. Should capacity constraints exist beyond servicing the hospital, development would need to hold until the SNFWWS infrastructure is in place.

The flow projections for the proposed South Niagara Hospital to be built in the Grassy Brook SPS catchment was provided through the Stantec Functional Servicing and SWM Report, 2021. The Stantec report identified that the hospital will contribute an additional 8.7 L/s of average daily sanitary flows, with a peaking factor of 3.58, and infiltration allowance of 5.5 L/s, adding up to a peak design flow of approximately 36.5 L/s. The additional peak design flows with the existing peak design flows exceed the Grassy Brook SPS pump capacity by more than 300%.

These values were further validated against the MOE/MECP Design Guidelines for Sewage Works. It is confirmed that a fully operational hospital could generate peak design flows of 30 – 36.5 L/s based on design guidelines and that these projected flows are the best available information for the Grassy Brook SPS planning.

4 CAPACITY ASSESSMENT

The proposed hospital development will generate an increase in average daily flows (increasing from 1.9 L/s to 10.6 L/s) and increase in peak wet weather flows (increasing from 19.4 L/s to 55.9 L/s under the design flow condition and up to 61.5 L/s under the 5 year design flow). These flows will exceed the current rated and operational capacity of the Grassy Brook SPS under a 2 pump facility.

It is recommended that the 3rd pump be added to the Grassy Brook SPS. The 3rd pump should be selected in order to maximize the available capacity of the pump station. However, given the station's existing 150 mm forcemain, it is anticipated that the ultimate capacity of the station will be limited to 35-44 L/s (2.0-2.5 m/s velocity). Even when accounting for the 3rd pump and an increase in station capacity to 35-44 L/s, the combined existing and South Niagara Hospital flows of 55.9 L/s under the Region 0.286 L/sha design flow condition and up to 61.5 L/s under the 5 year design storm will exceed the expanded capacity of the station.

When completing a desktop review of station's storage capacity, the typical methodology is used when determining appropriate exceedance durations:

- 0-50% exceedance – 1 hour
- 50-100 % exceedance – 2 hours
- 100-300 % exceedance – 3 hours
- >300 % exceedance – 4 hours

When considering the future 61.5 L/s peak flow value, this represents a more than 250% exceedance of the current pump capacity of 19.9 L/s. Based on existing conditions, typically a 3-hour exceedance would be used. However, given the catchments high infiltration characteristics, a more conservative 4-hour exceedance was used to calculate the storage need.

For a 4-hour storage duration, the 400 m^3 of wet well and system storage, can accommodate a flow exceedance of 27.7 L/s.

As such, the recommended Grassy Brook SPS capacity to satisfy current conditions and all future flows from the South Niagara Hospital equates to:

	61.5 L/s	total future flow requirement
Less	27.7 L/s	4 hour storage equivalent
	33.8 L/s	minimum rated capacity requirement

The station will need to be upgraded to a minimum capacity of 33.8 L/s to safely manage the proposed total peak flow of 61.5 L/s, which is within the operational limits of the existing 150 mm forcemain.

Once the Grassy Brook SPS is upgraded, it is recommended that the impacts of peak flows to the station and frequency and severity of any sewer surcharging be continuously monitored as hospital flows come online.

Given that storage is required to support the peak flow capacity at the Grassy Brook SPS, it is recommended that no additional growth related flows be approved to the station. Adding the 3rd pump will support existing peak wet weather conditions and will support the full needs of the South Niagara Hospital. However, additional flows beyond these commitments will put the facility at risk of insufficient capacity, operational constraints, and potentially environmental overflows.

5 FACILITY UPGRADES

The addition of the 3rd pump and any other associated upgrades at the Grassy Brook SPS should be considered temporary and required to operate only until the new SNF trunk infrastructure is in place. On this basis the upgrades will have a service life of 2 – 5 years.

The design and construction assignment should consider:

- Installing the 3rd pump only, making use of existing provisions within the station
- Ensuring the 3 pump station will operate effectively between various pump duty, standby and emergency combinations
- Minimizing any other electrical, mechanical, civil or process upgrades
- Confirming the existing facility condition and performance will be sufficient through the service life of 2 – 5 years to avoid further upgrades

6 IMPLEMENTATION SEQUENCING

There are several projects moving forward concurrently in the Grassy Brook area:

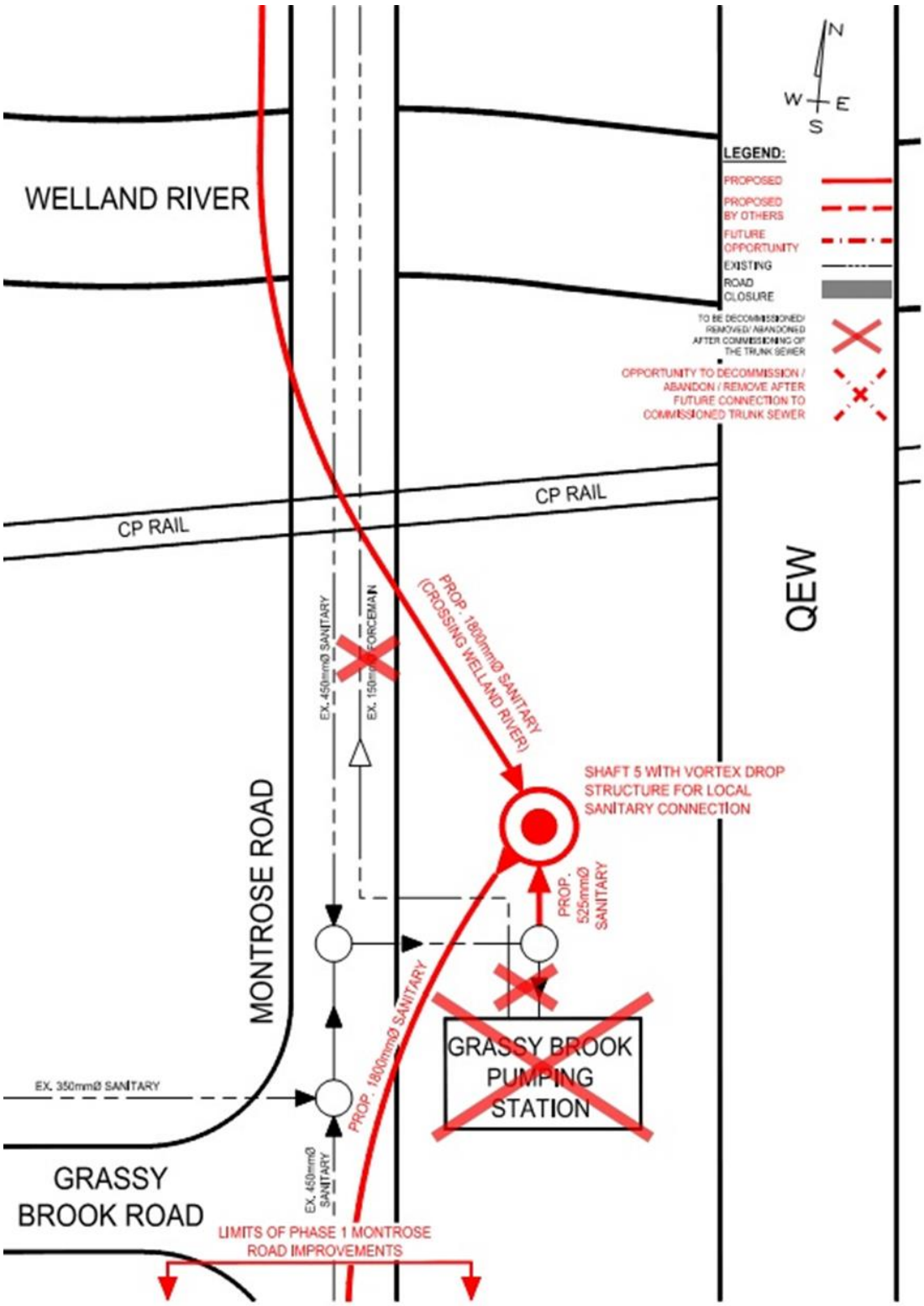
- Construction of the SNF trunk infrastructure,
- Construction of the South Niagara Falls Hospital,
- Planning within the Grassy Brook SPS catchment area, and
- Widening of Montrose Road including utility and infrastructure upgrades.

These projects will need continued integration and coordination.

In order to maintain continued operation of the Grassy Brook SPS and continued servicing for the area, the following implementation sequencing and considerations should be noted:

1. Upgrades at the Grassy Brook SPS will need to be completed while maintaining the existing 2 pumps in operation
2. Any changes to local sewers, including any new sewers from the hospital (if contemplated) will need to connect to the existing incoming manhole to the Grassy Brook SPS
3. Once the new SNF infrastructure is in place, it is anticipated that a connection sewer from the Grassy Brook SPS to the new SNF Trunk Sewer Manhole at Shaft 5 will be provided.
4. Once this connection is in place and the SNF WWTP and Trunk Sewer are operational, the Grassy Brook SPS can be decommissioned. All local servicing will then convey flows to the new SNF WWTP.
5. The SNF Trunk Sewer Manhole at Shaft 5 as well as the SNF Trunk Sewer Manhole at Shaft 6 at the corner of Montrose Road and Reixinger Road will provide for future local servicing connections to convey flows to the new SNF WWTP.

Connection requirements at the Grassy Brook SPS and SNF Trunk Sewer Manhole at Shaft 5 are shown in the following figure.


N
W
E
S
LEGEND:
PROPOSED
PROPOSED BY OTHERS
FUTURE OPPORTUNITY
EXISTING
ROAD CLOSURE
TO BE DECOMMISSIONED/ REMOVED/ ABANDONED AFTER COMMISSIONING OF THE TRUNK SEWER
OPPORTUNITY TO DECOMMISSION / ABANDON / REMOVE AFTER FUTURE CONNECTION TO COMMISSIONED TRUNK SEWER
WELLAND RIVER
CP RAIL
CP RAIL
QEW
MONTROSE ROAD
EX. 450mmØ SANITARY
EX. 150mmØ FORCEMAIN
PROP. 1800mmØ SANITARY (CROSSING WELLAND RIVER)
SHAFT 5 WITH VORTEX DROP STRUCTURE FOR LOCAL SANITARY CONNECTION
PROP. 525mmØ SANITARY
PROP. 1800mmØ SANITARY
GRASSY BROOK PUMPING STATION
EX. 350mmØ SANITARY
EX. 450mmØ SANITARY
GRASSY BROOK ROAD
LIMITS OF PHASE 1 MONTROSE ROAD IMPROVEMENTS

7 SUMMARY AND RECOMMENDATIONS

1. The existing Grassy Brook SPS experiences low dry weather flows and high peak wet weather flows relative to existing capacity.

2. The existing Grassy Brook SPS has historically seen peak wet weather flows in exceedance of the rated and operational capacity but has been capable of meeting these flows through pumping and storage.

3. In order to meet the South Niagara Hospital capacity requirements, a 3rd pump will need to be installed at the Grassy Brook SPS to increase the station capacity to a minimum of 33.8 L/s.

4. With installation of the 3rd pump and achieving a minimum capacity of 33.8 L/s, the Grassy Brook SPS will be capable of meeting the full South Niagara Falls capacity requirements as well as existing catchment area flows through a combination of pumping and storage.

5. The upgraded Grassy Brook SPS capacity will operate within acceptable velocities of the existing forcemain.

6. The Grassy Brook SPS upgrades should consider a very short service life of 2 – 5 years until the SNF trunk infrastructure is in place to minimize scope and costs.

7. Any new local servicing requirements (i.e.: new sewer from the hospital if contemplated), will need to connect to the incoming manhole to the station to maintain operational continuity.

8. The impacts of peak flows to the station and frequency and severity of any sewer surcharging should be continuously monitored as hospital flows come online.

9. The proposed Grassy Brook SPS upgrades (adding the 3rd pump) can accommodate the additional flows from the South Niagara Hospital only. Any additional flows beyond these commitments will put the facility at risk of insufficient capacity, operational constraints, and potentially environmental overflows.

10. The SNF trunk infrastructure, South Niagara Falls Hospital, Montrose Road widening and ultimately the Grassy Brook SPS decommissioning will need to be integrated and coordinated to ensure wastewater servicing is maintained through the implementation sequence.