JLR No.: 27931
Revision: 2

December 19, 2023

Prepared for:

THE TOWNSHIP OF STIRLING-RAWDON
2529 Stirling Marmora Rd,
Marmora, ON
K0K 2M0

Prepared by:

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Stirling Infrastructure Capacity Assessment

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

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1.0 Introduction

1.1 General

The Township of Stirling-Rawdon retained JLR to conduct the update to the infrastructure capacity assessment, taking into account the existing servicing conditions and projected growth that it anticipates over the coming years. The Water, Wastewater and Stormwater Capacity Assessment was completed and identifies preferred options to meet the Existing, Short-Term (10 year design basis), Mid-Term (20 year design basis), and Full Build Out (beyond 20 years design basis) water, wastewater and stormwater infrastructure needs of the Municipality.

The Municipality's urban area of Stirling is located approximately 20km northwest of the Bellville Hwy 62 Exit on the 401 Expressway. It is located on the Rawdon Creek at the confluence of Highway 8 and Highway 14.

2.0 Background

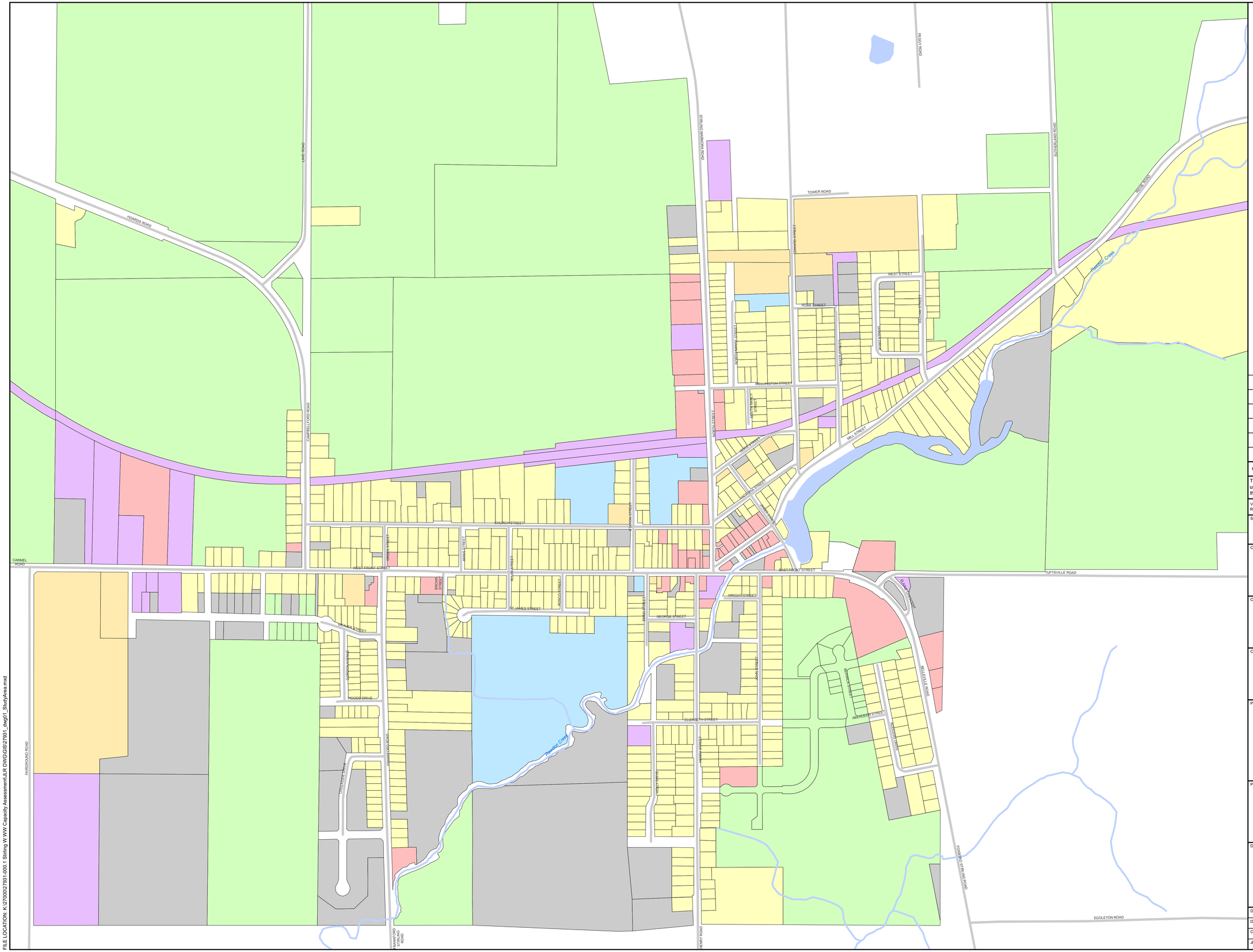
2.1 Study Area and Planning Periods

This Water & Wastewater Capacity Assessment considers the Study Area to be the entire boundary of the urban area of the Town of Stirling within the Municipality. Refer to Figure 1 for Study Area.

Future development areas are also considered as part of this report. The planning periods considered as part of this servicing assessment are as follows:

- Existing
- Short-term
- Mid-term
- Full build-out

Timeframes have been assigned to each of the three future planning periods but are approximate and should be based on the level of development actual occurring.



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MPAC Property Code

- No Information
- Vacant
- Farm
- Residential
- Commercial
- Industrial
- Institutional
- Special & Exempt

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PROJECT:

WATER AND WASTEWATER CAPACITY ASSESSMENT

STIRLING, ONTARIO

DRAWING:

STUDY AREA

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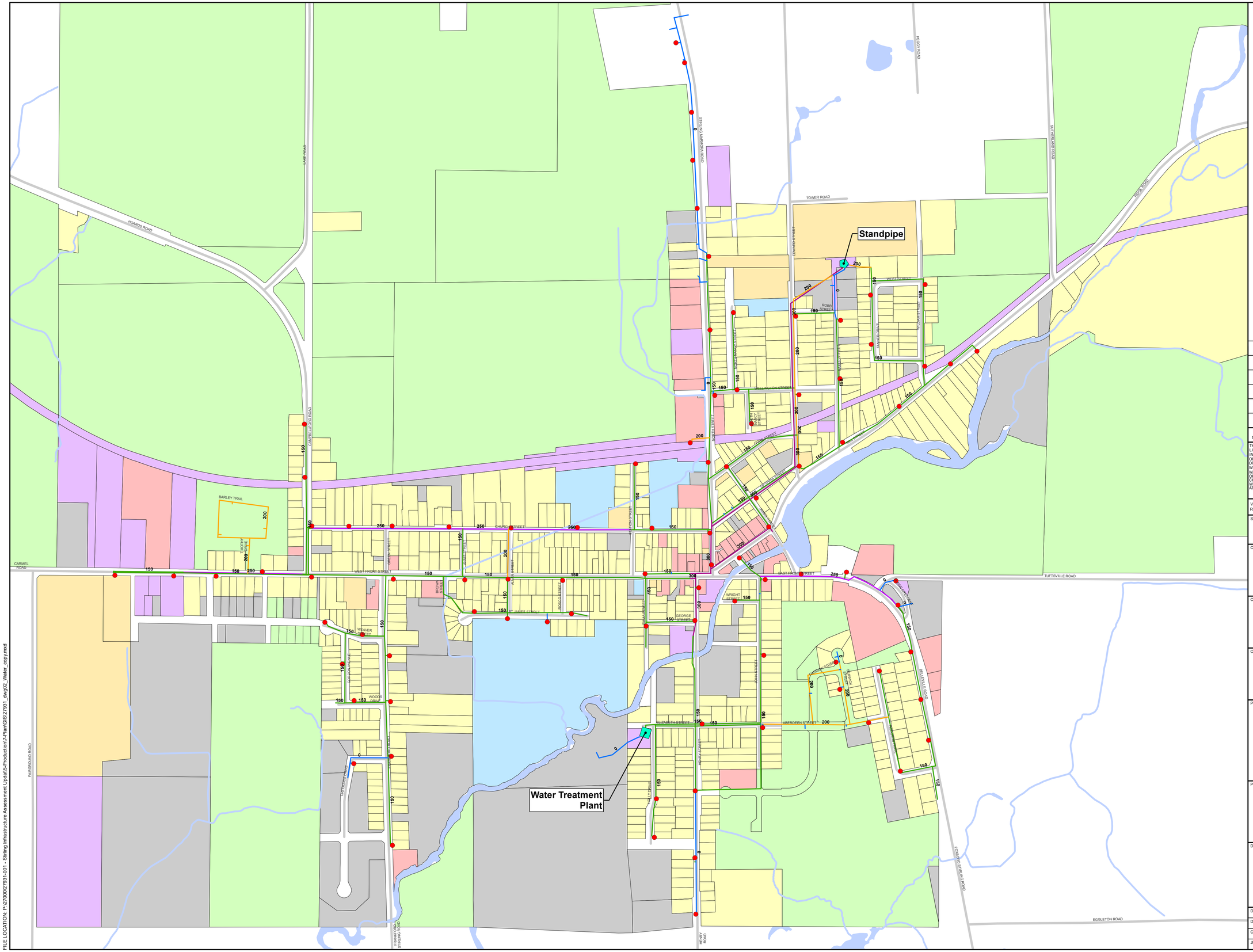
2.2 Existing Infrastructure

Wastewater
The sanitary system consists of gravity sewers conveying flow to five (5) pumping stations across the Town. Pumping station and forcemain upgrades were completed at Annis Street and Frankford Road SPS in 2011. Two lower capacity pumping stations, Henry Street SPS and Rogers Drive SPS service small areas and haven't had any major changes since their initial construction. All sewer lines terminate at the final and largest George Street SPS, which recently received capacity upgrades in 2022. George Street SPS pumps all of the town's wastewater into the town's sewage treatment lagoon.

Water
The Water Supply Plant located at the west end of Elizabeth Street, which runs four wells, provides the town's water supply. The Town resumed operation of the Water Treatment Plant in 2016 from Ontario Clean Water Agency (OCWA). In 2013, petroleum hydrocarbon odours were noted in well #5 and was subsequently taken offline. Well #4 was also taken offline as a precaution due to its close proximity to Well #5. Well #5 was returned to production in September 2017 and Well #4 returned to production in early 2018. A new well (Well #6) recently came online after its pilot well was drilled in 2018. Additionally, the Standpipe had spot repair done at the base of the structure in 2013.

Stormwater
The storm sewer system services a large portion of the town and has been upgraded to varying degrees over the years as road reconstructions have taken place. The un-serviced portion of the town relies on ditching for its stormwater management. Currently there are approximately 15 outlets into the Rawdon Creek.

Figures 2, 3 & 4 depict the existing systems, respectively.



Legend

- Fire Hydrant
- Standpipe
- Water Supply Plant

Watermain (Diameter)

- No Info
- 150
- 200
- 250
- 300

MPAC Property Code

- No Information
- Vacant
- Farm
- Residential
- Commercial
- Industrial
- Institutional
- Special & Exempt

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WATER AND WASTEWATER CAPACITY ASSESSMENT

STIRLING, ONTARIO

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EXISTING WATER SYSTEM

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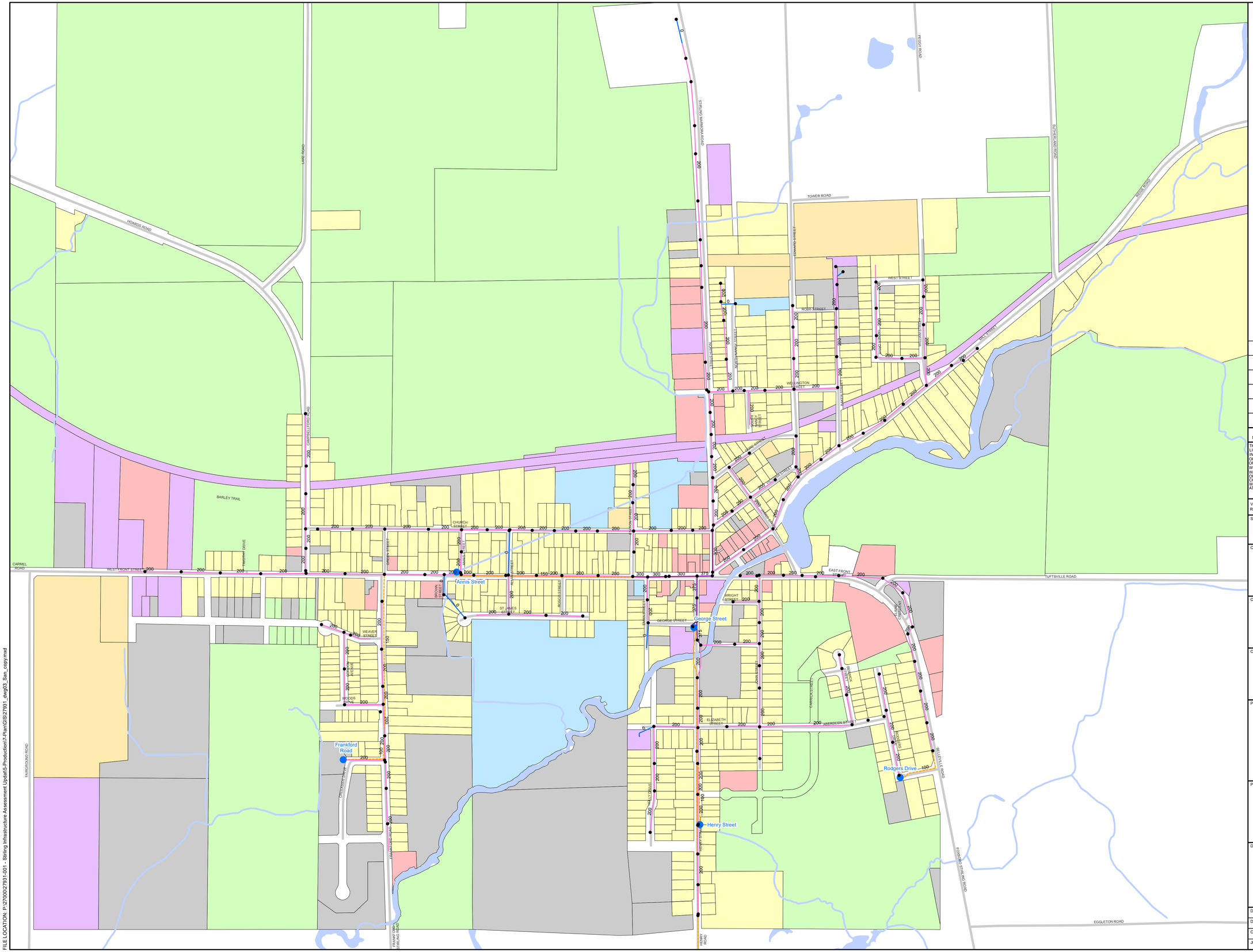

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- MH
- PS
- No Info
- 200mm
- 250mm
- 300mm
- 375mm
- 450mm
- Forcemain

MPAC Property Code

- No Information
- Vacant
- Farm
- Residential
- Commercial
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WATER AND WASTEWATER CAPACITY ASSESSMENT

STIRLING, ONTARIO

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EXISTING SANITARY SYSTEM

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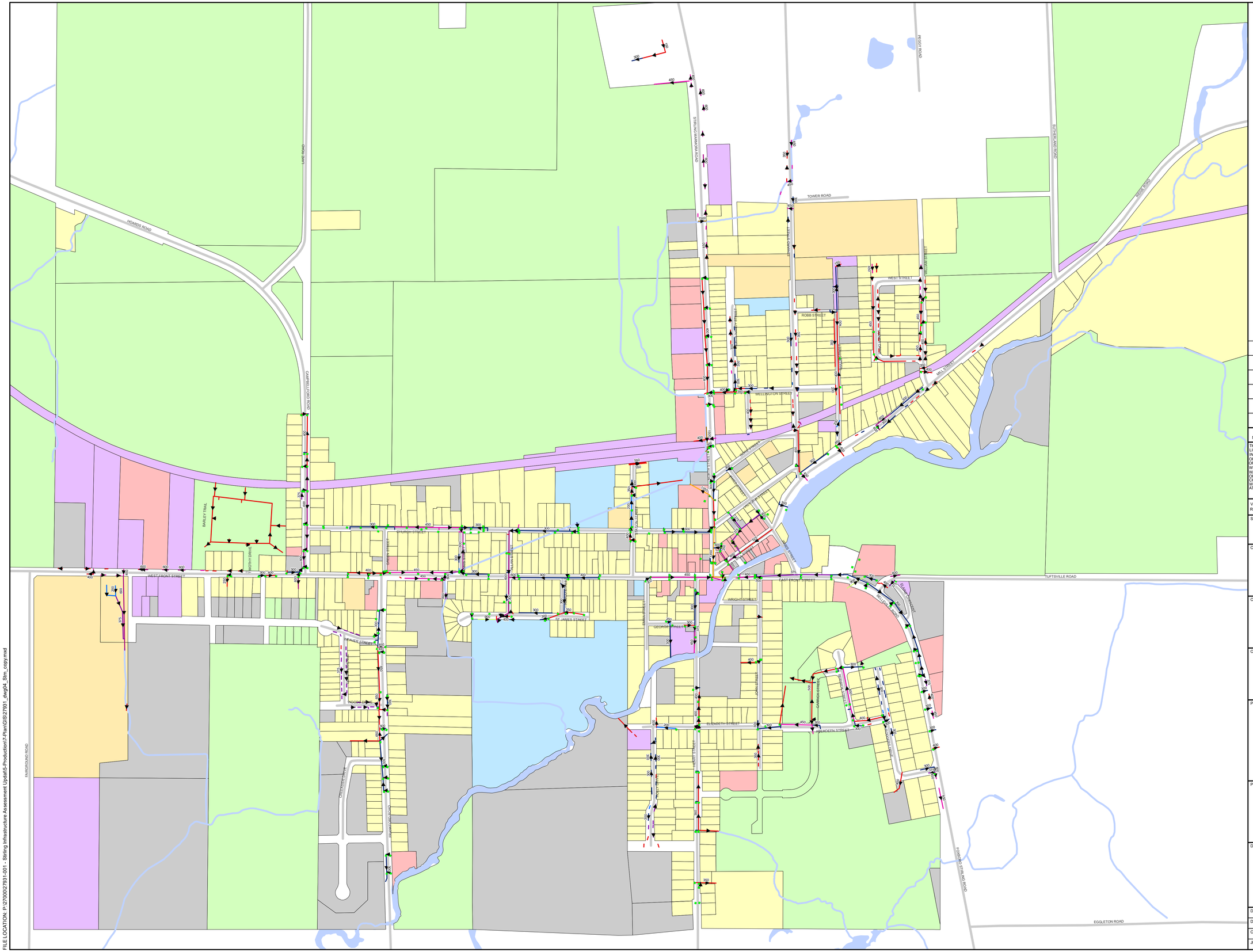

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- MH
- CB

stm_sewer

- No info

Size

- 200mm
- 250mm
- 300mm
- 375mm
- 450mm
- 525mm
- 600mm
- 900mm
- 1200mm
- 1350mm
- 1500mm

MPAC Property Code

- No Information
- Vacant
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WATER AND WASTEWATER CAPACITY ASSESSMENT

STIRLING, ONTARIO

DRAWING:

EXISTING STORMWATER SYSTEM

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2.3 Population Projections

Based on the StatsCan 2021 Census, the Town currently has a population of 2,074 residents and from 2016 to 2021 grew by 2.2%. Discussions with the Town have confirmed that this stagnation of growth was due largely to the Town's restrictions on adding new developments. Development was restricted due to the lack of sewage capacity at the sewage lagoon. Capacity is now available at the lagoon due to an upgrade which was completed in February of 2015.

The Town has identified future land areas that are expected to be developed over the short to long term. This future growth provided by the Town was divided into three scenarios. The various areas proposed for future development are shown on Figure 5 and Table 1 illustrates their respective areas and projected populations. The Short Term Growth scenario includes areas 1, 4, 9, 10, 14 and 16 which are subdivisions currently in their final development or construction stage. The Medium Growth scenario includes areas 3, 5, 6, 8, 9, and 11 which includes developments that have been proposed to the Town or are currently delayed. The final Full Build Out scenario includes all of the proposed development lands with a full buildout of all properties.

Based on discussions with the Town for planning purposes, the short-term growth scenario would be growth anticipated over the next 10 years to 2033. The medium-term over the next 20 years to 2043 and the full build out scenario would be growth anticipated beyond the 20 year timeframe.

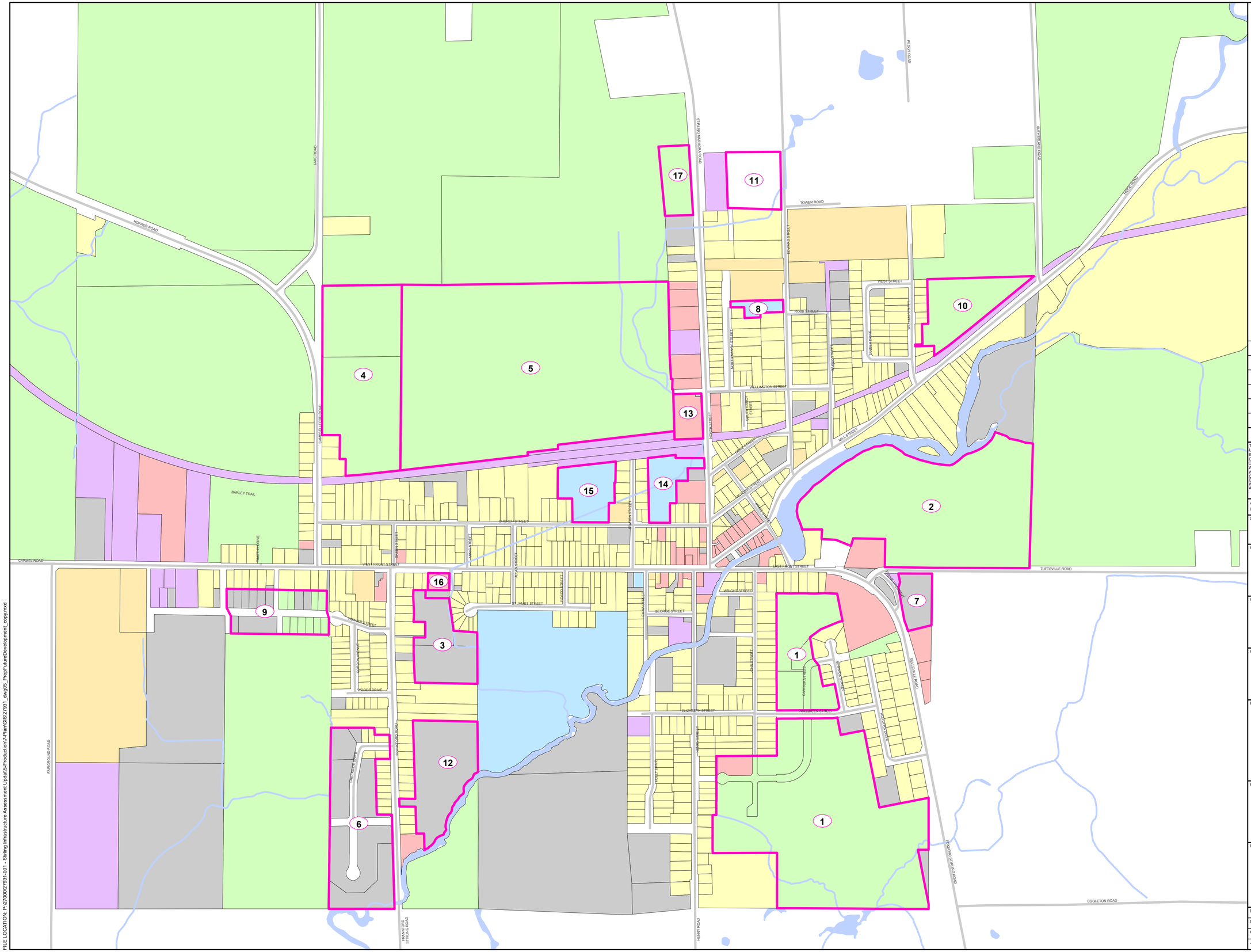
In Table 1, residential density of 13 units/ha was utilized. Although the most current development (Area 4 - Campbellford Rd.) is a subdivision with a density currently proposed at approx. 25 units/ha, applying that density to all developments would have a significant impact on the population growth for the future (approx. 245% growth rate). A population growth of this magnitude is both un-realistic and not feasible to for the Town's infrastructure. To more reasonably account for future unknown development lots, a medium residential density of 13 units/ha was utilized.

In addition, assessing the Town's building permits over the last five years, while excluding an outlier year of 2018 due to covid limited development, an average of 30 building permits were issued per year. Applying this estimation would provide roughly 720 people over the Short-Term period, while with a residential density of 13 units/ha, a population growth of 1085 is estimated for the Short-Term Period. With the additional push the Town is receiving from developers, this indicated that the residential density of 13 units/ha is reasonable.

Table 1: Proposed Development

Proposed Development				
Area	**Location**	**Area [Ha]**	**New Units**	**Projected Population[1]**
Short-Term Growth				
1	Ryell Subdivision	11.10[2]	100[3]	240
4	Property on Campbellford Rd.	9.24	215	516
9	Weaver Street Extension (1)	2.91	5	12
10	Mill and William Street	2.96[4]	80	192
14	Old School (1)	1.38	87	209
16	Old Black Dog Restaurant	0.24	29	70
N/A	Unassigned Growth	N/A	30	71
	TOTAL	**27.83**	**546**	**1310**
Mid-Term Growth				
3	Hilden Homes	2.92	51	122
5	Thompson Farmland[4]	29.66[4]	386	926
6	Dorann Holmes	6.77	45	108
8	Stirling Manor Expansion	N/A	N/A	56
9	Weaver Street Extension (2)	1.38	14	34
11	Edward Street	2.03[4]	19	46
N/A	Unassigned Growth	N/A	31	75
	SUBTOTAL	42.76	546	1367
	TOTAL	**70.59**	**1092**	**2676**
Full Build Out				
2	Spry/Cleaver property	15.17[4]	197	473
7	Old Brown Shoe Property [4]	1.09[4]	14	34
12	Frankford Road	4.01[4]	52	125
13	Stirling Manor Expansion (2)	0.84	N/A	96[5]
15	Old School (2)	1.85	117	280
17	Stirling-Marmora Road	1.88	24	58
N/A	Unassigned Growth	N/A	26	61
	SUBTOTAL	24.84	429	1126
	TOTAL	**95.43**	**1521**	**3802**

(1) Population density of 2.4 ppl/unit was used
(2) Area prorated based on units already constructed
(3) Proposal for 124 units, 24 units have been built to-date
(4) A Medium Residential Density of 13 units/ha was used
(5) Included for potential relocation



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- 2 — Future Development

MPAC Property Code

- No Information
- Vacant
- Farm
- Residential
- Commercial
- Industrial
- Institutional
- Special & Exempt

Future Development

Parcels	Area_Ha
1	19.22
1	3.89
2	15.17
3	2.92
4	9.24
5	29.67
6	6.77
7	1.09
8	0.42
9	2.88
10	2.94
11	2.01
12	4.01
13	0.84
14	1.41
15	1.85
16	0.24
17	1.33

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WATER AND WASTEWATER CAPACITY ASSESSMENT

STIRLING, ONTARIO

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PROPOSED FUTURE DEVELOPMENT

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Based on the development identified and standard design criteria, Table 2 details the projected average day flow (ADF) and infiltration:

Table 2: Future Average Day Flow and Average Day Demand

Future ADF/ADD			
Area	**Location**	**ADF[1] [L/s]**	**WW Infiltration[2] [L/s]**
Short-Term Growth			
1	Ryell Subdivision	0.83	1.55
4	Property on Campbellford Rd.	1.79	1.29
9	Weaver Street Extension (1)	0.04	0.41
10	Mill and William Street	0.67	0.41
14	Old School (1)	0.73	0.19
16	Old Black Dog Restaurant	0.24	0.03
N/A	Unassigned Growth	0.25	N/A
	SUBTOTAL	4.55	3.90
Mid-Term Growth			
3	Hilden Homes	0.43	0.41
5	Thompson Farmland[4]	3.22	4.15
6	Dorann Holmes	0.38	0.95
8	Stirling Manor Expansion	0.19	N/A
9	Weaver Street Extension (2)	0.12	0.19
11	Edward Street	0.16	0.28
N/A	Unassigned Growth	0.26	N/A
	SUBTOTAL	4.74	5.99
	TOTAL	9.29	9.88
Full Build Out			
2	Spry/Cleaver property	1.64	2.12
7	Old Brown Shoe Property [4]	0.12	0.15
12	Frankford Road	0.43	0.56
13	Stirling Manor Expansion (2)	0.33	0.12
15	Old School (2)	0.97	0.26
17	Stirling-Marmora Road	0.20	0.26
N/A	Unassigned Growth	0.21	N/A
	SUBTOTAL	3.70	3.48
	TOTAL	13.20	13.36

(1) 300 L/cap/day was used to develop ADF
(2) 0.14 L/s/ha was used to develop new WW Infiltration

2.4 Land Use

Land use in the Town is comparable to other similarly sized towns in Ontario. The land use is predominantly residential with some areas of commercial, industrial and institutional land distributed across the town. Industrial lands exist along the west end of West Front Street and commercial lands are centred around the downtown core and along North Street and East Front Street.

3.0 Identification and Evaluation of Servicing Strategies

One of the objectives of this Capacity Assessment is to develop and evaluate possible servicing strategies for both water, wastewater and stormwater infrastructure. All reasonable potential solutions to the problem are typically considered. Servicing strategies are examined in sufficient detail to allow conclusions to be drawn and to move forward to the next stage of the project. Capacity Assessments for infrastructure generally result in the identification and review of a broad range of options.

3.1 Evaluation Methodology

The evaluation process for the Infrastructure Capacity Assessment consisted of a review of the potential servicing strategies in consideration of the criteria described in the table below.

Table 3: Evaluation Criteria

Criteria	Description
Natural Environment Considerations	Natural features, natural heritage areas, Areas of Natural and Significant Interest, designated natural areas, watercourses and aquatic habitat
Social and Cultural Environment Considerations	Proximity of facilities to residential, commercial and institutions, archeological and cultural features, designated heritage features, well or wellhead protection areas, land-use and planning designations
Technical Feasibility	Constructability, maintaining, or enhancing drinking water quality, maintaining or enhancing wastewater treatment, reliability and security of systems, ease of connection to existing infrastructure and operating and maintenance requirements
Financial Considerations	Capital and Operational costs

In order to qualitatively evaluate any servicing alternatives, each of the criteria presented in the following sections were assessed in a descriptive manner rather than a quantitative manner. Rather than having a numerical or weighted ranking system, the evaluation focuses instead on the strengths and weaknesses of each servicing alternative to identify the preferred alternative.

For each evaluation criterion and for each system alternative, the potential effects on the environment were identified and evaluated relative to the other alternatives as being most preferred, less preferred and least preferred. The evaluation is based on the relative advantages and disadvantages of the potential effects for each system alternative.

3.2 Cost Estimates

All opinion of probable costs associated with the preferred alternatives were completed in 2023 dollar value. These costs are based on a Class 'D' estimate class, which is generally defined as follows:

- Work Definition: A description of the intended solutions with such supporting documentation as is available (definition of project typically in the order of 1% to 5%).
- Intended Purpose: To aid in the screening of various options prior to recommending a preferred solution.
- Level of Effort: Limited and expected accuracy could range from -15% to +30%.

It is noted that a mark-up has been applied to base construction cost estimates to account for items such as engineering, permits, approvals, construction overhead, building and site works, field investigations, etc.

4.0 Potable Water System

4.1 Existing Potable Water System

The existing potable water system is comprised of five functioning groundwater wells located along the south creek-bed in the 100-year floodplain of the Rawdon Creek, an elevated water storage standpipe and an assortment of sized watermains.

The five groundwater wells in operation identified as 1, 3, 4, 5 and 6 have a total Permit to take water (PTTW) rated capacity of 2,687 m^3/day and services a population of approximately 2000 people (BluMetric 2018).

Wells 4 and 5 have had earth fill placed around them to protect against flooding. The water that is collected from the aquifer is classified as Groundwater Under the Direct Influence of surface water (GUDI) with adequate filtration in place. The aquifer is comprised of a sand and gravel filled bedrock valley. Wells 4 & 5 are located approximately 50 m from Rawdon Creek and Wells 1 & 3 are located approximately 60 m from Rawdon Creek. There was a water shortage in 2016 and there have been concerns that the current system is unsatisfactory (BluMetric 2018). Well #6 came online recently and was installed southeast of Wells 4 and 5 and is approximately 110 m from Rawdon Creek.

4.1.1 Groundwater Well Number 1

Well #1 has a depth of 6.1 m and is constructed with a 1.5 m diameter corrugated steel cased dug well that is perforated in the bottom 3 m (BluMetric 2018). It has operated since at least 1958 and there hasn't been any noted reduction in yield over that time period. The well has had a video inspection in April 2017 and showed that it was in good condition with some hardness in

the lower section. The well currently operates with a maximum flow rate of 576 m^3/day which is roughly 44% of it's rated PTTW maximum allowable of 1,305 m^3/day.
Well #1 is located in the basement level of the pump house and in peak high-water table conditions the existing sump hole system cannot control artesian flow into the building. The Township has indicated they rely heavily on Well #1.

4.1.2 Groundwater Well Number 3

Well #3 extends to the limestone bedrock and has a depth of 12 m and a 0.25 m stainless steel casing with a screen located from 9.75 m to the bottom of the well (BluMetric 2018). It has operated since at least 1986 and there has not been any noted reduction in yield over that time period. The well screen was last cleaned in February 2009. The well currently operates with a maximum flow rate of 598 m^3/day which is roughly 46% of it's rated PTTW maximum allowable of 1,305 m^3/day.

4.1.3 Groundwater Well Number 4

Well #4 is a 400 mm x 200 mm diameter drilled well with 2.8 m of 200 mm diameter well screen within a 200 mm diameter gravel pack. The bottom 2.4 m is installed within the limestone bedrock. When the well was commissioned in 1994 it rapidly experienced a decline in well yield soon after entering operation.

In November 2013, the well was taken offline after petroleum hydrocarbon odours were reported for the well water, various hydrocarbon sources have been investigated by Greer and Galloway Group in 2016 but there was no conclusion on the source of the contamination. After extensive rehabilitation and efforts to increase well yield, the well has been brought back into service and as of January 2018 has operated with a maximum flow rate of 825 m^3/day which is roughly 42% of it's rated PTTW maximum allowable of 1,944 m^3/day. Well pumping rate maximum flow rates were historically not achieved due to the flow demand on the water system. Well #4 has previously had some fowling issues plugging the screen with iron and manganese, however this was fixed due to chemical cleaning and bailing. There are currently no issues with the flow rate at this well.

4.1.4 Groundwater Well Number 5

Well #5 is a 150 mm diameter drilled well and is located 3 m from Well #4. The well depth extends to the limestone bedrock and the bottom 2.4 m is installed with a telescoping stainless steel well screen to the limestone bedrock. Well #5 has historically outperformed Well #4.

In November 2013, the well was taken offline with Well #4 after petroleum hydrocarbon odours were reported for the well water. The well was brought back into operation in September 2016. The well has operated with a maximum flow rate of 343 m^3/day which is roughly 53% of it's rated PTTW maximum allowable of 648 m^3/day. Due to Well #5's proximity to Well #4 the two well's frequently influence the yield of the other and maximum flow rates cannot be reached when both are in operation concurrently.

4.1.5 Groundwater Well Number 6

There was a study conducted by Blumetric Engineering in February 2018 that investigated the potential for installing a new groundwater well outside of the 100-year floodplain that wouldn't be

as impacted by GUDI concerns. As a result of this study a pilot well was installed with an outer diameter (OD) of 168 mm and a depth of 13.57 m, this well was installed with a recommended maximum pumping rate of 817 m^3/day. This well has recently come into service.

A table summarizing the operational characteristics of the wells is shown below.

Table 4: Groundwater Well Operating Conditions

Well	Year Constructed	Depth (m)	Size (mm)	PTTW (m^3/day)	Peak Production (m^3/day)
1	1958	6.1	1500	**2687**	576
3	1986	12	250		598
4	1994	12	200		825
5	1991	12	150		343
6	2020	12	150		817
				TOTAL	**3,159**

The water distribution system includes a standpipe water storage tank (2.6 ML nominal capacity) and piping network. The standpipe is located in the northeast quadrant of the Town at the end of Baker Street. The piping network generally consists of polyvinyl chloride, ductile iron and cast iron piping ranging in size from 50 mm to 300 mm in diameter. It is understood that some of the piping is the original infrastructure dating back to 1950's and earlier.

4.2 Historic Potable Water Demands

The first aspect to understanding the water system is the current demand on the system; Average Day Demand (ADD) & Max Day Demand (MDD). Water usage in the Town is metered at the Water Treatment Plant (WTP). Results for the past five years of which can be found in Table 5:

Table 5: Potable Water Demands

Existing Water Demand															
	2022			2021			2020			2019			2018		
	MDD	ADD	MDF	MDD	ADD	MDF	MDD	ADD	MDF	MDD	ADD	MDF	MDD	ADD	MDF
Jan	901	692	1.30	902	566	1.59	813	622	1.31	840	592	1.42	932	692	1.35
Feb	933	691	1.35	795	628	1.27	733	586	1.25	792	625	1.27	938	675	1.39
Mar	849	720	1.18	730	603	1.21	934	692	1.35	785	634	1.24	781	651	1.20
Apr	975	722	1.35	741	545	1.36	1268	688	1.84	777	580	1.34	722	573	1.26
May	961	686	1.40	1186	691	1.72	789	584	1.35	730	588	1.24	858	668	1.28
Jun	1416	830	1.71	1306	786	1.66	775	638	1.21	1167	737	1.58	888	710	1.25
Jul	992	738	1.34	904	629	1.44	1290	767	1.68	1317	711	1.85	895	687	1.30
Aug	1033	749	1.38	903	654	1.38	720	576	1.25	1194	992	1.20	1003	648	1.55
Sep	1029	747	1.38	825	645	1.28	641	573	1.12	1462	1051	1.39	812	597	1.36
Oct	1057	832	1.27	879	625	1.41	850	572	1.49	1177	640	1.84	1026	609	1.68
Nov	1050	710	1.48	788	603	1.31	673	583	1.15	681	565	1.21	878	602	1.46
Dec	847	642	1.32	795	664	1.20	770	603	1.28	757	611	1.24	796	628	1.27
MAX	1416	730	1.71	1306	637	1.72	1290	624	1.84	1462	694	1.85	1026	645	1.68

The two highlighted values in each year represent seasonal high usage. Using these seasonal highs, the existing daily usages were taken and the representative Average Day Demand and Max Day Demand were determined. Based on the operational data, the typical water demand was summarized as in Table 6.

Table 6: Typical Water Demands

Typical Water Demand		
666	m3/day	ADD (5yr)
1462	m3/day	MDD (2018 - 2022)
1.85		MDD factor (Ext Data)
2.7		PHF (MOECC for MDF 1.8)

4.3 Potable Water System Design Criteria

Water pumping stations or wells are rated on their 'firm' pumping capacity. The MOECC Guidelines for Drinking Water Systems (MOECC, 2008) defines firm capacity as the "Capacity of the raw water pumping station able to supply the water treatment plant design capacity with the largest unit out of service." This allows for the continuity of service in the event that one of the pumps experiences mechanical issues. Treated water and booster pumping stations are also rated based on their firm capacity defined as the capacity of the station with the largest pump out of service. In pressure zones that do not have adequate floating storage and the treated water pumped is the sole source of water supply then firm capacity is defined as the capacity of the pumping station with the two largest units (including the fire pumps, if any) out of service. Since the Township has adequate storage and uses high lift pumps to pump raw water to the water treatment plant, the required firm capacity is only for the largest pumping unit out of service.

Pumping stations or well systems are sized based on maximum day flows for areas with sufficient water storage volume, and on peak hour flows for areas without sufficient storage. Storage capacities are based on MOECC Guidelines for Drinking Water Systems (MOECC, 2008). The total storage capacity requirements for a pressure zone are the sum of the equalization storage, fire storage, and emergency storage allowances.

The assessment used a land based approach to assess the distribution systems capacity, with industrial commercial and institutional lands having a greater demand than residential areas. The Max Day Demand that is typical for the Town of Stirling was used to assess the systems distribution capacity. The design used a conservative 25% of the MDD at any given point in the system to assess the areas ability to handle a worst case scenario.

Watermains are to be sized to carry the greater of the maximum day plus fire flow or peak hour demand. The MOECC Guidelines (MOECC, 2008) recommend the following range of acceptable pressures:

- Under normal conditions (average to peak hour flows) 275 kPa (40 psi) to 690 kPa (100 psi),
- During fire flow conditions pressures a minimum of 140 kPa (20 psi)

4.3.1 Fire Flow Demand

The process to determine the Fire Flow demands and duration on a Town scale is typically determined through one (1) of two (2) ways, either the use of the MOECC Drinking Water Guidelines (DWG) or the Fire Underwrites Survey (FUS).

The MOECC Drinking Water Guidelines (DWG) (MOECC, 2008) is a population based approach and provides a general fire flow target for an entire area. The MOECC provides typically suggested fire flows and durations for small municipalities but indicates that the latest edition of the FUS document should be consulted. Based on the Town of Stirling's populations (2000 ppl) the MOECC DWG criteria indicates at Fire Flow of 95 L/s with a duration of 2 hrs.

The FUS method is a formula based approach to calculate the target fire flows (FF) based on the specifics of a site. Construction type, floor area, building use, exposure distance and fire suppression system (i.e. sprinklers) are considered in the calculations. In order to calculate the FUS target fire flows on a Town scale, a land use based approach was developed. This approach entailed reviewing a representative sample of the different land use types to determine an average fire flow: Based on the different residential and Industrial, Commercial & Institutional (ICI) land uses the flowing fire flows were determined:

Table 7: Typical Fire Flow Demands

	Typical Fire Flow
Residential	50 L/s
ICI	100 L/s

As the FUS method provides a more Town specific demand on the system, the FUS fire flow demands were used in the analysis.

It should be noted that the above noted targets would be applied (most stringent target applied for multi-zoned areas) to determine if there is a difference or gaps between the available capacity and the above noted targets. Targets may not be achieved due to limitation of the existing system.

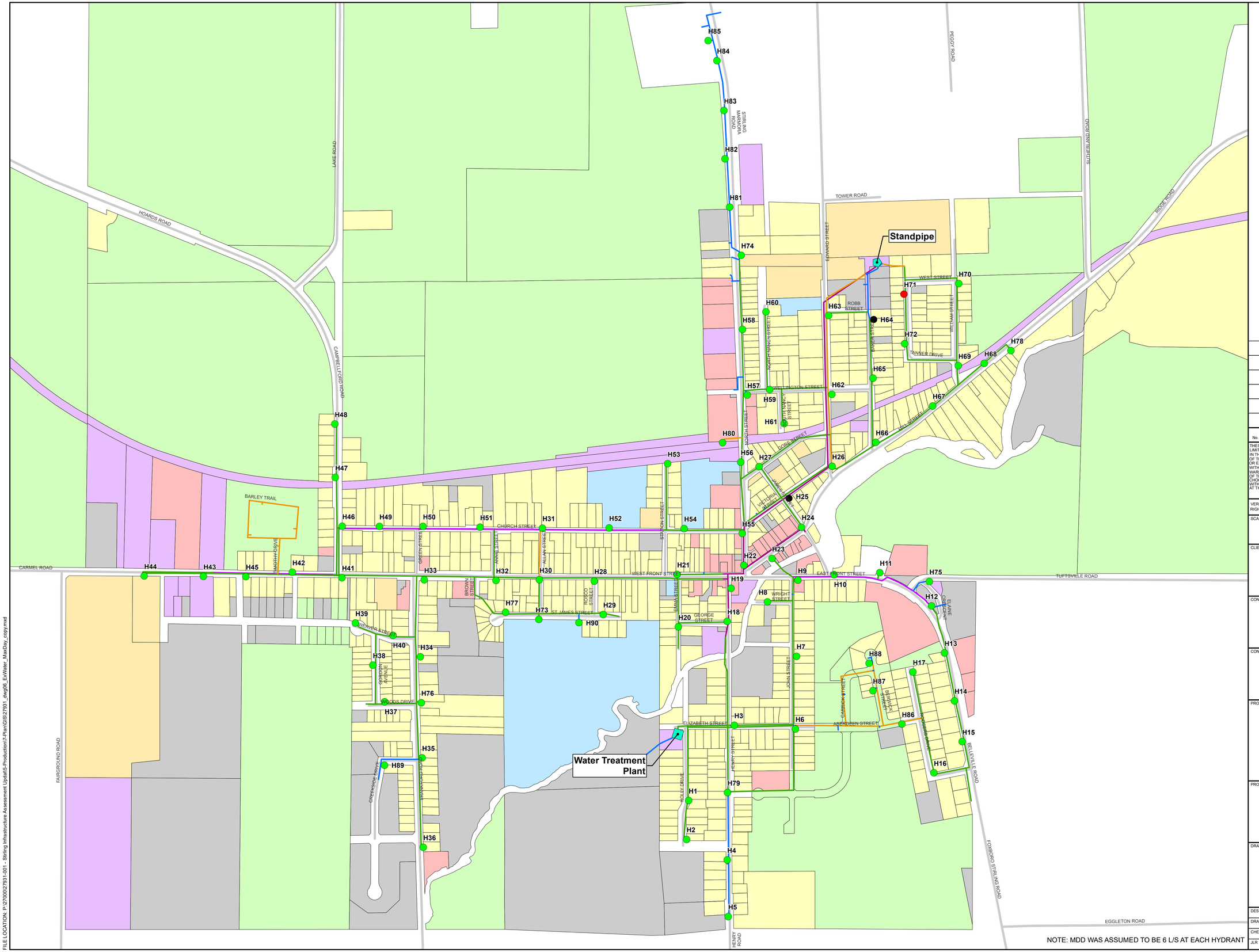
4.4 Water Distribution System

The existing and future requirements for the potable water system are shown in Figure 6 through 9. Figure 6 and 7 show the existing water system under Max Day Demand (MDD) and MDD + Fire Flow (FF) conditions. It can be seen from the Figure 6 that under MDD the system can meet the demand within the required pressures. The MDD + FF under the existing system does generally provide the required demand and pressure with the exception of two (2) dead end areas, North St and Belleville Rd. These conditions have recently been approved, and potentially rectified at some hydrant locations due to the recent downtown reconstruction project and looping completed through the Ryell subdivision. Updated hydrant testing is required to confirm locations that are still inadequately serviced for MDD + FF.

Figure 8 illustrates the MDD condition with all of the proposed developments. Previous hydrant testing across the Town shows that under MDD conditions, all areas in the distribution system

are able to achieve the required 140KPa (40PSI) minimum operating pressure for the Full Build Out study period.

Figure 9 shows the proposed potable water system under MDD + FF conditions with all of the proposed developments. Most future developments have sufficient flow under current infrastructure conditions with the exception of areas 5, 11, and 17, the Campbellford Rd. Subdivision, Edward St. Development, and northern Stirling-Marmora Rd. development, respectively. These locations lack available pressures (minimum of 20 psi) under the required MDD + FF conditions due to elevation increases, as well as increased distances with a smaller pipe network creating too sufficient of pressure losses.



Legend

- Standpipe
- Water Supply Plant

Fire Hydrant

Flows at 275Kpa (40psi)

- No Info
- Green - Sufficient Capacity
- Red - Over 20Kp under capacity

Watermain (Diameter)

- No Info
- 150
- 200
- 250
- 300

MPAC Property Code

- No Information
- Vacant
- Farm
- Residential
- Commercial
- Industrial
- Institutional
- Special & Exempt

No.	ISSUE / REVISION	DD/MM/YY

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PROJECT:

WATER AND WASTEWATER CAPACITY ASSESSMENT

STIRLING, ONTARIO

DRAWING:

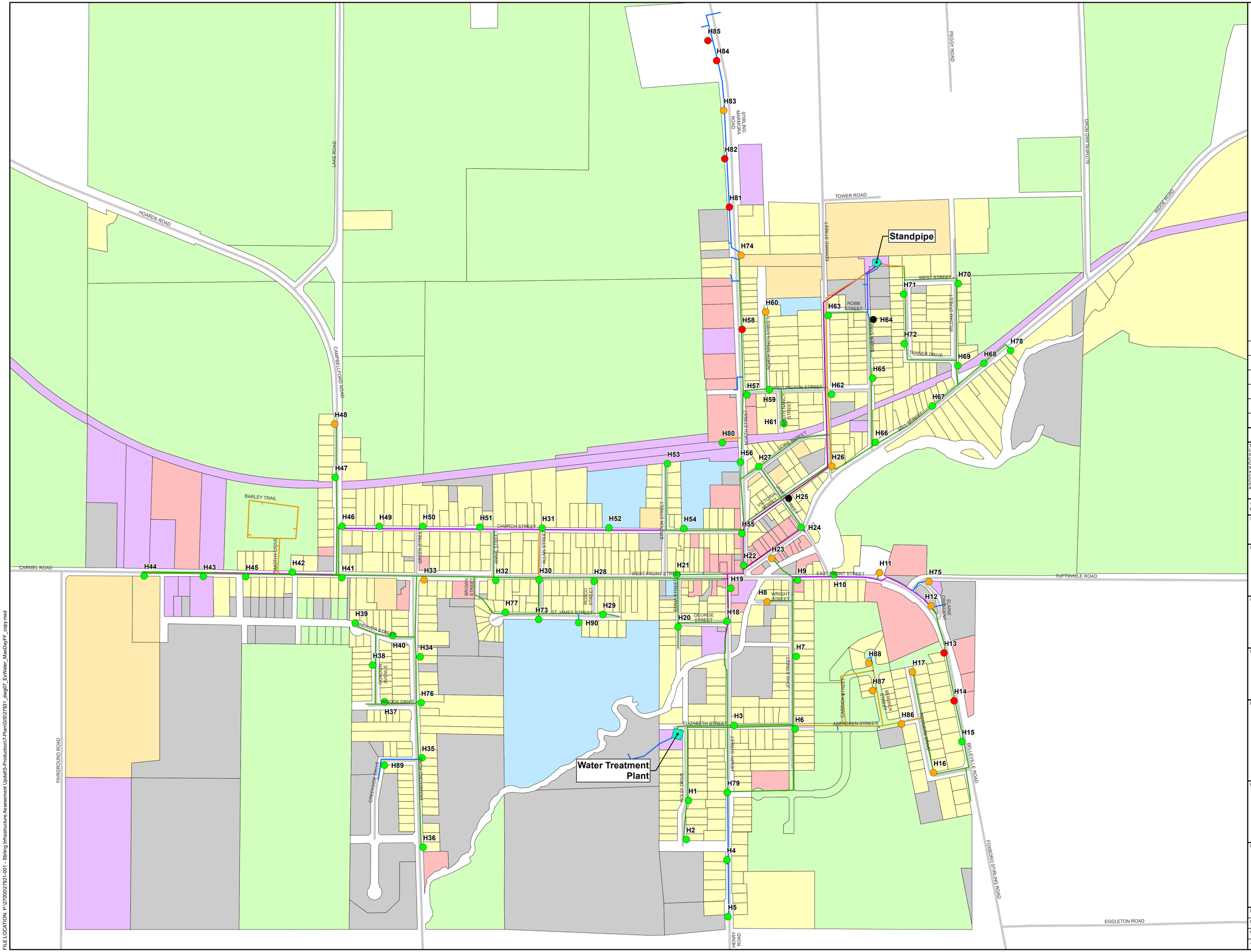
EXISTING WATER SYSTEM MAX DAY DEMAND

DESIGN: CT	
DRAWN: KTK	DRAWING #:
CHECKED: MM	**FIGURE 06**
JLR #: 27931	

NOTE: MDD WAS ASSUMED TO BE 6 L/S AT EACH HYDRANT

FILE LOCATION: P:\27000\27931-001 - Stirling Infrastructure Assessment Update\5-Production\7-Plan\GIS\27931_dwg06_ExtWater_MaxDay_copy.mxd

PLOT DATE: November 1, 2023 3:59:20 PM



Legend

- Standpipe
- Water Supply Plant

Fire Hydrant

Flows at 140Kpa (20psi)

- Green - Sufficient Capcity
- Orange - 0-20 Kpa under capacity
- Red Over 20 Kpa under capacity
- NoInfo

Watermain (Diameter)

- No Info
- 150
- 200
- 250
- 300

MPAC Property Code

- No Information
- Vacant
- Farm
- Residential
- Commercial
- Industrial
- Institutional
- Special & Exempt

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PROJECT:

DRAWING:

EXISTING WATER SYSTEM
MAX DAY DEMAND / FIRE FLOW

DESIGN:

DRAWN:

CHECKED:

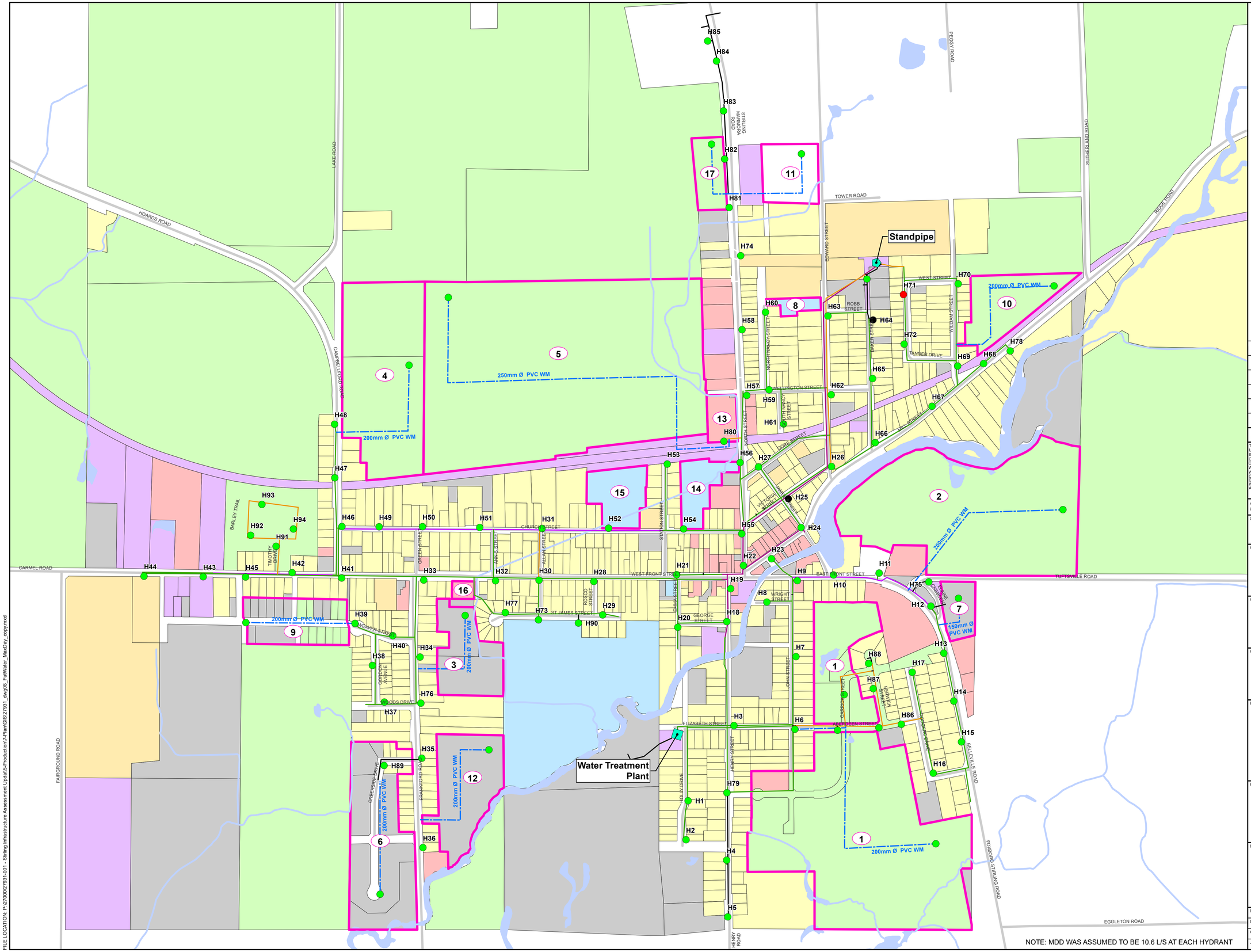
JLR #:

DRAWING #:

FIGURE 07

FILE LOCATION: P:\27000\27931-001 - Sliding Infrastructure Assessment Update\5-Production\7-Plan\GIS\27931_dwg07_ExtWater_MaxDayFF_ copy.mxd

PLOT DATE: November 2, 2023 10:46:35 AM



Legend

- Standpipe
- Water Supply Plant

Fire Hydrant

Sufficiency
- No info
- Green
- Red

Watermain (Diameter)
- No Info
- 150
- 200
- 250
- 300
- Future

Future Development

2

MPAC Property Code
- No Information
- Vacant
- Farm
- Residential
- Commercial
- Industrial
- Institutional
- Special & Exempt

No.	ISSUE / REVISION	DD/MM/YY

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PROJECT:

DRAWING:

FUTURE WATER SYSTEM: FULL BUILD OUT MAX DAY DEMAND

DESIGN:

DRAWN:

CHECKED:

JLR #:

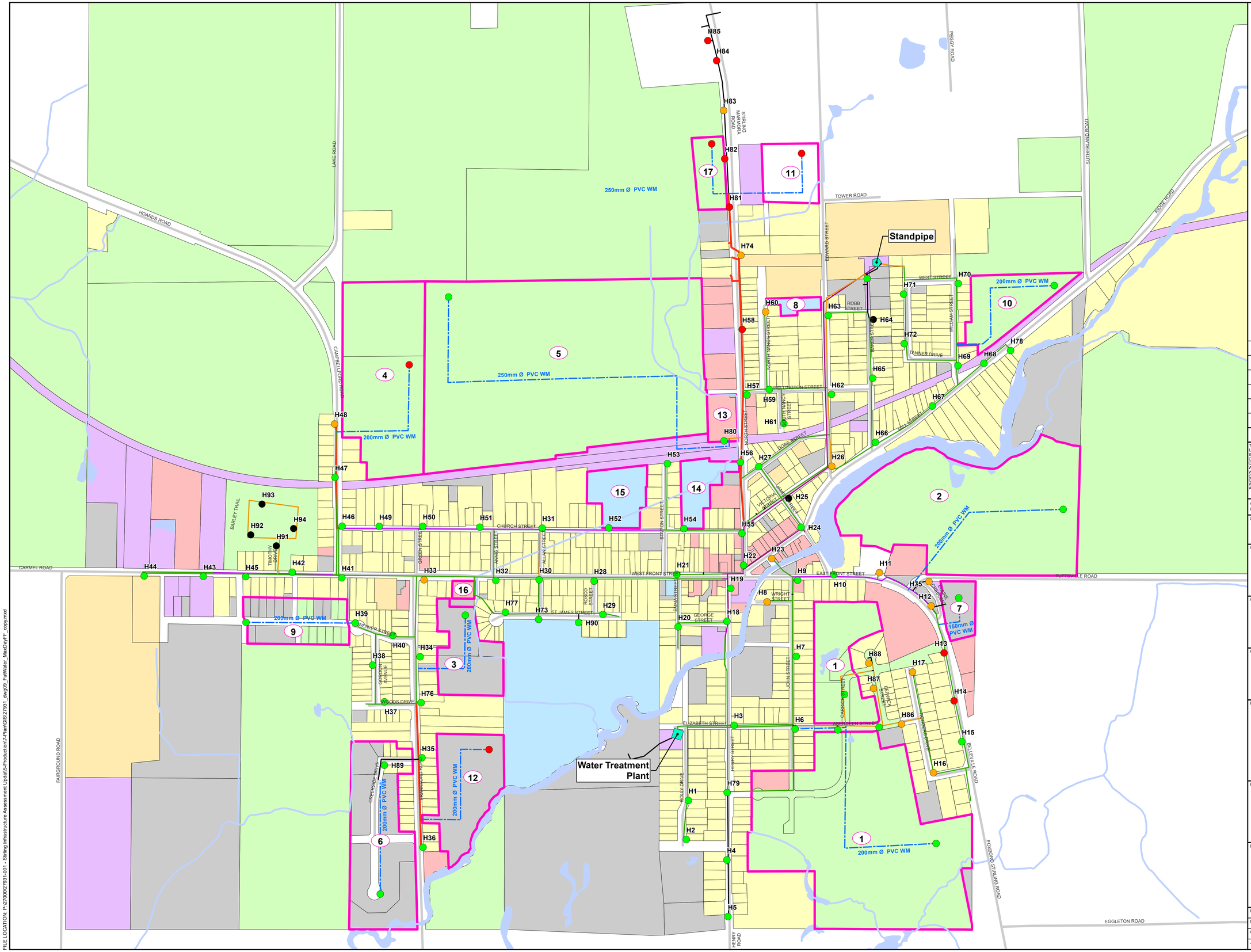
DRAWING #:

FIGURE 08

NOTE: MDD WAS ASSUMED TO BE 10.6 L/S AT EACH HYDRANT

FILE LOCATION: P:\27000\27931-001 - Stirling Infrastructure Assessment Update\5-Production\7-Plan\GIS\27931_dwg\08_FutWater_MaxDay_copy.mxd

PLOT DATE: November 9, 2023 11:22:26 AM



Legend

- Standpipe
- Water Supply Plant

Fire Hydrant

Flows at 140kpa (20psi)

- NoInfo
- Green
- Orange
- Red

Watermain (Diameter)

- No Info
- 150
- 200
- 250
- 300
- Undersized
- Future

Future Development

2

MPAC Property Code

- No Information
- Vacant
- Farm
- Residential
- Commercial
- Industrial
- Institutional
- Special & Exempt

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PROJECT:

DRAWING:

FUTURE WATER SYSTEM:
FULL BUILD OUT
MAX DAY DEMAND / FIRE FLOW

DESIGN:

DRAWN:

CHECKED:

JLR #:

DRAWING #:

FIGURE 09

FILE LOCATION: P:\27000\27931-001 - Stirling Infrastructure Assessment Update\5-Production\7-Plan\GIS\27931_dwg\09_FutWater_MaxDayFF_copy.mxd

PLOT DATE: December 19, 2023 10:50:40 AM

4.5 Water Distribution Servicing Strategies

The distribution system was analyzed for sufficient Max Day Demands and Fire Flows using the results of hydrant tests. The existing system can accommodate the MDD across the Town as shown in the figures. However, when looking at the demand for MDD + FF there are some areas that do not meet the requirements.

The distribution system was also analyzed under the Full Buildout condition to evaluate the worst-case scenario. In order to improve the system and close the gap between the provided and required demand and pressure, the following distribution upgrades were identified:

- Aberdeen Street looping has now been completed by extending a 200 mm watermain from John/Elizabeth St. intersection to Aberdeen/Berwick St. intersection. Existing hydrants should be re-tested to determine if the industrial locations flows are adequate.

- Campbellford Road: by installing a 200 mm watermain on Campbellford Rd., north from Church St., the proposed development off Campbellford Rd. will be adequately serviced. With the existing watermain, the development will not achieve 20 psi under MDD + FF.

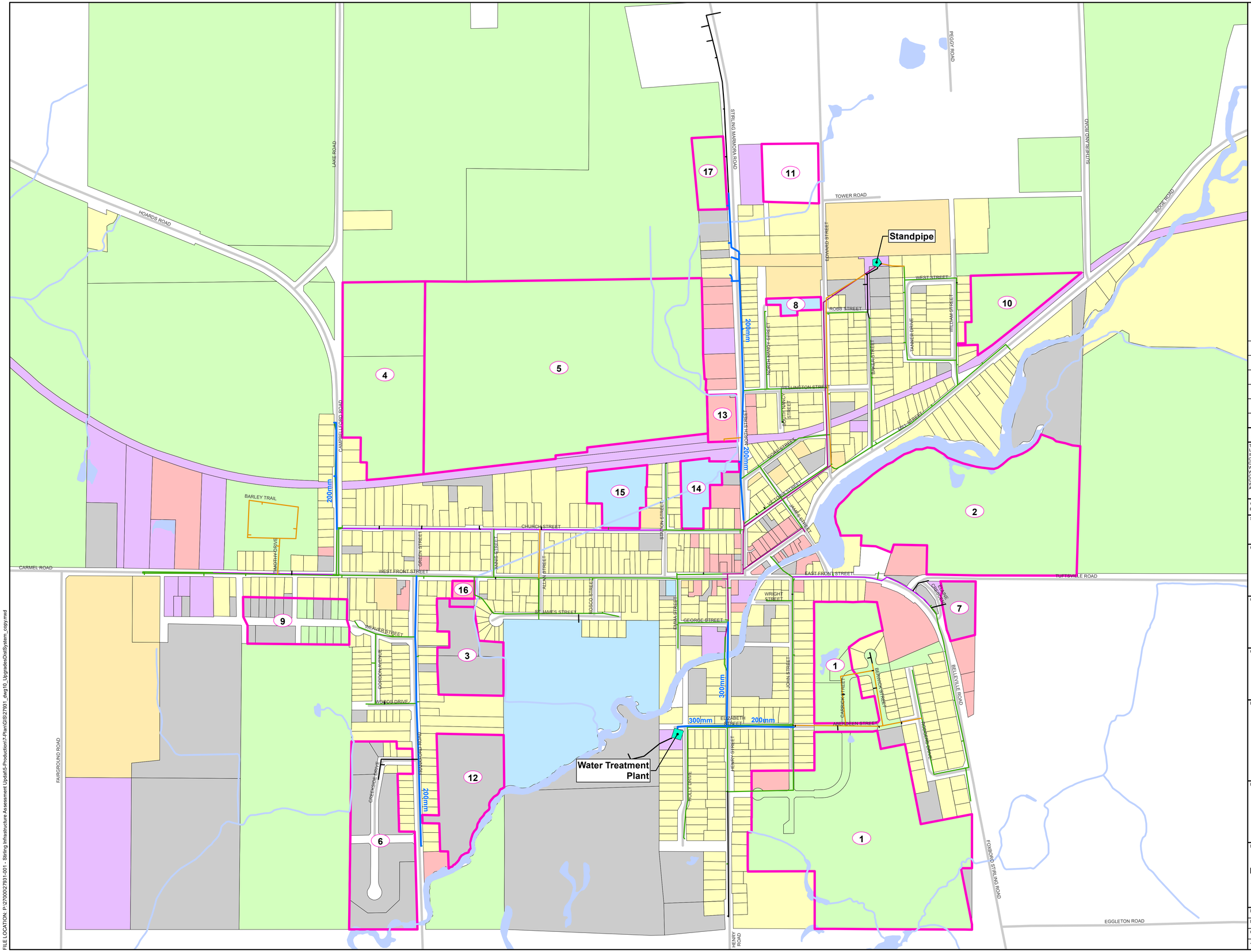
- Frankford Road: by installing a 200 mm watermain on Frankford Rd. the proposed development off Frankford Dr. will be adequately serviced. With the existing watermain, the development will not achieve 20 psi under MDD + FF.

- North Street: installing a 200 mm watermain from Victoria St. to the Thompson Farmland development connection location (Hydrant #80) should be completed to improve flows to the development as well as northern hydrants on Stirling-Marmora Rd. Additionally, a 200 mm watermain should be installed further up North St. as required in the future to service the Edward St. and northern Stirling-Marmora Rd. developments, as well as northern hydrants which currently have pressure deficits under fire flows. This may be solved with the recent upgrades on Henry, Front and North St. and should be investigated with updated hydrant tests.

- Completion of a Distribution Spine: Currently the water distribution system has a partially complete arterial water main to help facilitate flow through the system and specifically between the WTP and the standpipe. By increasing the watermain size in the remaining places, water can be distributed more evenly throughout the system.

    - Elizabeth St. Upgrades: by installing a 300 mm watermain from the WTP to Henry St. water flow will be increased to the entire water distribution network. By upgrading the watermain to 200mm from Henry St to John St in conjunction with the looping along Aberdeen St., flow will be improved to the entire south-eastern portion of the town where there are current deficits.

    - Henry St. Upgrades: the remainder of the installation of an upgraded 300 mm watermain from Elizabeth St. to Front St., when done in conjunction with the 300mm upgrades on Elizabeth St. will improve hydraulic flow to all of the town north of the Rawdon Creek. Additionally, since this line forms the spine of the system and feeds into the Standpipe, it will improve flow to the entire town.



Legend

- Standpipe
- Water Supply Plant

Proposed Watermain

Watermain (Diameter)

- No Info
- 150
- 200
- 250
- 300

Future Development

2

MPAC Property Code

- No Information
- Vacant
- Farm
- Residential
- Commercial
- Industrial
- Institutional
- Special & Exempt

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PROJECT:

DRAWING:

PROPOSED WATER SYSTEM UPGRADES DISTRIBUTION SYSTEM

DESIGN:	
DRAWN:	DRAWING #:
CHECKED:	**FIGURE 10**
JLR #:	

FILE LOCATION: P:\27000\27931-001 - Stirling Infrastructure Assessment Update\5-Production\7-Plan\GIS\27931_dwg\10_Upgrades\DistSystem_copy.mxd

PLOT DATE: December 19, 2023 10:52:22 AM

4.6 Water Supply and Treatment Servicing Strategies

The MOECC DWG (MOECC, 2008) indicates that plant capacity should be greater or equal to the Maximum Day Demand (MDD) with an allowance for water need for plant use. The current rated capacity of the Water Supply Plant is 2687 m^3/day. Figure 11 shows the MDD for the past 5 years in comparison to the Water Supply Plants rated capacity.

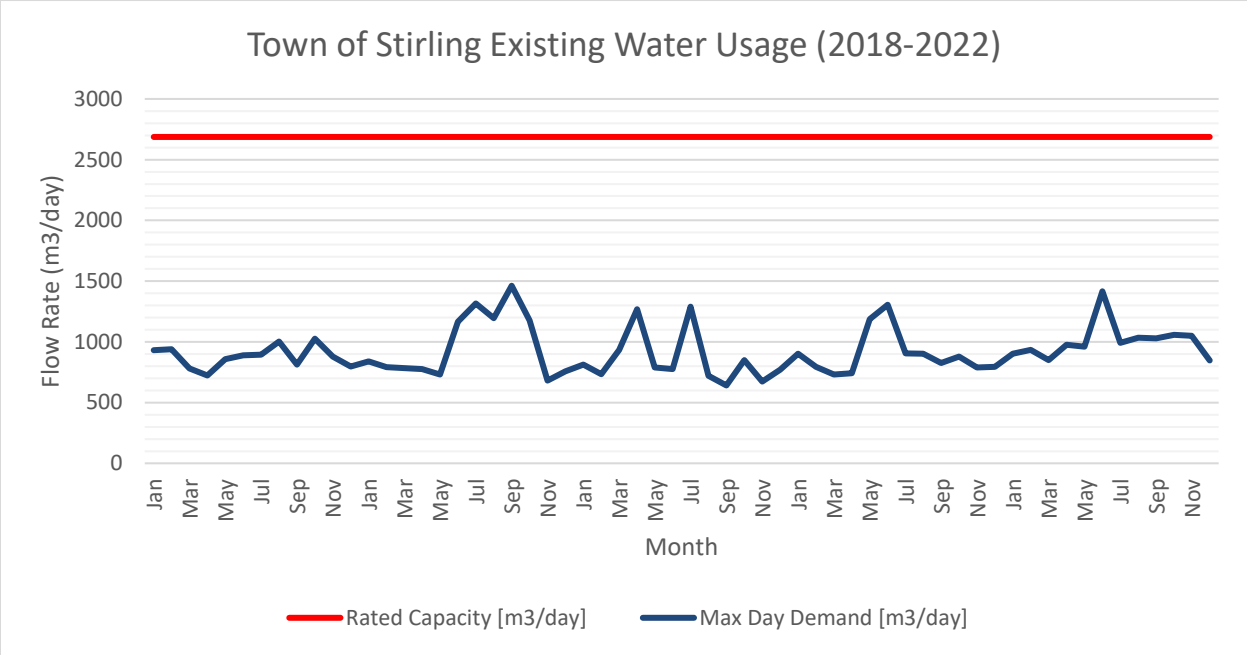


Figure 11: Existing Water Usage (2018-2022)

As shown above, the Town's water demand over the last five years did not surpass a MDD of 1462 m^3/day and typically has more than sufficient capacity.

Figure 12 presents the MDD vs. the plant capacities for each of the different future scenarios.

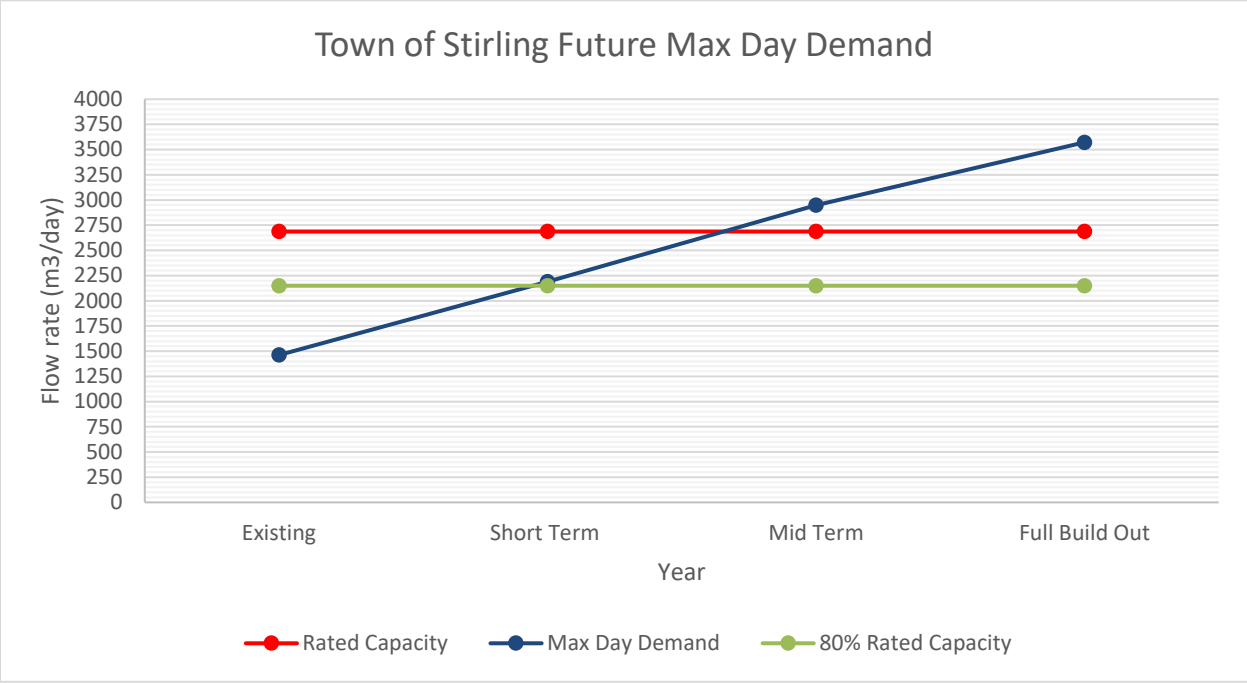


Figure 12: Future Max Day Demand

The figure above illustrates that the WTP should have sufficient capacity for the short-term development, though will be surpassing the 80% capacity mark at the completion and therefore would trigger the need to develop a plan to increase capacity prior to the plant being over capacity, which is indicated to occur part way through the mid-term development. The plant is shown to require additional capacity beyond the Mid-Term Scenario. Increasing capacity of the WTP would require a Schedule 'C' Municipal Class Environmental Assessment.

4.7 Water Storage Servicing Strategies

Water Storage in a drinking water system is intended to provide continuity of supply, maintain system pressure and to meet critical water demands during fire flow and emergency conditions. The MOECC DWG (MOECC, 2008) outlines the requirements to determine the quantity of storage needed. The formula for calculating the required treated water storage in the distribution system is as follows:

$$Total\ Treated\ Water\ Storage\ Requirements = A + B + C$$

Where: A = Fire Storage
B = Equalization Storage (25% of Max Day Demand)
C = Emergency Storage (25% of A+B)

Fire storage is the product of the maximum fire flow required in the system and the corresponding fire duration.

The current standpipe system has a rated total capacity of 2.6 ML. The standpipe typically operates between 60% and 80% of the total capacity. However, the standpipe needs to be capable of supplying minimum required pressures for fire flow scenarios (20 psi). This means

the volume considered as capacity inside the tank is limited based on the highest elevation area to be serviced in the Town. The elevation of liquid required to reach 20 psi (approx. 14 m) is required in the reservoir at all times, and therefore the volume up to this level is subtracted from the total capacity of 2.6 ML for the functional capacity. In this circumstance, the nearest homes are approximately at the elevation of the base of the tank; however, there are approximately 5 homes that were constructed after the storage tank, while the next highest homes are approx. 4 m lower. Since fire flow requirements assume worst case scenarios (industrial flows at 100 L/s), and the highest elevation areas are residential (with fire flow requirements of only 50 L/s), the considered functional capacity remains conservative. The total storage requirements for the existing system and each growth scenario are shown in Figure 13.

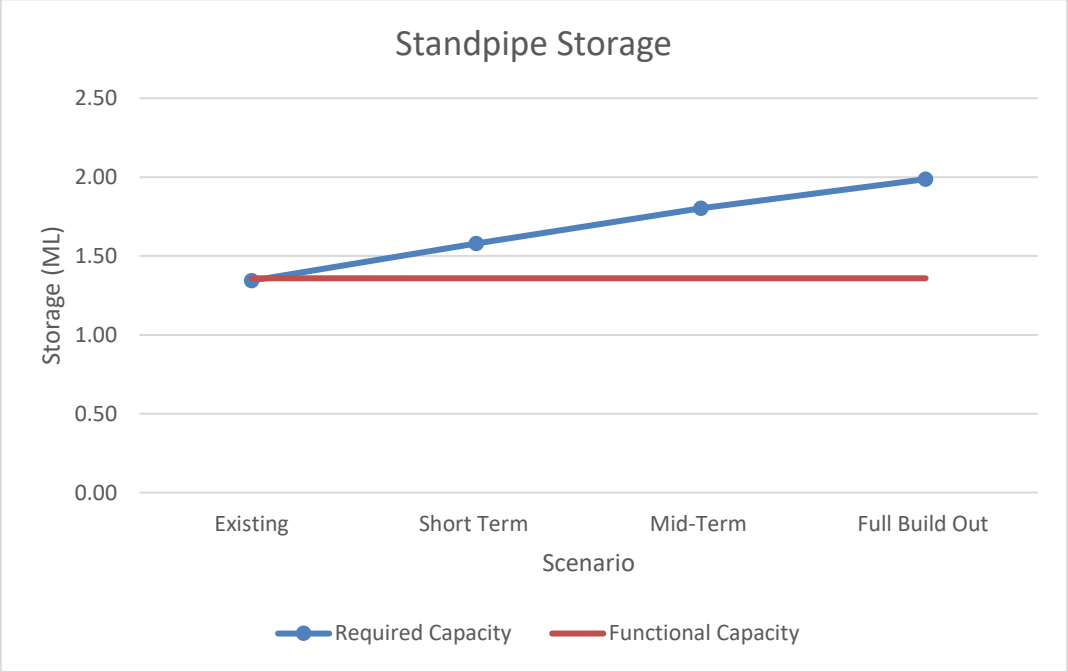


Figure 13: Existing and Future Storage Requirements

As indicated in the MOECC DWG, storage facilities should be sized for a 20 year projection as this is a reasonable lifespan and within growth predictability. Based on the projected growth and criteria indicated above, the standpipe functional capacity (capacity where fire flow pressures are available) is currently at capacity. The functional capacity (approx. 1.36 ML based on an elevation of 166.300 m (20 m of water in the tank)) would need to increase approx. 50% in functional capacity (to 1.99 ML) to meet the full buildout demand.

The Town has recently completed a rehabilitation project for the standpipe as it was nearing the end of its lifespan and has had noted leakage. As such, JLR would recommend that the Town look at alternative water storage locations and type to facilitate additional storage. Water storage reliability within the system should also be considered (see section below).

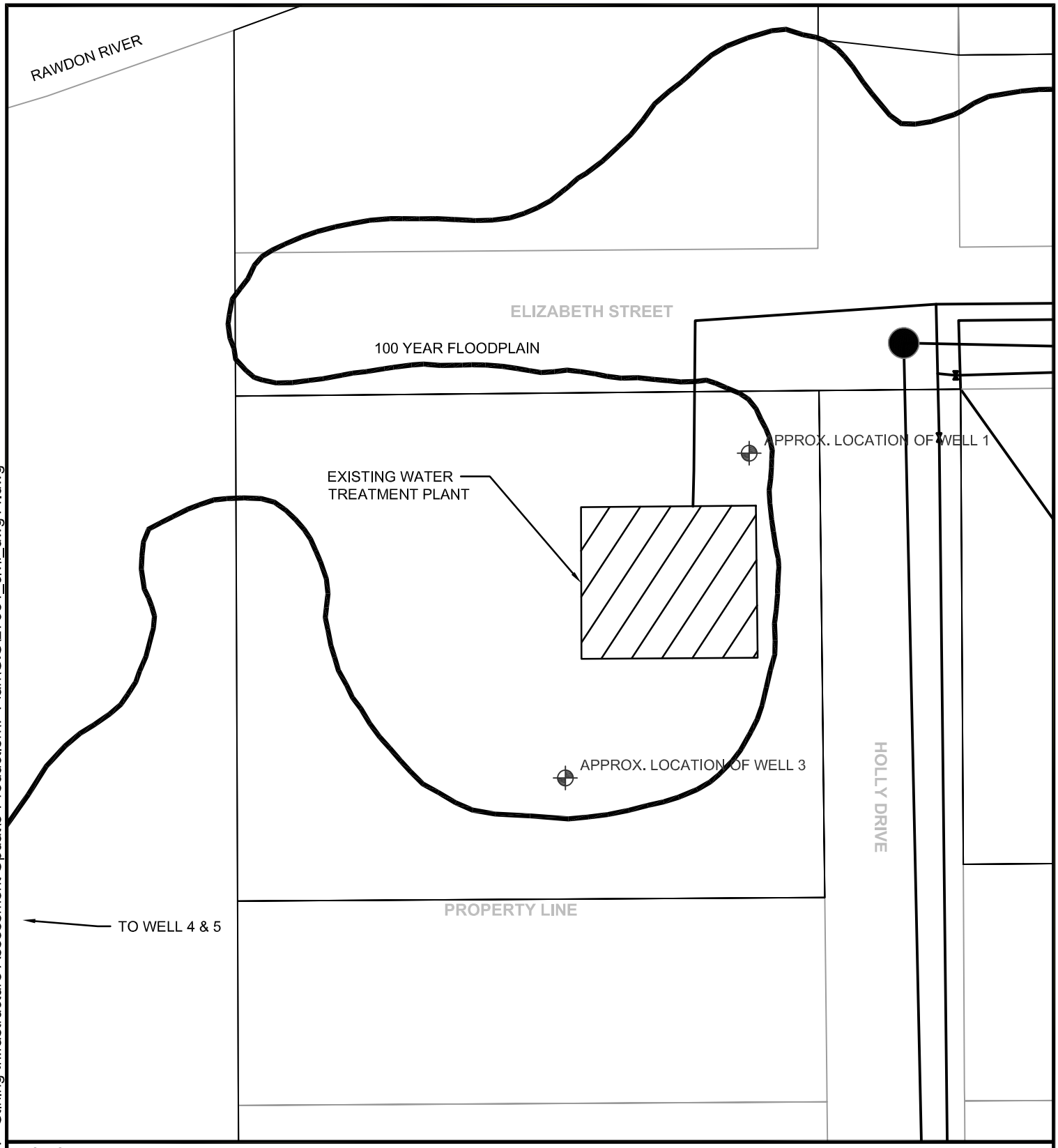
4.7.1 Water Storage Reliability

The Town has indicated that during any maintenance of the standpipe there is concern that there is no available storage within the system. In addition, there are limited watermain

crossings of the Rawdon Creek and additional storage on the south side of the Creek would provide additional reliability in case of watermain breaks. In order to increase reliability, consideration should given to provide storage in an alternate location, including the WTP. If water storage was provided at the WTP, the process to distribute potable water would need to be revised including:

- Installation of a tank
- Installation of high lift pumps
- New well pumps with lower head (i.e. pump to clear only, not for distribution)

The new storage tank would be placed outside of the 100yr flood plain to ensure integration of the system. Figures 14 and 15 illustrate this alternative to increase reliability in the system.



PROJECT:

STIRLING STANDPIPE REHABILITATION

2529 STIRLING-MAMORA ROAD, STIRLING, ONTARIO

DRAWING:

WATER TREATMENT PLANT SITE PLAN

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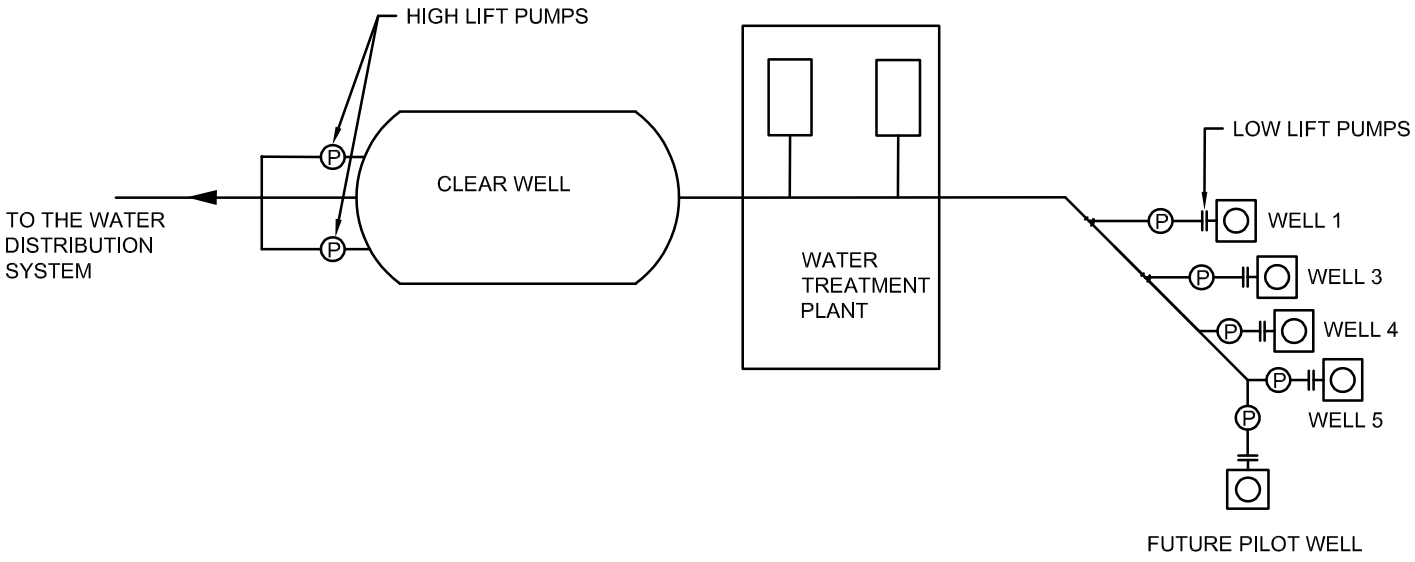
DESIGN:	MM
DRAWN:	CT
CHECKED:	MM
JLR #:	27931

DRAWING #:

FIGURE 14

File Location: P:\27000\27931-001 - Stirling Infrastructure Assessment Updat\5-Production\7-Plan\GIS\27931_civil_dwg14.dwg

PLOT DATE: November 27, 2023 4:40:36 PM



PROJECT:

STIRLING STANDPIPE REHABILITATION

2529 STIRLING-MAMORA ROAD, STIRLING, ONTARIO

DRAWING:

WATER TREATMENT PLANT PROCESS DIAGRAM

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CHECKED:	MM
JLR #:	27931

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FIGURE 15

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PLOT DATE: November 6, 2023 8:56:15 AM

4.8 Summary of Potable Water Servicing Strategies

In summary, the Town should consider the following servicing strategies for the water system as they move forwards;

- Prioritize the completion of the network spine from the Water Treatment Plant to the Standpipe as the Town proceeds with road reconstructions. This process has begun with the 2022/2023 reconstruction of Henry, West Front, North and Mill Street Project.
- During the second phase of the Ryell subdivision development, continue to ensure that the subdivision loops the watermain from Rogers Dr to Elizabeth St. This looping was completed, though only to John St., while increasing the size between Henry and John St. to a 200mm would further improve flows.
- Install a 200mm watermain on Campbellford Rd. from the existing 200mm watermain on Church St. to provide adequate fire flows to the Campbellford Development.
- Install a 200mm watermain on Frankford Rd. south from Front St. to provide adequate fire flows to the southern Frankford Dr. development.
- Update hydrant test results with improved flows from various upgrades.
- Install a 200 mm watermain further up North St. as required to service the Edward St. and northern Stirling-Marmora Rd. developments, as well as northern hydrants which currently have pressure deficits under fire flows. This may be solved with the recent upgrades on Henry, Front and North St. and should be investigated with updated hydrant tests.
- Complete a Schedule ‘C’ MCEA to increase the Town’s water supply and treatment capacity.
- Complete a Schedule ‘B’ MCEA to increase the Town’s available water storage.

5.0 Wastewater System

5.1 Existing Wastewater System

The Town of Stirling is serviced by a communal wastewater system. The existing communal wastewater system was established in the 1950s and generally consists of 30 km gravity sewers/forcemains, four sub-area pumping stations, a main pumping station, and a relatively new extended aeration wastewater treatment lagoon. The sewage collection system is owned and operated by the Municipality.

5.1.1 Existing Wastewater Collection System

The wastewater collection system generally consists of polyvinyl chloride, ductile iron, asbestos cement, and vitrified clay piping ranging from 100 mm to 450 mm in diameter. It is understood that some of the piping is the original infrastructure dating back to the 1950s.

5.1.2 Existing Sewage Pump Stations

All sewage generated in the Town of Stirling service area is ultimately conveyed to the George Street Sewage Pumping Station (SPS), which houses three VFD pumps (each rated for 74 L/s at 36.2 m TDH, providing a firm capacity of 145 L/s) in a wet well configuration and conveys

wastewater to the wastewater treatment lagoon via one 1300 m long 300 mm forcemain. The George Street Sewage Pumping Station was upgraded in 2022.

The Annis Street SPS was reconstructed in 2011 to house two submersible pumps (each rated for 48.89 L/s at 12.35 m TDH) in a 3 m diameter wet well configuration. The SPS drainage area includes the area of the Town west of Station St. (existing and future). There have been reported issues with flooding near the SPS, however this has been directly attributed to the mechanical failure of equipment components in the station or due to lightening strikes that caused damage. This station receives high flows during the spring thaw and it is assumed that multiple illegal sump pumps are interconnected into the sanitary sewer system in this collection area.

The Frankford Road SPS was reconstructed in 2011 to house two submersible pumps (each rated for 17.5 L/s at 25.57 m TDH) in a 2.4 m diameter wet well configuration. The SPS drainage area includes the area of the Town along Frankford Road (existing and future).

The Henry Street SPS houses two submersible pumps (each rated for 6.5 L/s at 4.9 m TDH) in a wet well configuration. The SPS drainage area includes the area of the Town along Henry St south of Elizabeth St and will eventually also include the phase 4 of the Ryell Subdivision development (existing and future).

The Rogers Drive SPS houses two submersible pumps (each rated for 6.5 L/s at 5 m TDH) in a wet well configuration. The SPS drainage area includes the area of the Town along Rogers Drive (existing and future). Operators have noted that this wet well has relatively small storage and will frequently run intermittently for short periods of time.

5.1.3 Existing Wastewater Treatment System

The Stirling Lagoons and Wetlands are located south of Stirling, at the end of Henry St. The wastewater treatment facility has a rated capacity of 1,500 cubic meters/day. The facility is operated in accordance with Environmental Compliance Approval (ECA) number 9487-9GFSJS issued May 27, 2014. The wastewater enters the treatment system from the George Street Sewage Pumping Station where aluminum sulfate (alum) is added for coagulation purposes. From the George Street Pumping Station the wastewater enters the North Lagoon through a horizontal discharge forcemain in the Northeast corner of the lagoon berm edge. The North Lagoon has an operating volume of 119,670 cubic meters. The water is aerated and the settling of suspended solids and facultative processes provides passive treatment. Water is then gravity fed to the South Lagoon.

The South Lagoon continues treatment though retention time for the chemical and biological breakdown of the organic matter and the settling of the suspended solids. The South Lagoon outlet controls flow to the wetland polishing system on the West bank of the cell and discharges via Agri-Drain control. Levels are controlled through the addition or removal of weir plates.

The effluent from the South Lagoon is gravity fed to the engineered wetland cells. The engineered wetland consists of a total of 15 operational trains for the full average day capacity of 1,500 cubic meters/day, plus an additional three trains for redundancy. At the pumping station, 25% hydrogen peroxide is dosed to control hydrogen sulphide levels to conform to the plants ECA. The plant effluent can either flow gravity to Mud Creek or can be discharged to Mud

Creek via two submersible pumps rated at 50 L/s at a 25 m TDH. Effluent can also be pumped back into the South Lagoon to be held during maintenance or if discharging is not permitted.

5.2 Historic Wastewater Flows

Design sheets of the existing wastewater collection system have been developed using land use designation, as discussed below, which are in included in the appendix. The capacities of the collection system shows that there are few cases where there is potential surcharging. Most of the pipe infrastructure has significant room to accommodate additional growth.

5.2.1 Historic Sanitary Collection System Flows

There are currently no sewers estimated to be surcharging in the existing collection system. The sewers nearest their capacities at approx. 60 – 80% are MH 65 – 61 on North St. from Wellington to Gore St. This can be seen on the attached Figure 17.

5.2.2 Historic Sewage Pumping Station Flows

George St. SPS underwent recent upgrades in 2022 per recommendations in the 2017 Capacity Assessment Report. With these upgrades complete, all existing sewage pumping stations have sufficient capacity to convey peak flow rates from the sanitary collection system. This can be seen in Table 8.

Table 8: Historic Sewage Pumping Station Flows

Pumping station	Number of Pumps	Rated firm capacity [L/s]	Existing Flows [L/s]
Annis Street	2	**48.9**	38.20
Frankford Road	2	**17.5**	7.07
Henry Street	2	**6.5**	2.54
Rodgers Drive	2	**6.5**	2.58
George Street	2	**145**	110.86
1. Calculated flows assume sewage pump stations outlet at their firm capacity (or at the estimated flow rate when exceeding existing firm capacity) to provide worst case scenarios			

The Municipality advised there is a history of sewer system surcharging at the Annis St SPS resulting in basement flooding during peak weather events. This was thought to be caused by mechanical issues with the pumps and heavy flows generated from illegal sump pump connections, though it was discovered additionally that approximately 40% of Annis St. SPS flows were directed back toward the station as the manhole the SPS outlets into has a sewer that also heads back towards the SPS. It is noted that there have been no bypasses to the wastewater system from 2015 to 2023.

5.2.3 Historic Wastewater Treatment Flows

Figure 16 provides a summary of historic wastewater flows recorded at the Wastewater Treatment Lagoon in 2022 for the Town of Stirling.

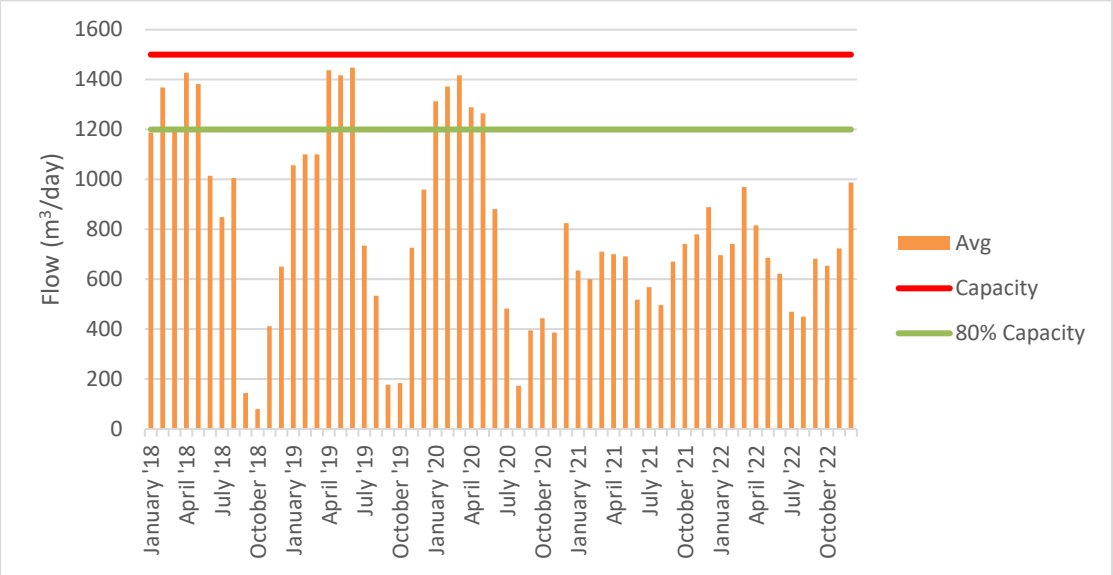


Figure 16: Wastewater Treatment Plant Operational Flows

Seen above, ADF for certain months is near capacity during 2018 – 2020 years; however, the ECA for the WWTP indicates the rated capacity is for an annual ADF. Additionally, data from these three (3) years are effluent flow, with highs and lows driven by release periods, whereas 2021 and 2022 data are influent flow which provides a better representation of the actual ADF incoming to the WWTP. The 2018 – 2020 data is however equally relevant for a 5-year average as influent will match effluent flows over a longer averaged time period. Based on the 2018 – 2022 data, the ADF was 806 m^3/day which is below the rated capacity of 1500 m^3/day.

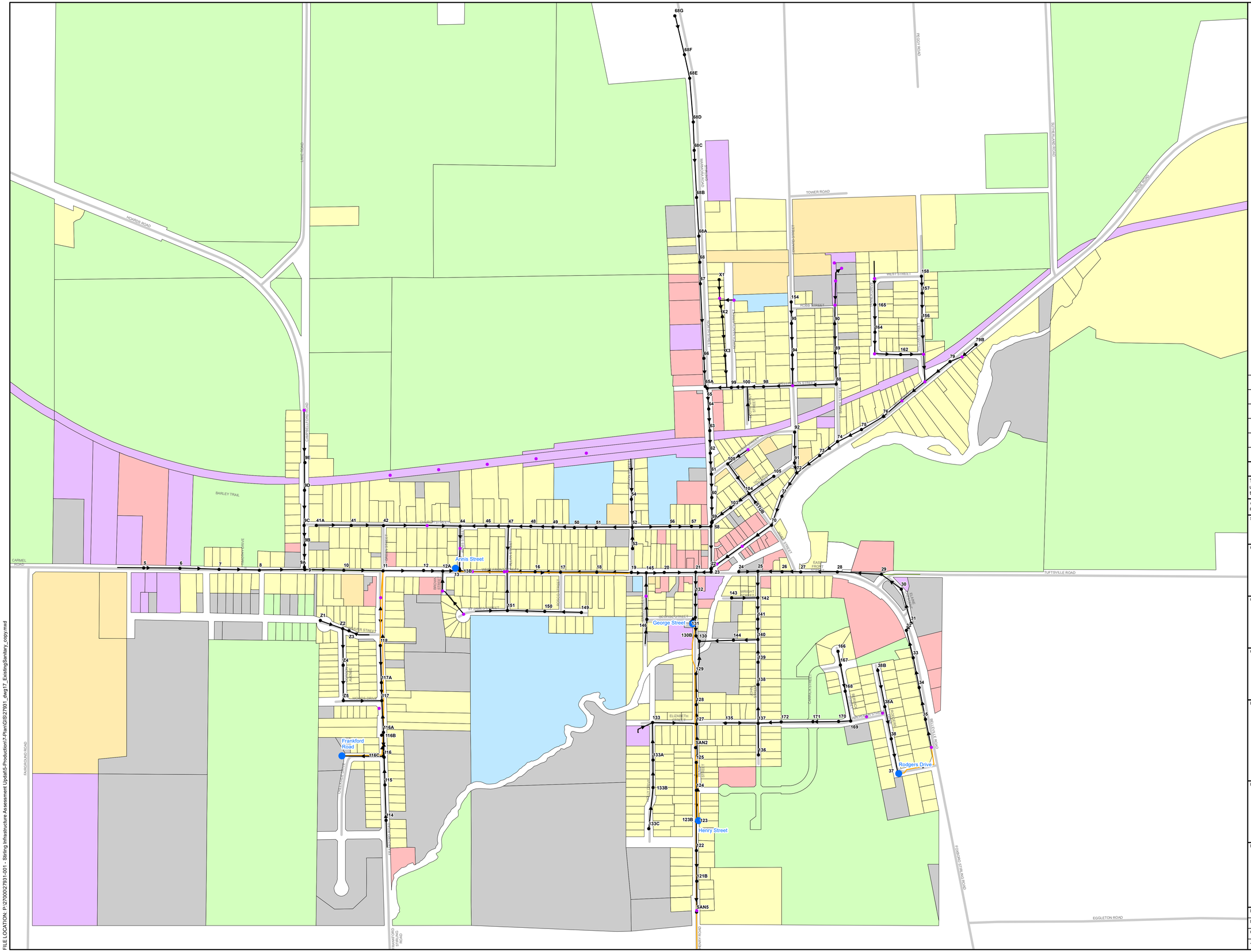
5.3 Wastewater System Design Criteria

Table 9 provides a summary of the residential wastewater generation rates to be used to assess and size the Municipality's wastewater system. These values are based on the MOECC Design Guidelines for Sewage Works.

The design used a land based approach to estimate population distribution across the Town. Rather than a separate Average Day Flow (ADF) from the typical residential value of 300 L/cap/day, the Industrial, Institutional and Commercial lands were converted to an equivalent population. The population per hectare (ppha) estimates of population densities are in Table 9.

Table 9: Land Use Equivalent Population

Land Use Designation	Equivalent Population Density (ppha)	Comments
Low Density Residential	15.6	Detached, Semi-detached
Medium Density Residential	31.2	Multi-unit, Low Rise Apartment
High Density Residential	60	Large Apartment buildings
Industrial	12.9	Warehouses, Factories etc.
Commercial	23.3	Stores, offices, etc.
Institutional	6.4	Schools, Community centres, Public services, Churches, etc.



Legend

- MH Missing IDs
- PS

Sewers

- Missing Information
- Gravity Sanitary Sewer
- Sanitary Forcemain
- Sewers

MPAC Property Code

- No Information
- Vacant
- Farm
- Residential
- Commercial
- Industrial
- Institutional
- Special & Exempt

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PROJECT NORTH

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PROJECT:

WATER AND WASTEWATER CAPACITY ASSESSMENT

STIRLING, ONTARIO

DRAWING:

EXISTING SANITARY SEWERS

DESIGN: CT	
DRAWN: KTK	DRAWING #:
CHECKED: MM	**FIGURE 17**
JLR #: 27931	

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The sewage flows were separated into 5 different drainage areas by the pumping stations that service them. In order to get a representative analysis of the design flows the extraneous flow varied from drainage area to drainage area. Some areas with newer piping networks are noted as having smaller extraneous flows while other areas with older piping are noted as having higher extraneous flows.

Table 10: Drainage Areas Design Criteria

Drainage Area	Average Day Flow	Extraneous Flow	Peaking Factor
Frankford Rd. SPS	300 L/cap/day	0.40 L/s/ha	Varies based on Harmon Peaking Factor
Annis St. SPS	300 L/cap/day	0.28 L/s/ha	Varies based on Harmon Peaking Factor
Henry St. SPS	300 L/cap/day	0.35 L/s/ha	Varies based on Harmon Peaking Factor
Rogers Dr. SPS	300 L/cap/day	0.50 L/s/ha	Varies based on Harmon Peaking Factor
George St. SPS	300 L/cap/day	0.45 L/s/ha	Varies based on Harmon Peaking Factor

Wastewater pumping facilities are rated on their 'firm' pumping capacity. Firm capacity is based on the capacity of the station with the largest pump out of service. Pumping stations are sized based on peak flows. Wastewater treatment facilities are designed based on the average and peak flows, depending on the treatment process (e.g., aeration tanks are sized for average day flows, whereas settling tanks are sized for peak flows).

5.4 Future Requirements: Wastewater System

5.4.1 Wastewater Collection

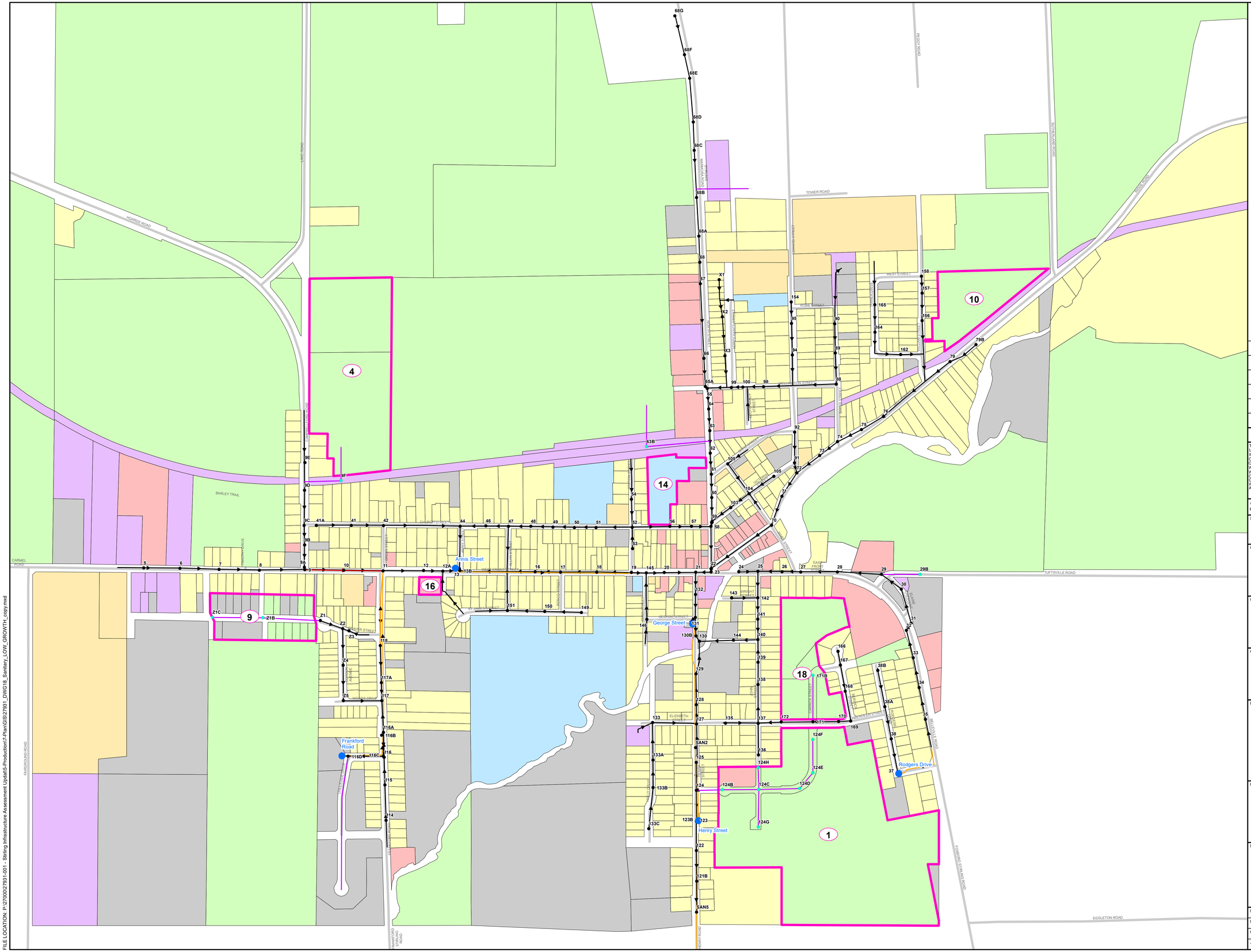
Design sheets of the future wastewater collection system have been developed and are included in the appendix. The capacities of the collection system shows that there are few cases where there is potential surcharging. Most of the pipe infrastructure has significant room to accommodate additional growth. The following infrastructure capacity gaps were noted in the different scenarios.

Short Term Scenario: Due to the development on Campbellford Rd., there is surcharging on Front Street sewers between MH 9 to MH 11, from Campbellford Rd. to Green St.

Medium-Term Scenario: Due to the development within the Thompson Farmland, there is surcharging on North Street between MH 63 to MH 59, from the old rail bed (where Thompson Farmland development is proposed to connect to the existing network) to Victoria Street.

Full Build Out Scenario: Due to northern developments on Edward St. and Stirling-Marmora Rd., the North Street sewers between MH 65 to MH 63, from Wellington St. to the old rail bed are near capacity. This exacerbates the surcharging immediately south to Victoria St (MH 59). Additionally, due to the Spry/Cleaver Property development, there is surcharging on John St. sewers between MH 25 and 142, down to MH 140, from East Front St. to Robert St.

The capacity gaps in the gravity sewer system are identified in Figures 18 through 20.



Legend

- MH Missing IDs
- Proposed MH
- MH
- PS
- 2 Future Development

Sewers

- Missing Information
- Gravity Sanitary Sewer
- Sanitary Forcemain
- Surcharging on Sanitary Sewers
- Proposed Sanitary Sewer

MPAC Property Code

- No Information
- Vacant
- Farm
- Residential
- Commercial
- Industrial
- Institutional
- Special & Exempt

No.	ISSUE / REVISION	DD/MM/YY

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PROJECT:

WATER AND WASTEWATER CAPACITY ASSESSMENT

STIRLING, ONTARIO

DRAWING:

FUTURE SANITARY SYSTEM SHORT-TERM GROWTH

DESIGN:	CT
DRAWN:	KTK
CHECKED:	MM
JLR #:	27931

DRAWING #:

FIGURE 18

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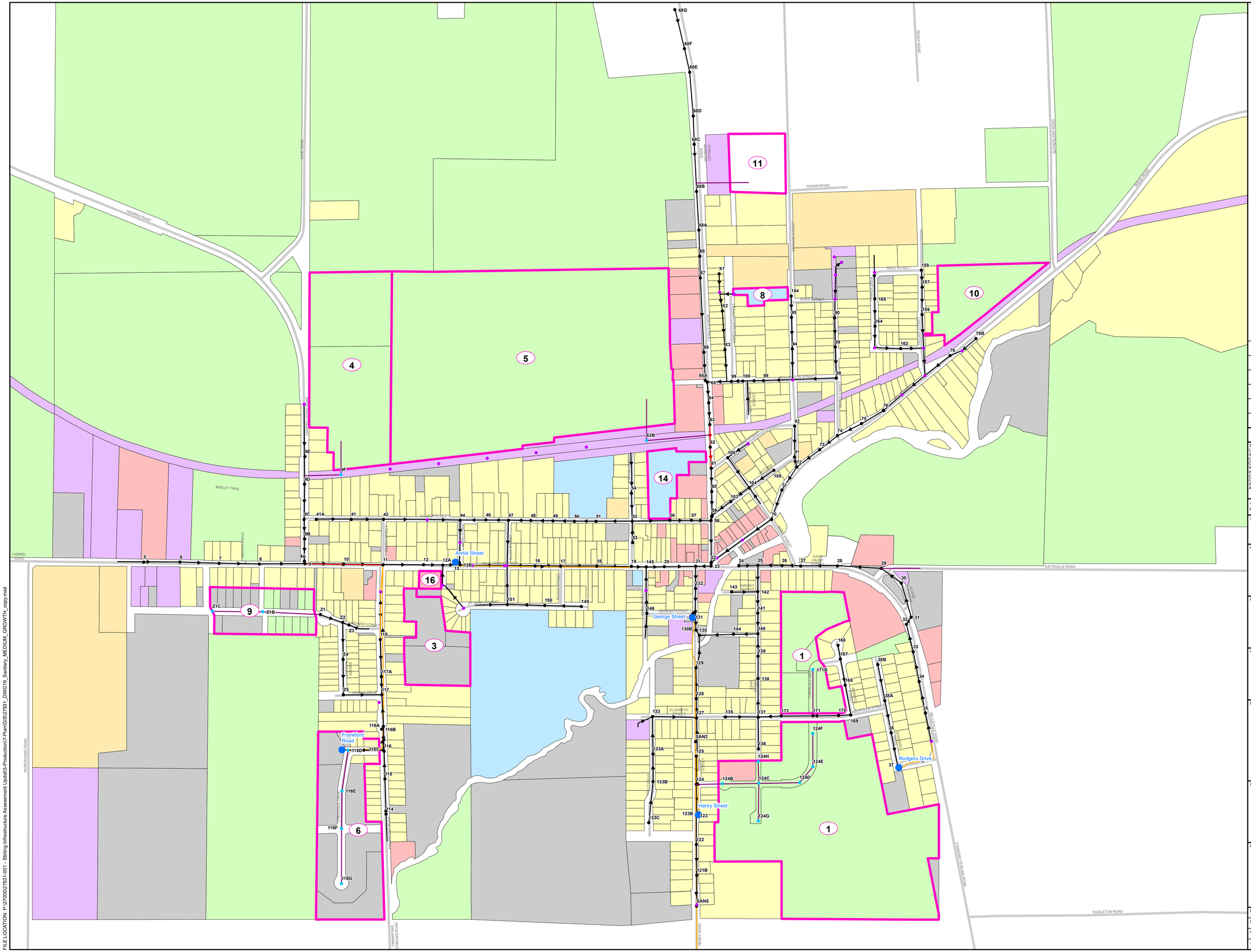

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- MH Missing IDs
- MH
- PS
- 2 Future Development

Sewers

- MISSING INFORMATION
- Gravity Sanitary Sewer
- Sanitary Forcemain
- Surcharging on Sanitary Sewers
- Proposed Sanitary Sewers

MPAC Property Code

- No Information
- Vacant
- Farm
- Residential
- Commercial
- Industrial
- Institutional
- Special & Exempt

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PROJECT:

WATER AND WASTEWATER CAPACITY ASSESSMENT

STIRLING, ONTARIO

DRAWING:

FUTURE SANITARY SYSTEM MID-TERM GROWTH

DESIGN: CT	
DRAWN: KTK	DRAWING #:
CHECKED: MM	**FIGURE 19**
JLR #: 27931	

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PROJECT NORTH:

Legend

- Proposed MH
- MH Missing IDs
- MH
- PS
- 2 Future Development

Sewers

- Missing Information
- Gravity Sanitary Sewer
- Sanitary Forcemain
- Surcharging Sewers
- Proposed Sanitary Sewers

MPAC Property Code

- No Information
- Vacant
- Farm
- Residential
- Commercial
- Industrial
- Institutional
- Special & Exempt

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PROJECT:

WATER AND WASTEWATER CAPACITY ASSESSMENT

STIRLING, ONTARIO

DRAWING:

FUTURE SANITARY SYSTEM FULL BUILD OUT

DESIGN: CT	
DRAWN: KTK	DRAWING #:
CHECKED: MM	**FIGURE 20**
JLR #: 27931	

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5.4.2 Wastewater Pumping Stations

Sewage pumping stations provide pumping of wastewater from low points in the sewage collection system while maintaining certain flow rates. Sewage pumping stations are rated based on their firm capacity. The MOECC Design Guidelines For Sewage Works (DGSW) defines "firm capacity" as the capacity of the station with the largest pump out of service. (MOECC, 2008). These rated firm capacities are shown below in the table below with the potential flows generated in each growth scenario.

Table 11: Sewage Pumping Station Operating Conditions

Pumping station	Number of Pumps	Rated firm capacity [L/s]	Existing Flows [L/s]	Short Term Projection [L/s]	Mid Term Projection [L/s]	Full Buildout Projection [L/s]
Annis Street	2	**48.9**	38.20	49.16	49.35	54.91
Frankford Road	2	**17.5**	7.07	7.17	13.18	18.09
Henry Street	2	**6.5**	2.54	4.73	4.76	4.79
Rodgers Drive	2	**6.5**	2.58	2.61	2.64	2.66
George Street	2	**145**	110.86	119.34	134.21	149.38
1. Calculated flows assume sewage pump stations outlet at their firm capacity (or at the estimated flow rate when exceeding existing firm capacity) to provide worst case scenarios						

As shown above, Annis St. SPS is of primary concern, exceeding the firm capacity in the short term due to the Campbellford Rd. development. The issue is exacerbated in the Full Buildout with development of the 2nd Old School on Church St, though would remain adequate without the Campbellford Rd. development.

The Frankford Rd. SPS is shown to exceed firm capacity in the Full Buildout Scenario. This is due to additional flows assumed from Hilden and Dorann Homes developments in the Mid-Term, as well as the southeastern Frankford Rd. development in the Full Buildout. It should be noted that because the projected flows are only slightly above the rated capacity, it is recommended that these flows be monitoring over time as the actual flows maybe be slight lower than the theoretical values and Frankford St SPS would have sufficient capacity.

Additionally, the George St. SPS is shown to minorly exceed the firm capacity at the completion of the Full Buildout. Though George St. was recently upgraded, population projections far exceed those assumed in the previous 2017 Infrastructure Assessment, while all flows, including all new development flows, increase the demand of George St. SPS. It should also be noted that because the projected flows are only slightly above the rated capacity, it is recommended that these flows be monitoring as the actual flow maybe be slight lower than the theoretical values and George St SPS would have sufficient capacity.

From an operational and maintenance standpoint, Annis St. SPS had multiple reports of the station running continuously in wet weather events and flooding of local resident's basements, which was contrary to what the theoretical SPS capacity can take.

Further investigation of the Annis St. SPS showed that the outlet structure of the forcemain from the SPS in Manhole-19 was not directed towards the outlet of the manhole. The manhole with the forcemain outlet has two inverts, the eastern invert at 122.675 m directs all flow towards the George St SPS and the western invert at 122.705 m directs sewer flows west on Front St W back to the Annis St. SPS. With a difference of only 30 mm between the two directions and the forcemain outlet being undirected toward the outlet allowed a significant portion of the flow to the west invert, back toward the Annis St PS that was being continually re-pumped. Particularly in wet weather events when the flows increased this would have significantly inhibited the SPS stations ability to pump flows into the George St SPS drainage area.
With the installation of a temporary barrier on the western invert of Manhole-19, flows have decreased to the pumping station by 20-25% during dry weather conditions. This increase in efficiency will be even greater in wet weather events, when the flows are larger and more turbulent.

5.4.3 Wastewater Lagoons and Wetlands

The MOECC indicates a sewage treatment plant should be able to treat the flows of sewage generated within buildings serviced by the sewer system exclusive of any extraneous flows (i.e. the average daily flow).

Figure 21 illustrates the anticipated daily flow as a result of the various flow and development scenarios:

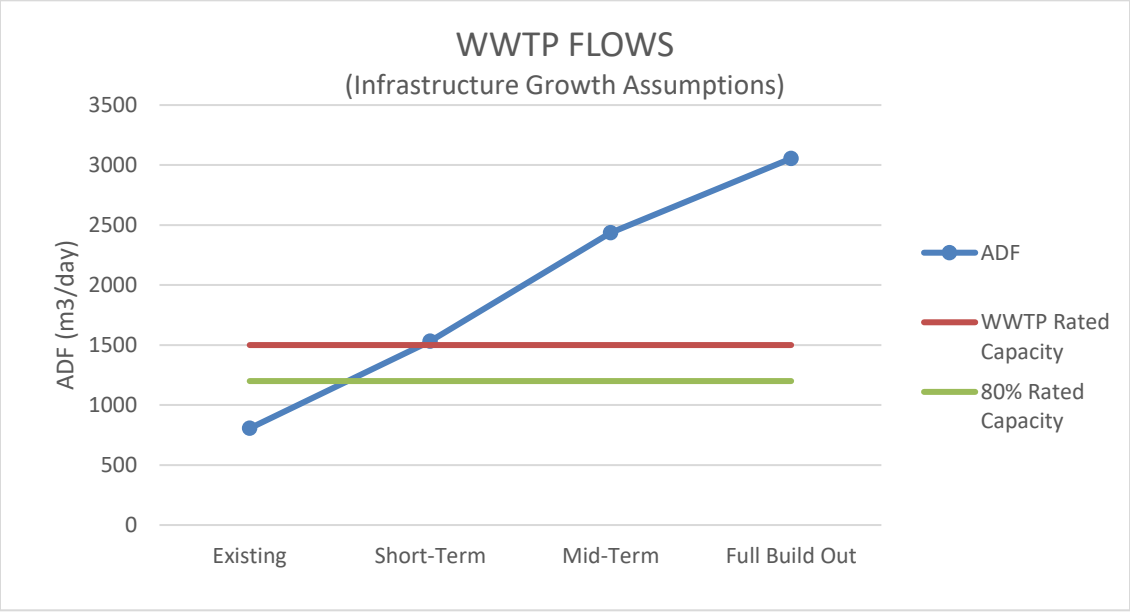

Figure 21: Wastewater Treatment Plant Existing and Future ADF

It can be seen from the figure above that the WWTP will exceed 80% capacity during the Short Term and exceed the rated capacity by the end. Exceedance will be heavily increased within the Mid Term and Buildout growth scenarios. Generally, capacity upgrades are triggered when a treatment facility reaches approximately 80% of the current functional or production capacity. This early identification allows time to accommodate the required planning and design between the anticipated need and the implementation of the upgrades. Based on projections, the WWTP

will reach 80% capacity with the development of approx. 327 units, and reach capacity with approx. 576 units.

5.5 Wastewater Collection and Pumping Servicing Strategies

As previously noted, the Annis St. SPS will require additional capacity over the Short-Term growth-planning period. Additionally relevant to the Campbellford Rd. development, the Front St. sewers from Campbellford Rd. to Green St. will become surcharged. Since the alternatives to both the conveyance system and pumping station capacity issues are inter-connected, servicing strategies were combined.

5.5.1 Annis Street SPS and Front Street Sewer Design Alternatives

Various options to address the noted future capacity issues anticipated at the Annis St SPS and North St sewer were reviewed. The alternatives included:

(1) Redirect the Campbellford Rd. Development sanitary sewer flows to a new sewer installed along the old railbed which outlets to North St. and bypasses Annis St. SPS.
(2) Upgrading the Annis St. SPS and the Front St. Sewers

5.5.1.1 Alternative 1: Redirecting Campbellford Rd. Development Sewer Flows to North St.

This alternative would involve directing the Campbellford Rd. development sewer flows to a new sewer installed along the old rail bed (immediately south of the development), directing flows east approx. 900 m to North St. Refer to Figure 22 for details.

Since flows will head immediately to North St. from the development, Campbellford Rd. will be bypassed, therefore bypassing both Front St. sewers and the Annis St. SPS. This solution then reduces Front St. sewers on concern to existing flows, and Annis St. SPS to approx. 46.45 L/s for the Full Buildout scenario (below the firm capacity of 48.9 L/s).

5.5.1.2 Alternative 2: Upgrading Annis St. SPS and Front St. Sewers

This alternative involves upgrading the Annis St. SPS and the Front St. sewers to accommodate for the increased flows from the Campbellford development and additional Full Buildout flows. Refer to Figure 23 for details.

PROJECT NORTH:

CAMPBELLFORD DEVELOPMENT
SANITARY FLOWS REDIRECTED TO NORTH ST

SEWERS MAINTAIN CAPACITY

ANNIS ST. SPS MAINTAINS CAPACITY

Annis Street

George Street

Frankford Road

Rodgers' Drive

Henry Street

HOWDEN ROAD

CARMEL ROAD

BARLEY TRAIL

FAIRGROUND ROAD

CHURCH STREET

TOWER ROAD

WEST STREET

NORTH STREET

ROSE STREET

ELIZABETH STREET

ABERDEEN STREET

GEORGE STREET

FRANKFORD ROAD

HENRY ROAD

EGGLETON ROAD

UPTSVILLE ROAD

SUTHERLAND ROAD

Legend

- MH Missing IDs
- Proposed MH
- MH
- PS
- Over Capacity PS
- 2 Future Development

Sewers

- Missing Information
- Gravity Sanitary Sewer
- Sanitary Forcemain
- Proposed Sanitary Sewer

MPAC Property Code

- No Information
- Vacant
- Farm
- Residential
- Commercial
- Industrial
- Institutional
- Special & Exempt

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PROJECT:

DRAWING:
PROPOSED SANITARY SYSTEM
ALTERNATIVE 1
CAMPBELLFORD RD DEVELOPMENT
REDIRECTION TO NORTH ST

DESIGN: CT	
DRAWN: KTK	DRAWING #:
CHECKED: MM	**FIGURE 22**
JLR #: 27931	

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PLOT DATE: November 9, 2023 3:15:05 PM

PROJECT NORTH:

UPGRADE SURCHARGING SANITARY SEWERS

UPGRADE SEWAGE PUMPING STATION

Annis Street

Frankford Road

George Street

Henry Street

Rodgers Drive

Legend

- MH Missing IDs
- MH
- PS
- Over Capacity PS
- 2 Future Development

Sewer

- Proposed Sanitary Sewer
- Surcharging on Sanitary Sewer
- Proposed Forcemain
- Missing Information
- Gravity Sanitary Sewer
- Sanitary Forcemain

MPAC Property Code

- No Information
- Vacant
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- Special & Exempt

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PROFESSIONAL STAMP

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PROJECT:

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PROPOSED SANITARY SYSTEM ALTERNATIVE 2 ANNIS ST SPS UPGRADES

DESIGN: CT	
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CHECKED: MM	**FIGURE 23**
JLR #: 27931	

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5.5.2 Evaluation of Alternatives and Recommendations

The evaluation of key aspects of the two alternatives for the wastewater collection system are shown below.

Table 12: Wastewater Evaluation of Alternatives

Criteria		Description	
		Alt 1: Campbellford Rd. Dev. Redirection to North St.	Alt 2: Annis St. SPS and Front St. Sewer Upgrade
Financial Considerations	**Capital Costs**	$1,700,000	$2,000,000
	Operational Costs	$0	$200,000
	Total	**$1,700,000**	**$2,200,000**
Natural Environment Considerations: Natural features, natural heritage areas, Areas of Natural and Significant Interest, designated natural areas, watercourses and aquatic habitat		• Minimal impact to existing natural features, watercourses and aquatic habitat	• Minimal impact to existing natural features, watercourses and aquatic habitat
Social and Cultural Environment Considerations: Proximity of facilities to residential, commercial and institutions, archeological and cultural features, designated heritage features, well or wellhead protection areas, land-use and planning designations		• Minimal impact on residents with increased noise, minimal impact to traffic with trucks entering/existing site area, minimal interruption to residents	• Interruption to the busy roadway along West Front St, Interruption of local traffic, Interruption to residents • Increased noise at night due to extended bypass requirement
Technical Feasibility: Constructability, maintaining, or enhancing drinking water quality, maintaining or enhancing wastewater treatment, reliability and security of systems, ease of connection to existing infrastructure and operating and maintenance requirements		• Installation of approx. 900 m of sanitary sewers at standard depths • Straightforward installation requirements and staging with minimal anticipated obstacles	• Installation of new pumps and potential wet well upsizing • Constant SPS bypass operation • Minimal available workspace at station • Upsizing of approx. 200 m of existing sanitary sewers
Overall Preference Rating		Has the least overall impact to the Town with the lower financial burden	More impact to the Town and large financial burden.

As indicated above, altering the Campbellford development sanitary flows to outlet easterly to North St. with approx. 900 m of additional sanitary sewers along the abandoned railbed is favourable in all accounts compared to the typical design approach of utilizing the nearest existing maintenance hole (Campbellford Rd.). Redirecting flows allows the increased demand to bypass Annis St. SPS, therefore enabling Annis St. SPS to avoid requiring upgrades. This is the primary benefit to Alternative 1 which creates large capital cost savings. Additionally, Annis St. SPS is located in a busy area on West Front St and therefore Alternative 1 drastically reduces the social and cultural impacts of residents and heavily simplifies technical requirements and constructability.

While the Annis St SPS is noted for it`s history of surcharging and basement flooding, this can be heavily attributed to the forcemain outlet directing flows back towards itself. Additionally, during one rainfall event, the pumping station experienced a mechanical malfunction, which lead to the surcharging and flooding. In another instance, a lighting strike caused issues within the station.

The Town has also expressed a desire for additional redundancy to prevent any flooding in the future. Ideally, this could be accomplished with an overflow being installed from the pumping station. However, investigations showed that with current grades around the pumping station, an overflow would have to be piped approx. 500m before overflowing to the Rawdon Creek. Other mitigation measures would include Inflow and Infiltration reduction programs, but these programs don't always yield measurable concrete reductions in flows.

Since Annis St SPS theoretically has more than enough capacity over the entire study period, it is recommended that the Town complete the control upgrades currently schedule and to monitor the flows at the station now that the outlet has been directed downstream.

Alternative 1 to redirect the Campbellford Rd. Development flows to North St. is the preferred option. Installation of these sewers would need to be completed in conjunction with the Campbellford Rd. Development. Increased flows will not immediately surcharge sewers on North St., though from the connection location (MH 63) to Gore St. (MH 61) will be near capacity, and these sewers, along with those extending to Victoria St. (MH 59) will be surcharged with the addition of the Thompson Farmland Development in the Mid-Term and will require upgrades.

5.5.3 Reliability and O&M Design Alternatives

Rogers Dr. is constantly running for short periods of time and the Town has expressed a desire to try and eliminate the SPS by redirecting flows through the new Ryell Subdivision. See Figure 24 for more detail.

5.5.3.1 Alternative 1: Rogers Drive SPS Redirection

This option would involve redirecting the sewer flows from the Rogers Dr SPS to Aberdeen St and then draining by gravity through the new subdivision to the George St SPS. A small portion of Aberdeen St will have to be excavated to reach the nearest manhole to connect into.

5.5.3.2 Alternative 2: Do Nothing

Do not update sewer line and continue to run the Rogers Dr SPS. This option has no capital costs however there will be operational maintenance costs over time.

5.5.4 Evaluation of Alternatives and Recommendations

The existing Rogers Drive roadway is in a poor state of repair, as such since it is feasible to redirect the flows to Aberdeen Street, It is recommended that the Town redirect the sewer flows and remove the Rogers Dr. SPS when the Town chooses to proceed with the road reconstruction. This will mitigate the capital costs associated with the redirection and save the Town annually in operational and maintenance costs.

PROJECT NORTH:

Legend

- MH Missing IDs
- MH
- PS
- Over Capacity PS
- 2 Future Development

Sewers

- Missing Information
- Gravity Sanitary Sewer
- Sanitary Forcemain
- Surcharging on Sanitary Sewer

MPAC Property Code

- No Information
- Vacant
- Farm
- Residential
- Commercial
- Industrial
- Institutional
- Special & Exempt

No.	ISSUE / REVISION	DD/MM/YY

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PROJECT:

DRAWING:

PROPOSED SANITARY SYSTEM
O&M UPGRADES
ROGERS DR SPS REDIRECTION

DESIGN:	CT
DRAWN:	KTK
CHECKED:	MM
JLR #:	27931

DRAWING #:

FIGURE 24

FILE LOCATION: P:\27000\27931-001 - Stirling Infrastructure Assessment Update\5-Production\7-Plan\GIS\27931_dwg24_Sanitary_Rodgers_copy.mxd

PLOT DATE: November 9, 2023 3:22:30 PM

5.6 Wastewater Treatment Servicing Strategies

It can be seen from Figure 21 the WWTP will be near its rated capacity by the end of the Short-Term Scenario, exceeding 80% capacity part way through. Starting the upgrade process will need to commence before the short term growth is achieved and will allow time to accommodate the required planning and design between the anticipated need and the implementation of the upgrades. A detailed analysis of the treatment options through a Municipal Class Environmental Assessment would need to be completed but it is assumed that the current treatment strategy would be maintained.

5.7 Summary of Wastewater Servicing Strategies

In summary, the recommend upgrades are as follows:

Short Term:

- Install new sanitary sewers along the abandoned railbed from the Campbellford Road development to North St., avoiding the requirement to upgrade Annis St. SPS and Front St. sewers between MH 9 and MH 11.
- When the Wastewater Treatment Lagoon reaches it's 80% capacity the Town should look into the viability of various treatment options and increasing capacity through the Municipal Class Environmental Assessment process.

Mid Term:

- Upgrade North St. sewers from MH 63 to MH 59 (between Gore and Wellington St. to Victoria St.). This can be done in conjunction with watermain upgrades on North St.
- Redirect the Rogers Drive SPS to the nearest Aberdeen St. manhole, and take the pumping station out of service

Long Term:

- Upgrade North St. sewers from MH 65 to MH63 (from Gore St. heading south). These upgrades could be completed during the medium term in conjunction with upgrades required for the Thompson Farmland to save on long-term capital costs.
- Upgrade John St. sewers from MH 25 – MH 140 (From Front St. to Robert St.).

6.0 Stormwater System

6.1 Existing Stormwater System

The existing storm sewer system in Stirling is a combination of storm sewers and ditches. Figure 4 illustrates all the known storm infrastructure in Stirling. As noted in the drawing, there are significant gaps of information in the storm sewer system. Current understanding of the Stormwater systems capacity is only in certain areas.

6.2 Historic Stormwater Flows

A large portion of downtown Stirling is located in the 100-year floodplain of Rawdon Creek. There is a history of flooding in the downtown core, particularly in the block north of Mill St. A report by Jewell Engineering (2017) looked into the condition of the storm sewer that passed under the downtown storefronts on Mill St. The report showed CCTV inspections that identified a collapsed portion of the storm sewer and recommended that the line be taken out of service and the building that sits above the collapsed pipe be assessed for its structural integrity. The recent downtown reconstruction project has undertaken the required structural repairs under the building prior to sealing each end for abandonment and rerouting the existing sewer system for alternate outlets.

6.3 Stormwater System Design Criteria

Stormwater conditions and design criteria were used to create a representative look at the stormwater flows generated for a typical 5-year storm for the town of Stirling. The rainfall conditions were assessed from data taken from the Belleville weather station (The nearest reporting weather station). The short duration rainfall intensity was then taken from the IDF curve.

Rainfall intensity is assessed based on the following formula:

$$i = A*T^{B}$$

Where;
i = Rainfall intensity
A = Storm Return Period Variable
T = Time of Concentration
B = -0.677

For the town of Stirling, the following design criteria were used;

Table 13: Stormwater Design Criteria

Parameter	Value	Comment
Runoff Coefficient	0.4	
Storm Return Period Variable	28.2 – 38.5	Dependent on return period
Time of Concentration	20 minutes	

6.4 Future Requirements: Stormwater System

As identified in the population growth projections, there is significant growth for the Town of Stirling. There are a variety of concerns for the storm sewer system that should be addressed. As identified in the existing storm sewer system. There are various streets in the Town that lack any storm sewers for residents to connect. Many streets in the town have ditches that have deteriorated over time and will need to be re-trenched or replaced with storm sewers. Additionally, the standpipe has an outlet for draining in emergencies and the storm sewer along Baker St needs to be assessed for its ability to drain the standpipe.

6.5 Stormwater Distribution Servicing Strategies

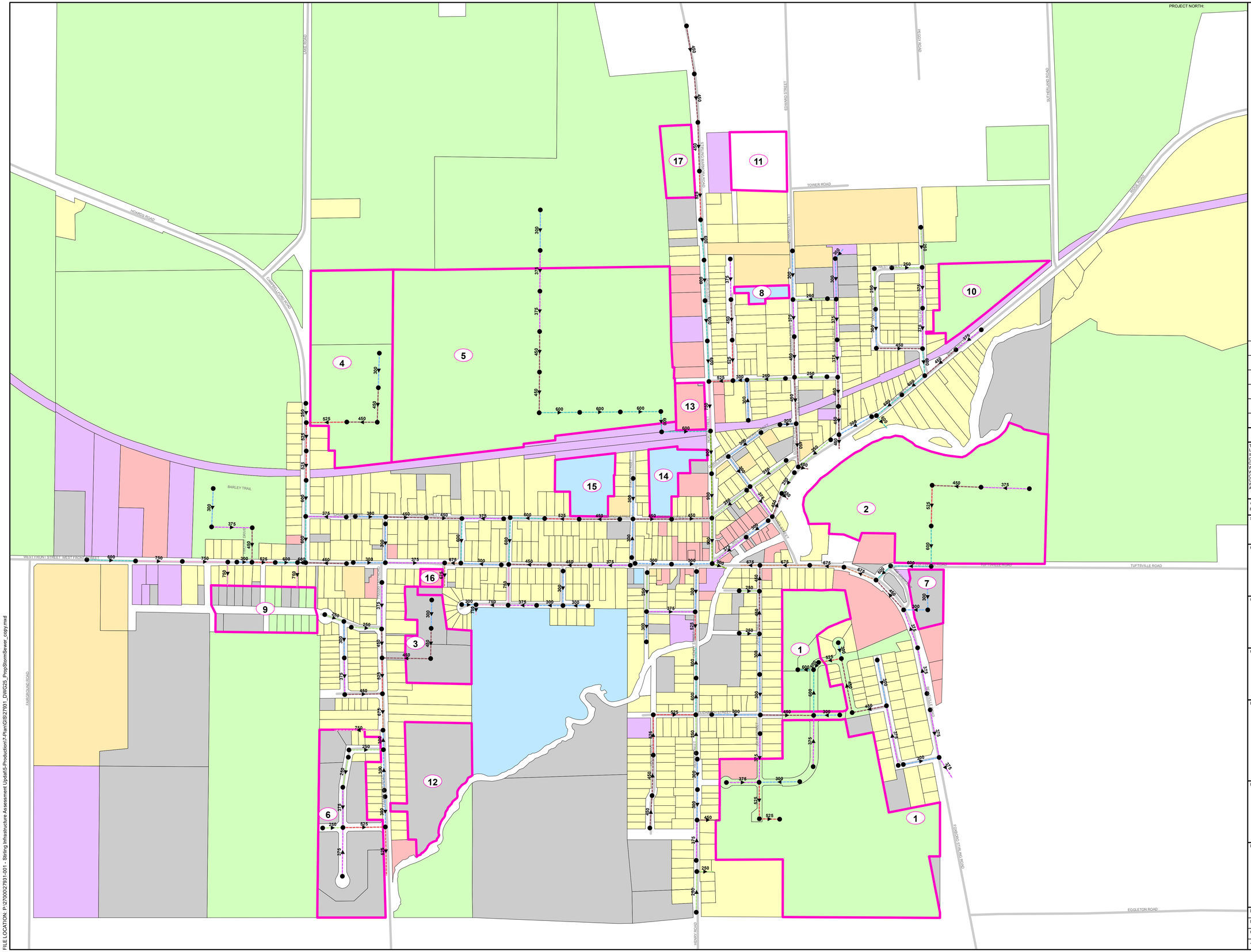
For future road reconstructions, it is recommended that the Town of Stirling repair and replace existing infrastructure holistically and look at all the infrastructure within the road easement needing to be replaced or upgraded over the entire lifespan of the roadway. In future road reconstructions, the Town should consider installing storm sewers along streets that are currently lacking them, and look into the adequacy and condition of existing storm sewers when they already exist.

The proposed storm sewers for each roadway in Stirling were assessed based on the design criteria for a 5-year storm. Each roadway was then sized for what the storm sewer would need to be able to accommodate all the stormwater runoff in the Towns existing catchment areas. The future sizing of all the proposed storm sewers is shown in Figure 25. This can be regarded as a preliminary assessment of the storm sewer system, prior to any development a more detailed analysis should take place to confirm design criteria used in this assessment. The proposed storm sewer does not generally modify the Towns existing outlet infrastructure and maintains the current drainage schematic. Additionally, there are hypothetical storm sewers added to the design for each of the future developments. These storm sewers are not accurate predictions of the storm sewers required for each of the proposed developments but they act as placeholders and help to predict the effect the new developments could have on the downstream storm sewer network.

6.6 Stormwater Retention Servicing Strategies

There is a noted need to stop the drainage from Thompson Farmlands into the downtown area, the current system drains all the fields with tile drainage into a vegetated drainage ditch south of the railway easement on North St. Discussions with the Town investigated the possibility of redirecting this runoff either east or west along the railway easement. Due to the railway easements high elevations on Campbellford Rd and Tanner Dr, it would be difficult to redirect the surface overland flow from the farmlands away from the downtown core. As such, the storm sewers have been adequately sized along North St to include the runoff from the Thompson Farmlands.

There are several future developments proposed for the Town. Typically any new developments are required to include stormwater retention systems so that they don’t add significant new flows to the system and cause surcharging downstream in the system (i.e. pre vs. post). Additionally, there are new regulations coming into place that require the application of LID design principles and the use of perforated pipes. Any new developments will need to consider how they will comply with new regulations.



Legend

Storm Sewer

- Storm MH
- 200
- 250
- 300
- 375
- 450
- 525
- 600
- 675
- 750
- 900

- Future Development

MPAC Property Code

- No Information
- Vacant
- Farm
- Residential
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- Industrial
- Institutional
- Special & Exempt

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DRAWING:

PROPOSED STORMWATER SYSTEM

DESIGN:	
DRAWN:	DRAWING #:
CHECKED:	**FIGURE 25**
JLR #:	

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PLOT DATE: November 7, 2023 2:01:48 PM

6.7 Summary of Stormwater Servicing Strategies

In summary, the following strategies should be implemented for the storm sewer system as the Towns roadways are gradually upgraded.

- Clean and unplug existing storm sewers specifically at areas that are noted for having poor drainage.
- Reinstate adequate ditching along roads where they have eroded, sedimentation has occurred and there is no storm-sewer.
- Ensure that storm-sewer installation is considered whenever there is a new road or road reconstruction and design holistically to account for future system requirements.
- Look into mapping the existing storm sewer system to identity the current systems capacity and areas of concern.
- New developments will need to comply with new storm-water retention regulations when they come into force.
- New developments will need to incorporate stormwater retention systems to mitigate new stresses on the existing system.

7.0 Recommended Servicing Strategies

7.1 Implementation

It is recommended that the Town coordinate all of the different servicing recommendations together to optimize efficiency and cost effectiveness. The Town should consider the full lifespan of infrastructure and when it will need replacement, then it should proceed with making upgrades to the water, wastewater and storm in tandem. The Town should also consider which infrastructure upgrades are a priority and stagger the implementation of these recommendations so that new infrastructure will come online when its needed.

7.2 Capital Improvement Plan

A capital Improvement Plan has been developed to summarize the infrastructure upgrades that need throughout the Town. This section provides an implementation timing of recommended servicing strategies as well as the Opinion of Probably Cost (OPC) in 2023 dollars and the anticipated Municipal Class Environmental Assessment requirements. It should be noted that the timing on some of the recommended upgrades may have been altered from the original recommended timing in order to coordinate projects or group upgrades together in a logical manner. These aspects are included to assist the Town in planning for the required upgrades.

Municipal Class Environmental Assessments (MCEA) are categorized into Schedules A, A+, B and C with reference to the magnitude of their anticipated environmental impact. The divisions between schedules also have varying levels of complexity. Schedule A activities are Pre-approved. The proponent may proceed without following the procedures set out in any other parts of the MCEA requirements. Schedule A+ activities are Pre-approved, however, the public has to be advised prior to the projects implementation. Schedule B activities involve completion of Phases 1 and 2 of the MCEA planning process and are then approved subject to screening. If the screening process through Phases 1 and 2 results in other requirements of the Class EA being applicable, then those requirements must also be fulfilled. Finally, a Schedule C MCEA

pertains to activities subject to the full planning process of the Municipal Class Environmental Assessment.

Overall Potable Water System Improvements:
The potable water system currently has some difficulty distributing potable water efficiently; it is recommended that the Town finish installation of the network spine from the WTP to the downtown area to improve water distribution, as well as upgrades identified on Aberdeen St., Campbellford Rd., and Frankford Rd. The Town will need to undertake a Class C MCEA to address the requirement for increasing their water supply capacity. The Town will also need to undertake a Class B MCEA to address the requirement for increased potable water storage capacity.

Overall Wastewater System Improvements:
With the recent upgrades part of the George St. SPS Upgrades and the Downtown Reconstruction Project, the current wastewater system is working well, with no immediate risks of reaching capacity for any sewers or pumping stations. However, partway through the Short-term Scenario, the WWTP demand will exceed 80% capacity and trigger the need to develop a plan for increasing capacity. The Town will then need to begin the process of undertaking a Class C MCEA an ensure the determined solution is implemented prior to exceeding capacity (shortly within the Mid-Term Scenario). Furthermore, sewer installation is required in the short term for the Campbellford Rd. development redirection to North St. Additionally, the Town will require a few future upgrades to sanitary sewers on North St. and John St., as well as Rodgers Dr. and Annis St. to accommodate abandonment of Rodgers Dr. SPS.

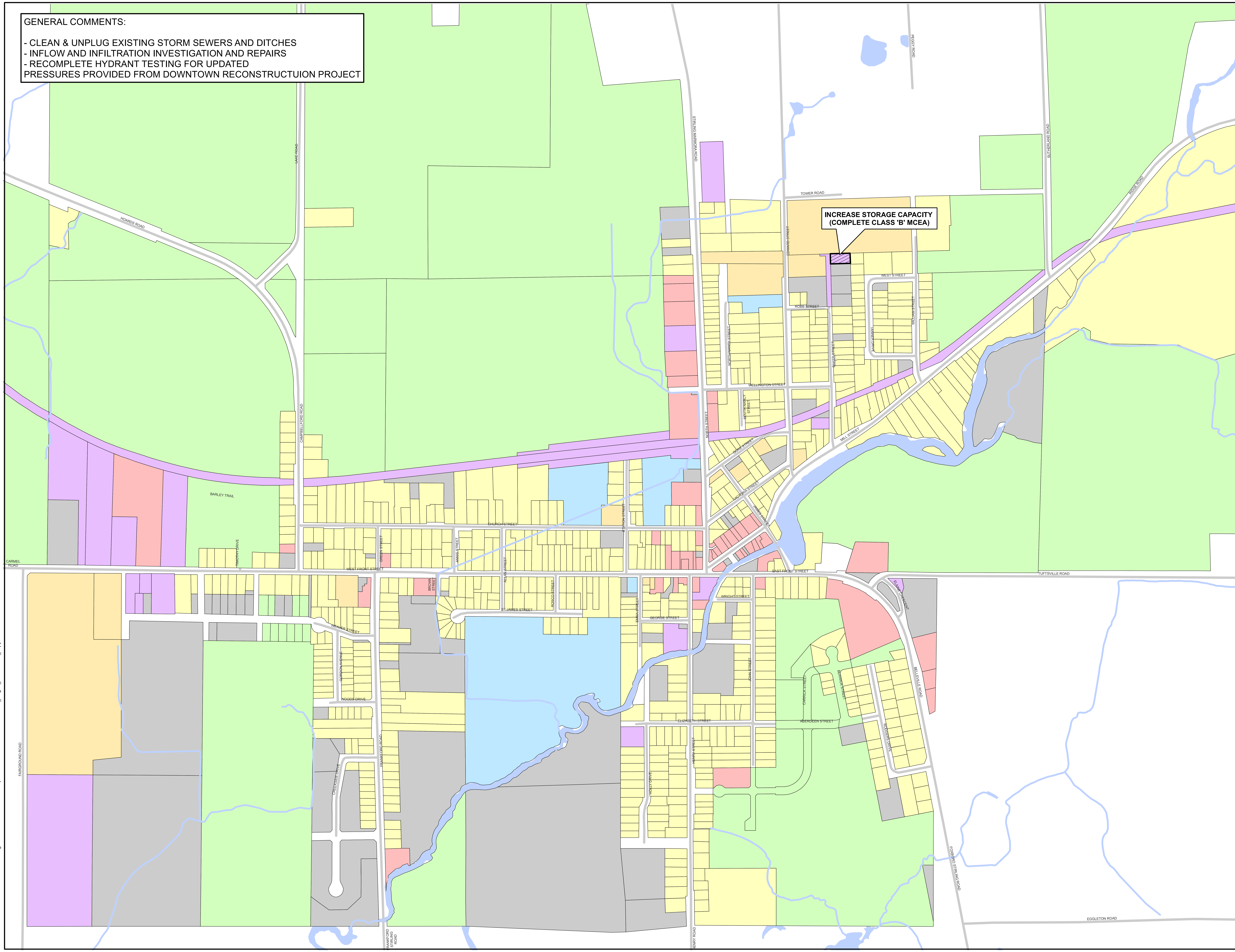
Overall Stormwater System Improvements:
Due to a lack of knowledge of the existing storm sewer system, existing system recommendations are limited. The theoretical sizing of the storm sewer system for any future road reconstructions has been developed. Downstream effects of these upgrades should be determined during design to determine the effects on existing infrastructure. It should be noted that overall costs for the storm sewer upgrades have not been included but we have included typical unit pricing of any future storm sewer work. We would recommend that the Town continue to map and examine the existing storm sewer network, clean and unplug existing storm sewers where possible and reinstate any eroded ditches in areas of the Town that lack any storm sewers.

Table 14: Implementation and Timing for Recommended Servicing Strategies

Timing	Area	Classification	EA Schedule	Cost 2023$ [2]	Description [1]	Notes
Existing	Water	Storage	B	150k	Class 'B' MCEA for Water Storage Upgrades	• Complete a Class 'B' Municipal Class Environmental Assessment to determine the most appropriate means to increase the Town's available water storage.
	Water	Storage	A/A+	2.0M	Water Storage Upgrades	• Complete water storage upgrades per Class 'B' MCEA
	Water	Distribution	A/A+	50K	Hydrant Pressure Testing	• Complete updated hydrant testing to inform on updated available hydrant pressures from the Downtown Reconstruction Project.
	Wastewater	Collection	A/A+	50k	Inflow & Infiltration Investigation & Repairs	• Incremental inspection of existing manholes and CCTV of sewers. Gradual repair of all recommended areas.
	Stormwater	Collection	A/A+	50k	Clean and Unplug Existing Storm Sewers & Ditches	• Cleaning and Ditching program to fix poorly drained areas of the Town.
Short-Term Growth	Water	Distribution	A/A+	800k	Aberdeen St. Watermain Looping	• Replacement and upsizing of watermain on Elizabeth St. from Henry St. to John St. with next phase of subdivision development
	Water	Distribution	A/A+	1.1M	Elizabeth & Henry St. Watermain Upgrades	• Completion of the network spine from the WTP to Front St. tie in.
	Water	Distribution	A/A+	600K	Campbellford Rd. Watermain Upgrades	• Replacement and upsizing of watermain on Campbellford Rd. from Church St. to the Campbellford Rd. development connection
	Wastewater	Treatment	C	350k	Class 'C' MCEA for WWTP Capacity Upgrades	• Complete a Class 'C' Municipal Class Environmental Assessment in preparation to upgrade WWTP Capacity.
	Wastewater	Treatment	C	15 - 20M[4]	WWTP Capacity Upgrades	• Complete WWTP capacity upgrades per Class 'C' MCEA
	Wastewater	Treatment	A/A+	1.7M	Campbellford Rd. Sanitary Sewers to North St.	• Install new sanitary sewers along the abandoned railbed from the Campbellford Rd. development to North St.
	Wastewater	Collection	A/A+	50k	Inflow & Infiltration Investigation & Repairs	• Incremental inspection of existing manholes and CCTV of sewers. Gradual repair of all recommended areas.
	Stormwater	Collection	A/A+	50k	Clean and Unplug Existing Storm Sewers & Ditches	• Cleaning and Ditching program to fix poorly drained areas of the Town.
Medium-Term Growth	Water	Treatment	C	350K	Class 'C' MCEA for WTP Capacity Upgrades	• Complete a Class 'C' Municipal Class Environmental Assessment in preparation to upgrade WTP Capacity.
	Water	Treatment	C	5.25M[3]	Class 'C' MCEA for WTP Capacity Upgrades	• Complete WTP capacity upgrades per Class 'C' MCEA. To provide cost estimations, it has been assumed there is additional groundwater sources available approx. 1 km east of the Belleville Rd. and Tuftsville Rd. intersection.
	Water	Distribution	A/A+	700K	North St. Watermain Upgrades	• Replacement and upsizing to 200mm watermain on North St. from Victoria St. to the Thompson Farmland connection location.
	Wastewater	Collection	A/A+	600K	North St. Sanitary Sewer Upgrades	• Replacement and upsizing of sanitary sewers on North St. from Victoria St. to the Thompson Farmland connection location.
	Wastewater	Pumping	A/A+	1.0M	Rogers Dr SPS redirection and decommissioning	• Redirect sewers to new section of Aberdeen St and decommission PS
	Wastewater	Collection	A/A+	50k	Inflow & Infiltration Investigation & Repairs	• Incremental inspection of existing manholes and CCTV of stormsewers. Gradual repair of all recommended areas.
	Stormwater	Collection	A/A+	50k	Clean and Unplug Existing Storm Sewers & Ditches	• Cleaning and Ditching program to fix poorly drained areas of the Town.

Timing	Area	Classification	EA Schedule	Cost 2023$[2]	Description[1]	Area
Full Build Out	Water	Distribution	A/A+	800k	Frankford Rd. Watermain Upgrades	• Replacement and upsizing to 200mm watermain on Frankford Rd. from Woods Dr. south to eastern Frankford Rd. development connection
	Wastewater	Collection	A/A+	500k	Upgrade North St. sewers	• Replacement and upsizing of sewer on North St. from Wellington St. to the Thompson Farmland tie in location. This work could be completed in conjunction with the Medium-Term North St. upgrades to reduce the long-term capital costs.
	Wastewater	Collection	A/A+	700k	Upgrade John St. sewers	• Replacement and upsizing of sewer on John St. from Front St. to Robert St.

(1) This table provides a summary of all of the proposed works, for a detailed description of each of the proposed servicing strategies refer to sections 4.8, 5.8 and 6.8
(2) All costs indicated include full reinstatement of asphalt, granulars, curbs & sidewalks (if currently present) unless otherwise noted
(3) Assumes that: land acquisition is not included; additional treatment is not required; suitable subsurface conditions (unknown); excludes dewatering, bedrock excavation, electrical servicing; historic construction data accounting for inflation, but does not include impacts on labour, material, equipment, manufacturing, supply, and transportation in relation to COVID-19.
(4) Assumes primary treatment can be accommodated through existing system.



Legend

MPAC Property Code

- No Information
- Vacant
- Farm
- Residential
- Commercial
- Industrial
- Institutional
- Special & Exempt

No.	ISSUE / REVISION	DD/MM/YY

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EXISTING RECOMMENDED SERVICING STRATEGIES

DESIGN:	CT
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JLR #:	27931

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FIGURE 26

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PLOT DATE: November 9, 2023 3:26:39 PM

GENERAL COMMENTS:

- CLEAN & UNPLUG EXISTING STORM SEWERS AND DITCHES
- INFLOW AND INFILTRATION INVESTIGATION AND REPAIRS

CAMPBELLFORD ROAD DEVELOPMENT SEWER INSTALLATION

CAMPBELLFORD ROAD WATERMAIN UPGRADES

ELIZABETH STREET WATERMAIN UPGRADES

HENRY STREET WATERMAIN UPGRADES

ABERDEEN STREET WATERMAIN LOOPING

WWTP UPGRADES (COMPLETE CLASS 'C' MCEA)

4

8

7

1

1

Legend

2 Future Development

MPAC Property Code

- No Information
- Vacant
- Farm
- Residential
- Commercial
- Industrial
- Institutional
- Special & Exempt

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SHORT-TERM GROWTH RECOMMENDED SERVICING STRATEGIES

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JLR #: 27931	

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PLOT DATE: November 9, 2023 4:34:39 PM

GENERAL COMMENTS:

- CLEAN & UNPLUG EXISTING STORM SEWERS AND DITCHES
- INFLOW AND INFILTRATION INVESTIGATION AND REPAIRS

NORTH STREET WATERMAIN AND SEWER UPGRADES FOR THOMPSON FARMLAND

WTP UPGRADES (COMPLETE CLASS 'C' MCEA)

ROGERS DRIVE SPS REDIRECTION AND DECOMMISSIONING

Legend

- 2 Future Development

MPAC Property Code

- No Information
- Vacant
- Farm
- Residential
- Commercial
- Industrial
- Institutional
- Special & Exempt

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MID-TERM GROWTH RECOMMENDED SERVICING STRATEGIES

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PLOT DATE: November 9, 2023 4:27:56 PM

GENERAL COMMENTS:

- CLEAN & UNPLUG EXISTING STORM SEWERS AND DITCHES
- INFLOW AND INFILTRATION INVESTIGATION AND REPAIRS

UPGRADE NORTH STREET SEWER

JOHN STREET SANITARY SEWER UPGRADES

FRANKFORD ROAD WATERMAIN UPGRADES

7

HOARDS ROAD
LAKE ROAD
CAMPBELLFORD ROAD
STIRLING MEMORIAL ROAD
PECOY ROAD
SUTHERLAND ROAD
ROSE ROAD
TOWER ROAD
HANNAH STREET
WEST STREET
ROBB STREET
NORTH STREET
KELLAR STREET
HONEY GROVE
MAPLE STREET
WELLINGTON STREET
SOUTH STREET
MILL STREET
BARLEY TRAIL
TIMOTHY DRIVE
CHURCH STREET
GREEN STREET
JAMES STREET
ADAM STREET
BROWN STREET
CARMEL ROAD
WEST FRONT STREET
ST. JAMES STREET
ROCCO STREET
ELIZA STREET
GEORGE STREET
EAST END
TUFTSVILLE ROAD
WRIGHT STREET
ROBERT STREET
ELIZABETH STREET
ABERDEEN STREET
DUKE STREET
DERRICK STREET
BERWICK STREET
BELLEVILLE ROAD
ROSEMOUNT DRIVE
ROSEMOUNT ROAD
EGGLETON ROAD
FAIRGROUND ROAD
WOODS DRIVE
CHRISTOPHER DRIVE
GORDON AVENUE
FRANKFORD STIRLING ROAD
HENRY ROAD
HENRY DRIVE
BLAKE STREET

Legend

MPAC Property Code

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- Farm
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- Industrial
- Institutional
- Special & Exempt

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FULL BUILD-OUT RECOMMENDED SERVICING STRATEGIES

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7.3 Unit Price Costing

In order to assist the Town in estimating costs of infrastructure upgrades, below is a list of cost for typical linear infrastructure in 2023 dollars:

Watermains

Table 15 - Watermain Costs

Watermain	
Size (mm)	**$/m**
150	600
200	700
300	775
400	850
500	925

- Watermain costs included all appurtenance (valves, bends etc.)
- Costs do not include roadway reinstatement
- Costs do not include rock removal

Sanitary & Storm Sewers

Table 16 - Sanitary & Storm Sewer Costs

Sanitary Sewer	
Size(mm)	**$/m**
200	1120
250	1240
300	1380
375	1600
450	1860
525	2140
600	2460
675	2800
750	3170

- Sanitary Costs include all appurtenances (manholes, temporary pumping etc.)
- Costs do not include roadway reinstatement
- Costs do not include rock removal

Roadway Reinstatement

Table 17 - Roadway Reinstatement Costs

Roadway	
Width (m)	**$/m**
7	1200
8	1400

- Cost includes sidewalk and curb on both sides
- Cost do not include lighting or traffic signals
- Cost includes standard roadway cross section
- Cost are not for high traffic roadways requiring more than a standard roadway cross section (e.g. 40mm of HL3, 50mm of HL8, 150mm of Gran A & 300mm of Gran B)

J.L. RICHARDS & ASSOCIATES LIMITED

Prepared by:

Owen Perrett, EIT
Civil Engineering Intern

Prepared by:

Matthew Morkem, P.Eng., Senior Associate
Environmental Market Chief

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APPENDIX A: POPULATION GROWTH ESTIMATES

Proposed Development		Area [Ha]	New Units	Projected Population	ADF	Peaking Factor	Peak Flow Rate (SAN)		WW Infiltration		Water MDD	
Lot (Figure 5)	Location				[l/s]		[l/s]	[m3/day]	[l/s]	[m3/day]	[m^3/day]	[L/s]
1	Ryell Subdivision*	11.10	100	240	0.83	4.12	3.43	296.50	1.55	134.27	133.20	1.54
4	Property on Campbellford Rd.	9.24	215	516	1.79	3.97	7.11	614.11	1.29	111.75	286.38	3.31
9	Weaver Street Extension (1)	2.91	5	12	0.04	4.41	0.18	15.86	0.41	35.20	6.66	0.08
10	Mill and William Street	2.96	80	192	0.67	4.15	2.77	239.30	0.41	35.80	106.56	1.23
14	Old School (1)	1.38	87	209	0.73	4.14	3.00	259.40	0.19	16.69	115.88	1.34
16	Old Black Dog Restaurant	0.24	29	70	0.24	4.28	1.04	89.44	0.03	2.90	38.63	0.45
-	Unassigned Growth	-	30	71	0.25	4.28	1.06	91.72			39.64	0.46
3	Hilden Homes	2.92	51	122	0.43	4.22	1.79	154.90	0.41	35.36	67.93	0.79
5	Thompson farm land	29.66	386	926	3.22	3.82	12.29	1061.98	4.15	358.79	514.15	5.95
6	Dorann Holmes	6.77	45	108	0.38	4.23	1.59	137.19	0.95	81.83	59.94	0.69
8	Stirling Manor Expansion**	N/A**	N/A**	56	0.19	4.30	0.84	72.32	0.00	0.00	31.08	0.36
9	Weaver Street Extension (2)	1.38	14	34	0.12	4.35	0.51	43.81	0.19	16.69	18.65	0.22
11	Edward Street	2.03	19	46	0.16	4.32	0.68	59.13	0.28	24.55	25.31	0.29
-	Unassigned Growth	-	31	75	0.26	4.28	1.11	95.62			41.37	0.48
2	Spry/Cleaver property	15.1678	197	473	1.64	3.99	6.54	565.46	2.12	183.47	262.40	3.04
7	Old Brown Shoe Property	1.090	14	34	0.12	4.35	0.51	43.81	0.15	13.18	18.65	0.22
12	Frankford Road	4.010	52	125	0.43	4.22	1.83	157.85	0.56	48.50	69.26	0.80
13	Stirling Manor Expansion(2)	0.84	N/A**	96	0.33	4.25	1.42	122.35	0.12	10.16	53.28	0.62
15	Old School (2)	1.850	117	280	0.97	4.09	3.98	343.55	0.26	22.38	155.35	1.80
17	Stirling-Marmora Road	1.880	24	58	0.20	4.30	0.86	74.34	0.26	22.74	31.97	0.37
-	Unassigned Growth	-	26	61	0.21	4.30	0.92	79.11			34.07	0.39
	TOTAL	**95**	**1495**	**3741**	**13**		**53**	**4539**	**13**	**1154**	**2110**	**24**
	Low Growth	**27.83**	**545.76**	**1309.82**	**4.55**		**18.59**	**1606.34**	**3.90**	**336.62**	**726.95**	**8.41**
	Medium Growth	**70.59**	**1091.82**	**2676.36**	**9.29**		**37.40**	**3231.30**	**9.88**	**853.85**	**1485.38**	**17.19**
	Full Buildout	**95.43**	**1521.02**	**3802.46**	**13.20**		**53.45**	**4617.77**	**13.36**	**1154.28**	**2110.36**	**24.43**

Avg Household size	2.4	cap/unit
Low Residential Density	6.5	unit/Ha
Med Density	13	unit/Ha
High Density	25	unit/Ha
Daily Flow/Cap (q)	300	L/cap/D
Infiltration Rate	0.14	L/s/Ha

APPENDIX B: WATER PRESSURE HYDRANT FLOW ANALYSIS

Water Pressure Hydrant Flow Analysis

Hydrant Number	Test Date	Street	Pitot PSI	Flow USGPM	Flow Rating Colour	Static Pressure PSI	Residual Pressure PSI	Flow @ 20PSI [USGPM]	Flow @ 140Kpa (20PSI) [L/s]	Required Flow @ 140Kpa (20PSI) [L/s]	Sufficiency	Flow @ 40PSI [USGPM]	Flow @ 275Kpa (40PSI) [L/s]	Required Flow @ 275Kpa (40PSI) [L/s]	Sufficiency
1	2015-11-26	Holly Drive	35	1000	GREEN	79	58	1747	110.2103	55	Green	1397	88.13268	18	Green
2	2015-11-26	Holly Drive	33	960	ORANGE	72	30	1077	67.97026	55	Green	829	52.29475	18	Green
3	2015-11-26	Elizabeth	50	1190	GREEN	70	40	1568	98.92494	55	Green	1190	75.0771	18	Green
4	2015-10-01	Henry	35	1000	Green	74	47	1454	91.73113	55	Green	1133	71.45337	18	Green
5	2015-11-26	Henry	45	1130	GREEN	72		948	59.80276	55	Green	729	46.01087	18	Green
6	2015-10-01	John	34	980	Orange	77	60	1883	118.8274	55	Green	1491	94.09642	18	Green
7	2015-10-01	John	45	1130	Green	81	28	1219	76.91448	55	Green	984	62.06307	18	Green
8	2015-10-01	Wright	18	750	Orange	84	25	784	49.44233	55	Orange	640	40.38556	18	Green
9	2015-10-01	East Front	45	1130	Green	84	35	1305	82.35126	55	Green	1066	67.2663	18	Green
10	2015-10-01	East Front	40	1060	Green	73	45	1496	94.38653	55	Green	1158	73.08001	18	Green
11	2015-10-01	East Front	40	1060	Green	74	46	1511	95.34407	105	Orange	1177	74.26765	18	Green
12	2015-10-01	Belleville	40	1060	Green	70	48	1651	104.1842	105	Orange	1253	79.06852	18	Green
13	2015-10-01	Belleville	35	1000	Green	72	42	1346	84.90961	105	Red	1035	65.3275	18	Green
14	2015-10-01	Belleville	30	920	Orange	72	38	1157	73.01155	105	Red	890	56.1734	18	Green
15	2015-10-02	Belleville	30	920	Orange	72	30	1032	65.13817	55	Green	794	50.11581	18	Green
16	2015-10-02	Rodgers	22	800	Orange	72	24	835	52.70139	55	Orange	643	40.54723	18	Green
17	2015-10-02	Rodgers	13	600	Orange	74	20	600	37.854	55	Orange	467	29.48613	18	Green
18	2015-10-02	Henry	55	1250	Green	80	62	2395	151.0863	55	Green	1924	121.3768	18	Green
19	2015-10-02	Henry	55	1250	Green	78	60	2351	148.3455	105	Green	1871	118.061	18	Green
20	2015-10-02	Emma	40	1060	Green	74	52	1721	108.6052	55	Green	1341	84.59735	18	Green
21	2015-10-13	West Front	37	1130	Green	66	44	1683	106.1744	105	Green	1237	78.02187	18	Green
22	2015-10-07	North	60	1300	Green	76	64	2987	188.4376	105	Green	2353	148.4395	18	Green
23	2015-10-06	Mill	43	1100	Green	78	48	1570	99.07381	105	Orange	1250	78.84804	18	Green
24	2015-10-06	James	50	1190	Green	78	67	2920	184.2496	105	Green	2324	146.6353	18	Green
25	2015-11-26	Victoria	60	1300	Green	---	---	---	---	---	---	---	---	---	---
26	2015-10-06	Edward	55	1250	Green		60	691	43.57376	55	Orange	1004	63.35505	18	Green
27	2015-10-08	Gore	50	1190	Green	68	54	2315	146.0389	55	Green	1730	109.16	18	Green
28	2015-10-13	W. Front	43	1100	Green	72	48	1670	105.3613	55	Green	1285	81.06253	18	Green
29	2015-10-14	St. James	40	1060	Green	70	40	1397	88.11802	55	Green	1060	66.8754	18	Green
30	2015-10-13	W. Front	55	1250	Green	76	60	2459	155.1198	55	Green	1937	122.1938	18	Green
31	2015-10-08	Church	53	1210	Green	66	60	3635	229.3155	55	Green	2671	168.5116	18	Green
32	2015-10-13	W. Front	55	1250	Green	74	60	2591	163.476	55	Green	2018	127.3386	18	Green
33	2015-10-13	W. Front	40	1060	Green	70	46	1576	99.40223	105	Orange	1196	75.43933	18	Green
34	2015-10-14	Frankford	37	1030	Green	70	40	1357	85.62411	55	Green	1030	64.9827	18	Green
35	2015-10-14	Frankford	30	920	Orange	72	35	1106	69.75273	55	Green	851	53.66615	18	Green
36	2015-10-14	Frankford	25	840	Orange	72	30	943	59.47398	55	Green	725	45.75791	18	Green
37	2015-10-14	Woods	35	1000	Green	72	38	1258	79.36038	55	Green	968	61.05805	18	Green
38	2015-10-14	Gordon	33	950	Orange	72	38	1195	75.39236	55	Green	919	58.00514	18	Green
39	2015-10-14	Weaver	30	920	Orange	72	38	1157	73.01155	55	Green	890	56.1734	18	Green
40	2015-10-14	Weaver	35	1000	Green	72	40	1300	82.00141	55	Green	1000	63.09	18	Green
41	2015-10-13	W. Front	50	1190	Green	70	56	2366	149.2939	55	Green	1796	113.3036	18	Green

42	2015-10-13	W. Front	45	1130	Green	78	58	2008	126.6875	55	Green	1598	100.8245	18	Green
43	2015-10-13	W. Front	45	1130	Green	66	50	1999	126.0966	105	Green	1469	92.6616	18	Green
44	2015-10-13	W. Front	45	1130	Green	70	50	1853	116.9302	105	Green	1407	88.7418	18	Green
45	2015-10-13	W. Front	50	1190	Green	70	58	2572	162.2533	55	Green	1952	123.1389	18	Green
46	2015-10-08	Church	43	1100	Green	58	50	2552	160.9785	55	Green	1704	107.5305	18	Green
47	2015-10-08	Campbellford	23	800	Orange	60	28	902	56.93534	55	Green	621	39.15847	18	Green
48	2015-10-08	Campbellford	17	700	Orange	60	22	720	45.40334	55	Orange	495	31.2271	18	Green
49	2015-10-08	Church	47	1150	Green	64	55	2709	170.9353	55	Green	1953	123.2201	18	Green
50	2015-10-08	Church	47	1150	Green	68	55	2328	146.8924	55	Green	1740	109.798	18	Green
51	2015-10-08	Church	50	1190	Green	68	58	2776	175.1369	55	Green	2075	130.91	18	Green
52	2015-10-08	Church	55	1250	Green	68	60	3289	207.5259	105	Green	2459	155.1198	18	Green
53	2015-10-08	Church	25	840	Green	68	30	953	60.1211	55	Green	712	44.93886	18	Green
54	2015-10-08	Church	55	1160	Green	70	60	2766	174.5269	105	Green	2099	132.4537	18	Green
55	2015-10-07	Church	60	1300	Green	71	60	2976	187.7758	105	Green	2275	143.5116	18	Green
56	2015-10-07	North	50	1190	Green	70	56	2366	149.2939	105	Green	1796	113.3036	18	Green
57	2015-10-07	North	45	1130	Green	70	50	1853	116.9302	105	Green	1407	88.7418	18	Green
58	2015-10-07	North	25	840	Orange	68	30	953	60.1211	105	Red	712	44.93886	18	Green
59	2015-10-08	Wellington	45	1130	Green	65	50	2045	129.0281	55	Green	1489	93.93713	18	Green
60	2015-10-08	N. Nancy	35	1000	Green	54	38	1502	94.78385	105	Orange	930	58.70092	18	Green
61	2015-10-08	S. Nancy	40	1060	Green	78	42	1371	86.51953	55	Green	1091	68.8567	18	Green
62	2015-10-06	Edward	43	1100	Green	62	56	3146	198.4752	55	Green	2219	139.978	18	Green
63	2015-10-06	Edward	43	1100	Green	56	50	2895	182.6228	105	Green	1868	117.8627	18	Green
64	2015-10-06	Baker	N/A	N/A	N/A	---	---	---	---	---	---	---	---	---	---
65	2015-10-06	Baker	38	1020	Green	60	41	1525	96.19359	55	Green	1049	66.15916	18	Green
66	2015-10-06	Mill	47	1155	Green	70	52	2005	126.5142	55	Green	1522	96.01539	18	Green
67	2015-10-06	Mill	40	1060	Green	70	43	1478	93.27683	55	Green	1122	70.79057	18	Green
68	2015-10-06	Mill	22	900	Orange	65	30	1031	65.03409	55	Green	750	47.34716	18	Green
69	2015-10-06	William	40	1060	Green	64	40	1470	92.77197	55	Green	1060	66.8754	18	Green
70	2015-10-06	William	35	1000	Green	52	42	1874	118.2338	55	Green	1103	69.6175	18	Green
71	2015-10-06	Tanner	30	920	Orange	40	32	1509	95.19978	55	Green	0	0	18	Red
72	2015-10-06	Tanner	30	920	Orange	60	36	1212	76.47979	55	Green	834	52.60057	18	Green
73	2015-10-14	St. James	55	1250	Green	70	56	2486	156.8214	105	Green	1886	119.0164	18	Green
74	2015-10-07	Stir-Marm	17	700	Orange	62	22	719	45.34201	55	Orange	507	31.97823	18	Green
75	2015-10-01	Tufftsville	40	1060	Green	71	44	1494	94.27963	105	Orange	1142	72.05519	18	Green
76	2015-10-14	Frankford	37	1030	Green	76	40	1308	82.49278	55	Green	1030	64.9827	18	Green
77	2015-10-14	St. James	55	1250	Green	70	64	3928	247.8065	105	Green	2981	188.0678	18	Green
78	2015-10-06	Mill	25	840	Orange	64	30	965	60.91239	55	Green	696	43.90917	18	Green
79	2015-11-26	Henry	40	1060	Green	68		878	55.4092	55	Green	656	41.41684	18	Green
80	2015-10-07	Albert	50	1190	Green	70	54	2202	138.9078	105	Green	1671	105.4213	18	Green
81	2015-10-07	Stir-Marm	17	700	Orange	66	22	717	45.23591	105	Red	527	33.24143	18	Green
82	2015-10-07	Stir-Marm	17	700	Orange	60	22	720	45.40334	105	Red	495	31.2271	18	Green
83	2015-10-07	Stir-Marm	15	650	Orange	60	20	650	41.0085	55	Orange	447	28.20445	18	Green
84	2015-10-07	Stir-Marm	13	600	Orange	54		467	29.48613	105	Red	289	18.26116	18	Green
85	2015-10-07	Stir-Marm	13	600	Orange	50	20	600	37.854	105	Red	332	20.91541	18	Green
86	2015-10-02	Aberdeen	15	650	Orange	70	20	650	41.0085	55	Orange	493	31.12258	18	Green
87	2015-10-02	Berwick	15	620	Orange	70	20	620	39.1158	55	Orange	471	29.68615	18	Green
88	2015-10-02	Berwick	15	650	Orange	70	20	650	41.0085	55	Orange	493	31.12258	18	Green
89	2015-10-14	Creekside	30	920	Orange	76	40	1168	73.68287	55	Green	920	58.0428	18	Green
90	2015-10-14	St. James	45	1130	Green	70	50	1853	116.9302	105	Green	1407	88.7418	18	Green

APPENDIX C: STANDPIPE STORAGE CAPACITY ASSESSMENT

Storage Requirements - Existing			
A) Fire Storage	Fire Flow	Duration	Required
	100 L/sec	2 hrs	0.72 ML
B) Equalization Storage	Max Day	Multiplier	Required
	1.42 ML/day	0.25	0.36 ML
C) Emergency Storage	A+B	Multiplier	Required
	1.08 ML	0.25	0.27 ML
		Total	**1.34 ML**

Storage Requirements - 10 year			
A) Fire Storage	Fire Flow	Duration	Required
	100 L/sec	2 hrs	0.72 ML
B) Equalization Storage	Max Day	Multiplier	Required
	2.17 ML/day	0.25	0.54 ML
C) Emergency Storage	A+B	Multiplier	Required
	1.26 ML	0.25	0.32 ML
		Total	**1.58 ML**

Storage Requirements - 20 year			
A) Fire Storage	Fire Flow	Duration	Required
	100 L/sec	2 hrs	0.72 ML
B) Equalization Storage	Max Day	Multiplier	Required
	2.89 ML/day	0.25	0.72 ML
C) Emergency Storage	A+B	Multiplier	Required
	1.44 ML	0.25	0.36 ML
		Total	**1.80 L**

Storage Requirements - Build Out			
A) Fire Storage	Fire Flow	Duration	Required
	100 L/sec	2 hrs	0.72 ML
B) Equalization Storage	Max Day	Multiplier	Required
	3.48 ML/day	0.25	0.87 ML
C) Emergency Storage	A+B	Multiplier	Required
	1.59 ML	0.25	0.40 ML
		Total	**1.99 ML**

APPENDIX D: SANITARY SEWER DESIGNSHEETS

Medium Term Growth Frankford Road SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION																	OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	MANHOLE TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Weaver Street	MH Z1D	MH Z1C	A1B	RES LOW	1.52	A1B	11.84	18	0.018	0.018	300	4.39	0.27	1.52	0.21	0.49	200	PVC	0.40%	20.74	0.02	0.66	18	0.072
Weaver Street	MH Z1C	MH Z1B	A1C	RES LOW	0.6	A1C	26.67	16	0.016	0.034	300	4.35	0.51	2.12	0.30	0.81	200	PVC	0.40%	20.74	0.04	0.66	18	0.072
Weaver Street	MH Z1B	MH Z1	A1D	RES MED	0.6	A1D	20	12	0.012	0.046	300	4.32	0.69	2.72	0.38	1.07	200	PVC	0.40%	20.74	0.05	0.66	18	0.072
Weaver Street	MH Z1	MH Z2	A1	RES MED	0.51	A1, A1D	31.2	16	0.016	0.062	300	4.30	0.92	3.23	0.58	1.51	200	PVC	0.40%	20.74	0.07	0.66	18	0.072
Weaver Street	MH Z3	MH Z2	A2	RES MED	0.46	A1, A2	31.2	14	0.014	0.014	300	4.40	0.22	0.46	0.18	0.40	200	PVC	0.40%	20.74	0.02	0.66	56	0.224
Gorden Ave	MH Z2	MH Z4	A3	RES MED	0.53	A1 - A3	31.2	17	0.017	0.093	300	4.25	1.37	4.22	0.98	2.35	200	PVC	0.40%	20.74	0.11	0.66	90	0.360
Gorden Ave	MH Z4	MH Z5	A4	RES MED	0.71	A1 - A4	31.2	22	0.022	0.115	300	4.23	1.69	4.93	1.26	2.95	200	PVC	0.40%	20.74	0.14	0.66	90	0.360
Woods Drive	MH Z5	MH 117	A5	RES MED	0.55	A1 - A5	31.2	17	0.017	0.132	300	4.21	1.93	5.48	1.48	3.42	200	PVC	0.40%	20.74	0.16	0.66	97	0.388
Frankford Road	MH 119	MH 118	A6	RES LOW	1.39	A6	16.7	23	0.023	0.023	300	4.37	0.35	1.39	0.56	0.91	200	PVC	0.89%	30.94	0.03	0.98	117	1.041
Frankford Road	Hilden Homes	Frankford	A7B	RES LOW	3.02	A6, A7B	40.4	122	0.122	0.122	300	4.22	1.79	3.02	0.42	2.21	200	PVC	0.89%	30.94	0.07	0.98	117	1.041
Frankford Road	MH 118	MH 117A	A7	RES LOW	0.88	A6, A7	16.7	15	0.015	0.160	300	4.18	2.32	5.29	1.33	3.65	200	PVC	0.40%	20.74	0.18	0.66	90	0.360
Frankford Road	MH 117A	MH 117	A8	RES MED	0.63	A6 - A8	31.2	20	0.020	0.180	300	4.16	2.60	5.92	1.58	4.18	200	PVC	0.40%	20.74	0.20	0.66	90	0.360
Frankford Road	MH 117	MH 116A	A9	RES LOW	0.8	A1 - A9, A1D	16.7	13	0.013	0.325	300	4.06	4.59	12.20	4.09	8.68	200	PVC	0.75%	28.40	0.31	0.90	120	0.900
Frankford Road	MH 116A	MH 116C	A10	RES MED	0.51	A1 - A10, A1D	31.2	16	0.016	0.341	300	4.05	4.80	12.71	4.30	9.10	200	PVC	0.40%	20.74	0.44	0.66	90	0.360
Frankford Road	MH 159	MH 114	A13	RES MED	0.41	A13	31.2	13	0.013	0.013	300	4.40	0.20	0.41	0.16	0.36	200	PVC	0.90%	31.12	0.01	0.99	85	0.765
Frankford Road	MH 114	MH 115	A12	RES MED	0.76	A12, A13	31.2	24	0.024	0.037	300	4.34	0.55	1.17	0.47	1.02	200	PVC	0.55%	24.32	0.04	0.77	60	0.330
Frankford Road	MH 115	MH 116	A11	RES MED	0.67	A11 - A13	31.2	21	0.021	0.057	300	4.30	0.86	1.84	0.74	1.59	200	PVC	0.55%	24.32	0.07	0.77	63	0.347
Frankford Road	MH 116	MH 116C		RES MED		A11 - A13	31.2	0	0.000	0.057	300	4.30	0.86	1.84	0.74	1.59	200	PVC	0.55%	24.32	0.07	0.77	63	0.347
Frankford Road	MH 116C	MH 116D	A14	RES MED	0.35	A1 - A14, A1D	31.2	11	0.011	0.409	300	4.02	5.71	14.90	5.17	10.88	200	PVC	0.59%	25.21	0.43	0.80	30	0.177
Creekside Drive	MH 116G	MH 116F	A14D	RES LOW	3.66	A14D	16.4	60	0.060	0.060	300	4.30	0.90	3.66	0.51	1.41	200	PVC	0.50%	23.19	0.06	0.74	130	0.650
Creekside Drive	MH 116F	MH 116E	A14C	RES LOW	1.38	A14D, C	18.8	26	0.026	0.086	300	4.26	1.27	5.04	0.71	1.98	200	PVC	0.50%	23.19	0.09	0.74	130	0.650
Creekside Drive	MH 116E	MH 116D	A14B	RES LOW	1.23	A14D, C, B	17.9	22	0.022	0.108	300	4.23	1.59	6.27	0.88	2.47	200	PVC	0.50%	23.19	0.11	0.74	130	0.650
Frankford Road	MH 116D	Pumping Station		RES MED		A1 - A14	-	-	-	0.517	300	3.97	7.12	21.17	6.05	13.18	200	PVC	0.59%	25.21	0.52	0.80	7	0.041

DESIGN PARAMETER

Mannings n =	0.0130
Average Daily Flow (q)=	300 l/cap/d
Infiltration Rate (I) =	0.4 l/s/ha
New Development Infiltration rate	0.14 l/s/ha

Short-Term Development =
Medium-Term Development =
Full Buildout Development =

Designed By: Owen Perrett

Checked By: Matt Morkem

Dwg. Reference: Report Figures 2, 17, 18, 19

PROJECT: STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION: Stirling, ON, Canada

Project Number: 27931

Date: 30-Oct-23

Medium Term Growth Annis Street SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION																	OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Cambellford Road	MH 39	MH 9E	A15	RES LOW	0.96	A15	16.7	16.032	0.016	0.016	300	4.39	0.24	0.96	0.27	0.51	200	PVC	0.54%	24.10	0.02	0.77	97	0.524
Cambellford Road	MH 9E	MH 9D	A16	RES LOW	0.81	A15, A16	16.7	13.527	0.014	0.030	300	4.36	0.45	1.77	0.50	0.94	200	PVC	0.54%	24.10	0.04	0.77	71	0.383
Cambellford Development	Campbellford Dev.	MH 9F	A16C	RES HIGH	9.24	A16C	55.8	516.0	0.516	0.516	300	3.97	7.11	9.24	1.29	8.40	200	PVC	0.50%	23.19	0.36	0.74	10	0.050
Old Rail Bed	MH 9F	MH 9D	A16B	-	0.41	A16C, A16B	-	-	-	0.516	300	3.97	7.11	9.65	1.35	8.46	200	PVC	0.50%	23.19	0.36	0.74	150	0.750
Cambellford Road	MH 9D	MH 9C	A17	RES LOW	0.69	A15 - A17	16.7	11.523	0.012	0.557	300	3.95	7.64	12.11	2.04	9.68	200	PVC	1.97%	46.03	0.21	1.47	82	1.615
Cambellford Road	MH 9C	MH 9B	A18	RES LOW	0.36	A15 - A18	16.7	6.012	0.006	0.563	300	3.95	7.72	12.47	2.14	9.86	200	PVC	3.43%	60.74	0.16	1.93	50	1.715
Cambellford Road	MH 9B	MH 9A	A19	RES LOW	0.39	A15 - A19	16.7	6.513	0.007	0.570	300	3.94	7.80	12.86	2.25	10.05	200	PVC	1.85%	44.61	0.23	1.42	60	1.110
Cambellford Road	MH 9A	MH 9	-	RES LOW	-	A15 - A19	-	-	-	0.570	300	3.94	7.80	12.86	2.25	10.05	200	PVC	4.50%	69.58	0.14	2.21	5	0.225
Front Street	MH 5	MH 6	A20	COMM	6.22	A20	27.23	169.391	0.169	0.169	300	4.17	2.45	6.22	1.74	4.20	200	PVC	1.01%	32.96	0.13	1.05	90	0.909
Front Street	Harvest Glen	MH 6	A21B	RES MED	4.13	A20, A21	47.1	194.4	0.194	0.364	300	4.04	5.10	10.35	1.45	6.55	200	VC	1.00%	32.80	0.20	1.04	96	0.960
Front Street	MH 6	MH 7	A21	RES MED	0.92	A20, A21	75	69	0.069	0.433	300	4.01	6.02	11.27	3.16	9.18	200	VC	1.00%	32.80	0.28	1.04	96	0.960
Front Street	MH 7	MH 8	A22	RES LOW	1.07	A20 - A22	16.7	17.869	0.018	0.451	300	4.00	6.25	12.34	3.46	9.71	200	VC	0.51%	23.33	0.42	0.74	101	0.511
Front Street	MH 8	MH 9	A23	RES LOW	1.1	A20 - A23	16.7	18.37	0.018	0.469	300	3.99	6.50	13.44	3.76	10.26	200	VC	0.50%	23.17	0.44	0.74	111	0.554
Front Street	MH 9	MH 10	A24	RES LOW	0.86	A15 - A24	16.7	14.362	0.014	1.053	300	3.79	13.84	27.16	6.25	20.09	200	VC	0.53%	23.88	0.84	0.76	97	0.514
Front Street	MH 10	MH 11	A25	RES LOW	1.17	A15 - A25	16.7	19.539	0.020	1.073	300	3.78	14.10	28.33	6.58	20.68	200	VC	0.41%	20.90	0.99	0.67	97	0.394
Front Street	**Frankford Road Pumping station (forcemain)**	MH 11		-												17.50	100	PVC	FM					
Front Street	MH 11	MH 12	A26	RES LOW	0.97	A15 - A26, Frankford SPS	16.7	16.199	0.016	1.089	300	3.78	14.27	29.30	6.85	38.63	300	VC	1.29%	109.83	0.35	1.55	100	1.290
Front Street	MH 12	MH 12A	A27	RES LOW	0.78	A15 - A27, Frankford SPS	16.7	13.026	0.013	1.102	300	3.77	14.46	30.08	7.07	39.03	300	VC	0.47%	66.29	0.59	0.94	92	0.432
Front Street	MH 12	MH 12A	A27B	RES HIGH	-	A15 - A27, Frankford SPS	73.04	56.974	0.057	1.159	300	3.76	15.15	30.08	7.07	22.22	300	VC	0.47%	66.29	0.34	0.94	92	0.432
Front Street	MH 12A	MH 13B	A28	RES LOW	0.31	A15 - A28, Frankford SPS	16.7	5.177	0.005	1.164	300	3.76	15.21	30.39	7.16	39.87	300	VC	0.47%	66.29	0.60	0.94	92	0.432
Church Street	MH 41A	MH 41	A29	RES LOW	1.09	A29	16.7	18.203	0.018	0.018	300	4.39	0.28	1.09	0.31	0.58	200	PVC	1.12%	34.63	0.02	1.10	87	0.970
Church Street	MH 41	MH 42	A30	RES LOW	1.23	A29, A30	16.7	20.541	0.021	0.039	300	4.34	0.58	2.32	0.65	1.23	200	VC	0.68%	27.05	0.05	0.86	80	0.544
Church Street	MH 42	MH 43	A31	RES LOW	1.23	A29 - A31	16.7	20.541	0.021	0.059	300	4.30	0.88	3.55	0.99	1.88	200	VC	1.75%	43.39	0.04	1.38	96	1.680
Church Street	MH 43	MH 44	A32	RES LOW	1.06	A29 - A32	16.7	17.702	0.018	0.077	300	4.27	1.14	4.61	1.29	2.43	200	VC	2.25%	49.20	0.05	1.57	92	2.070
Church Street	MH 52	MH 51	A33	RES LOW	0.69	A33	16.7	11.523	0.012	0.012	300	4.41	0.29	0.69	0.19	0.48	200	VC	0.52%	23.65	0.02	0.75	88	0.458
Church Street	MH 51	MH 50	A34	RES LOW	0.64	A33, A34	16.7	10.688	0.011	0.022	300	4.37	0.34	1.33	0.37	0.71	200	VC	0.57%	24.76	0.03	0.79	53	0.302
Church Street	MH 50	MH 49	A35	RES LOW	0.44	A33 - A35	16.7	7.348	0.007	0.030	300	4.36	0.45	1.77	0.50	0.94	200	VC	0.46%	22.24	0.04	0.71	53	0.244
Church Street	MH 49	MH 48	A36	RES LOW	0.49	A33 - A36	16.7	8.183	0.008	0.038	300	4.34	0.57	2.26	0.63	1.20	200	VC	0.74%	28.21	0.04	0.90	53	0.392
Church Street	MH 48	MH 47	A37	RES LOW	0.74	A33 - A37	16.7	12.358	0.012	0.050	300	4.31	0.75	3.00	0.84	1.59	200	VC	0.69%	27.24	0.06	0.87	53	0.366
Church Street	MH 47	MH 46	A38	RES LOW	0.52	A33 - A38	16.7	8.684	0.009	0.059	300	4.30	0.88	3.52	0.99	1.86	200	VC	0.37%	19.95	0.09	0.64	57	0.211
Church Street	MH 46	MH 44	A39	RES LOW	0.81	A33 - A39	16.7	13.527	0.014	0.072	300	4.28	1.07	4.33	1.21	2.29	200	VC	0.52%	23.65	0.10	0.75	64	0.333
Annis Street	MH 44	MH 45	A40	RES LOW	0.41	A29 - A40	16.7	6.847	0.007	0.156	300	4.19	2.27	9.35	2.62	4.89	200	VC	0.50%	23.19	0.21	0.74	55	0.275
Annis Street	MH 45	MH 13	A41	RES LOW	0.16	A29 - A41	16.7	2.672	0.003	0.159	300	4.18	2.31	9.51	2.66	4.97	200	VC	0.50%	23.19	0.21	0.74	55	0.275
St. James Street	Stub	MH 151	A42	RES MED	1.06	A42	31.2	33.072	0.033	0.033	300	4.35	0.50	1.06	0.30	0.80	200	PVC	N/A					
St. James Street	MH 149	MH 150	A43	RES LOW	1.11	A43	16.7	18.537	0.019	0.019	300	4.38	0.28	1.11	0.31	0.59	200	VC	0.54%	24.10	0.02	0.77	91	0.491
St. James Street	MH 150	MH 151	A44	RES LOW	2.79	A43, A44	16.7	46.593	0.047	0.065	300	4.29	1.17	3.90	1.09	2.26	200	VC	0.71%	27.62	0.08	0.88	91	0.645
Alan Street	MH 151	MH 15	A45	RES LOW	0.39	A42 - A45	16.7	6.513	0.007	0.105	300	4.24	1.54	5.35	1.50	3.04	200	VC	0.49%	22.86	0.13	0.73	97	0.471
Front Street	MH 19	MH 18	A46	RES LOW	1.04	A46	16.7	17.368	0.017	0.017	300	4.39	0.26	1.04	0.29	0.56	200	VC	0.78%	28.97	0.02	0.92	86	0.671
Front Street	MH 18	MH 17	A47	RES LOW	1.14	A46, A47	16.7	19.038	0.019	0.036	300	4.34	0.55	2.18	0.61	1.16	200	VC	1.91%	45.33	0.03	1.44	87	1.662
Front Street	MH 17	MH 16	A48	RES LOW	0.74	A46 - A48	16.7	12.358	0.012	0.049	300	4.32	0.73	2.92	0.82	1.55	200	VC	1.19%	35.78	0.04	1.14	64	0.762
Front Street	MH 16	MH 15	A49	RES LOW	0.58	A46 - A49	16.7	9.686	0.010	0.058	300	4.30	0.87	3.50	0.98	1.85	200	VC	1.19%	35.78	0.05	1.14	67	0.797
Front Street	MH 15	MH 14	A50	RES LOW	0.57	A42 - A50	16.7	9.519	0.010	0.173	300	4.17	2.50	9.42	2.64	5.14	200	VC	0.55%	24.32	0.21	0.77	56	0.308
Front Street	MH 14	MH 13B	A51	RES LOW	0.6	A42 - A51	16.7	10.02	0.010	0.183	300	4.16	2.64	10.02	2.81	5.45	200	VC	0.70%	27.44	0.20	0.87	61	0.427
Front Street	MH 13B	MH 13	-	RES LOW	-	A15-28, A42 - 51, Frankford SPS	-	-	-	1.347	300	3.71	17.36	40.41	9.96	44.82	300	VC	0.70%	80.91	0.55	1.14	61	0.427
Annis Station	MH 13	Pumping Station	-	-	-	A15 - A51, Frankford SPS	-	-	-	1.505	300	3.68	19.23	49.92	12.63	49.35	300	PVC	0.50%	68.38	0.72	0.97	12	0.060

DESIGN PARAMETER

Mannings n = 0.0130
Average Daily Flow (q)= 300 l/cap/d
Infiltration Rate (I) = 0.28 l/s/ha
New Development Infiltration rate 0.14 l/s/ha

Short-Term Development =
Medium-Term Development =
Full Buildout Development =

Designed By: Owen Perrett

Checked By: Matt Morkem

Dwg. Reference: Report Figures 2, 17, 18, 19

PROJECT: STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION: Stirling, ON, Canada

Project Number: 27931

Date: 30-Oct-23

Medium Term Growth Henry Street SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION																	OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Henry street	MH 121	SAN4	A52	RES LOW	0.92	A52	16.7	15	0.015	0.015	300	4.39	0.23	0.92	0.32	0.56	200	PVC	3.70%	63.09	0.01	2.01	60	2.220
Henry street	SAN4	MH122	A53	RES LOW	0.88	A52, A53	16.7	15	0.015	0.030	300	4.35	0.45	1.80	0.63	1.08	200	PVC	1.04%	33.45	0.03	1.06	75	0.780
Henry street	MH 122	MH 123	A54	RES LOW	0.55	A52 - A54	16.7	9	0.009	0.039	300	4.33	0.59	2.35	0.82	1.41	200	PVC	1.00%	32.80	0.04	1.04	71	0.710
Henry street	MH 123	MH 123B					-	-	-	0.039	300	4.33	0.59	2.35	0.82	1.41	200	PVC	1.00%	32.80	0.04	1.04	71	0.710
Carrick Street	MH 124F	MH 124E	A158E	RES LOW	1.31	A153 - A155	18.3	24.0	0.024	0.024	300	4.37	0.36	1.31	0.18	0.55	200	PVC	0.50%	23.19	0.02	0.74	69	0.345
Carrick Street	MH 124E	MH 124D	A158D	RES LOW	1.25	A153 - A155	17.3	21.6	0.022	0.046	300	4.32	0.68	2.56	0.36	1.04	200	PVC	0.50%	23.192	0.04	0.74	69	0.345
Carrick Street	MH 124D	MH 124C	-	RES LOW	-	A153 - A155	-	-	-	0.046	300	4.32	0.68	2.56	0.36	1.04	200	PVC	0.50%	23.192	0.04	0.74	69	0.345
Carrick Street	MH 124G	MH 124C	A158C	RES LOW	0.92	A153 - A155	20.9	19.2	0.019	0.019	300	4.38	0.29	0.92	0.13	0.42	200	PVC	0.50%	23.192	0.02	0.74	69	0.345
Carrick Street	MH 124H	MH 124C	A158B	RES LOW	0.73	A153 - A155	20.9	15.3	0.015	0.015	300	4.40	0.23	0.73	0.10	0.34	200	PVC	0.50%	23.192	0.01	0.74	69	0.345
Carrick Street	MH 124C	MH 124B	A158F	RES LOW	0.97	A153 - A155	20.9	20.3	0.020	0.100	300	4.24	1.48	5.18	0.73	2.20	200	PVC	0.50%	23.192	0.10	0.74	69	0.345
Carrick Street	MH 124B	MH 124	-	RES LOW	-	A153 - A155	-	-	-	0.100	300	4.24	1.48	5.18	0.73	2.20	200	PVC	0.50%	23.192	0.10	0.74	69	0.345
Henry street	MH 125	MH 124	A55	RES LOW	1.12	A55	16.7	19	0.019	0.019	300	4.38	0.28	1.12	0.39	0.68	200	VC	1.32%	37.68	0.02	1.20	77	1.016
Henry street	MH 124	MH 123B	A56	RES LOW	0.9	A55, A56	16.7	15	0.015	0.134	300	4.21	1.96	7.20	1.43	3.39	200	VC	1.28%	37.11	0.09	1.18	77	0.986
Henry street	MH 123B	Pumping Station			-	A52 - A56	-	-	-	0.173	300	4.17	2.51	9.55	2.25	4.76	200	PVC	0.59%	25.19	0.19	0.80	5.1	0.030

DESIGN PARAMETER

Mannings n =	0.0130	
Average Daily Flow (q)=	300	l/cap/d
Infiltration Rate (I) =	0.35	l/s/ha
New Development Infiltration rate	0.14	l/s/ha

Short-Term Development =
Medium-Term Development =
Full Buildout Development =

Designed By: Owen Perrett

Checked By: Matt Morkem

Dwg. Reference: Report Figures 2, 17, 18, 19

PROJECT: STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION: Stirling, ON, Canada

Project Number: 27931

Date: 30-Oct-23

Medium Term Growth Rogers Drive SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION																	OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	MANHOLE TO	INCREMENTAL AREA No.		INCREMENTAL AREA Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Rodgers Drive	MH 38B	MH 38A	A57	RES LOW	1.08		16.7	18	0.018	0.018	300	4.39	0.27	1.08	0.54	0.81	200	AC	0.43%	21.38	0.04	0.68	91	0.387
Rodgers Drive	MH 38A	MH 38	A58	RES LOW	0.63		16.7	11	0.011	0.029	300	4.36	0.43	1.71	0.86	1.29	200	AC	0.42%	21.26	0.06	0.68	65	0.273
Rodgers Drive	MH 38	MH 37	A59	RES LOW	1.81		16.7	30	0.030	0.059	300	4.30	0.88	3.52	1.76	2.64	200	VC	0.54%	24.10	0.11	0.77	82	0.443
Rodgers Drive	MH 37	Pumping Station			3.52			0	0.000	0.059	300	4.30	0.88	3.52	1.76	2.64	150	VC	0.36%	9.14	0.29	0.52	4	0.014

DESIGN PARAMETER

Mannings n = 0.0130
Average Daily Flow (q)= 300 l/cap/d
Infiltration Rate (I) = 0.5 l/s/ha
New Development Infiltration rate 0.14 l/s/ha

Short-Term Development =
Medium-Term Development =
Full Buildout Development =

Designed By: Owen Perrett

Checked By: Matt Morkem

Dwg. Reference: Report Figures 2, 17, 18, 19

PROJECT: STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION: Stirling, ON, Canada

Project Number: 27931

Date: 30-Oct-23

Medium Term Growth George Street SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION																OUTLET PIPE DATA								
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)	
Baker Street	Stub	MH 90	A60	RES LOW	0.52	A60	55.8	29.0	0.029	0.029	300	4.36	0.44	0.52	0.07	0.51	200	VC	4.09%	66.331	0.01	2.11	75	3.068	
Baker Street	Stub	MH 90	A60	RES LOW	0.43	A60	16.7	7.2	0.007	0.036	300	4.34	0.55	0.95	0.43	0.97	200	VC	4.09%	66.331	0.01	2.11	75	3.068	
Baker Street	MH 90	MH 89	A61	RES MED	0.78	A60, A61	31.2	24.3	0.024	0.061	300	4.30	0.90	1.73	0.78	1.68	200	VC	4.09%	66.331	0.03	2.11	75	3.068	
Baker Street	MH 89	MH 88	A62	RES LOW	0.79	A60 - A62	16.7	13.2	0.013	0.074	300	4.28	1.09	2.52	1.13	2.23	200	VC	5.02%	73.486	0.03	2.34	80	4.016	
Wellington Street	MH 88	MH 93	A63	RES LOW	0.75	A60 - A63	16.7	12.5	0.013	0.086	300	4.26	1.28	3.27	1.47	2.75	200	VC	0.69%	27.323	0.10	0.87	108	0.750	
Stirling Manor Nursing Home	MH 154	MH 95	A64	RES HIGH	1.93	A64	84.0	162.1	0.162	0.162	300	4.1799	2.65	1.93	0.87	3.52	200	VC	0.03	61.27	0.06	1.95	63	2.199	
Edward Street	MH 95	MH 94	A65	RES LOW	1.03	A64, A65	16.7	17.2	0.017	0.179	300	4.16	2.59	2.96	1.33	3.93	200	VC	2.11%	47.642	0.08	1.52	78	1.646	
Edward Street	MH 94	MH 93	A66	RES LOW	0.74	A64 - A66	16.7	12.4	0.012	0.192	300	4.15	2.77	3.70	1.67	4.43	200	VC	3.02%	56.998	0.08	1.81	78	2.356	
Wellington Street	MH 93	MH 98	A67	RES LOW	0.6	A60 - A67	16.7	10.0	0.010	0.288	300	4.09	4.09	7.57	3.41	7.49	200	VC	2.50%	51.859	0.14	1.65	80	2.000	
Wellington Street	MH 98	Nancy St.	A68	RES LOW	0.5	A60 - A68	16.7	8.4	0.008	0.296	300	4.08	4.20	8.07	3.63	7.83	200	VC	3.20%	58.672	0.13	1.87	30	0.960	
Nancy Street	stub	Nancy St.	A69	RES HIGH	0.83	A69	84.0	69.7	0.070	0.070	300	4.28	1.04	0.83	0.37	1.41	200	VC	N/A						S
Wellington Street	Nancy st.	MH 100	-	RES LOW	-	A60 - A69	-	-	-	0.366	300	4.04	5.13	8.90	4.01	9.14	200	VC	3.20%	58.672	0.16	1.87	50	1.600	
Wellington Street	MH 100	MH 99	A70	RES LOW	0.11	A60 - A70	16.7	1.8	0.002	0.368	300	4.04	5.16	9.01	4.05	9.21	200	PVC	1.00%	32.798	0.28	1.04	16	0.160	
Nancy Street	MH X0	MH X1*	A71	RES LOW	0.17	A71	16.7	2.8	0.003	0.003	300	4.45	0.04	0.17	0.08	0.12	200	PVC	1.00%	32.798	0.00	1.04	36	0.360	
Nancy Street	MH X1	MH X2	A72	RES LOW	0.43	A71, A72	16.7	7.2	0.007	0.010	300	4.41	0.15	0.60	0.27	0.42	200	PVC	1.00%	32.798	0.01	1.04	110	1.100	
Nancy Street	MH X2	MH X3	A73	RES LOW	1.33	A71 - A73	16.7	22.2	0.022	0.032	300	4.35	0.49	1.93	0.87	1.36	200	PVC	1.00%	32.798	0.04	1.04	90	0.900	
Nancy Street	MH X3	MH 99	A74	RES LOW	0.59	A71 - A74	16.7	9.9	0.010	0.042	300	4.33	0.63	2.52	1.13	1.77	200	PVC	1.00%	32.798	0.05	1.04	65	0.650	
Wellington Street	MH 99	MH 65	A75	RES LOW	0.24	A60 - A75	16.7	4.0	0.004	0.414	300	4.02	5.78	11.77	5.30	11.08	200	VC	0.55%	24.324	0.46	0.77	45	0.248	
North Street	MH 68H	MH 68G	A76	INST	1.24	A76	7.5	9.3	0.009	0.009	300	4.42	0.14	1.24	0.56	0.70	200	PVC	1.58%	41.227	0.02	1.31	60	0.948	
North Street	MH 68G	MH 68F	-	-	-	A76	-	-	-	0.009	300	4.42	0.15	1.24	0.56	0.71	200	PVC	1.29%	37.252	0.02	1.19	109	1.406	
North Street	MH 68F	MH 68E	A77	INDU	0.36	A76, A77	27.2	9.8	0.010	0.019	300	4.38	0.30	1.60	0.72	1.02	200	PVC	2.55%	52.375	0.02	1.67	70	1.785	
North Street	MH 68E	MH 68D	A78	INST	0.39	A76 - A78	7.5	2.9	0.003	0.022	300	4.37	0.35	1.99	0.90	1.25	200	PVC	2.17%	48.315	0.03	1.54	100	2.170	
North Street	MH 68D	MH 68C	A79	COMM	0.45	A76 - A79	27.2	12.3	0.012	0.034	300	4.35	0.52	2.44	1.10	1.62	200	PVC	0.60%	25.406	0.06	0.81	103	0.618	
North Street	Edward St. Dev.	MH 68C	A79B	COMM	1.62	A79B	28.4	46.0	0.046	0.046	300	4.32	0.69	1.62	0.23	0.92	200	PVC	0.60%	25.406	0.04	0.81	103	0.618	
North Street	MH 68C	MH 68B	A80	RES LOW	0.49	A76 - A80	16.7	8.2	0.008	0.088	300	4.26	1.31	4.55	1.55	2.85	200	PVC	0.67%	26.847	0.11	0.85	12	0.080	
North Street	MH 68B	MH 68A	-	-	-	A76 - A80	-	-	-	0.088	300	4.26	1.33	4.55	1.55	2.87	200	PVC	0.56%	24.544	0.12	0.78	64	0.358	
North Street	MH 68A	MH 68	A81	RES LOW	1.17	A76 - A81	16.7	19.5	0.020	0.108	300	4.23	1.61	5.72	2.07	3.68	200	PVC	0.55%	24.324	0.15	0.77	51	0.281	
North Street	MH 68	MH 67	A82	RES LOW	0.57	A76 - A82	16.7	9.5	0.010	0.118	300	4.22	1.72	6.29	2.33	4.05	200	PVC	1.47%	39.766	0.10	1.27	100	1.470	
North Street	MH 67	MH 66	A83	RES LOW	1.68	A76 - A83	16.7	28.1	0.028	0.146	300	4.20	2.16	7.97	3.08	5.24	200	PVC	0.60%	25.406	0.21	0.81	80	0.480	
North Street	MH 66	MH 65A	A84	RES LOW	0.83	A76 - A84	16.7	13.9	0.014	0.159	300	4.18	2.37	8.80	3.46	5.82	200	PVC	0.60%	25.406	0.23	0.81	70	0.420	
North Street	MH 65A	MH 65	-	-	-	A76 - A84	-	-	-	0.159	300	4.18	2.37	8.80	3.46	5.82	200	PVC	0.60%	25.406	0.23	0.81	5	0.030	
North Street	MH 65	MH 64	A85	COMM	0.13	A60 - A85	27.2	3.5	0.004	0.577	300	3.94	7.90	20.70	8.81	16.71	200	VC	0.40%	20.744	0.81	0.66	60	0.240	
North Street	MH 64	MH 63	A86	COMM	0.55	A60 - A86	27.2	15.0	0.015	0.592	300	3.94	8.09	21.25	9.06	17.15	200	VC	0.51%	23.423	0.73	0.75	60	0.306	
Thompson Farmland	Thompson Dev.	MH 63B	A87C	RES HIGH	29.67	A98D	31.2	926.0	0.926	0.926	300	3.82	12.29	29.67	4.15	16.44	250	PVC	0.50%	42.050	0.39	0.86	100	0.500	
Thompson Farmland	Thompson Dev.	MH 63	A87B	RES HIGH	0.93	A98D	-	-	-	0.926	300	3.82	12.29	30.60	4.28	16.57	250	PVC	0.50%	42.050	0.39	0.86	100	0.500	
North Street	MH 63	MH 62	A87	INST	0.36	A60 - A87	7.5	2.7	0.003	1.521	300	3.68	19.40	52.21	13.51	32.91	200	VC	0.69%	27.244	Surcharged	0.87	55	0.380	S
North Street	MH 62	MH 61	A88	RES LOW	0.19	A60 - A88	16.7	3.2	0.003	1.524	300	3.67	19.44	52.40	13.59	33.03	200	VC	0.74%	28.214	Surcharged	0.90	50	0.370	S
North Street	MH 61	MH 60	A89	COMM	0.62	A60 - A89	27.2	16.9	0.017	1.541	300	3.67	19.77	52.83	13.79	33.55	200	VC	1.60%	41.487	0.81	1.32	110	1.760	
North Street	MH 60	MH 59	A90	COMM	0.25	A60 - A90	27.2	6.8	0.007	1.547	300	3.67	19.72	53.08	13.90	33.62	200	VC	1.60%	41.487	0.81	1.32	110	1.760	
Gore Street	MH 109	MH 108	A91	RES LOW	0.44	A91	16.7	7.3	0.007	0.007	300	4.43	0.12	0.44	0.20	0.32	200	VC	1.65%	42.130	0.01	1.34	60	0.990	
Gore Street	MH 108	MH 61	A92	INST	0.42	A91, A92	7.5	3.2	0.003	0.010	300	4.41	0.19	0.86	0.39	0.58	200	VC	3.83%	64.188	0.01	2.04	91	3.485	
James Street	MH 108	MH 104	A93	INST	0.5	A91 - A93	7.5	3.8	0.004	0.014	300	4.40	0.25	1.36	0.61	0.86	200	VC	3.83%	64.188	0.01	2.04	91	3.485	
James Street	STUB	MH 104	A94	RES LOW	0.18	A94	16.7	3.0	0.003	0.003	300	4.45	0.06	0.18	0.08	0.14	200	VC	1.65%	42.130	0.00	1.34	60	0.990	

DRAINAGE AREA DESCRIPTION																OUTLET PIPE DATA							
	MANHOLE		INCREMENTAL AREA			CONTRIBUTING	POPULATION			Σ	q	M	Peak Flow	Σ	IA	Q	SIZE	Type of Pipe	Slope	CAP	Q/Qfull	VEL	LENGTH	FALL
LOCATION	FROM	TO	No.		Ha	AREAS	Ppha	P	P(1000)	P(1000)	l/cap/d)		(l/s)	AREA (ha)	(l/s)	(l/s)	(mm)		(%)	(l/s)		(m/s)	(m)	(m)
Victoria Street	MH 105	MH 104	A95	RES MED	0.43	A95	31.2	13.4	0.013	0.013	300	4.40	0.21	0.43	0.19	0.40	200	PVC	2.53%	52.169	0.01	1.66	74	1.872
Victoria Street	MH 104	MH 103	A96	RES LOW	0.29	A91 - A96	16.7	4.8	0.005	0.036	300	4.34	0.54	2.26	1.02	1.55	200	VC	0.77%	28.780	0.05	0.92	60	0.462
Victoria Street	MH 103	MH 59	A97	RES LOW	0.35	A91 - A97	16.7	5.8	0.006	0.041	300	4.33	0.62	2.61	1.17	1.80	200	VC	0.32%	18.554	0.10	0.59	57	0.182
North Street	MH 59	MH 58	-	-	-	A60 - A97	-	-	-	1.589	300	3.66	20.20	55.69	15.07	35.27	300	VC	1.51%	118.828	0.30	1.68	13.2	0.199
Station Street	Stub	MH 153	A98	RES LOW	0.47	A98	16.7	7.8	0.008	0.008	300	4.42	0.12	0.47	0.21	0.33	200	VC	0.40%	20.744	0.02	0.66	50	0.200
Station Street	MH 153	MH 54	A99	RES LOW	0.46	A98, A99	16.7	7.7	0.008	0.016	300	4.39	0.24	0.93	0.42	0.66	200	VC	0.50%	23.192	0.03	0.74	46	0.230
Station Street	MH 54	MH 52	A100	RES LOW	0.53	A98 - A100	16.7	8.9	0.009	0.024	300	4.37	0.43	1.46	0.66	1.09	200	VC	0.53%	23.878	0.05	0.76	70	0.371
Station Street	MH 53	MH 52	A101	RES LOW	0.2	A101	16.7	3.3	0.003	0.003	300	4.45	0.05	0.20	0.09	0.14	200	VC	1.83%	44.369	0.00	1.41	50	0.915
Church Street	MH 52	MH 56	A102	RES LOW	1.04	A98 - A102	16.7	17.4	0.017	0.045	300	4.32	0.82	2.70	1.22	2.03	200	VC	0.60%	25.406	0.08	0.81	95	0.570
Church Street	MH 52	MH 56	A102B	RES HIGH	0.74	A98 - A102	107.7	191.6	0.192	0.237	300	4.12	3.53	3.44	0.48	4.01	200	VC	0.60%	25.406	0.16	0.81	95	0.570
Church Street	MH 56	MH 57	A103	RES LOW	0.56	A98 - A103	16.7	9.4	0.009	0.246	300	4.11	3.51	4.00	0.73	4.25	200	VC	1.14%	35.019	0.12	1.11	54	0.616
Church Street	MH 57	MH 58	A104	RES LOW	0.34	A98 - A104	16.7	5.7	0.006	0.252	300	4.11	3.59	4.34	0.89	4.48	200	VC	1.44%	39.358	0.11	1.25	50	0.720
North Street	MH 58	MH 22	A105	COMM	0.23	A60 - A105	27.2	6.3	0.006	1.847	300	3.61	23.20	60.26	16.90	40.09	300	VC	0.65%	77.963	0.51	1.10	103.2	0.671
Tanner Drive	Stub	MH 166	A106	RES LOW	0.75	A106	16.7	12.5	0.013	0.013	300	4.40	0.19	0.75	0.34	0.53	200	PVC	0.60%	25.406	0.02	0.81	48	0.288
Tanner Drive	MH 166	MH 165	A107	RES MED	0.5	A106, A107	31.2	15.6	0.016	0.028	300	4.36	0.43	1.25	0.56	0.99	200	PVC	6.00%	80.339	0.01	2.56	61	3.660
Tanner Drive	MH 165	MH 164	A108	RES MED	0.63	A106 - A108	31.2	19.7	0.020	0.048	300	4.32	0.72	1.88	0.85	1.56	200	PVC	6.00%	80.339	0.02	2.56	61	3.660
Tanner Drive	MH 164	MH 163	A109	RES LOW	0.48	A106 - A109	16.7	8.0	0.008	0.056	300	4.30	0.83	2.36	1.06	1.90	200	PVC	3.70%	63.089	0.03	2.01	57	2.109
Tanner Drive	MH 163	MH 162	A110	RES MED	0.8	A106 - A110	31.2	25.0	0.025	0.081	300	4.27	1.20	3.16	1.42	2.62	200	PVC	3.00%	56.808	0.05	1.81	67	2.010
Tanner Drive	MH 162	MH 155	A111	RES LOW	0.28	A106 - A111	16.7	4.7	0.005	0.085	300	4.26	1.26	3.44	1.55	2.81	200	PVC	0.87%	30.592	0.09	0.97	55	0.479
William St	MH 158	MH 157	A112	RES LOW	0.84	A112	16.7	14.0	0.014	0.014	300	4.40	0.21	0.84	0.38	0.59	200	PVC	1.10%	34.399	0.02	1.09	36	0.396
William St	MH 157	MH 156	A113	RES LOW	0.67	A112, A113	16.7	11.2	0.011	0.025	300	4.37	0.38	1.51	0.68	1.06	200	PVC	8.36%	94.832	0.01	3.02	72	6.019
William St	William Dev.	MH 156	A113	RES MED	2.94	A112, A113	31.2	192.0	0.192	0.192	300	4.15	2.77	2.94	0.41	3.18	200	PVC	8.36%	94.832	0.03	3.02	72	6.019
William St	MH 156	MH 155	A114	RES LOW	0.64	A112 - A114	16.7	10.7	0.011	0.228	300	4.13	3.27	5.09	1.38	4.64	200	PVC	3.00%	56.808	0.08	1.81	75	2.250
William St	MH 155	MH 78	A115	RES LOW	0.28	A106 - A115	16.7	4.7	0.005	0.318	300	4.07	4.49	8.81	3.35	7.85	200	PVC	0.50%	23.192	0.34	0.74	75	0.375
Mill St	MH 79B	MH 79	A116	RES LOW	0.62	A116	16.7	10.4	0.010	0.010	300	4.41	0.16	0.62	0.28	0.44	200	VC	1.65%	42.130	0.01	1.34	90	1.485
Mill St	MH 79	MH 78	A117	RES LOW	1.13	A116, A117	16.7	18.9	0.019	0.029	300	4.36	0.44	1.75	0.79	1.23	200	VC	1.65%	42.130	0.03	1.34	90	1.485
Mill St	MH 78	MH 77	A118	RES LOW	1.16	A106 - A118	16.7	19.4	0.019	0.367	300	4.04	5.14	11.72	4.36	9.51	200	VC	2.09%	47.416	0.20	1.51	50	1.045
Mill St	MH 77	MH 76	A119	RES LOW	0.44	A106 - A119	16.7	7.3	0.007	0.374	300	4.04	5.24	12.16	4.56	9.80	200	VC	1.09%	34.243	0.29	1.09	74	0.807
Mill St	MH 76	MH 75	A120	RES LOW	0.83	A106 - A120	16.7	13.9	0.014	0.388	300	4.03	5.42	12.99	4.93	10.36	200	VC	0.88%	30.768	0.34	0.98	71	0.625
Mill St	MH 75	MH 74	A121	RES LOW	0.4	A106 - A121	16.7	6.7	0.007	0.395	300	4.03	5.51	13.39	5.11	10.63	200	VC	0.68%	27.046	0.39	0.86	52	0.354
Baker St	Stub	MH 74	A122	RES LOW	0.39	A122	16.7	6.5	0.007	0.007	300	4.43	0.10	0.39	0.18	0.28	200	PVC	0.50%	23.192	0.01	0.74	70	0.350
Mill St	MH 74	MH 73	A123	RES LOW	0.27	A106 - A123	16.7	4.5	0.005	0.406	300	4.02	5.66	14.05	5.41	11.07	200	VC	1.39%	38.669	0.29	1.23	55	0.765
Mill St	MH 73	MH 72	A124	RES LOW	0.37	A106 - A124	16.7	6.2	0.006	0.412	300	4.02	5.74	14.42	5.58	11.32	200	VC	0.98%	32.469	0.35	1.03	72	0.706
								0.0																
Edward St	MH 92	MH 91	A125	RES LOW	0.76	A125	16.7	12.7	0.013	0.013	300	4.40	0.19	0.76	0.34	0.54	200	VC	2.86%	55.467	0.01	1.77	75	2.145
Edward St	MH 91	MH 72	-	-	-	A125	-	-	-	0.013	300	4.40	0.19	0.76	0.34	0.54	200	VC	3.26%	59.219	0.01	1.89	26	0.848
Mill St	MH 72	MH 71	A126	RES LOW	0.29	A106 - A126	16.7	4.8	0.005	0.429	300	4.01	5.97	15.47	6.05	12.02	200	VC	0.55%	24.324	0.49	0.77	68	0.374
Mill St	MH 71	MH 70	A127	RES LOW	0.34	A106 - A127	16.7	5.7	0.006	0.435	300	4.00	6.05	15.81	6.20	12.25	200	VC	0.94%	31.799	0.39	1.01	81	0.761
Mill St	MH 70	MH 69	A128	COMM	0.77	A106 - A128	27.2	21.0	0.021	0.456	300	3.99	6.47	16.58	6.55	13.02	200	VC	1.42%	39.084	0.33	1.24	90	1.278
Mill St	MH 69	MH 22	A129	COMM	0.35	A106 - A129	27.2	9.5	0.010	0.465	300	3.99	6.55	16.93	6.71	13.26	200	VC	0.42%	21.256	0.62	0.68	80	0.336
North St	MH 22	MH 23	-	-	-	A106 - A129	-	-	-	2.312	300	3.54	28.49	77.19	22.77	51.26	300	VC	0.95%	94.252	0.54	1.33	80	0.760
Front St	MH 23	MH 21	A130	IND	0.18	A60 - A124	12.9	2.3	0.002	2.315	300	3.54	28.41	77.37	22.85	51.27	375	VC	0.43%	114.971	0.45	1.04	37.3	0.160
Emma St	stub	MH 146	A131	RES LOW	1.04	A131	16.7	17.4	0.017	0.017	300	4.39	0.26	1.04	0.47	0.73	200	VC	0.40%	20.744	0.04	0.66	50	0.200
Emma St	MH 146	MH 161	A132	RES LOW	0.54	A131, A132	16.7	9.0	0.009	0.026	300	4.36	0.40	1.58	0.71	1.11	200	VC	0.65%	26.443	0.04	0.84	57	0.371
Emma St	MH 161	MH 145	A133	RES LOW	0.2	A131 - A133	16.7	3.3	0.003	0.030	300	4.36	0.45	1.78	0.80	1.25	200	VC	0.59%	25.193	0.05	0.80	57	0.336
Front St	Annis St Pumping station (forcemain)	MH 19	-	-	-	ANNIS SPS			-	-	-	-	-	-	-	49.35	100	D.I.	F.M					
Front St	MH 19	MH 145	A134	RES MED	0.48	A134, Annis	31.2	15.0	0.015	0.015	300	4.40	0.23	0.48	0.22	49.80	300	VC	2.24%	144.567	0.34	2.05	37	0.827
Front St	MH 145	MH 20	A135	RES MED	0.49	A131 - A135, Annis	31.2	15.3	0.015	0.060	300	4.30	0.90	2.75	1.24	51.49	300	VC	0.76%	84.302	0.61	1.19	45	0.342
Front St	MH 20	MH 21	A136	COMM	0.64	A131 - A136, Annis	27.2	17.4	0.017	0.077	300	4.27	1.15	3.39	1.53	52.03	300	VC	3.06%	169.157	0.31	2.39	79	2.417
Henry St	MH 21	MH 132	A137	COMM	0.2	A60 - A137, Annis	27.2	5.4	0.005	2.397	300	3.52	29.33	80.96	24.47	103.15	375	VC	0.69%	145.640	0.71	1.32	52.2	0.360
Henry St	MH 132	MH 131	A138	RES LOW	0.59	A60 - A138, Annis	16.7	9.9	0.010	2.407	300	3.52	29.44	81.55	24.73	103.52	375	VC	1.28%	198.363	0.52	1.80	57.7	0.739

DRAINAGE AREA DESCRIPTION																	OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Highway 14	Rodgers Drive Pumping Station (forcemain)	MH 36	-	-	-	-	-	-	-	-	-	-	-	-	-	6.50	100	D.I.	F.M					
Highway 14	MH 36	MH35	A139	RES LOW	0.44	A139, Rodgers	16.7	7.3	0.007	0.007	300	4.43	0.11	0.44	0.20	6.81	200	VC	0.62%	25.825	0.26	0.82	67	0.415
Highway 14	MH35	MH 34	A140	RES LOW	0.89	A139, A140, Rodgers	16.7	14.9	0.015	0.022	300	4.37	0.34	1.33	0.60	7.44	200	VC	0.60%	25.427	0.29	0.81	82	0.493
Highway 14	MH 34	MH 33	A141	RES LOW	0.67	A139 - A141, Rodgers	16.7	11.2	0.011	0.033	300	4.35	0.50	2.00	0.90	7.90	200	VC	0.42%	21.154	0.37	0.67	71	0.295
Highway 14	MH 33	MH 32	A142	RES LOW	0.69	A139 - A142, Rodgers	16.7	11.5	0.012	0.045	300	4.32	0.67	2.69	1.21	8.38	200	VC	0.60%	25.469	0.33	0.81	70	0.422
Highway 14	MH 32	MH 31	A143	COMM	2.7	A139 - A143, Rodgers	27.2	73.5	0.074	0.118	300	4.22	1.74	2.69	1.21	9.45	200	VC	0.45%	22.002	0.43	0.70	21	0.095
Highway 14	MH 31	MH 30	-	-	-	A139 - A143, Rodgers	-	-	-		300	4.50	0.00	2.69	1.21	7.71	200	VC	0.87%	30.592	0.25	0.97	92	0.800
Highway 14	MH 30	MH 29	-	-	-	A139 - A143, Rodgers	-	-	-		300	4.50	0.00	2.69	1.21	7.71	200	VC	1.75%	43.388	0.18	1.38	61	1.068
Front St	MH 29	MH 28	144	COMM	1.35	A139 - A144, Rodgers	27.2	36.8	0.037	0.155	300	4.19	2.26	4.04	1.82	10.57	200	VC	0.54%	24.102	0.44	0.77	107	0.578
Front St	MH 28	MH 27	145	RES LOW	0.9	A139 - A145, Rodgers	16.7	15.0	0.015	0.170	300	4.17	2.47	4.94	2.22	11.19	200	VC	0.50%	23.192	0.48	0.74	92	0.460
Front St	MH 27	MH 26	146	RES LOW	0.46	A139 - A146, Rodgers	16.7	7.7	0.008	0.178	300	4.17	2.57	5.40	2.43	11.50	200	VC	1.87%	44.851	0.26	1.43	46	0.860
Front St	MH 26	MH 25	147	COMM	0.46	A139 - A147, Rodgers	27.2	12.5	0.013	0.190	300	4.16	2.75	5.86	2.64	11.89	200	VC	2.35%	50.279	0.24	1.60	61	1.434
Front St	MH 24	MH 25	148	RES LOW	0.21	A148	16.7	3.5	0.004	0.004	300	4.45	0.05	0.21	0.09	0.15	200	VC	0.50%	23.192	0.01	0.74	46	0.230
John St	MH 25	MH 142	149	RES LOW	0.21	A139 - A149, Rodgers	16.7	3.5	0.004	0.197	300	4.15	2.85	6.28	2.83	12.17	200	VC	0.47%	22.485	0.54	0.72	65	0.306
Wright St	MH 143	MH 142	150	RES LOW	0.59	A150	16.7	9.9	0.010	0.010	300	4.42	0.15	0.59	0.27	6.92	200	VC	0.55%	24.324	0.28	0.77	61	0.336
John St	MH 142	MH 141	151	RES LOW	0.5	A139 - A151, Rodgers	16.7	8.4	0.008	0.216	300	4.14	3.10	7.37	3.32	12.91	200	VC	0.47%	22.485	0.57	0.72	53	0.249
John St	MH 141	MH 140	152	RES LOW	0.44	A139 - A152, Rodgers	16.7	7.3	0.007	0.223	300	4.13	3.20	7.81	3.51	13.21	200	VC	0.35%	19.404	0.68	0.62	53	0.186
Berwick Street	MH 166	MH 167	A153	RES LOW	0.66	A153	16.7	11.0	0.011	0.011	300	4.41	0.17	0.66	0.30	0.47	200	PVC	1.00%	32.798	0.01	1.04	44.5	0.445
Berwick Street	MH 167	MH 168	A154	RES LOW	0.62	A153, A154	16.7	10.4	0.010	0.021	300	4.38	0.32	1.28	0.58	0.90	200	PVC	0.51%	23.423	0.04	0.75	67.7	0.345
Berwick Street	MH 168	MH 169	A155	RES LOW	0.41	A153 - A155	16.7	6.8	0.007	0.028	300	4.36	0.43	1.69	0.76	1.19	200	PVC	0.50%	23.192	0.05	0.74	69	0.345
Aberdeen Street	MH 169	MH 170	A156	RES LOW	0.44	A153 - A156	-	-	-	0.028	300	4.36	0.43	2.13	0.96	1.39	200	PVC	0.50%	23.192	0.06	0.74	30	0.150
Aberdeen Street	MH 170	MH 171	-	RES LOW	-	A153 - A156	-	-	-	0.028	300	4.36	0.43	2.13	0.96	1.39	200	PVC	0.50%	23.192	0.06	0.74	61	0.305
Carrick Street	MH 171B	MH 171	A156B, A156C	RES LOW	2.25	A153 - A155	48.0	108.0	0.108	0.108	300	4.23	1.59	2.25	0.32	1.90	200	PVC	0.50%	23.192	0.08	0.74	69	0.345
Aberdeen Street	MH 171	MH 172	-	RES LOW	-	A153 - A156	-	-	-	0.136	300	4.20	1.99	4.38	1.27	3.26	200	PVC	0.50%	23.192	0.14	0.74	79	0.395
Aberdeen Street	MH 172	MH 137	-	RES LOW	-	A153 - A156	-	-	-	0.136	300	4.20	1.99	4.38	1.27	3.26	200	PVC	0.50%	23.192	0.14	0.74	55	0.275
Elizabeth St	MH 135	MH 137	A157	RES LOW	0.9	A157	16.7	15.0	0.015	0.015	300	4.40	0.23	0.90	0.41	0.63	200	VC	2.36%	50.386	0.01	1.60	78	1.841
John St	Stub	MH 136	A158, 158B	RES LOW	1.05	A158	16.7	17.5	0.018	0.018	300	4.39	0.27	1.05	0.47	0.74	200	VC	0.50%	23.192	0.03	0.74	20	0.100
John St	MH 136	MH 137	A159	RES LOW	0.66	A158, A159	16.7	11.0	0.011	0.029	300	4.36	0.43	1.71	0.77	1.20	200	VC	0.50%	23.192	0.05	0.74	63	0.315
John St	MH 137	MH 138	A160	RES LOW	0.85	A153 - A160	16.7	14.2	0.014	0.222	300	4.13	3.19	7.84	2.83	6.02	200	VC	0.74%	28.214	0.21	0.90	64	0.474
John St	MH 138	MH 139	A161	RES LOW	0.69	A153 - A161	16.7	11.5	0.012	0.234	300	4.12	3.35	8.53	3.14	6.49	200	VC	2.64%	53.291	0.12	1.70	55	1.452
John St	MH 139	MH 140	A162	RES LOW	0.37	A153 - A162	16.7	6.2	0.006	0.240	300	4.12	3.43	8.90	3.31	6.74	200	VC	2.30%	49.741	0.14	1.58	55	1.265
Robert St	MH 140	MH 144	A163	RES LOW	0.34	A139 - A163, Rodgers	16.7	5.7	0.006	0.469	300	3.99	6.49	17.05	6.98	19.97	200	VC	2.00%	46.384	0.43	1.48	61	1.220
Robert St	MH 144	MH 130	-	-	-	A139 - A163, Rodgers	-	-	-	0.469	300	3.99	6.49	17.05	6.98	19.97	200	VC	1.44%	39.358	0.51	1.25	85	1.224
Henry St	Henry St Pumping station (forcemain)	MH 127	-	-	-	Henry St. SPS	-	-	-	-	-	-	-	-	-	6.50	100	A.C	F.M					
Holly Drv	MH 133C	MH 133B	A164	RES MED	1.42	A164	31.2	44.3	0.044	0.044	300	4.33	0.67	1.42	0.64	1.30	200	PVC	0.43%	21.407	0.06	0.68	102	0.435
Holly Drv	MH 133B	MH 133A	A165	RES LOW	0.74	A164, A165	16.7	12.4	0.012	0.057	300	4.30	0.85	2.16	0.97	1.82	200	PVC	0.88%	30.803	0.06	0.98	70	0.617
Holly Drv	MH 133A	MH 133	A166	RES LOW	0.84	A164 - A166	16.7	14.0	0.014	0.071	300	4.28	1.05	3.00	1.35	2.40	200	PVC	1.08%	34.069	0.07	1.08	92	0.993
Elizabeth Street	MH 133	MH 127	A167	RES LOW	1.06	A164 - A167	16.7	17.7	0.018	0.088	300	4.26	1.31	4.06	1.83	3.13	200	VC	0.50%	23.192	0.14	0.74	109	0.545
Henry St	MH 127	MH 128	A168	RES LOW	0.81	A164 - A168, Henry St. SPS	16.7	13.5	0.014	0.102	300	4.24	1.50	4.87	2.19	10.19	200	VC	1.00%	32.798	0.31	1.04	49	0.490
Henry St	MH 128	MH 129	A169	RES LOW	0.58	A164 - A169, Henry St. SPS	16.7	9.7	0.010	0.112	300	4.23	1.64	5.45	2.45	10.59	200	VC	1.06%	33.768	0.31	1.07	75	0.795
Henry St	MH 129	MH 130	A170	RES LOW	0.31	A164 - A170, Henry St. SPS	16.7	5.2	0.005	0.117	300	4.22	1.71	5.76	2.59	10.81	200	VC	0.93%	31.630	0.34	1.01	83	0.772
Henry St	MH 130	MH 130B	-	-		A139 - A171, Rodgers, Henry	-	-	-	0.585	300	3.94	8.00	22.81	9.57	30.57	375	VC	0.30%	96.032	0.32	0.87	10.1	0.030
Henry St	MH 130B	MH 131	A171	RES LOW	0.17	A139 - A171, Rodgers, Henry	16.7	2.8	0.003	0.588	300	3.94	8.04	22.98	9.64	30.68	375	VC	0.31%	97.620	0.31	0.88	51.9	0.161
George Station	MH 131	Pumping Station		-	-	A60 - A171, Annis, Rodgers, Henry	-	-	-	-	-	-	-	-	-	134.21	450	VC	0.50%	201.600	0.67	1.27	19	0.095

DRAINAGE AREA DESCRIPTION																OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
DESIGN PARAMETER																							
Mannings n =	0.0130																						
Average Daily Flow (q)=	300	l/cap/d																					
Infiltration Rate (I) =	0.45	l/s/ha																					
New Development Infiltration rate	0.14	l/s/ha																					

Short-Term Development =
Medium-Term Development =
Full Buildout Development =

Designed By: Owen Perrett

Checked By: Matt Morkem

Dwg. Reference: Report Figures 2, 17, 18, 19

PROJECT: STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION: Stirling, ON, Canada

Project Number: 27931

Date: 30-Oct-23

Long Term Growth Frankford Road SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION																	OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	MANHOLE TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Weaver Street	MH Z1D	MH Z1C	A1B	RES LOW	1.52	A1B	11.8	18	0.018	0.018	300	4.39	0.27	1.52	0.21	0.49	200	PVC	0.40%	20.74	0.02	0.66	18	0.072
Weaver Street	MH Z1C	MH Z1B	A1C	RES LOW	0.6	A1C	26.7	16	0.016	0.034	300	4.35	0.51	2.12	0.30	0.81	200	PVC	0.40%	20.74	0.04	0.66	18	0.072
Weaver Street	MH Z1B	MH Z1	A1D	RES MED	0.6	A1D	20.0	12	0.012	0.046	300	4.32	0.69	2.72	0.38	1.07	200	PVC	0.40%	20.74	0.05	0.66	18	0.072
Weaver Street	MH Z1	MH Z2	A1	RES MED	0.51	A1, A1D	31.2	16	0.016	0.062	300	4.30	0.92	3.23	0.58	1.51	200	PVC	0.40%	20.74	0.07	0.66	18	0.072
Weaver Street	MH Z3	MH Z2	A2	RES MED	0.46	A1, A2	31.2	14	0.014	0.014	300	4.40	0.22	0.46	0.18	0.40	200	PVC	0.40%	20.74	0.02	0.66	56	0.224
Gorden Ave	MH Z2	MH Z4	A3	RES MED	0.53	A1 - A3	31.2	17	0.017	0.093	300	4.25	1.37	4.22	0.98	2.35	200	PVC	0.40%	20.74	0.11	0.66	90	0.360
Gorden Ave	MH Z4	MH Z5	A4	RES MED	0.71	A1 - A4	31.2	22	0.022	0.115	300	4.23	1.69	4.93	1.26	2.95	200	PVC	0.40%	20.74	0.14	0.66	90	0.360
Woods Drive	MH Z5	MH 117	A5	RES MED	0.55	A1 - A5	31.2	17	0.017	0.132	300	4.21	1.93	5.48	1.48	3.42	200	PVC	0.40%	20.74	0.16	0.66	97	0.388
Frankford Road	MH 119	MH 118	A6	RES LOW	1.39	A6	17.2	24	0.024	0.024	300	4.37	0.36	1.39	0.56	0.92	200	PVC	0.89%	30.94	0.03	0.98	117	1.041
Frankford Road	Hilden Homes	Frankford	A7B	RES LOW	3.02	A6, A7B	40.4	122	0.122	0.122	300	4.22	1.79	3.02	0.42	2.21	200	PVC	0.89%	30.94	0.07	0.98	117	1.041
Frankford Road	MH 118	MH 117A	A7	RES LOW	0.88	A6, A7	17.2	15	0.015	0.161	300	4.18	2.34	5.29	1.33	3.67	200	PVC	0.40%	20.74	0.18	0.66	90	0.360
Frankford Road	MH 117A	MH 117	A8	RES MED	0.63	A6 - A8	31.2	20	0.020	0.181	300	4.16	2.61	5.92	1.58	4.19	200	PVC	0.40%	20.74	0.20	0.66	90	0.360
Frankford Road	MH 117	MH 116A	A9	RES LOW	0.8	A1 - A9, A1D	17.2	14	0.014	0.326	300	4.06	4.60	12.20	3.39	7.99	200	PVC	0.75%	28.40	0.28	0.90	120	0.900
Frankford Road	MH 116A	MH 116C	A10	RES MED	0.51	A1 - A10, A1D	31.2	16	0.016	0.342	300	4.05	4.82	12.71	3.59	8.41	200	PVC	0.40%	20.74	0.41	0.66	90	0.360
Frankford Road	MH 159	MH 114	A13	RES MED	0.41	A13	31.2	13	0.013	0.013	300	4.40	0.20	0.41	0.16	0.36	200	PVC	0.90%	31.12	0.01	0.99	85	0.765
Frankford Road	Frankford Dev.	MH 115	A13B	RES MED	4.1	A12, A13	31.2	125	0.125	0.125	300	4.22	1.83	17.22	2.41	4.24	200	PVC	0.55%	24.32	0.17	0.77	60	0.330
Frankford Road	MH 114	MH 115	A12	RES MED	0.76	A12, A13	31.2	24	0.024	0.162	300	4.18	2.34	1.17	0.47	2.81	200	PVC	0.55%	24.32	0.12	0.77	60	0.330
Frankford Road	MH 115	MH 116	A11	RES MED	0.67	A11 - A13	31.2	21	0.021	0.307	300	4.07	4.35	19.06	3.15	7.50	200	PVC	0.55%	24.32	0.31	0.77	63	0.347
Frankford Road	MH 116	MH 116C		RES MED		A11 - A13	-	-	-	0.307	300	4.07	4.35	19.06	3.15	7.50	200	PVC	0.55%	24.32	0.31	0.77	63	0.347
Frankford Road	MH 116C	MH 116D	A14	RES MED	0.35	A1 - A14, A1D	31.2	11	0.011	0.661	300	3.91	8.97	32.12	6.88	15.85	200	PVC	0.59%	25.21	0.63	0.80	30	0.177
Creekside Drive	MH 116G	MH 116F	A14D	RES LOW	3.66	A14D	16.4	60	0.060	0.060	300	4.30	0.90	3.66	0.51	1.41	200	PVC	0.50%	23.19	0.06	0.74	130	0.650
Creekside Drive	MH 116F	MH 116E	A14C	RES LOW	1.38	A14D, C	18.8	26	0.026	0.086	300	4.26	1.27	5.04	0.71	1.98	200	PVC	0.50%	23.19	0.09	0.74	130	0.650
Creekside Drive	MH 116E	MH 116D	A14B	RES LOW	1.23	A14D, C, B	17.9	22	0.022	0.108	300	4.23	1.59	6.27	0.88	2.47	200	PVC	0.50%	23.19	0.11	0.74	130	0.650
Frankford Road	MH 116D	Pumping Station		RES MED		A1 - A14	-	-	-	0.769	300	3.87	10.33	38.39	7.76	18.09	200	PVC	0.59%	25.21	0.72	0.80	7	0.041

DESIGN PARAMETER

Mannings n = 0.0130
Average Daily Flow (q)= 300 l/cap/d
Infiltration Rate (I) = 0.4 l/s/ha
New Development Infiltration rate 0.14 l/s/ha

Short-Term Development =
Medium-Term Development =
Full Buildout Development =

Designed By: Owen Perrett

Checked By: Matt Morkem

Dwg. Reference: Report Figures 2, 17, 18, 19

PROJECT: STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION: Stirling, ON, Canada

Project Number: 27931

Date: 30-Oct-23

Long Term Growth Annis Street SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION																	OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Cambellford Road	MH 39	MH 9E	A15	RES LOW	0.96	A15	17.16	16.4736	0.016	0.016	300	4.39	0.25	0.96	0.27	0.52	200	PVC	0.54%	24.10	0.02	0.77	97	0.524
Cambellford Road	MH 9E	MH 9D	A16	RES LOW	0.81	A15, A16	17.16	13.8996	0.014	0.030	300	4.35	0.46	1.77	0.50	0.95	200	PVC	0.54%	24.10	0.04	0.77	71	0.383
Cambellford Development	Campbellford Dev.	MH 9F	A16C	RES HIGH	9.24	A16C	55.8	516.0	0.516	0.516	300	3.97	7.11	9.24	1.29	8.40	200	PVC	0.50%	23.19	0.36	0.74	10	0.050
Old Rail Bed	MH 9F	MH 9D	A16B	-	0.41	A16C, A16B	-	-	-	0.516	300	3.97	7.11	9.65	1.35	8.46	200	PVC	0.50%	23.19	0.36	0.74	150	0.750
Cambellford Road	MH 9D	MH 9C	A17	RES LOW	0.69	A15 - A17	17.16	11.8404	0.012	0.558	300	3.95	7.65	12.11	2.04	9.69	200	PVC	1.97%	46.03	0.21	1.47	82	1.615
Cambellford Road	MH 9C	MH 9B	A18	RES LOW	0.36	A15 - A18	17.16	6.1776	0.006	0.564	300	3.95	7.73	12.47	2.14	9.87	200	PVC	3.43%	60.74	0.16	1.93	50	1.715
Cambellford Road	MH 9B	MH 9A	A19	RES LOW	0.39	A15 - A19	17.16	6.6924	0.007	0.571	300	3.94	7.82	12.86	2.25	10.07	200	PVC	1.85%	44.61	0.23	1.42	60	1.110
Cambellford Road	MH 9A	MH 9	-	RES LOW	-	A15 - A19	-	-	-	0.571	300	3.94	7.82	12.86	2.25	10.07	200	PVC	4.50%	69.58	0.14	2.21	5	0.225
Front Street	MH 5	MH 6	A20	COMM	6.22	A20	27.23	169.391	0.169	0.169	300	4.17	2.45	6.22	1.74	4.20	200	PVC	1.01%	32.96	0.13	1.05	90	0.909
Front Street	Harvest Glen	MH 6	A21B	RES MED	4.13	A20, A21	47.1	194.4	0.194	0.364	300	4.04	5.10	10.35	2.90	8.00	200	VC	1.00%	32.80	0.24	1.04	96	0.960
Front Street	MH 6	MH 7	A21	RES MED	0.92	A20, A21	75	69	0.069	0.433	300	4.01	6.02	11.27	3.16	9.18	200	VC	1.00%	32.80	0.28	1.04	96	0.960
Front Street	MH 7	MH 8	A22	RES LOW	1.07	A20 - A22	17.16	18.3612	0.018	0.451	300	4.00	6.26	12.34	3.46	9.72	200	VC	0.51%	23.33	0.42	0.74	101	0.511
Front Street	MH 8	MH 9	A23	RES LOW	1.1	A20 - A23	17.16	18.876	0.019	0.470	300	3.99	6.51	13.44	3.76	10.27	200	VC	0.50%	23.17	0.44	0.74	111	0.554
Front Street	MH 9	MH 10	A24	RES LOW	0.86	A15 - A24	17.16	14.7576	0.015	1.056	300	3.78	13.88	27.16	6.25	20.13	200	VC	0.53%	23.88	0.84	0.76	97	0.514
Front Street	MH 10	MH 11	A25	RES LOW	1.17	A15 - A25	17.16	20.0772	0.020	1.076	300	3.78	14.14	28.33	6.58	20.72	200	VC	0.41%	20.90	0.99	0.67	97	0.394
Front Street	**Frankford Road Pumping station (forcemain)**	MH 11		-												18.09	100	PVC	FM					
Front Street	MH 11	MH 12	A26	RES LOW	0.97	A15 - A26, Frankford SPS	17.16	16.6452	0.017	1.093	300	3.77	14.32	29.30	6.85	39.26	300	VC	1.29%	109.83	0.36	1.55	100	1.290
Front Street	MH 12	MH 12A	A27	RES LOW	0.78	A15 - A27, Frankford SPS	17.16	13.3848	0.013	1.106	300	3.77	14.51	30.08	7.07	39.67	300	VC	0.47%	66.29	0.60	0.94	92	0.432
Front Street	MH 12	MH 12A	A27B	RES HIGH	-	A15 - A27, Frankford SPS	72.58	56.615	0.057	1.163	300	3.76	15.20	30.08	7.07	22.27	300	VC	0.47%	66.29	0.34	0.94	92	0.432
Front Street	MH 12A	MH 13B	A28	RES LOW	0.31	A15 - A28, Frankford SPS	17.16	5.3196	0.005	1.168	300	3.76	15.26	30.39	7.16	40.51	300	VC	0.47%	66.29	0.61	0.94	92	0.432
Church Street	MH 41A	MH 41	A29	RES LOW	1.09	A29	17.16	18.7044	0.019	0.019	300	4.38	0.28	1.09	0.31	0.59	200	PVC	1.12%	34.63	0.02	1.10	87	0.970
Church Street	MH 41	MH 42	A30	RES LOW	1.23	A29, A30	17.16	21.1068	0.021	0.040	300	4.33	0.60	2.32	0.65	1.25	200	VC	0.68%	27.05	0.05	0.86	80	0.544
Church Street	MH 42	MH 43	A31	RES LOW	1.23	A29 - A31	17.16	21.1068	0.021	0.061	300	4.30	0.91	3.55	0.99	1.90	200	VC	1.75%	43.39	0.04	1.38	96	1.680
Church Street	MH 43	MH 44	A32	RES LOW	1.06	A29 - A32	17.16	18.1896	0.018	0.079	300	4.27	1.17	4.61	1.29	2.46	200	VC	2.25%	49.20	0.05	1.57	92	2.070
Church Street	MH 52	MH 51	A33	RES LOW	0.69	A33	17.16	11.8404	0.012	0.012	300	4.41	0.29	0.69	0.19	0.48	200	VC	0.52%	23.65	0.02	0.75	88	0.458
Church Street	MH 51	MH 50	A34	RES LOW	0.64	A33, A34	17.16	10.9824	0.011	0.023	300	4.37	0.35	1.33	0.37	0.72	200	VC	0.57%	24.76	0.03	0.79	53	0.302
North Street	Old School (2)	MH 50	A34B	RES MED	1.67	A139 - A143, Rodgers	167.7	280	0.280	0.280	300	4.09	3.98	1.67	0.23	4.21	200	VC	0.57%	24.76	0.17	0.79	53	0.302
Church Street	MH 50	MH 49	A35	RES LOW	0.44	A33 - A35	17.16	7.5504	0.008	0.310	300	4.07	4.39	3.44	0.73	5.12	200	VC	0.46%	22.24	0.23	0.71	53	0.244
Church Street	MH 49	MH 48	A36	RES LOW	0.49	A33 - A36	17.16	8.4084	0.008	0.319	300	4.07	4.50	3.93	0.87	5.37	200	VC	0.74%	28.21	0.19	0.90	53	0.392
Church Street	MH 48	MH 47	A37	RES LOW	0.74	A33 - A37	17.16	12.6984	0.013	0.331	300	4.06	4.67	4.67	1.07	5.75	200	VC	0.69%	27.24	0.21	0.87	53	0.366
Church Street	MH 47	MH 46	A38	RES LOW	0.52	A33 - A38	17.16	8.9232	0.009	0.340	300	4.05	4.79	5.19	1.22	6.01	200	VC	0.37%	19.95	0.30	0.64	57	0.211
Church Street	MH 46	MH 44	A39	RES LOW	0.81	A33 - A39	17.16	13.8996	0.014	0.354	300	4.05	4.98	6.00	1.45	6.42	200	VC	0.52%	23.65	0.27	0.75	64	0.333
Annis Street	MH 44	MH 45	A40	RES LOW	0.41	A29 - A40	17.16	7.0356	0.007	0.440	300	4.00	6.12	11.02	2.85	8.97	200	VC	0.50%	23.19	0.39	0.74	55	0.275
Annis Street	MH 45	MH 13	A41	RES LOW	0.16	A29 - A41	17.16	2.7456	0.003	0.443	300	4.00	6.16	11.18	2.90	9.05	200	VC	0.50%	23.19	0.39	0.74	55	0.275
St. James Street	Stub	MH 151	A42	RES MED	1.06	A42	31.2	33.072	0.033	0.033	300	4.35	0.50	1.06	0.30	0.80	200	PVC	N/A					
St. James Street	MH 149	MH 150	A43	RES LOW	1.11	A43	17.16	19.0476	0.019	0.019	300	4.38	0.29	1.11	0.31	0.60	200	VC	0.54%	24.10	0.02	0.77	91	0.491
St. James Street	MH 150	MH 151	A44	RES LOW	2.79	A43, A44	17.16	47.8764	0.048	0.067	300	4.29	1.20	3.90	1.09	2.29	200	VC	0.71%	27.62	0.08	0.88	91	0.645
Alan Street	MH 151	MH 15	A45	RES LOW	0.39	A42 - A45	17.16	6.6924	0.007	0.107	300	4.24	1.57	5.35	1.50	3.07	200	VC	0.49%	22.86	0.13	0.73	97	0.471
Front Street	MH 19	MH 18	A46	RES LOW	1.04	A46	17.16	17.8464	0.018	0.018	300	4.39	0.27	1.04	0.29	0.56	200	VC	0.78%	28.97	0.02	0.92	86	0.671
Front Street	MH 18	MH 17	A47	RES LOW	1.14	A46, A47	17.16	19.5624	0.020	0.037	300	4.34	0.56	2.18	0.61	1.17	200	VC	1.91%	45.33	0.03	1.44	87	1.662
Front Street	MH 17	MH 16	A48	RES LOW	0.74	A46 - A48	17.16	12.6984	0.013	0.050	300	4.31	0.75	2.92	0.82	1.57	200	VC	1.19%	35.78	0.04	1.14	64	0.762
Front Street	MH 16	MH 15	A49	RES LOW	0.58	A46 - A49	17.16	9.9528	0.010	0.060	300	4.30	0.90	3.50	0.98	1.88	200	VC	1.19%	35.78	0.05	1.14	67	0.797

DRAINAGE AREA DESCRIPTION																OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Front Street	MH 15	MH 14	A50	RES LOW	0.57	A42 - A50	17.16	9.7812	0.010	0.177	300	4.17	2.55	9.42	2.64	5.19	200	VC	0.55%	24.32	0.21	0.77	56	0.308
Front Street	MH 14	MH 13B	A51	RES LOW	0.6	A42 - A51	17.16	10.296	0.010	0.187	300	4.16	2.70	10.02	2.81	5.50	200	VC	0.70%	27.44	0.20	0.87	61	0.427
Front Street	MH 13B	MH 13	-	RES LOW	-	A15-28, A42 - 51, Frankford SPS	-	-	-	1.355	300	3.71	17.46	40.41	11.31	46.86	300	VC	0.70%	80.91	0.58	1.14	61	0.427
Annis Station	MH 13	Pumping Station	-	-	-	A15 - A51, Frankford SPS	-	-	-	1.798	300	3.62	22.61	51.59	14.21	54.91	300	PVC	0.50%	68.38	0.80	0.97	12	0.060

DESIGN PARAMETER

Mannings n =	0.0130	
Average Daily Flow (q)=	300	l/cap/d
Infiltration Rate (I) =	0.28	l/s/ha
New Development Infiltration rate	0.14	l/s/ha

Short-Term Development =
Medium-Term Development =
Full Buildout Development =

Designed By: Owen Perrett

Checked By: Matt Morkem

Dwg. Reference: Report Figures 2, 17, 18, 19

PROJECT: STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION: Stirling, ON, Canada

Project Number: 27931

Date: 30-Oct-23

Long Term Growth Henry Street SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION																	OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Henry street	**MH 121**	**SAN4**	A52	RES LOW	0.92	A52	17.16	16	0.016	0.016	300	4.39	0.24	0.92	0.32	0.56	200	PVC	3.70%	63.09	0.01	2.01	60	2.220
Henry street	SAN4	MH122	A53	RES LOW	0.88	A52, A53	17.16	15	0.015	0.031	300	4.35	0.47	1.80	0.63	1.10	200	PVC	1.04%	33.45	0.03	1.06	75	0.780
Henry street	**MH 122**	**MH 123**	A54	RES LOW	0.55	A52 - A54	17.16	9	0.009	0.040	300	4.33	0.61	2.35	0.82	1.43	200	PVC	1.00%	32.80	0.04	1.04	71	0.710
Henry street	**MH 123**	**MH 123B**					-	-	-	0.040	300	4.33	0.61	2.35	0.82	1.43	200	PVC	1.00%	32.80	0.04	1.04	71	0.710
Carrick Street	MH 124F	MH 124E	A158E	RES LOW	1.31	A153 - A155	18.3	24.0	0.024	0.024	300	4.37	0.36	1.31	0.18	0.55	200	PVC	0.50%	23.19	0.02	0.74	69	0.345
Carrick Street	MH 124E	MH 124D	A158D	RES LOW	1.25	A153 - A155	17.3	21.6	0.022	0.046	300	4.32	0.68	2.56	0.36	1.04	200	PVC	0.50%	23.192	0.04	0.74	69	0.345
Carrick Street	MH 124D	MH 124C	-	RES LOW	-	A153 - A155	-	-	-	0.046	300	4.32	0.68	2.56	0.36	1.04	200	PVC	0.50%	23.192	0.04	0.74	69	0.345
Carrick Street	MH 124G	MH 124C	A158C	RES LOW	0.92	A153 - A155	20.9	19.2	0.019	0.019	300	4.38	0.29	0.92	0.13	0.42	200	PVC	0.50%	23.192	0.02	0.74	69	0.345
Carrick Street	MH 124H	MH 124C	A158B	RES LOW	0.73	A153 - A155	20.9	15.3	0.015	0.015	300	4.40	0.23	0.73	0.10	0.34	200	PVC	0.50%	23.192	0.01	0.74	69	0.345
Carrick Street	MH 124C	MH 124B	A158F	RES LOW	0.97	A153 - A155	20.9	20.3	0.020	0.100	300	4.24	1.48	5.18	0.73	2.20	200	PVC	0.50%	23.192	0.10	0.74	69	0.345
Carrick Street	MH 124B	MH 124	-	RES LOW	-	A153 - A155	-	-	-	0.100	300	4.24	1.48	5.18	0.73	2.20	200	PVC	0.50%	23.192	0.10	0.74	69	0.345
Henry street	**MH 125**	**MH 124**	A55	RES LOW	1.12	A55	17.16	19	0.019	0.019	300	4.38	0.29	1.12	0.39	0.68	200	VC	1.32%	37.68	0.02	1.20	77	1.016
Henry street	MH 124	MH 123B	A56	RES LOW	0.9	A55, A56	17.16	15	0.015	0.135	300	4.21	1.97	7.20	1.43	3.40	200	VC	1.28%	37.11	0.09	1.18	77	0.986
Henry street	MH 123B	Pumping Station			-	A52 - A56	-	-	-	0.175	300	4.17	2.54	9.55	2.25	4.79	200	PVC	0.59%	25.19	0.19	0.80	5.1	0.030

DESIGN PARAMETER

Mannings n =	0.0130	
Average Daily Flow (q)=	300	l/cap/d
Infiltration Rate (I) =	0.35	l/s/ha
New Development Infiltration rate	0.14	l/s/ha

Short-Term Development =
Medium-Term Development =
Full Buildout Development =

Designed By: Owen Perrett

Checked By: Matt Morkem

Dwg. Reference: Report Figures 2, 17, 18, 19

PROJECT: STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION: Stirling, ON, Canada

Project Number: 27931

Date: 30-Oct-23

Long Term Growth Rogers Drive SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION																OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	MANHOLE TO	INCREMENTAL AREA No.		INCREMENTAL AREA Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Rodgers Drive	MH 38B	MH 38A	A57	RES LOW	1.08		17.16	19	0.019	0.019	300	4.38	0.28	1.08	0.54	0.82	200	AC	0.43%	21.38	0.04	0.68	91	0.387
Rodgers Drive	MH 38A	MH 38	A58	RES LOW	0.63		17.16	11	0.011	0.029	300	4.36	0.44	1.71	0.86	1.30	200	AC	0.42%	21.26	0.06	0.68	65	0.273
Rodgers Drive	MH 38	MH 37	A59	RES LOW	1.81		17.16	31	0.031	0.060	300	4.30	0.90	3.52	1.76	2.66	200	VC	0.54%	24.10	0.11	0.77	82	0.443
Rodgers Drive	MH 37	Pumping Station			3.52			0	0.000	0.060	300	4.30	0.90	3.52	1.76	2.66	150	VC	0.36%	9.14	0.29	0.52	4	0.014

DESIGN PARAMETER

Mannings n = 0.0130
Average Daily Flow (q)= 300 l/cap/d
Infiltration Rate (I) = 0.5 l/s/ha
New Development Infiltration rate 0.14 l/s/ha

Short-Term Development =
Medium-Term Development =
Full Buildout Development =

Designed By: Owen Perrett

Checked By: Matt Morkem

Dwg. Reference: Report Figures 2, 17, 18, 19

PROJECT: STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION: Stirling, ON, Canada

Project Number: 27931

Date: 30-Oct-23

Long Term Growth George Street SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION																OUTLET PIPE DATA								
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)	
Baker Street	Stub	MH 90	A60	RES LOW	0.52	A60	55.8	29.0	0.029	0.029	300	4.36	0.44	0.52	0.07	0.51	200	VC	4.09%	66.331	0.01	2.11	75	3.068	
Baker Street	Stub	MH 90	A60	RES LOW	0.43	A60	17.2	7.4	0.007	0.036	300	4.34	0.55	0.95	0.43	0.98	200	VC	4.09%	66.331	0.01	2.11	75	3.068	
Baker Street	MH 90	MH 89	A61	RES MED	0.78	A60, A61	31.2	24.3	0.024	0.061	300	4.30	0.91	1.73	0.78	1.68	200	VC	4.09%	66.331	0.03	2.11	75	3.068	
Baker Street	MH 89	MH 88	A62	RES LOW	0.79	A60 - A62	17.2	13.6	0.014	0.074	300	4.28	1.10	2.52	1.13	2.24	200	VC	5.02%	73.486	0.03	2.34	80	4.016	
Wellington Street	MH 88	MH 93	A63	RES LOW	0.75	A60 - A63	17.2	12.9	0.013	0.087	300	4.26	1.29	3.27	1.47	2.76	200	VC	0.69%	27.323	0.10	0.87	108	0.750	
Stirling Manor Nursing Home	MH 154	MH 95	A64	RES HIGH	1.93	A64	84.0	162.1	0.162	0.162	300	4.1799	2.65	1.93	0.87	3.52	200	VC	0.03	61.27	0.06	1.95	63	2.199	
Edward Street	MH 95	MH 94	A65	RES LOW	1.03	A64, A65	17.2	17.7	0.018	0.180	300	4.16	2.60	2.96	1.33	3.93	200	VC	2.11%	47.642	0.08	1.52	78	1.646	
Edward Street	MH 94	MH 93	A66	RES LOW	0.74	A64 - A66	17.2	12.7	0.013	0.192	300	4.15	2.78	3.70	1.67	4.44	200	VC	3.02%	56.998	0.08	1.81	78	2.356	
Wellington Street	MH 93	MH 98	A67	RES LOW	0.6	A60 - A67	17.2	10.3	0.010	0.290	300	4.08	4.11	7.57	3.41	7.52	200	VC	2.50%	51.859	0.14	1.65	80	2.000	
Wellington Street	MH 98	Nancy St.	A68	RES LOW	0.5	A60 - A68	17.2	8.6	0.009	0.299	300	4.08	4.23	8.07	3.63	7.86	200	VC	3.20%	58.672	0.13	1.87	30	0.960	
Nancy Street	stub	Nancy St.	A69	RES HIGH	0.83	A69	84.0	69.7	0.070	0.070	300	4.28	1.04	0.83	0.37	1.41	200	VC	N/A						S
Wellington Street	Nancy st.	MH 100	-	RES LOW	-	A60 - A69	-	-	-	0.368	300	4.04	5.16	8.90	4.01	9.17	200	VC	3.20%	58.672	0.16	1.87	50	1.600	
Wellington Street	MH 100	MH 99	A70	RES LOW	0.11	A60 - A70	17.2	1.9	0.002	0.370	300	4.04	5.19	9.01	4.05	9.24	200	PVC	1.00%	32.798	0.28	1.04	16	0.160	
Nancy Street	MH X0	MH X1*	A71	RES LOW	0.17	A71	17.2	2.9	0.003	0.003	300	4.45	0.05	0.17	0.08	0.12	200	PVC	1.00%	32.798	0.00	1.04	36	0.360	
Nancy Street	MH X1	MH X2	A72	RES LOW	0.43	A71, A72	17.2	7.4	0.007	0.010	300	4.41	0.16	0.60	0.27	0.43	200	PVC	1.00%	32.798	0.01	1.04	110	1.100	
Nancy Street	MH X2	MH X3	A73	RES LOW	1.33	A71 - A73	17.2	22.8	0.023	0.033	300	4.35	0.50	1.93	0.87	1.37	200	PVC	1.00%	32.798	0.04	1.04	90	0.900	
Nancy Street	MH X3	MH 99	A74	RES LOW	0.59	A71 - A74	17.2	10.1	0.010	0.043	300	4.33	0.65	2.52	1.13	1.78	200	PVC	1.00%	32.798	0.05	1.04	65	0.650	
Wellington Street	MH 99	MH 65	A75	RES LOW	0.24	A60 - A75	17.2	4.1	0.004	0.417	300	4.01	5.83	11.77	5.30	11.12	200	VC	0.55%	24.324	0.46	0.77	45	0.248	
North Street	MH 68H	MH 68G	A76	INST	1.24	A76	7.5	9.3	0.009	0.009	300	4.42	0.14	1.24	0.56	0.70	200	PVC	1.58%	41.227	0.02	1.31	60	0.948	
North Street	MH 68G	MH 68F	-	-	-	A76	-	-	-	0.009	300	4.42	0.15	1.24	0.56	0.71	200	PVC	1.29%	37.252	0.02	1.19	109	1.406	
North Street	Stirling-Marmora Rd.	MH 68F	A76B	RES LOW	1.88	A76	17.2	58.0	0.058	0.058	300	4.30	0.88	1.88	0.26	1.14	200	PVC	1.29%	37.252	0.03	1.19	109	1.406	
North Street	MH 68F	MH 68E	A77	INDU	0.36	A76, A77	27.2	9.8	0.010	0.077	300	4.27	1.15	3.48	0.98	2.14	200	PVC	2.55%	52.375	0.04	1.67	70	1.785	
North Street	MH 68E	MH 68D	A78	INST	0.39	A76 - A78	7.5	2.9	0.003	0.080	300	4.27	1.21	3.87	1.16	2.36	200	PVC	2.17%	48.315	0.05	1.54	100	2.170	
North Street	MH 68D	MH 68C	A79	COMM	0.45	A76 - A79	27.2	12.3	0.012	0.092	300	4.25	1.36	4.32	1.36	2.72	200	PVC	0.60%	25.406	0.11	0.81	103	0.618	
North Street	Edward St. Dev.	MH 68C	A79B	COMM	1.62	A79B	28.4	46.0	0.046	0.046	300	4.32	0.69	1.62	0.23	0.92	200	PVC	0.60%	25.406	0.04	0.81	103	0.618	
North Street	MH 68C	MH 68B	A80	RES LOW	0.49	A76 - A80	17.2	8.4	0.008	0.147	300	4.19	2.14	6.43	1.81	3.94	200	PVC	0.67%	26.847	0.15	0.85	12	0.080	
North Street	MH 68B	MH 68A	-	-	-	A76 - A80	-	-	-	0.147	300	4.19	2.16	6.43	1.81	3.96	200	PVC	0.56%	24.544	0.16	0.78	64	0.358	
North Street	MH 68A	MH 68	A81	RES LOW	1.17	A76 - A81	17.2	20.1	0.020	0.167	300	4.18	2.44	7.60	2.34	4.77	200	PVC	0.55%	24.324	0.20	0.77	51	0.281	
North Street	MH 68	MH 67	A82	RES LOW	0.57	A76 - A82	17.2	9.8	0.010	0.177	300	4.17	2.55	8.17	2.59	5.15	200	PVC	1.47%	39.766	0.13	1.27	100	1.470	
North Street	MH 67	MH 66	A83	RES LOW	1.68	A76 - A83	17.2	28.8	0.029	0.205	300	4.14	3.00	9.85	3.35	6.34	200	PVC	0.60%	25.406	0.25	0.81	80	0.480	
North Street	MH 66	MH 65A	A84	RES LOW	0.83	A76 - A84	17.2	14.2	0.014	0.220	300	4.13	3.20	10.68	3.72	6.92	200	PVC	0.60%	25.406	0.27	0.81	70	0.420	
North Street	MH 65A	MH 65	-	-	-	A76 - A84	-	-	-	0.220	300	4.13	3.20	10.68	3.72	6.92	200	PVC	0.60%	25.406	0.27	0.81	5	0.030	
North Street	MH 65	MH 64	A85	COMM	0.13	A60 - A85	27.2	3.5	0.004	0.641	300	3.92	8.71	22.58	9.08	17.79	200	VC	0.40%	20.744	0.86	0.66	60	0.240	
North Street	MH 64	MH 63	A86	COMM	0.33	A60 - A86	27.2	9.0	0.009	0.650	300	3.91	8.83	22.91	9.22	18.05	200	VC	0.51%	23.423	0.77	0.75	60	0.306	
North Street	Manor Expansion	MH63	A86B	RES MED	1.09	A139 - A143, Rodgers	31.2	96.0	0.096	0.096	300	4.25	1.42	1.09	0.15	1.57	250	VC	0.50%	42.050	0.04	0.86	21	0.105	
Thompson Farmland	Thompson Dev.	MH 63B	A87C	RES HIGH	29.67	A98D	31.2	926.0	0.926	0.926	0	3.82	0.00	29.67	4.15	4.15	250	PVC	0.50%	42.050	0.10	0.86	100	0.500	
Thompson Farmland	Thompson Dev.	MH 63	A87B	RES HIGH	0.93	A98D	-	-	-	0.926	0	3.82	0.00	30.60	4.28	4.28	250	PVC	0.50%	42.050	0.10	0.86	100	0.500	
North Street	MH 63	MH 62	A87	INST	0.36	A60 - A87	7.5	2.7	0.003	1.674	300	3.64	21.19	54.96	13.82	35.01	200	VC	0.69%	27.244	Surcharged	0.87	55	0.380	S
North Street	MH 62	MH 61	A88	RES LOW	0.19	A60 - A88	17.2	3.3	0.003	1.678	300	3.64	21.23	55.15	13.91	35.13	200	VC	0.74%	28.214	Surcharged	0.90	50	0.370	S
North Street	MH 61	MH 60	A89	COMM	0.62	A60 - A89	27.2	16.9	0.017	1.694	300	3.64	21.55	55.58	14.10	35.65	200	VC	1.60%	41.487	0.86	1.32	110	1.760	
North Street	MH 60	MH 59	A90	COMM	0.25	A60 - A90	27.2	6.8	0.007	1.701	300	3.64	21.50	55.83	14.21	35.71	200	VC	1.60%	41.487	0.86	1.32	110	1.760	
Gore Street	MH 109	MH 108	A91	RES LOW	0.44	A91	17.2	7.6	0.008	0.008	300	4.43	0.13	0.44	0.20	0.32	200	VC	1.65%	42.130	0.01	1.34	60	0.990	

DRAINAGE AREA DESCRIPTION																OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d)	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Gore Street	MH 108	MH 61	A92	INST	0.42	A91, A92	7.5	3.2	0.003	0.011	300	4.41	0.19	0.86	0.39	0.58	200	VC	3.83%	64.188	0.01	2.04	91	3.485
James Street	MH 108	MH 104	A93	INST	0.5	A91 - A93	7.5	3.8	0.004	0.014	300	4.40	0.25	1.36	0.61	0.86	200	VC	3.83%	64.188	0.01	2.04	91	3.485
James Street	STUB	MH 104	A94	RES LOW	0.18	A94	17.2	3.1	0.003	0.003	300	4.45	0.06	0.18	0.08	0.14	200	VC	1.65%	42.130	0.00	1.34	60	0.990
Victoria Street	MH 105	MH 104	A95	RES MED	0.43	A95	31.2	13.4	0.013	0.013	300	4.40	0.21	0.43	0.19	0.40	200	PVC	2.53%	52.169	0.01	1.66	74	1.872
Victoria Street	MH 104	MH 103	A96	RES LOW	0.29	A91 - A96	17.2	5.0	0.005	0.036	300	4.34	0.54	2.26	1.02	1.56	200	VC	0.77%	28.780	0.05	0.92	60	0.462
Victoria Street	MH 103	MH 59	A97	RES LOW	0.35	A91 - A97	17.2	6.0	0.006	0.042	300	4.33	0.63	2.61	1.17	1.80	200	VC	0.32%	18.554	0.10	0.59	57	0.182
North Street	MH 59	MH 58	-	-	-	A60 - A97	-	-	-	1.743	300	3.63	21.98	58.44	15.39	37.37	300	VC	1.51%	118.828	0.31	1.68	13.2	0.199
Station Street	Stub	MH 153	A98	RES LOW	0.47	A98	17.2	8.1	0.008	0.008	300	4.42	0.12	0.47	0.21	0.34	200	VC	0.40%	20.744	0.02	0.66	50	0.200
Station Street	MH 153	MH 54	A99	RES LOW	0.46	A98, A99	17.2	7.9	0.008	0.016	300	4.39	0.24	0.93	0.42	0.66	200	VC	0.50%	23.192	0.03	0.74	46	0.230
Station Street	MH 54	MH 52	A100	RES LOW	0.53	A98 - A100	17.2	9.1	0.009	0.025	300	4.37	0.44	1.46	0.66	1.10	200	VC	0.53%	23.878	0.05	0.76	70	0.371
Station Street	MH 53	MH 52	A101	RES LOW	0.2	A101	17.2	3.4	0.003	0.003	300	4.45	0.05	0.20	0.09	0.14	200	VC	1.83%	44.369	0.00	1.41	50	0.915
Church Street	MH 52	MH 56	A102	RES LOW	1.04	A98 - A102	17.2	17.8	0.018	0.046	300	4.32	0.84	2.70	1.22	2.05	200	VC	0.60%	25.406	0.08	0.81	95	0.570
Church Street	MH 52	MH 56	A102B	RES HIGH	0.74	A98 - A102	107.4	191.2	0.191	0.237	300	4.12	3.54	3.44	1.55	5.09	200	VC	0.60%	25.406	0.20	0.81	95	0.570
Church Street	MH 56	MH 57	A103	RES LOW	0.56	A98 - A103	17.2	9.6	0.010	0.247	300	4.11	3.53	3.26	1.47	5.00	200	VC	1.14%	35.019	0.14	1.11	54	0.616
Church Street	MH 57	MH 58	A104	RES LOW	0.34	A98 - A104	17.2	5.8	0.006	0.253	300	4.11	3.61	3.60	1.62	5.23	200	VC	1.44%	39.358	0.13	1.25	50	0.720
North Street	MH 58	MH 22	A105	COMM	0.23	A60 - A105	27.2	6.3	0.006	2.002	300	3.59	24.96	62.27	16.88	41.84	300	VC	0.65%	77.963	0.54	1.10	103.2	0.671
Tanner Drive	Stub	MH 166	A106	RES LOW	0.75	A106	17.2	12.9	0.013	0.013	300	4.40	0.20	0.75	0.34	0.53	200	PVC	0.60%	25.406	0.02	0.81	48	0.288
Tanner Drive	MH 166	MH 165	A107	RES MED	0.5	A106, A107	31.2	15.6	0.016	0.028	300	4.36	0.43	1.25	0.56	0.99	200	PVC	6.00%	80.339	0.01	2.56	61	3.660
Tanner Drive	MH 165	MH 164	A108	RES MED	0.63	A106 - A108	31.2	19.7	0.020	0.048	300	4.32	0.72	1.88	0.85	1.57	200	PVC	6.00%	80.339	0.02	2.56	61	3.660
Tanner Drive	MH 164	MH 163	A109	RES LOW	0.48	A106 - A109	17.2	8.2	0.008	0.056	300	4.30	0.84	2.36	1.06	1.90	200	PVC	3.70%	63.089	0.03	2.01	57	2.109
Tanner Drive	MH 163	MH 162	A110	RES MED	0.8	A106 - A110	31.2	25.0	0.025	0.081	300	4.27	1.20	3.16	1.42	2.63	200	PVC	3.00%	56.808	0.05	1.81	67	2.010
Tanner Drive	MH 162	MH 155	A111	RES LOW	0.28	A106 - A111	17.2	4.8	0.005	0.086	300	4.26	1.27	3.44	1.55	2.82	200	PVC	0.87%	30.592	0.09	0.97	55	0.479
William St	MH 158	MH 157	A112	RES LOW	0.84	A112	17.2	14.4	0.014	0.014	300	4.40	0.22	0.84	0.38	0.60	200	PVC	1.10%	34.399	0.02	1.09	36	0.396
William St	MH 157	MH 156	A113	RES LOW	0.67	A112, A113	17.2	11.5	0.011	0.026	300	4.36	0.39	1.51	0.68	1.07	200	PVC	8.36%	94.832	0.01	3.02	72	6.019
William St	William Dev.	MH 156	A113	RES MED	2.94	A112, A113	31.2	192.0	0.192	0.192	300	4.15	2.77	2.94	0.41	3.18	200	PVC	0.50%	23.192	0.14	0.74	72	0.360
William St	MH 156	MH 155	A114	RES LOW	0.64	A112 - A114	17.2	11.0	0.011	0.229	300	4.13	3.28	5.09	1.38	4.66	200	PVC	3.00%	56.808	0.08	1.81	75	2.250
William St	MH 155	MH 78	A115	RES LOW	0.28	A106 - A115	17.2	4.8	0.005	0.320	300	4.07	4.52	8.81	3.05	7.57	200	PVC	0.50%	23.192	0.33	0.74	75	0.375
Mill St	MH 79B	MH 79	A116	RES LOW	0.62	A116	17.2	10.6	0.011	0.011	300	4.41	0.16	0.62	0.28	0.44	200	VC	1.65%	42.130	0.01	1.34	90	1.485
Mill St	MH 79	MH 78	A117	RES LOW	1.13	A116, A117	17.2	19.4	0.019	0.030	300	4.35	0.45	1.75	0.79	1.24	200	VC	1.65%	42.130	0.03	1.34	90	1.485
Mill St	MH 78	MH 77	A118	RES LOW	1.16	A106 - A118	17.2	19.9	0.020	0.370	300	4.04	5.18	11.72	4.36	9.55	200	VC	2.09%	47.416	0.20	1.51	50	1.045
Mill St	MH 77	MH 76	A119	RES LOW	0.44	A106 - A119	17.2	7.6	0.008	0.377	300	4.03	5.29	12.16	4.56	9.85	200	VC	1.09%	34.243	0.29	1.09	74	0.807
Mill St	MH 76	MH 75	A120	RES LOW	0.83	A106 - A120	17.2	14.2	0.014	0.392	300	4.03	5.47	12.99	4.93	10.41	200	VC	0.88%	30.768	0.34	0.98	71	0.625
Mill St	MH 75	MH 74	A121	RES LOW	0.4	A106 - A121	17.2	6.9	0.007	0.398	300	4.02	5.57	13.39	5.11	10.68	200	VC	0.68%	27.046	0.39	0.86	52	0.354
Baker St	Stub	MH 74	A122	RES LOW	0.39	A122	17.2	6.7	0.007	0.007	300	4.43	0.10	0.39	0.18	0.28	200	PVC	0.50%	23.192	0.01	0.74	70	0.350
Mill St	MH 74	MH 73	A123	RES LOW	0.27	A106 - A123	17.2	4.6	0.005	0.410	300	4.02	5.72	14.05	5.41	11.13	200	VC	1.39%	38.669	0.29	1.23	55	0.765
Mill St	MH 73	MH 72	A124	RES LOW	0.37	A106 - A124	17.2	6.3	0.006	0.416	300	4.01	5.80	14.42	5.58	11.38	200	VC	0.98%	32.469	0.35	1.03	72	0.706
								0.0																
Edward St	MH 92	MH 91	A125	RES LOW	0.76	A125	17.2	13.0	0.013	0.013	300	4.40	0.20	0.76	0.34	0.54	200	VC	2.86%	55.467	0.01	1.77	75	2.145
Edward St	MH 91	MH 72	-	-	-	A125	-	-	-	0.013	300	4.40	0.20	0.76	0.34	0.54	200	VC	3.26%	59.219	0.01	1.89	26	0.848
Mill St	MH 72	MH 71	A126	RES LOW	0.29	A106 - A126	17.2	5.0	0.005	0.434	300	4.01	6.04	15.47	6.96	13.00	200	VC	0.55%	24.324	0.53	0.77	68	0.374
Mill St	MH 71	MH 70	A127	RES LOW	0.34	A106 - A127	17.2	5.8	0.006	0.440	300	4.00	6.11	15.81	7.11	13.23	200	VC	0.94%	31.799	0.42	1.01	81	0.761
Mill St	MH 70	MH 69	A128	COMM	0.77	A106 - A128	27.2	21.0	0.021	0.461	300	3.99	6.54	16.58	7.46	14.00	200	VC	1.42%	39.084	0.36	1.24	90	1.278
Mill St	MH 69	MH 22	A129	COMM	0.35	A106 - A129	27.2	9.5	0.010	0.470	300	3.99	6.61	16.93	7.62	14.23	200	VC	0.42%	21.256	0.67	0.68	80	0.336
North St	MH 22	MH 23	-	-	-	A106 - A129	-	-	-	2.473	300	3.51	30.26	79.20	23.59	53.85	300	VC	0.95%	94.252	0.57	1.33	80	0.760
Front St	MH 23	MH 21	A130	IND	0.18	A60 - A124	12.9	2.3	0.002	2.475	300	3.51	30.18	79.38	23.67	53.85	375	VC	0.43%	114.971	0.47	1.04	37.3	0.160
Emma St	stub	MH 146	A131	RES LOW	1.04	A131	17.2	17.8	0.018	0.018	300	4.39	0.27	1.04	0.47	0.74	200	VC	0.40%	20.744	0.04	0.66	50	0.200
Emma St	MH 146	MH 161	A132	RES LOW	0.54	A131, A132	17.2	9.3	0.009	0.027	300	4.36	0.41	1.58	0.71	1.12	200	VC	0.65%	26.443	0.04	0.84	57	0.371
Emma St	MH 161	MH 145	A133	RES LOW	0.2	A131 - A133	17.2	3.4	0.003	0.031	300	4.35	0.46	1.78	0.80	1.26	200	VC	0.59%	25.193	0.05	0.80	57	0.336
Front St	Annis St Pumping station (forcemain)	MH 19	-	-	-	ANNIS SPS			-	-	-	-	-	-	-	54.91	100	D.I.	F.M					
Front St	MH 19	MH 145	A134	RES MED	0.48	A134, Annis	31.2	15.0	0.015	0.015	300	4.40	0.23	0.48	0.22	55.35	300	VC	2.24%	144.567	0.38	2.05	37	0.827

DRAINAGE AREA DESCRIPTION																	OUTLET PIPE DATA								
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d)	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)	
Front St	MH 145	MH 20	A135	RES MED	0.49	A131 - A135, Annis	31.2	15.3	0.015	0.061	300	4.30	0.91	2.75	1.24	57.05	300	VC	0.76%	84.302	0.68	1.19	45	0.342	
Front St	MH 20	MH 21	A136	COMM	0.64	A131 - A136, Annis	27.2	17.4	0.017	0.078	300	4.27	1.16	3.39	1.53	57.59	300	VC	3.06%	169.157	0.34	2.39	79	2.417	
Henry St	MH 21	MH 132	A137	COMM	0.2	A60 - A137, Annis	27.2	5.4	0.005	2.559	300	3.50	31.10	82.97	25.29	111.29	375	VC	0.69%	145.640	0.76	1.32	52.2	0.360	
Henry St	MH 132	MH 131	A138	RES LOW	0.59	A60 - A138, Annis	17.2	10.1	0.010	2.569	300	3.50	31.21	83.56	25.55	111.67	375	VC	1.28%	198.363	0.56	1.80	57.7	0.739	
Highway 14	Rodgers Drive Pumping Station (forcemain)	MH 36	-	-	-	-	-	-	-	-	-	-	-	-	-	6.50	100	D.I.	F.M						S
Highway 14	MH 36	MH35	A139	RES LOW	0.44	A139, Rodgers	17.2	7.6	0.008	0.008	300	4.43	0.12	0.44	0.20	6.81	200	VC	0.62%	25.825	0.26	0.82	67	0.415	
Highway 14	MH35	MH 34	A140	RES LOW	0.89	A139, A140, Rodgers	17.2	15.3	0.015	0.023	300	4.37	0.35	1.33	0.60	7.45	200	VC	0.60%	25.427	0.29	0.81	82	0.493	
Highway 14	MH 34	MH 33	A141	RES LOW	0.67	A139 - A141, Rodgers	17.2	11.5	0.011	0.034	300	4.35	0.52	2.00	0.90	7.92	200	VC	0.42%	21.154	0.37	0.67	71	0.295	
Highway 14	MH 33	MH 32	A142	RES LOW	0.69	A139 - A142, Rodgers	17.2	11.8	0.012	0.046	300	4.32	0.69	2.69	1.21	8.40	200	VC	0.60%	25.469	0.33	0.81	70	0.422	
Highway 14	MH 32	MH 31	A143	COMM	2.7	A139 - A143, Rodgers	27.2	73.5	0.074	0.120	300	4.22	1.75	2.69	1.21	9.46	200	VC	0.45%	22.002	0.43	0.70	21	0.095	
Highway 14	MH 31	MH 30	-	-	-	A139 - A143, Rodgers	-	-	-	0.120	300	4.22	1.75	2.69	1.21	9.46	200	VC	0.87%	30.592	0.31	0.97	92	0.800	
Highway 14	Brown Shoe Dev.	MH 30	A143B	RES LOW	1.09	A139 - A143, Rodgers	17.2	34.0	0.034	0.034	300	4.35	0.51	1.09	0.15	0.67	250	VC	0.50%	42.050	0.02	0.86	21	0.105	
Highway 14	MH 30	MH 29	-	-	-	A139 - A143, Rodgers	-	-	-	0.154	300	4.19	2.23	3.78	1.36	10.10	200	VC	1.75%	43.388	0.23	1.38	61	1.068	
Highway 14	MH 29B	MH29	A143C	RES LOW	15.17	A139 - A143, Rodgers	17.2	473.0	0.473	0.473	300	3.99	6.55	15.17	2.12	8.67	250	VC	0.50%	42.050	0.21	0.86	21	0.105	
Front St	MH 29	MH 28	144	COMM	1.35	A139 - A144, Rodgers	27.2	36.8	0.037	0.663	300	3.91	9.00	20.30	4.09	19.60	200	VC	0.54%	24.102	0.81	0.77	107	0.578	
Front St	MH 28	MH 27	145	RES LOW	0.9	A139 - A145, Rodgers	17.2	15.4	0.015	0.679	300	3.90	9.20	21.20	4.50	20.20	200	VC	0.50%	23.192	0.87	0.74	92	0.460	
Front St	MH 27	MH 26	146	RES LOW	0.46	A139 - A146, Rodgers	17.2	7.9	0.008	0.687	300	3.90	9.30	21.66	4.71	20.51	200	VC	1.87%	44.851	0.46	1.43	46	0.860	
Front St	MH 26	MH 25	147	COMM	0.46	A139 - A147, Rodgers	27.2	12.5	0.013	0.699	300	3.89	9.46	22.12	4.91	20.87	200	VC	2.35%	50.279	0.42	1.60	61	1.434	
Front St	MH 24	MH 25	148	RES LOW	0.21	A148	17.2	3.6	0.004	0.004	300	4.45	0.06	0.21	0.09	0.15	200	VC	0.50%	23.192	0.01	0.74	46	0.230	
John St	MH 25	MH 142	149	RES LOW	0.21	A139 - A149, Rodgers	17.2	3.6	0.004	0.707	300	3.89	9.55	22.54	5.10	21.15	200	VC	0.47%	22.485	0.94	0.72	65	0.306	
Wright St	MH 143	MH 142	150	RES LOW	0.59	A150	17.2	10.1	0.010	0.010	300	4.41	0.16	0.59	0.27	6.92	200	VC	0.55%	24.324	0.28	0.77	61	0.336	
John St	MH 142	MH 141	151	RES LOW	0.5	A139 - A151, Rodgers	17.2	8.6	0.009	0.725	300	3.89	9.78	23.63	5.59	21.88	200	VC	0.47%	22.485	0.97	0.72	53	0.249	
John St	MH 141	MH 140	152	RES LOW	0.44	A139 - A152, Rodgers	17.2	7.6	0.008	0.733	300	3.88	9.88	24.07	5.79	22.17	200	VC	0.35%	19.404	Surcharged	0.62	53	0.186	S
Berwick Street	MH 166	MH 167	A153	RES LOW	0.66	A153	17.2	11.3	0.011	0.011	300	4.41	0.17	0.66	0.30	0.47	200	PVC	1.00%	32.798	0.01	1.04	44.5	0.445	
Berwick Street	MH 167	MH 168	A154	RES LOW	0.62	A153, A154	17.2	10.6	0.011	0.022	300	4.37	0.33	1.28	0.58	0.91	200	PVC	0.51%	23.423	0.04	0.75	67.7	0.345	
Berwick Street	MH 168	MH 169	A155	RES LOW	0.41	A153 - A155	17.2	7.0	0.007	0.029	300	4.36	0.44	1.69	0.76	1.20	200	PVC	0.50%	23.192	0.05	0.74	69	0.345	
Aberdeen Street	MH 169	MH 170	A156	RES LOW	0.44	A153 - A156	-	-	-	0.029	300	4.36	0.44	2.13	0.96	1.40	200	PVC	0.50%	23.192	0.06	0.74	30	0.150	
Aberdeen Street	MH 170	MH 171	-	RES LOW	-	A153 - A156	-	-	-	0.029	300	4.36	0.44	2.13	0.96	1.40	200	PVC	0.50%	23.192	0.06	0.74	61	0.305	
Carrick Street	MH 171B	MH 171	A156B, A156C	RES LOW	2.25	A153 - A155	48.0	108.0	0.108	0.108	300	4.23	1.59	2.25	0.32	1.90	200	PVC	0.50%	23.192	0.08	0.74	69	0.345	
Aberdeen Street	MH 171	MH 172	-	RES LOW	-	A153 - A156	-	-	-	0.137	300	4.20	2.00	4.38	1.27	3.27	200	PVC	0.50%	23.192	0.14	0.74	79	0.395	
Aberdeen Street	MH 172	MH 137	-	RES LOW	-	A153 - A156	-	-	-	0.137	300	4.20	2.00	4.38	1.27	3.27	200	PVC	0.50%	23.192	0.14	0.74	55	0.275	
Elizabeth St	MH 135	MH 137	A157	RES LOW	0.9	A157	17.2	15.4	0.015	0.015	300	4.39	0.24	0.90	0.41	0.64	200	VC	2.36%	50.386	0.01	1.60	78	1.841	
John St	Stub	MH 136	A158, 158B	RES LOW	1.05	A158	17.2	18.0	0.018	0.018	300	4.39	0.27	1.05	0.47	0.75	200	VC	0.50%	23.192	0.03	0.74	20	0.100	
John St	MH 136	MH 137	A159	RES LOW	0.66	A158, A159	17.2	11.3	0.011	0.029	300	4.36	0.44	1.71	0.77	1.21	200	VC	0.50%	23.192	0.05	0.74	63	0.315	
John St	MH 137	MH 138	A160	RES LOW	0.85	A153 - A160	17.2	14.6	0.015	0.088	300	4.26	1.31	7.84	2.83	4.14	200	VC	0.74%	28.214	0.15	0.90	64	0.474	
John St	MH 138	MH 139	A161	RES LOW	0.69	A153 - A161	17.2	11.8	0.012	0.100	300	4.24	1.48	8.53	3.14	4.62	200	VC	2.64%	53.291	0.09	1.70	55	1.452	
John St	MH 139	MH 140	A162	RES LOW	0.37	A153 - A162	17.2	6.3	0.006	0.107	300	4.24	1.57	8.90	3.31	4.87	200	VC	2.30%	49.741	0.10	1.58	55	1.265	
Robert St	MH 140	MH 144	A163	RES LOW	0.34	A139 - A163, Rodgers	17.2	5.8	0.006	0.845	300	3.85	11.29	33.31	9.25	27.04	200	VC	2.00%	46.384	0.58	1.48	61	1.220	
Robert St	MH 144	MH 130	-	-	-	A139 - A163, Rodgers	-	-	-	0.845	300	3.85	11.29	33.31	9.25	27.04	200	VC	1.44%	39.358	0.69	1.25	85	1.224	
Henry St	Henry St Pumping station (forcemain)	MH 127	-	-	-	Henry St. SPS	-	-	-	-	-	-	-	-	-	6.50	100	A.C	F.M						S
Holly Drv	MH 133C	MH 133B	A164	RES MED	1.42	A164	31.2	44.3	0.044	0.044	300	4.33	0.67	1.42	0.64	1.30	200	PVC	0.43%	21.407	0.06	0.68	102	0.435	
Holly Drv	MH 133B	MH 133A	A165	RES LOW	0.74	A164, A165	17.2	12.7	0.013	0.057	300	4.30	0.85	2.16	0.97	1.82	200	PVC	0.88%	30.803	0.06	0.98	70	0.617	
Holly Drv	MH 133A	MH 133	A166	RES LOW	0.84	A164 - A166	17.2	14.4	0.014	0.071	300	4.28	1.06	3.00	1.35	2.41	200	PVC	1.08%	34.069	0.07	1.08	92	0.993	
Elizabeth Street	MH 133	MH 127	A167	RES LOW	1.06	A164 - A167	17.2	18.2	0.018	0.090	300	4.26	1.32	4.06	1.83	3.15	200	VC	0.50%	23.192	0.14	0.74	109	0.545	
Henry St	MH 127	MH 128	A168	RES LOW	0.81	A164 - A168, Henry St. SPS	17.2	13.9	0.014	0.104	300	4.24	1.52	4.87	2.19	10.22	200	VC	1.00%	32.798	0.31	1.04	49	0.490	

DRAINAGE AREA DESCRIPTION																OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d)	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Henry St	MH 128	MH 129	A169	RES LOW	0.58	A164 - A169, Henry St. SPS	17.2	10.0	0.010	0.113	300	4.23	1.67	5.45	2.45	10.62	200	VC	1.06%	33.768	0.31	1.07	75	0.795
Henry St	MH 129	MH 130	A170	RES LOW	0.31	A164 - A170, Henry St. SPS	17.2	5.3	0.005	0.119	300	4.22	1.74	5.76	2.59	10.83	200	VC	0.93%	31.630	0.34	1.01	83	0.772
Henry St	MH 130	MH 130B	-	-		A139 - A171, Rodgers, Henry	-	-	-	0.964	300	3.81	12.75	39.07	11.84	37.60	375	VC	0.30%	96.032	0.39	0.87	10.1	0.030
Henry St	MH 130B	MH 131	A171	RES LOW	0.17	A139 - A171, Rodgers, Henry	17.2	2.9	0.003	0.967	300	3.81	12.79	39.24	11.92	37.71	375	VC	0.31%	97.620	0.39	0.88	51.9	0.161
George Station	MH 131	Pumping Station		-	-	A60 - A171, Annis, Rodgers, Henry	-	-	-	-	-	-	-	-	-	149.38	450	VC	0.50%	201.600	0.74	1.27	19	0.095

DESIGN PARAMETER

Mannings n =	0.0130	
Average Daily Flow (q)=	300	l/cap/d
Infiltration Rate (I) =	0.45	l/s/ha
New Development Infiltration rate	0.14	l/s/ha

Short-Term Development =
Medium-Term Development =
Full Buildout Development =

Designed By: Owen Perrett

Checked By: Matt Morkem

Dwg. Reference: Report Figures 2, 17, 18, 19

PROJECT: **STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT**

LOCATION: **Stirling, ON, Canada**

Project Number: 27931

Date: 30-Oct-23

Existing Frankford Road SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION																OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Weaver Street	STUB	MH Z2	A1	RES MED	0.51	A1	31.2	16	0.016	0.016	300	4.39	0.24	0.51	0.20	0.45	200	PVC	0.40%	20.74	0.02	0.66	18	0.072
Weaver Street	MH Z3	MH Z2	A2	RES MED	0.46	A1, A2	31.2	14	0.014	0.014	300	4.40	0.22	0.46	0.18	0.40	200	PVC	0.40%	20.74	0.02	0.66	56	0.224
Gorden Ave	MH Z2	MH Z4	A3	RES MED	0.53	A1 - A3	31.2	17	0.017	0.047	300	4.32	0.70	1.50	0.60	1.30	200	PVC	0.40%	20.74	0.06	0.66	90	0.360
Gorden Ave	MH Z4	MH Z5	A4	RES MED	0.71	A1 - A4	31.2	22	0.022	0.069	300	4.28	1.03	2.21	0.88	1.91	200	PVC	0.40%	20.74	0.09	0.66	90	0.360
Woods Drive	MH Z5	MH 117	A5	RES MED	0.55	A1 - A5	31.2	17	0.017	0.086	300	4.26	1.27	2.76	1.10	2.38	200	PVC	0.40%	20.74	0.11	0.66	97	0.388
Frankford Road	MH 119	MH 118	A6	RES LOW	1.39	A6	15.6	22	0.022	0.022	300	4.38	0.33	1.39	0.56	0.89	200	PVC	0.89%	30.94	0.03	0.98	117	1.041
Frankford Road	MH 118	MH 117A	A7	RES LOW	0.88	A6, A7	15.6	14	0.014	0.035	300	4.34	0.53	2.27	0.91	1.44	200	PVC	0.40%	20.74	0.07	0.66	90	0.360
Frankford Road	MH 117A	MH 117	A8	RES MED	0.63	A6 - A8	31.2	20	0.020	0.055	300	4.31	0.82	2.90	1.16	1.98	200	PVC	0.40%	20.74	0.10	0.66	90	0.360
Frankford Road	MH 117	MH 116A	A9	RES LOW	0.8	A1 - A9	15.6	12	0.012	0.154	300	4.19	2.23	6.46	2.58	4.82	200	PVC	0.75%	28.40	0.17	0.90	120	0.900
Frankford Road	MH 116A	MH 116C	A10	RES MED	0.51	A1 - A10	31.2	16	0.016	0.170	300	4.17	2.46	6.97	2.79	5.25	200	PVC	0.40%	20.74	0.25	0.66	90	0.360
Frankford Road	MH 159	MH 114	A13	RES MED	0.41	A13	31.2	13	0.013	0.013	300	4.40	0.20	0.41	0.16	0.36	200	PVC	0.90%	31.12	0.01	0.99	85	0.765
Frankford Road	MH 114	MH 115	A12	RES MED	0.76	A12, A13	31.2	24	0.024	0.037	300	4.34	0.55	1.17	0.47	1.02	200	PVC	0.55%	24.32	0.04	0.77	60	0.330
Frankford Road	MH 115	MH 116	A11	RES MED	0.67	A11 - A13	31.2	21	0.021	0.057	300	4.30	0.86	1.84	0.74	1.59	200	PVC	0.55%	24.32	0.07	0.77	63	0.347
Frankford Road	MH 116	MH 116C		RES MED		A11 - A13	31.2	0	0.000	0.057	300	4.30	0.86	1.84	0.74	1.59	200	PVC	0.55%	24.32	0.07	0.77	63	0.347
Frankford Road	MH 116C	Pumping Station	A14	RES MED	0.35	A1 - A14	31.2	11	0.011	0.238	300	4.12	3.40	9.16	3.66	7.07	200	PVC	0.59%	25.21	0.28	0.80	7	0.041

DESIGN PARAMETER

Mannings n = 0.0130
Average Daily Flow (q)=
Residential 300 l/cap/d
Infiltration Rate (I) = 0.4 l/s/ha
New Development Infiltration rate 0.14 l/s/ha

Designed By: Owen Perrett

Checked By: Matt Morkem

Dwg. Reference: Report Figures 2, 17, 18, 19

PROJECT: STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION: Stirling, ON, Canada

Project Number: 27931

Date: 30-Oct-23

Existing Annis Street SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION																OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	MANHOLE TO	INCREMENTAL AREA No.		INCREMENTAL AREA Ha	CONTRIBUTING AREAS	POPULATION Ppha	POPULATION P	POPULATION P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Cambellford Road	MH 39	MH 9E	A15	RES LOW	0.96	A15	15.6	14.976	0.015	0.015	300	4.40	0.23	0.96	0.27	0.50	200	PVC	0.54%	24.10	0.02	0.77	97	0.524
Cambellford Road	MH 9E	MH 9D	A16	RES LOW	0.81	A15, A16	15.6	12.636	0.013	0.028	300	4.36	0.42	1.77	0.50	0.91	200	PVC	0.54%	24.10	0.04	0.77	71	0.383
Cambellford Road	MH 9D	MH 9C	A17	RES LOW	0.69	A15 - A17	15.6	10.764	0.011	0.038	300	4.34	0.58	2.46	0.69	1.27	200	PVC	1.97%	46.03	0.03	1.47	82	1.615
Cambellford Road	MH 9C	MH 9B	A18	RES LOW	0.36	A15 - A18	15.6	5.616	0.006	0.044	300	4.33	0.66	2.82	0.79	1.45	200	PVC	3.43%	60.74	0.02	1.93	50	1.715
Cambellford Road	MH 9B	MH 9A	A19	RES LOW	0.39	A15 - A19	15.6	6.084	0.006	0.050	300	4.31	0.75	3.21	0.90	1.65	200	PVC	1.85%	44.61	0.04	1.42	60	1.110
Cambellford Road	MH 9A	MH 9	-	RES LOW	-	A15 - A19	-	-	-	0.050	300	4.31	0.75	3.21	0.90	1.65	200	PVC	4.50%	69.58	0.02	2.21	5	0.225
Front Street	MH 5	MH 6	A20	COMM	6.22	A20	27.23	169.391	0.169	0.169	300	4.17	2.45	6.22	1.74	4.20	200	PVC	1.01%	32.96	0.13	1.05	90	0.909
Front Street	Harvest Glen	MH 6	A21B	RES MED	4.13	A20, A21	19.6	81	0.081	0.250	300	4.11	3.57	10.35	1.45	5.02	200	VC	1.00%	32.80	0.15	1.04	96	0.960
Front Street	MH 6	MH 7	A21	RES MED	0.92	A20, A21	75	69	0.069	0.319	300	4.07	4.51	7.14	2.00	6.51	200	VC	1.00%	32.80	0.20	1.04	96	0.960
Front Street	MH 7	MH 8	A22	RES LOW	1.07	A20 - A22	15.6	16.692	0.017	0.336	300	4.06	4.73	8.21	2.30	7.03	200	VC	0.51%	23.33	0.30	0.74	101	0.511
Front Street	MH 8	MH 9	A23	RES LOW	1.1	A20 - A23	15.6	17.16	0.017	0.353	300	4.05	4.96	9.31	2.61	7.57	200	VC	0.50%	23.17	0.33	0.74	111	0.554
Front Street	MH 9	MH 10	A24	RES LOW	0.86	A15 - A24	15.6	13.416	0.013	0.417	300	4.01	5.81	13.38	3.75	9.55	200	VC	0.53%	23.88	0.40	0.76	97	0.514
Front Street	MH 10	MH 11	A25	RES LOW	1.17	A15 - A25	15.6	18.252	0.018	0.435	300	4.00	6.07	14.55	4.07	10.14	200	VC	0.41%	20.90	0.49	0.67	97	0.394
Front Street	**Frankford Road Pumping station (forcemain)**	MH 11		-												17.50	100	PVC	FM					
Front Street	MH 11	MH 12	A26	RES LOW	0.97	A15 - A26, Frankford SPS	15.6	15.132	0.015	0.450	300	4.00	6.25	15.52	4.35	28.09	300	VC	1.29%	109.83	0.26	1.55	100	1.290
Front Street	MH 12	MH 12A	A27	RES LOW	0.78	A15 - A27, Frankford SPS	15.6	12.168	0.012	0.462	300	3.99	6.44	16.30	4.56	28.50	300	VC	0.47%	66.29	0.43	0.94	92	0.432
Front Street	MH 12A	MH 13B	A28	RES LOW	0.31	A15 - A28, Frankford SPS	15.6	4.836	0.005	0.467	300	3.99	6.50	16.61	4.65	28.65	300	VC	0.47%	66.29	0.43	0.94	92	0.432
Church Street	MH 41A	MH 41	A29	RES LOW	1.09	A29	15.6	17.004	0.017	0.017	300	4.39	0.26	1.09	0.31	0.56	200	PVC	1.12%	34.63	0.02	1.10	87	0.970
Church Street	MH 41	MH 42	A30	RES LOW	1.23	A29, A30	15.6	19.188	0.019	0.036	300	4.34	0.55	2.32	0.65	1.20	200	VC	0.68%	27.05	0.04	0.86	80	0.544
Church Street	MH 42	MH 43	A31	RES LOW	1.23	A29 - A31	15.6	19.188	0.019	0.055	300	4.31	0.83	3.55	0.99	1.82	200	VC	1.75%	43.39	0.04	1.38	96	1.680
Church Street	MH 43	MH 44	A32	RES LOW	1.06	A29 - A32	15.6	16.536	0.017	0.072	300	4.28	1.07	4.61	1.29	2.36	200	VC	2.25%	49.20	0.05	1.57	92	2.070
Church Street	MH 52	MH 51	A33	RES LOW	0.69	A33	15.6	10.764	0.011	0.011	300	4.41	0.27	0.69	0.19	0.47	200	VC	0.52%	23.65	0.02	0.75	88	0.458
Church Street	MH 51	MH 50	A34	RES LOW	0.64	A33, A34	15.6	9.984	0.010	0.021	300	4.38	0.32	1.33	0.37	0.69	200	VC	0.57%	24.76	0.03	0.79	53	0.302
Church Street	MH 50	MH 49	A35	RES LOW	0.44	A33 - A35	15.6	6.864	0.007	0.028	300	4.36	0.42	1.77	0.50	0.91	200	VC	0.46%	22.24	0.04	0.71	53	0.244
Church Street	MH 49	MH 48	A36	RES LOW	0.49	A33 - A36	15.6	7.644	0.008	0.035	300	4.34	0.53	2.26	0.63	1.16	200	VC	0.74%	28.21	0.04	0.90	53	0.392
Church Street	MH 48	MH 47	A37	RES LOW	0.74	A33 - A37	15.6	11.544	0.012	0.047	300	4.32	0.70	3.00	0.84	1.54	200	VC	0.69%	27.24	0.06	0.87	53	0.366
Church Street	MH 47	MH 46	A38	RES LOW	0.52	A33 - A38	15.6	8.112	0.008	0.055	300	4.31	0.82	3.52	0.99	1.81	200	VC	0.37%	19.95	0.09	0.64	57	0.211
Church Street	MH 46	MH 44	A39	RES LOW	0.81	A33 - A39	15.6	12.636	0.013	0.068	300	4.29	1.01	4.33	1.21	2.22	200	VC	0.52%	23.65	0.09	0.75	64	0.333
Annis Street	MH 44	MH 45	A40	RES LOW	0.41	A29 - A40	15.6	6.396	0.006	0.146	300	4.19	2.12	9.35	2.62	4.74	200	VC	0.50%	23.19	0.20	0.74	55	0.275
Annis Street	MH 45	MH 13	A41	RES LOW	0.16	A29 - A41	15.6	2.496	0.002	0.148	300	4.19	2.16	9.51	2.66	4.82	200	VC	0.50%	23.19	0.21	0.74	55	0.275
St. James Street	Stub	MH 151	A42	RES MED	1.06	A42	31.2	33.072	0.033	0.033	300	4.35	0.50	1.06	0.30	0.80	200	PVC	N/A					
St. James Street	MH 149	MH 150	A43	RES LOW	1.11	A43	15.6	17.316	0.017	0.017	300	4.39	0.26	1.11	0.31	0.57	200	VC	0.54%	24.10	0.02	0.77	91	0.491
St. James Street	MH 150	MH 151	A44	RES LOW	2.79	A43, A44	15.6	43.524	0.044	0.061	300	4.30	1.11	3.90	1.09	2.20	200	VC	0.71%	27.62	0.08	0.88	91	0.645
Alan Street	MH 151	MH 15	A45	RES LOW	0.39	A42 - A45	15.6	6.084	0.006	0.100	300	4.24	1.47	5.35	1.50	2.97	200	VC	0.49%	22.86	0.13	0.73	97	0.471
Front Street	MH 19	MH 18	A46	RES LOW	1.04	A46	15.6	16.224	0.016	0.016	300	4.39	0.25	1.04	0.29	0.54	200	VC	0.78%	28.97	0.02	0.92	86	0.671
Front Street	MH 18	MH 17	A47	RES LOW	1.14	A46, A47	15.6	17.784	0.018	0.034	300	4.35	0.51	2.18	0.61	1.12	200	VC	1.91%	45.33	0.02	1.44	87	1.662
Front Street	MH 17	MH 16	A48	RES LOW	0.74	A46 - A48	15.6	11.544	0.012	0.046	300	4.32	0.68	2.92	0.82	1.50	200	VC	1.19%	35.78	0.04	1.14	64	0.762
Front Street	MH 16	MH 15	A49	RES LOW	0.58	A46 - A49	15.6	9.048	0.009	0.055	300	4.31	0.82	3.50	0.98	1.80	200	VC	1.19%	35.78	0.05	1.14	67	0.797
Front Street	MH 15	MH 14	A50	RES LOW	0.57	A42 - A50	15.6	8.892	0.009	0.163	300	4.18	2.37	9.42	2.64	5.01	200	VC	0.55%	24.32	0.21	0.77	56	0.308
Front Street	MH 14	MH 13B	A51	RES LOW	0.6	A42 - A51	15.6	9.36	0.009	0.173	300	4.17	2.50	10.02	2.81	5.31	200	VC	0.70%	27.44	0.19	0.87	61	0.427
Front Street	MH 13B	MH 13	-	RES LOW	-	A15-28, A42 - 51, Frankford SPS	-	-	-	0.640	300	3.92	8.70	26.63	7.46	33.66	300	VC	0.70%	80.91	0.42	1.14	61	0.427
Annis Station	MH 13	Pumping Station	-	-	-	A15 - A51, Frankford SPS	-	-	-	0.788	300	3.86	10.58	36.14	10.12	38.20	300	PVC	0.50%	68.38	0.56	0.97	12	0.060

DESIGN PARAMETER

Mannings n =	0.0130
Average Daily Flow (q)=	300 l/cap/d
Infiltration Rate (I) =	0.28 l/s/ha
New Development Infiltration rate	0.14 l/s/ha

Designed By: Owen Perrett

Checked By: Matt Morkem

Dwg. Reference: Report Figures 2, 17, 18, 19

PROJECT: STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION: Stirling, ON, Canada

Project Number: 27931

Date: 30-Oct-23

Existing Henry Street SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION																OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Henry street	**MH 121**	**SAN4**	A52	RES LOW	0.92	A52	15.6	14	0.014	0.014	300	4.40	0.22	0.92	0.32	0.54	200	PVC	3.70%	63.09	0.01	2.01	60	2.220
Henry street	SAN4	MH122	A53	RES LOW	0.88	A52, A53	15.6	14	0.014	0.028	300	4.36	0.43	1.80	0.63	1.06	200	PVC	1.04%	33.45	0.03	1.06	75	0.780
Henry street	**MH 122**	**MH 123**	A54	RES LOW	0.55	A52 - A54	15.6	9	0.009	0.037	300	4.34	0.55	2.35	0.82	1.37	200	PVC	1.00%	32.80	0.04	1.04	71	0.710
Henry street	**MH 123**	**MH 123B**					-	-	-	0.037	300	4.34	0.55	2.35	0.82	1.37	200	PVC	1.00%	32.80	0.04	1.04	71	0.710
Henry street	**MH 125**	**MH 124**	A55	RES LOW	1.12	A55	15.6	17	0.017	0.017	300	4.39	0.27	1.12	0.39	0.66	200	VC	1.32%	37.68	0.02	1.20	77	1.016
Henry street	MH 124	MH 123B	A56	RES LOW	0.9	A55, A56	15.6	14	0.014	0.032	300	4.35	0.48	2.02	0.71	1.18	200	VC	1.28%	37.11	0.03	1.18	77	0.986
Henry street	MH 123B	Pumping Station			-	A52 - A56	-	-	-	0.068	300	4.29	1.01	4.37	1.53	2.54	200	PVC	0.59%	25.19	0.10	0.80	5.1	0.030

DESIGN PARAMETER

Mannings n = 0.0130

Average Daily Flow (q)= 300 l/cap/d
Infiltration Rate (I) = 0.35 l/s/ha
New Development Infiltration rate 0.14 l/s/ha

Designed By: Owen Perrett

Checked By: Matt Morkem

Dwg. Reference: Report Figures 2, 17, 18, 19

PROJECT: STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION: Stirling, ON, Canada

Project Number: 27931

Date: 30-Oct-23

Existing Rogers Drive SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION																OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	MANHOLE TO	INCREMENTAL AREA No.		INCREMENTAL AREA Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Rodgers Drive	MH 38B	MH 38A	A57	RES LOW	1.08		15.6	17	0.017	0.017	300	4.39	0.26	1.08	0.54	0.80	200	AC	0.43%	21.38	0.04	0.68	91	0.387
Rodgers Drive	MH 38A	MH 38	A58	RES LOW	0.63		15.6	10	0.010	0.027	300	4.36	0.40	1.71	0.86	1.26	200	AC	0.42%	21.26	0.06	0.68	65	0.273
Rodgers Drive	MH 38	MH 37	A59	RES LOW	1.81		15.6	28	0.028	0.055	300	4.31	0.82	3.52	1.76	2.58	200	VC	0.54%	24.10	0.11	0.77	82	0.443
Rodgers Drive	MH 37	Pumping Station			3.52			0	0.000	0.055	300	4.31	0.82	3.52	1.76	2.58	150	VC	0.36%	9.14	0.28	0.52	4	0.014

DESIGN PARAMETER

Mannings n = 0.0130

Average Daily Flow (q)= 300 l/cap/d
Infiltration Rate (I) = 0.5 l/s/ha
New Development Infiltration rate 0.28 l/s/ha

Designed By: Owen Perrett

Checked By: Matt Morkem

Dwg. Reference: Report Figures 2, 17, 18, 19

PROJECT: STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION: Stirling, ON, Canada

Project Number: 27931

Date: 30-Oct-23

Existing George Street SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION																OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d)	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Baker Street	Stub	MH 90	A60	RES LOW	0.52	A60	55.8	29.0	0.029	0.029	300	4.36	0.44	0.52	0.23	0.67	200	VC	4.09%	66.331	0.01	2.11	75	3.068
Baker Street	Stub	MH 90	A60	RES LOW	0.43	A60	15.6	6.7	0.007	0.036	300	4.34	0.54	0.95	0.43	0.97	200	VC	4.09%	66.331	0.01	2.11	75	3.068
Baker Street	MH 90	MH 89	A61	RES MED	0.78	A60, A61	31.2	24.3	0.024	0.060	300	4.30	0.90	1.73	0.78	1.67	200	VC	4.09%	66.331	0.03	2.11	75	3.068
Baker Street	MH 89	MH 88	A62	RES LOW	0.79	A60 - A62	15.6	12.3	0.012	0.072	300	4.28	1.08	2.52	1.13	2.21	200	VC	5.02%	73.486	0.03	2.34	80	4.016
Wellington Street	MH 88	MH 93	A63	RES LOW	0.75	A60 - A63	15.6	11.7	0.012	0.084	300	4.26	1.24	3.27	1.47	2.72	200	VC	0.69%	27.323	0.10	0.87	108	0.750
Stirling Manor Nursing Home	MH 154	MH 95	A64	RES HIGH	1.93	A64	84.0	162.1	0.162	0.162	300	4.1799	2.65	1.93	0.87	3.52	200	VC	0.03	61.27	0.06	1.95	63	2.199
Edward Street	MH 95	MH 94	A65	RES LOW	1.03	A64, A65	15.6	16.1	0.016	0.178	300	4.17	2.58	2.96	1.33	3.91	200	VC	2.11%	47.642	0.08	1.52	78	1.646
Edward Street	MH 94	MH 93	A66	RES LOW	0.74	A64 - A66	15.6	11.5	0.012	0.190	300	4.16	2.74	3.70	1.67	4.40	200	VC	3.02%	56.998	0.08	1.81	78	2.356
Wellington Street	MH 93	MH 98	A67	RES LOW	0.6	A60 - A67	15.6	9.4	0.009	0.283	300	4.09	4.02	7.57	3.41	7.43	200	VC	2.50%	51.859	0.14	1.65	80	2.000
Wellington Street	MH 98	Nancy St.	A68	RES LOW	0.5	A60 - A68	15.6	7.8	0.008	0.291	300	4.08	4.13	8.07	3.63	7.76	200	VC	3.20%	58.672	0.13	1.87	30	0.960
Nancy Street	stub	Nancy St.	A69	RES HIGH	0.83	A69	84.0	69.7	0.070	0.070	300	4.28	1.04	0.83	0.37	1.41	200	VC	N/A					
Wellington Street	Nancy st.	MH 100	-	RES LOW	-	A60 - A69	-	-	-	0.361	300	4.04	5.06	8.90	4.01	9.07	200	VC	3.20%	58.672	0.15	1.87	50	1.600
Wellington Street	MH 100	MH 99	A70	RES LOW	0.11	A60 - A70	15.6	1.7	0.002	0.362	300	4.04	5.09	9.01	4.05	9.14	200	PVC	1.00%	32.798	0.28	1.04	16	0.160
Nancy Street	MH X0	MH X1*	A71	RES LOW	0.17	A71	15.6	2.7	0.003	0.003	300	4.46	0.04	0.17	0.08	0.12	200	PVC	1.00%	32.798	0.00	1.04	36	0.360
Nancy Street	MH X1	MH X2	A72	RES LOW	0.43	A71, A72	15.6	6.7	0.007	0.009	300	4.42	0.14	0.60	0.27	0.41	200	PVC	1.00%	32.798	0.01	1.04	110	1.100
Nancy Street	MH X2	MH X3	A73	RES LOW	1.33	A71 - A73	15.6	20.7	0.021	0.030	300	4.35	0.46	1.93	0.87	1.32	200	PVC	1.00%	32.798	0.04	1.04	90	0.900
Nancy Street	MH X3	MH 99	A74	RES LOW	0.59	A71 - A74	15.6	9.2	0.009	0.039	300	4.33	0.59	2.52	1.13	1.73	200	PVC	1.00%	32.798	0.05	1.04	65	0.650
Wellington Street	MH 99	MH 65	A75	RES LOW	0.24	A60 - A75	15.6	3.7	0.004	0.405	300	4.02	5.67	11.77	5.30	10.97	200	VC	0.55%	24.324	0.45	0.77	45	0.248
North Street	MH 68H	MH 68G	A76	INST	1.24	A76	7.5	9.3	0.009	0.009	300	4.42	0.14	1.24	0.56	0.70	200	PVC	1.58%	41.227	0.02	1.31	60	0.948
North Street	MH 68G	MH 68F	-	-	-	A76	-	-	-	0.009	300	4.42	0.15	1.24	0.56	0.71	200	PVC	1.29%	37.252	0.02	1.19	109	1.406
North Street	MH 68F	MH 68E	A77	INDU	0.36	A76, A77	27.2	9.8	0.010	0.019	300	4.38	0.30	1.60	0.72	1.02	200	PVC	2.55%	52.375	0.02	1.67	70	1.785
North Street	MH 68E	MH 68D	A78	INST	0.39	A76 - A78	7.5	2.9	0.003	0.022	300	4.37	0.35	1.99	0.90	1.25	200	PVC	2.17%	48.315	0.03	1.54	100	2.170
North Street	MH 68D	MH 68C	A79	COMM	0.45	A76 - A79	27.2	12.3	0.012	0.034	300	4.35	0.52	2.44	1.10	1.62	200	PVC	0.60%	25.406	0.06	0.81	103	0.618
North Street	MH 68C	MH 68B	A80	RES LOW	0.49	A76 - A80	15.6	7.6	0.008	0.042	300	4.33	0.63	2.93	1.32	1.95	200	PVC	0.67%	26.847	0.07	0.85	12	0.080
North Street	MH 68B	MH 68A	-	-	-	A76 - A80	-	-	-	0.042	300	4.33	0.65	2.93	1.32	1.97	200	PVC	0.56%	24.544	0.08	0.78	64	0.358
North Street	MH 68A	MH 68	A81	RES LOW	1.17	A76 - A81	15.6	18.3	0.018	0.060	300	4.30	0.92	4.10	1.85	2.76	200	PVC	0.55%	24.324	0.11	0.77	51	0.281
North Street	MH 68	MH 67	A82	RES LOW	0.57	A76 - A82	15.6	8.9	0.009	0.069	300	4.28	1.03	4.67	2.10	3.13	200	PVC	1.47%	39.766	0.08	1.27	100	1.470
North Street	MH 67	MH 66	A83	RES LOW	1.68	A76 - A83	15.6	26.2	0.026	0.095	300	4.25	1.45	6.35	2.86	4.30	200	PVC	0.60%	25.406	0.17	0.81	80	0.480
North Street	MH 66	MH 65A	A84	RES LOW	0.83	A76 - A84	15.6	12.9	0.013	0.108	300	4.23	1.64	7.18	3.23	4.87	200	PVC	0.60%	25.406	0.19	0.81	70	0.420
North Street	MH 65A	MH 65	-	-	-	A76 - A84	-	-	-	0.108	300	4.23	1.64	7.18	3.23	4.87	200	PVC	0.60%	25.406	0.19	0.81	5	0.030
North Street	MH 65	MH 64	A85	COMM	0.13	A60 - A85	27.2	3.5	0.004	0.517	300	3.97	7.12	19.08	8.59	15.71	200	VC	0.40%	20.744	0.76	0.66	60	0.240
North Street	MH 64	MH 63	A86	COMM	0.55	A60 - A86	27.2	15.0	0.015	0.532	300	3.96	7.32	19.63	8.83	16.15	200	VC	0.51%	23.423	0.69	0.75	60	0.306
North Street	MH 63	MH 62	A87	INST	0.36	A60 - A87	7.5	2.7	0.003	0.535	300	3.96	7.35	19.99	9.00	16.35	200	VC	0.69%	27.244	0.60	0.87	55	0.380
North Street	MH 62	MH 61	A88	RES LOW	0.19	A60 - A88	15.6	3.0	0.003	0.538	300	3.96	7.39	20.18	9.08	16.47	200	VC	0.74%	28.214	0.58	0.90	50	0.370
North Street	MH 61	MH 60	A89	COMM	0.62	A60 - A89	27.2	16.9	0.017	0.552	300	3.95	7.70	20.61	9.27	16.98	200	VC	1.60%	41.487	0.41	1.32	110	1.760
North Street	MH 60	MH 59	A90	COMM	0.25	A60 - A90	27.2	6.8	0.007	0.559	300	3.95	7.66	20.86	9.39	17.05	200	VC	1.60%	41.487	0.41	1.32	110	1.760
Gore Street	MH 109	MH 108	A91	RES LOW	0.44	A91	15.6	6.9	0.007	0.007	300	4.43	0.12	0.44	0.20	0.31	200	VC	1.65%	42.130	0.01	1.34	60	0.990
Gore Street	MH 108	MH 61	A92	INST	0.42	A91, A92	7.5	3.2	0.003	0.010	300	4.41	0.18	0.86	0.39	0.57	200	VC	3.83%	64.188	0.01	2.04	91	3.485
James Street	MH 108	MH 104	A93	INST	0.5	A91 - A93	7.5	3.8	0.004	0.014	300	4.40	0.24	1.36	0.61	0.85	200	VC	3.83%	64.188	0.01	2.04	91	3.485
James Street	STUB	MH 104	A94	RES LOW	0.18	A94	15.6	2.8	0.003	0.003	300	4.45	0.05	0.18	0.08	0.13	200	VC	1.65%	42.130	0.00	1.34	60	0.990
Victoria Street	MH 105	MH 104	A95	RES MED	0.43	A95	31.2	13.4	0.013	0.013	300	4.40	0.21	0.43	0.19	0.40	200	PVC	2.53%	52.169	0.01	1.66	74	1.872
Victoria Street	MH 104	MH 103	A96	RES LOW	0.29	A91 - A96	15.6	4.5	0.005	0.035	300	4.34	0.52	2.26	1.02	1.54	200	VC	0.77%	28.780	0.05	0.92	60	0.462
Victoria Street	MH 103	MH 59	A97	RES LOW	0.35	A91 - A97	15.6	5.5	0.005	0.040	300	4.33	0.60	2.61	1.17	1.78	200	VC	0.32%	18.554	0.10	0.59	57	0.182
North Street	MH 59	MH 58	-	-	-	A60 - A97	-	-	-	0.599	300	3.93	8.17	23.47	10.56	18.74	300	VC	1.51%	118.828	0.16	1.68	13.2	0.199
Station Street	stub	MH 153	A98	RES LOW	0.47	A98	15.6	7.3	0.007	0.007	300	4.43	0.11	0.47	0.21	0.32	200	VC	0.40%	20.744	0.02	0.66	50	0.200

Station Street	MH 153	MH 54	A99	RES LOW	0.46	A98, A99	15.6	7.2	0.007	0.015	300	4.40	0.22	0.93	0.42	0.64	200	VC	0.50%	23.192	0.03	0.74	46	0.230
Station Street	MH 54	MH 52	A100	RES LOW	0.53	A98 - A100	15.6	8.3	0.008	0.023	300	4.37	0.41	1.46	0.66	1.06	200	VC	0.53%	23.878	0.04	0.76	70	0.371
Station Street	MH 53	MH 52	A101	RES LOW	0.2	A101	15.6	3.1	0.003	0.003	300	4.45	0.05	0.20	0.09	0.14	200	VC	1.83%	44.369	0.00	1.41	50	0.915
Church Street	MH 52	MH 56	A102	RES LOW	1.04	A98 - A102	15.6	16.2	0.016	0.042	300	4.33	0.77	2.70	1.22	1.99	300	VC	0.70%	80.906	0.02	1.14	93.1	0.652
Church Street	MH 56	MH 57	A103	RES LOW	0.56	A98 - A103	15.6	8.7	0.009	0.051	300	4.31	0.76	3.26	1.47	2.23	300	VC	1.00%	96.701	0.02	1.37	53.3	0.533
Church Street	MH 57	MH 58	A104	RES LOW	0.34	A98 - A104	15.6	5.3	0.005	0.056	300	4.30	0.84	3.60	1.62	2.46	300	VC	1.44%	116.041	0.02	1.64	48.2	0.694
North Street	MH 58	MH 22	A105	COMM	0.23	A60 - A105	27.2	6.3	0.006	0.661	300	3.91	9.00	27.30	12.29	21.29	300	VC	0.65%	77.963	0.27	1.10	103.2	0.671
Tanner Drive	Stub	MH 166	A106	RES LOW	0.75	A106	15.6	11.7	0.012	0.012	300	4.41	0.18	0.75	0.34	0.52	200	PVC	0.60%	25.406	0.02	0.81	48	0.288
Tanner Drive	MH 166	MH 165	A107	RES MED	0.5	A106, A107	31.2	15.6	0.016	0.027	300	4.36	0.41	1.25	0.56	0.98	200	PVC	6.00%	80.339	0.01	2.56	61	3.660
Tanner Drive	MH 165	MH 164	A108	RES MED	0.63	A106 - A108	31.2	19.7	0.020	0.047	300	4.32	0.70	1.88	0.85	1.55	200	PVC	6.00%	80.339	0.02	2.56	61	3.660
Tanner Drive	MH 164	MH 163	A109	RES LOW	0.48	A106 - A109	15.6	7.5	0.007	0.054	300	4.31	0.81	2.36	1.06	1.88	200	PVC	3.70%	63.089	0.03	2.01	57	2.109
Tanner Drive	MH 163	MH 162	A110	RES MED	0.8	A106 - A110	31.2	25.0	0.025	0.079	300	4.27	1.18	3.16	1.42	2.60	200	PVC	3.00%	56.808	0.05	1.81	67	2.010
Tanner Drive	MH 162	MH 155	A111	RES LOW	0.28	A106 - A111	15.6	4.4	0.004	0.084	300	4.26	1.24	3.44	1.55	2.79	200	PVC	0.87%	30.592	0.09	0.97	55	0.479
William St	MH 158	MH 157	A112	RES LOW	0.84	A112	15.6	13.1	0.013	0.013	300	4.40	0.20	0.84	0.38	0.58	200	PVC	1.10%	34.399	0.02	1.09	36	0.396
William St	MH 157	MH 156	A113	RES LOW	0.67	A112, A113	15.6	10.5	0.010	0.024	300	4.37	0.36	1.51	0.68	1.04	200	PVC	8.36%	94.832	0.01	3.02	72	6.019
William St	MH 156	MH 155	A114	RES LOW	0.64	A112 - A114	15.6	10.0	0.010	0.034	300	4.35	0.51	2.15	0.97	1.47	200	PVC	3.00%	56.808	0.03	1.81	75	2.250
William St	MH 155	MH 78	A115	RES LOW	0.28	A106 - A115	15.6	4.4	0.004	0.122	300	4.22	1.78	5.87	2.64	4.42	200	PVC	0.50%	23.192	0.19	0.74	75	0.375
Mill St	MH 79B	MH 79	A116	RES LOW	0.62	A116	15.6	9.7	0.010	0.010	300	4.42	0.15	0.62	0.28	0.43	200	VC	1.65%	42.130	0.01	1.34	90	1.485
Mill St	MH 79	MH 78	A117	RES LOW	1.13	A116, A117	15.6	17.6	0.018	0.027	300	4.36	0.41	1.75	0.79	1.20	200	VC	1.65%	42.130	0.03	1.34	90	1.485
Mill St	MH 78	MH 77	A118	RES LOW	1.16	A106 - A118	15.6	18.1	0.018	0.167	300	4.18	2.42	8.78	3.95	6.37	200	VC	2.09%	47.416	0.13	1.51	50	1.045
Mill St	MH 77	MH 76	A119	RES LOW	0.44	A106 - A119	15.6	6.9	0.007	0.174	300	4.17	2.52	9.22	4.15	6.67	200	VC	1.09%	34.243	0.19	1.09	74	0.807
Mill St	MH 76	MH 75	A120	RES LOW	0.83	A106 - A120	15.6	12.9	0.013	0.187	300	4.16	2.70	10.05	4.52	7.22	200	VC	0.88%	30.768	0.23	0.98	71	0.625
Mill St	MH 75	MH 74	A121	RES LOW	0.4	A106 - A121	15.6	6.2	0.006	0.193	300	4.15	2.79	10.45	4.70	7.49	200	VC	0.68%	27.046	0.28	0.86	52	0.354
Baker St	Stub	MH 74	A122	RES LOW	0.39	A122	15.6	6.1	0.006	0.006	300	4.43	0.09	0.39	0.18	0.27	200	PVC	0.50%	23.192	0.01	0.74	70	0.350
Mill St	MH 74	MH 73	A123	RES LOW	0.27	A106 - A123	15.6	4.2	0.004	0.203	300	4.15	2.93	11.11	5.00	7.93	200	VC	1.39%	38.669	0.21	1.23	55	0.765
Mill St	MH 73	MH 72	A124	RES LOW	0.37	A106 - A124	15.6	5.8	0.006	0.209	300	4.14	3.01	11.48	5.17	8.17	200	VC	0.98%	32.469	0.25	1.03	72	0.706
								0.0																
Edward St	MH 92	MH 91	A125	RES LOW	0.76	A125	15.6	11.9	0.012	0.012	300	4.41	0.18	0.76	0.34	0.52	200	VC	2.86%	55.467	0.01	1.77	75	2.145
Edward St	MH 91	MH 72	-	-	-	A125	-	-	-	0.012	300	4.41	0.18	0.76	0.34	0.52	200	VC	3.26%	59.219	0.01	1.89	26	0.848
Mill St	MH 72	MH 71	A126	RES LOW	0.29	A106 - A126	15.6	4.5	0.005	0.226	300	4.13	3.23	12.53	5.64	8.87	200	VC	0.55%	24.324	0.36	0.77	68	0.374
Mill St	MH 71	MH 70	A127	RES LOW	0.34	A106 - A127	15.6	5.3	0.005	0.231	300	4.12	3.31	12.87	5.79	9.10	200	VC	0.94%	31.799	0.29	1.01	81	0.761
Mill St	MH 70	MH 69	A128	COMM	0.77	A106 - A128	27.2	21.0	0.021	0.252	300	4.11	3.74	13.64	6.14	9.88	200	VC	1.42%	39.084	0.25	1.24	90	1.278
Mill St	MH 69	MH 22	A129	COMM	0.35	A106 - A129	27.2	9.5	0.010	0.261	300	4.10	3.82	13.99	6.30	10.12	200	VC	0.42%	21.256	0.48	0.68	80	0.336
North St	MH 22	MH 23	-	-	-	A106 - A129	-	-	-	0.922	300	3.82	12.34	13.99	6.30	18.64	300	VC	0.42%	62.669	0.30	0.89	80	0.336
Front St	MH 23	MH 21	A130	IND	0.18	A60 - A124	12.9	2.3	0.002	0.925	300	3.82	12.27	41.47	18.66	30.93	375	VC	0.43%	114.971	0.27	1.04	37.3	0.160
Emma St	stub	MH 146	A131	RES LOW	1.04	A131	15.6	16.2	0.016	0.016	300	4.39	0.25	1.04	0.47	0.72	200	VC	0.40%	20.744	0.03	0.66	50	0.200
Emma St	MH 146	MH 161	A132	RES LOW	0.54	A131, A132	15.6	8.4	0.008	0.025	300	4.37	0.37	1.58	0.71	1.08	200	VC	0.65%	26.443	0.04	0.84	57	0.371
Emma St	MH 161	MH 145	A133	RES LOW	0.2	A131 - A133	15.6	3.1	0.003	0.028	300	4.36	0.42	1.78	0.80	1.22	200	VC	0.59%	25.193	0.05	0.80	57	0.336
Front St	Annis St Pumping station (forcemain)	MH 19	-	-	-	ANNIS SPS			-	-	-	-	-	-	-	48.90	100	D.I.	F.M					
Front St	MH 19	MH 145	A134	RES MED	0.48	A134, Annis	31.2	15.0	0.015	0.015	300	4.40	0.23	0.48	0.216	49.34	300	VC	2.24%	144.567	0.34	2.05	37	0.827
Front St	MH 145	MH 20	A135	RES MED	0.49	A131 - A135, Annis	31.2	15.3	0.015	0.058	300	4.30	0.87	2.75	1.2375	51.00	300	VC	0.76%	84.302	0.61	1.19	45	0.342
Front St	MH 20	MH 21	A136	COMM	0.64	A131 - A136, Annis	27.2	17.4	0.017	0.075	300	4.28	1.12	3.39	1.5255	51.55	300	VC	3.06%	169.157	0.30	2.39	79	2.417
Henry St	MH 21	MH 132	A137	COMM	0.2	A60 - A137, Annis	27.2	5.4	0.005	1.006	300	3.80	13.26	45.06	20.28	82.44	375	VC	0.69%	145.640	0.57	1.32	52.2	0.360
Henry St	MH 132	MH 131	A138	RES LOW	0.59	A60 - A138, Annis	15.6	9.2	0.009	1.015	300	3.80	13.38	45.65	20.54	82.82	375	VC	1.28%	198.363	0.42	1.80	57.7	0.739
Highway 14	Rodgers Drive Pumping Station (forcemain)	MH 36	-	-	-	-	-	-	-	-	-	-	-	-	-	6.50	100	D.I.	F.M					
Highway 14	MH 36	MH35	A139	RES LOW	0.44	A139, Rodgers	15.6	6.9	0.007	0.007	300	4.43	0.11	0.44	0.20	6.80	200	VC	0.62%	25.825	0.26	0.82	67	0.415
Highway 14	MH35	MH 34	A140	RES LOW	0.89	A139, A140, Rodgers	15.6	13.9	0.014	0.021	300	4.38	0.32	1.33	0.60	7.41	200	VC	0.60%	25.427	0.29	0.81	82	0.493
Highway 14	MH 34	MH 33	A141	RES LOW	0.67	A139 - A141, Rodgers	15.6	10.5	0.010	0.031	300	4.35	0.47	2.00	0.90	7.87	200	VC	0.42%	21.154	0.37	0.67	71	0.295
Highway 14	MH 33	MH 32	A142	RES LOW	0.69	A139 - A142, Rodgers	15.6	10.8	0.011	0.042	300	4.33	0.63	2.69	1.21	8.34	200	VC	0.60%	25.469	0.33	0.81	70	0.422
Highway 14	MH 32	MH 31	A143	COMM	2.7	A139 - A143, Rodgers	27.2	73.5	0.074	0.115	300	4.23	1.69	2.69	1.21	9.41	200	VC	0.45%	22.002	0.43	0.70	21	0.095
Highway 14	MH 31	MH 30	-	-	-	A139 - A143, Rodgers	-	-	-		300	4.50	0.00	2.69	1.21	7.71	200	VC	0.87%	30.592	0.25	0.97	92	0.800
Highway 14	MH 30	MH 29	-	-	-	A139 - A143, Rodgers	-	-	-		300	4.50	0.00	2.69	1.21	7.71	200	VC	1.75%	43.388	0.18	1.38	61	1.068
Front St	MH 29	MH 28	144	COMM	1.35	A139 - A144, Rodgers	27.2	36.8	0.037	0.152	300	4.19	2.21	4.04	1.82	10.53	200	VC	0.54%	24.102	0.44	0.77	107	0.578
Front St	MH 28	MH 27	145	RES LOW	0.9	A139 - A145, Rodgers	15.6	14.0	0.014	0.166	300	4.18	2.41	4.94	2.22	11.13	200	VC	0.50%	23.192	0.48	0.74	92	0.460
Front St	MH 27	MH 26	146	RES LOW	0.46	A139 - A146, Rodgers	15.6	7.2	0.007	0.173	300	4.17	2.51	5.40	2.43	11.44	200	VC	1.87%	44.851	0.26	1.43	46	0.860
Front St	MH 26	MH 25	147	COMM	0.46	A139 - A147, Rodgers	27.2	12.5	0.013	0.186	300	4.16	2.69	5.86	2.64	11.82	200	VC	2.35%	50.279	0.24	1.60	61	1.434
Front St	MH 24	MH 25	148	RES LOW	0.21	A148	15.6	3.3	0.003	0.003	300	4.45	0.05	0.21	0.09	0.15	200	VC	0.50%	23.192	0.01	0.74	46	0.230

John St	MH 25	MH 142	149	RES LOW	0.21	A139 - A149, Rodgers	15.6	3.3	0.003	0.193	300	4.15	2.78	6.28	2.83	12.10	200	VC	0.47%	22.485	0.54	0.72	65	0.306
Wright St	MH 143	MH 142	150	RES LOW	0.59	A150	15.6	9.2	0.009	0.009	300	4.42	0.14	0.59	0.27	6.91	200	VC	0.55%	24.324	0.28	0.77	61	0.336
John St	MH 142	MH 141	151	RES LOW	0.5	A139 - A151, Rodgers	15.6	7.8	0.008	0.210	300	4.14	3.01	7.37	3.32	12.83	200	VC	0.47%	22.485	0.57	0.72	53	0.249
John St	MH 141	MH 140	152	RES LOW	0.44	A139 - A152, Rodgers	15.6	6.9	0.007	0.216	300	4.14	3.11	7.81	3.51	13.12	200	VC	0.35%	19.404	0.68	0.62	53	0.186
Berwick Street	MH 166	MH 167	A153	RES LOW	0.66	A153	15.6	10.3	0.010	0.010	300	4.41	0.16	0.66	0.30	0.45	200	PVC	1.00%	32.798	0.01	1.04	44.5	0.445
Berwick Street	MH 167	MH 168	A154	RES LOW	0.62	A153, A154	15.6	9.7	0.010	0.020	300	4.38	0.30	1.28	0.58	0.88	200	PVC	0.51%	23.423	0.04	0.75	67.7	0.345
Berwick Street	MH 168	MH 169	A155	RES LOW	0.41	A153 - A155	15.6	6.4	0.006	0.026	300	4.36	0.40	1.69	0.76	1.16	200	PVC	0.50%	23.192	0.05	0.74	69	0.345
Aberdeen Street	MH 169	MH 170	A156	RES LOW	0.44	A153 - A156	-	-	-	-	-	-	-	2.13	0.96	1.36	200	PVC	0.50%	23.192	0.06	0.74	30	0.150
Aberdeen Street	MH 170	MH 171	-	RES LOW	-	A153 - A156	-	-	-	-	-	-	-	2.13	0.96	1.36	200	PVC	0.50%	23.192	0.06	0.74	61	0.305
Aberdeen Street	MH 171	MH 172	-	RES LOW	-	A153 - A156	-	-	-	-	-	-	-	2.13	0.96	1.36	200	PVC	0.50%	23.192	0.06	0.74	79	0.395
Aberdeen Street	MH 172	MH 137	-	RES LOW	-	A153 - A156	-	-	-	-	-	-	-	2.13	0.96	1.36	200	PVC	0.50%	23.192	0.06	0.74	55	0.275
Elizabeth St	MH 135	MH 137	A157	RES LOW	0.9	A157	15.6	14.0	0.014	0.014	300	4.40	0.21	0.90	0.41	0.62	200	VC	2.36%	50.386	0.01	1.60	78	1.841
John St	Stub	MH 136	A158	RES LOW	0.57	A158	15.6	8.9	0.009	0.009	300	4.42	0.14	0.57	0.26	0.39	200	VC	0.50%	23.192	0.02	0.74	20	0.100
John St	MH 136	MH 137	A159	RES LOW	0.66	A158, A159	15.6	10.3	0.010	0.019	300	4.38	0.29	1.23	0.55	0.85	200	VC	0.50%	23.192	0.04	0.74	63	0.315
John St	MH 137	MH 138	A160	RES LOW	0.85	A153 - A160	15.6	13.3	0.013	0.073	300	4.28	1.08	5.11	2.30	3.38	200	VC	0.74%	28.214	0.12	0.90	64	0.474
John St	MH 138	MH 139	A161	RES LOW	0.69	A153 - A161	15.6	10.8	0.011	0.084	300	4.26	1.24	5.80	2.61	3.85	200	VC	2.64%	53.291	0.07	1.70	55	1.452
John St	MH 139	MH 140	A162	RES LOW	0.37	A153 - A162	15.6	5.8	0.006	0.089	300	4.26	1.32	6.17	2.78	4.10	200	VC	2.30%	49.741	0.08	1.58	55	1.265
Robert St	MH 140	MH 144	A163	RES LOW	0.34	A139 - A163, Rodgers	15.6	5.3	0.005	0.311	300	4.07	4.40	14.32	6.44	17.34	200	VC	2.00%	46.384	0.37	1.48	61	1.220
Robert St	MH 144	MH 130	-	-	-	A139 - A163, Rodgers	-	-	-	0.311	300	4.07	4.40	14.32	6.44	17.34	200	VC	1.44%	39.358	0.44	1.25	85	1.224
Henry St	Henry St Pumping station (forcemain)	MH 127	-	-	-	Henry St. SPS	-	-	-	-	-	-	-	-	-	6.50	100	A.C	F.M					
Holly Drv	MH 133C	MH 133B	A164	RES MED	1.42	A164	31.2	44.3	0.044	0.044	300	4.33	0.67	1.42	0.64	1.30	200	PVC	0.43%	21.407	0.06	0.68	102	0.435
Holly Drv	MH 133B	MH 133A	A165	RES LOW	0.74	A164, A165	15.6	11.5	0.012	0.056	300	4.30	0.83	2.16	0.97	1.81	200	PVC	0.88%	30.803	0.06	0.98	70	0.617
Holly Drv	MH 133A	MH 133	A166	RES LOW	0.84	A164 - A166	15.6	13.1	0.013	0.069	300	4.28	1.03	3.00	1.35	2.38	200	PVC	1.08%	34.069	0.07	1.08	92	0.993
Elizabeth Street	MH 133	MH 127	A167	RES LOW	1.06	A164 - A167	15.6	16.5	0.017	0.085	300	4.26	1.26	4.06	1.83	3.09	200	VC	0.50%	23.192	0.13	0.74	109	0.545
Henry St	MH 127	MH 128	A168	RES LOW	0.81	A164 - A168, Henry St. SPS	15.6	12.6	0.013	0.098	300	4.25	1.45	4.87	2.19	10.14	200	VC	1.00%	32.798	0.31	1.04	49	0.490
Henry St	MH 128	MH 129	A169	RES LOW	0.58	A164 - A169, Henry St. SPS	15.6	9.0	0.009	0.107	300	4.24	1.58	5.45	2.45	10.53	200	VC	1.06%	33.768	0.31	1.07	75	0.795
Henry St	MH 129	MH 130	A170	RES LOW	0.31	A164 - A170, Henry St. SPS	15.6	4.8	0.005	0.112	300	4.23	1.65	5.76	2.59	10.74	200	VC	0.93%	31.630	0.34	1.01	83	0.772
Henry St	MH 130	MH 130B	-	-		A139 - A171, Rodgers, Henry	-	-	-	0.423	300	4.01	5.89	20.08	9.04	27.93	375	VC	0.30%	96.032	0.29	0.87	10.1	0.030
Henry St	MH 130B	MH 131	A171	RES LOW	0.17	A139 - A171, Rodgers, Henry	15.6	2.7	0.003	0.426	300	4.01	5.93	20.25	9.11	28.04	375	VC	0.31%	97.620	0.29	0.88	51.9	0.161
George Station	MH 131	Pumping Station		-	-	A60 - A171, Annis, Rodgers, Henry	-	-	-	-	-	-	-	-	-	110.86	450	VC	0.50%	201.600	0.55	1.27	19	0.095

DESIGN PARAMETER

Mannings n =	0.0130	
Average Daily Flow (q)=	300	l/cap/d
Infiltration Rate (I) =	0.45	l/s/ha
New Development Infiltration rate	0.28	l/s/ha

Designed By:
Owen Perrett

Checked By:
Matt Morkem

Dwg. Reference:
Report Figures 2, 17, 18, 19

PROJECT:
STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION:
Stirling, ON, Canada

Project Number:
27931

Date:
30-Oct-23

Short Term Growth Frankford Road SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION																	OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Weaver Street	MH Z1B	MH Z2	A1D	RES MED	0.6	A1D	20	12	0.012	0.012	300	4.41	0.18	0.60	0.08	0.27	200	PVC	0.40%	20.74	0.01	0.66	18	0.072
Weaver Street	MH Z1	MH Z2	A1	RES MED	0.51	A1, A1D	31.2	16	0.016	0.028	300	4.36	0.42	1.11	0.44	0.87	200	PVC	0.40%	20.74	0.04	0.66	18	0.072
Weaver Street	MH Z3	MH Z2	A2	RES MED	0.46	A1, A2	31.2	14	0.014	0.014	300	4.40	0.22	0.46	0.18	0.40	200	PVC	0.40%	20.74	0.02	0.66	56	0.224
Gorden Ave	MH Z2	MH Z4	A3	RES MED	0.53	A1 - A3	31.2	17	0.017	0.059	300	4.30	0.88	2.10	0.52	1.39	200	PVC	0.40%	20.74	0.07	0.66	90	0.360
Gorden Ave	MH Z4	MH Z5	A4	RES MED	0.71	A1 - A4	31.2	22	0.022	0.081	300	4.27	1.20	2.81	0.80	2.00	200	PVC	0.40%	20.74	0.10	0.66	90	0.360
Woods Drive	MH Z5	MH 117	A5	RES MED	0.55	A1 - A5	31.2	17	0.017	0.098	300	4.25	1.45	3.36	1.02	2.47	200	PVC	0.40%	20.74	0.12	0.66	97	0.388
Frankford Road	MH 119	MH 118	A6	RES LOW	1.39	A6	16.1	22	0.022	0.022	300	4.37	0.34	1.39	0.56	0.90	200	PVC	0.89%	30.94	0.03	0.98	117	1.041
Frankford Road	MH 118	MH 117A	A7	RES LOW	0.88	A6, A7	16.1	14	0.014	0.037	300	4.34	0.55	2.27	0.91	1.46	200	PVC	0.40%	20.74	0.07	0.66	90	0.360
Frankford Road	MH 117A	MH 117	A8	RES MED	0.63	A6 - A8	31.2	20	0.020	0.056	300	4.30	0.84	2.90	1.16	2.00	200	PVC	0.40%	20.74	0.10	0.66	90	0.360
Frankford Road	MH 117	MH 116A	A9	RES LOW	0.8	A1 - A9, A1D	16.1	13	0.013	0.167	300	4.18	2.42	7.06	2.50	4.92	200	PVC	0.75%	28.40	0.17	0.90	120	0.900
Frankford Road	MH 116A	MH 116C	A10	RES MED	0.51	A1 - A10, A1D	31.2	16	0.016	0.183	300	4.16	2.65	7.57	2.70	5.35	200	PVC	0.40%	20.74	0.26	0.66	90	0.360
Frankford Road	MH 159	MH 114	A13	RES MED	0.41	A13	31.2	13	0.013	0.013	300	4.40	0.20	0.41	0.16	0.36	200	PVC	0.90%	31.12	0.01	0.99	85	0.765
Frankford Road	MH 114	MH 115	A12	RES MED	0.76	A12, A13	31.2	24	0.024	0.037	300	4.34	0.55	1.17	0.47	1.02	200	PVC	0.55%	24.32	0.04	0.77	60	0.330
Frankford Road	MH 115	MH 116	A11	RES MED	0.67	A11 - A13	31.2	21	0.021	0.057	300	4.30	0.86	1.84	0.74	1.59	200	PVC	0.55%	24.32	0.07	0.77	63	0.347
Frankford Road	MH 116	MH 116C		RES MED		A11 - A13	31.2	0	0.000	0.057	300	4.30	0.86	1.84	0.74	1.59	200	PVC	0.55%	24.32	0.07	0.77	63	0.347
Frankford Road	MH 116C	Pumping Station	A14	RES MED	0.35	A1 - A14, A1D	31.2	11	0.011	0.251	300	4.11	3.59	9.76	3.58	7.17	200	PVC	0.59%	25.21	0.28	0.80	7	0.041

DESIGN PARAMETER

Mannings n =	0.0130
Average Daily Flow (q)=	300 l/cap/d
Infiltration Rate (I) =	0.4 l/s/ha
New Development Infiltration rate	0.14 l/s/ha

Short-Term Development =
Medium-Term Development =
Full Buildout Development =

Designed By: Owen Perrett

Checked By: Matt Morkem

Dwg. Reference: Report Figures 2, 17, 18, 19

PROJECT: STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION: Stirling, ON, Canada

Project Number: 27931

Date: 30-Oct-23

Short Term Growth Annis Street SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION							POPULATION										OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	MANHOLE TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Cambellford Road	MH 39	MH 9E	A15	RES LOW	0.96	A15	16.1	15.456	0.015	0.015	300	4.39	0.24	0.96	0.27	0.50	200	PVC	0.54%	24.10	0.02	0.77	97	0.524
Cambellford Road	MH 9E	MH 9D	A16	RES LOW	0.81	A15, A16	16.1	13.041	0.013	0.028	300	4.36	0.43	1.77	0.50	0.93	200	PVC	0.54%	24.10	0.04	0.77	71	0.383
Cambellford Development	Campbellford Dev.	MH 9F	A16C	RES HIGH	9.24	A16C	55.8	516.0	0.516	0.516	300	3.97	7.11	9.24	1.29	8.40	200	PVC	0.50%	23.19	0.36	0.74	10	0.050
Old Rail Bed	MH 9F	MH 9D	A16B	-	0.41	A16C, A16B	-	-	-	0.516	300	3.97	7.11	9.65	1.35	8.46	200	PVC	0.50%	23.19	0.36	0.74	150	0.750
Cambellford Road	MH 9D	MH 9C	A17	RES LOW	0.69	A15 - A17	16.1	11.109	0.011	0.556	300	3.95	7.62	12.11	2.04	9.66	200	PVC	1.97%	46.03	0.21	1.47	82	1.615
Cambellford Road	MH 9C	MH 9B	A18	RES LOW	0.36	A15 - A18	16.1	5.796	0.006	0.561	300	3.95	7.70	12.47	2.14	9.84	200	PVC	3.43%	60.74	0.16	1.93	50	1.715
Cambellford Road	MH 9B	MH 9A	A19	RES LOW	0.39	A15 - A19	16.1	6.279	0.006	0.568	300	3.95	7.78	12.86	2.25	10.03	200	PVC	1.85%	44.61	0.22	1.42	60	1.110
Cambellford Road	MH 9A	MH 9	-	RES LOW	-	A15 - A19	-	-	-	0.568	300	3.95	7.78	12.86	2.25	10.03	200	PVC	4.50%	69.58	0.14	2.21	5	0.225
Front Street	MH 5	MH 6	A20	COMM	6.22	A20	27.23	169.391	0.169	0.169	300	4.17	2.45	6.22	1.74	4.20	200	PVC	1.01%	32.96	0.13	1.05	90	0.909
Front Street	Harvest Glen	MH 6	A21B	RES MED	4.13	A20, A21	47.1	194.4	0.194	0.364	300	4.04	5.10	10.35	1.45	6.55	200	VC	1.00%	32.80	0.20	1.04	96	0.960
Front Street	MH 6	MH 7	A21	RES MED	0.92	A20, A21	75	69	0.069	0.433	300	4.01	6.02	11.27	3.16	9.18	200	VC	1.00%	32.80	0.28	1.04	96	0.960
Front Street	MH 7	MH 8	A22	RES LOW	1.07	A20 - A22	16.1	17.227	0.017	0.450	300	4.00	6.25	12.34	3.46	9.70	200	VC	0.51%	23.33	0.42	0.74	101	0.511
Front Street	MH 8	MH 9	A23	RES LOW	1.1	A20 - A23	16.1	17.71	0.018	0.468	300	3.99	6.48	13.44	3.76	10.24	200	VC	0.50%	23.17	0.44	0.74	111	0.554
Front Street	MH 9	MH 10	A24	RES LOW	0.86	A15 - A24	16.1	13.846	0.014	1.049	300	3.79	13.79	27.16	6.25	20.05	200	VC	0.53%	23.88	0.84	0.76	97	0.514
Front Street	MH 10	MH 11	A25	RES LOW	1.17	A15 - A25	16.1	18.837	0.019	1.068	300	3.78	14.04	28.33	6.58	20.63	200	VC	0.41%	20.90	0.99	0.67	97	0.394
Front Street	**Frankford Road Pumping station (forcemain)**	MH 11		-												17.50	100	PVC	FM					
Front Street	MH 11	MH 12	A26	RES LOW	0.97	A15 - A26, Frankford SPS	16.1	15.617	0.016	1.084	300	3.78	14.21	29.30	6.85	38.57	300	VC	1.29%	109.83	0.35	1.55	100	1.290
Front Street	MH 12	MH 12A	A27	RES LOW	0.78	A15 - A27, Frankford SPS	16.1	12.558	0.013	1.096	300	3.77	14.40	30.08	7.07	38.97	300	VC	0.47%	66.29	0.59	0.94	92	0.432
Front Street	MH 12	MH 12A	A27B	RES HIGH	-	A15 - A27, Frankford SPS	73.64	57.442	0.057	1.154	300	3.76	15.09	30.08	7.07	22.16	300	VC	0.47%	66.29	0.33	0.94	92	0.432
Front Street	MH 12A	MH 13B	A28	RES LOW	0.31	A15 - A28, Frankford SPS	16.1	4.991	0.005	1.159	300	3.76	15.15	30.39	7.16	39.81	300	VC	0.47%	66.29	0.60	0.94	92	0.432
Church Street	MH 41A	MH 41	A29	RES LOW	1.09	A29	16.1	17.549	0.018	0.018	300	4.39	0.27	1.09	0.31	0.57	200	PVC	1.12%	34.63	0.02	1.10	87	0.970
Church Street	MH 41	MH 42	A30	RES LOW	1.23	A29, A30	16.1	19.803	0.020	0.037	300	4.34	0.56	2.32	0.65	1.21	200	VC	0.68%	27.05	0.04	0.86	80	0.544
Church Street	MH 42	MH 43	A31	RES LOW	1.23	A29 - A31	16.1	19.803	0.020	0.057	300	4.30	0.85	3.55	0.99	1.85	200	VC	1.75%	43.39	0.04	1.38	96	1.680
Church Street	MH 43	MH 44	A32	RES LOW	1.06	A29 - A32	16.1	17.066	0.017	0.074	300	4.28	1.10	4.61	1.29	2.39	200	VC	2.25%	49.20	0.05	1.57	92	2.070
Church Street	MH 52	MH 51	A33	RES LOW	0.69	A33	16.1	11.109	0.011	0.011	300	4.41	0.28	0.69	0.19	0.47	200	VC	0.52%	23.65	0.02	0.75	88	0.458
Church Street	MH 51	MH 50	A34	RES LOW	0.64	A33, A34	16.1	10.304	0.010	0.021	300	4.38	0.33	1.33	0.37	0.70	200	VC	0.57%	24.76	0.03	0.79	53	0.302
Church Street	MH 50	MH 49	A35	RES LOW	0.44	A33 - A35	16.1	7.084	0.007	0.028	300	4.36	0.43	1.77	0.50	0.93	200	VC	0.46%	22.24	0.04	0.71	53	0.244
Church Street	MH 49	MH 48	A36	RES LOW	0.49	A33 - A36	16.1	7.889	0.008	0.036	300	4.34	0.55	2.26	0.63	1.18	200	VC	0.74%	28.21	0.04	0.90	53	0.392
Church Street	MH 48	MH 47	A37	RES LOW	0.74	A33 - A37	16.1	11.914	0.012	0.048	300	4.32	0.72	3.00	0.84	1.56	200	VC	0.69%	27.24	0.06	0.87	53	0.366
Church Street	MH 47	MH 46	A38	RES LOW	0.52	A33 - A38	16.1	8.372	0.008	0.057	300	4.30	0.85	3.52	0.99	1.83	200	VC	0.37%	19.95	0.09	0.64	57	0.211
Church Street	MH 46	MH 44	A39	RES LOW	0.81	A33 - A39	16.1	13.041	0.013	0.070	300	4.28	1.04	4.33	1.21	2.25	200	VC	0.52%	23.65	0.10	0.75	64	0.333
Annis Street	MH 44	MH 45	A40	RES LOW	0.41	A29 - A40	16.1	6.601	0.007	0.151	300	4.19	2.19	9.35	2.62	4.81	200	VC	0.50%	23.19	0.21	0.74	55	0.275
Annis Street	MH 45	MH 13	A41	RES LOW	0.16	A29 - A41	16.1	2.576	0.003	0.153	300	4.19	2.23	9.51	2.66	4.89	200	VC	0.50%	23.19	0.21	0.74	55	0.275
St. James Street	Stub	MH 151	A42	RES MED	1.06	A42	31.2	33.072	0.033	0.033	300	4.35	0.50	1.06	0.30	0.80	200	PVC	N/A					
St. James Street	MH 149	MH 150	A43	RES LOW	1.11	A43	16.1	17.871	0.018	0.018	300	4.39	0.27	1.11	0.31	0.58	200	VC	0.54%	24.10	0.02	0.77	91	0.491
St. James Street	MH 150	MH 151	A44	RES LOW	2.79	A43, A44	16.1	44.919	0.045	0.063	300	4.29	1.14	3.90	1.09	2.23	200	VC	0.71%	27.62	0.08	0.88	91	0.645
Alan Street	MH 151	MH 15	A45	RES LOW	0.39	A42 - A45	16.1	6.279	0.006	0.102	300	4.24	1.50	5.35	1.50	3.00	200	VC	0.49%	22.86	0.13	0.73	97	0.471
Front Street	MH 19	MH 18	A46	RES LOW	1.04	A46	16.1	16.744	0.017	0.017	300	4.39	0.26	1.04	0.29	0.55	200	VC	0.78%	28.97	0.02	0.92	86	0.671
Front Street	MH 18	MH 17	A47	RES LOW	1.14	A46, A47	16.1	18.354	0.018	0.035	300	4.34	0.53	2.18	0.61	1.14	200	VC	1.91%	45.33	0.03	1.44	87	1.662
Front Street	MH 17	MH 16	A48	RES LOW	0.74	A46 - A48	16.1	11.914	0.012	0.047	300	4.32	0.71	2.92	0.82	1.52	200	VC	1.19%	35.78	0.04	1.14	64	0.762
Front Street	MH 16	MH 15	A49	RES LOW	0.58	A46 - A49	16.1	9.338	0.009	0.056	300	4.30	0.84	3.50	0.98	1.82	200	VC	1.19%	35.78	0.05	1.14	67	0.797
Front Street	MH 15	MH 14	A50	RES LOW	0.57	A42 - A50	16.1	9.177	0.009	0.168	300	4.17	2.43	9.42	2.64	5.07	200	VC	0.55%	24.32	0.21	0.77	56	0.308
Front Street	MH 14	MH 13B	A51	RES LOW	0.6	A42 - A51	16.1	9.66	0.010	0.177	300	4.17	2.57	10.02	2.81	5.37	200	VC	0.70%	27.44	0.20	0.87	61	0.427
Front Street	MH 13B	MH 13	-	RES LOW	-	A15-28, A42 - 51, Frankford SPS	-	-	-	1.336	300	3.72	17.24	40.41	9.96	44.70	300	VC	0.70%	80.91	0.55	1.14	61	0.427
Annis Station	MH 13	Pumping Station	-	-	-	A15 - A51, Frankford SPS	-	-	-	1.489	300	3.68	19.04	49.92	12.63	49.16	300	PVC	0.50%	68.38	0.72	0.97	12	0.060

DESIGN PARAMETER

Mannings n = 0.0130
Average Daily Flow (q)= 300 l/cap/d
Infiltration Rate (I) = 0.28 l/s/ha
New Development Infiltration rate 0.14 l/s/ha

Short-Term Development =
Medium-Term Development =
Full Buildout Development =

Designed By: Owen Perrett

Checked By: Matt Morkem

Dwg. Reference: Report Figures 2, 17, 18, 19

PROJECT: STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION: Stirling, ON, Canada

Project Number: 27931

Date: 30-Oct-23

Short Term Growth Henry Street SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION																OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Henry street	**MH 121**	**SAN4**	A52	RES LOW	0.92	A52	16.1	15	0.015	0.015	300	4.40	0.23	0.92	0.32	0.55	200	PVC	3.70%	63.09	0.01	2.01	60	2.220
Henry street	SAN4	MH122	A53	RES LOW	0.88	A52, A53	16.1	14	0.014	0.029	300	4.36	0.44	1.80	0.63	1.07	200	PVC	1.04%	33.45	0.03	1.06	75	0.780
Henry street	**MH 122**	**MH 123**	A54	RES LOW	0.55	A52 - A54	16.1	9	0.009	0.038	300	4.34	0.57	2.35	0.82	1.39	200	PVC	1.00%	32.80	0.04	1.04	71	0.710
Henry street	**MH 123**	**MH 123B**					-	-	-	0.038	300	4.34	0.57	2.35	0.82	1.39	200	PVC	1.00%	32.80	0.04	1.04	71	0.710
Carrick Street	MH 124F	MH 124E	A158E	RES LOW	1.31	A153 - A155	18.3	24.0	0.024	0.024	300	4.37	0.36	1.31	0.18	0.55	200	PVC	0.50%	23.19	0.02	0.74	69	0.345
Carrick Street	MH 124E	MH 124D	A158D	RES LOW	1.25	A153 - A155	17.3	21.6	0.022	0.046	300	4.32	0.68	2.56	0.36	1.04	200	PVC	0.50%	23.192	0.04	0.74	69	0.345
Carrick Street	MH 124D	MH 124C	-	RES LOW	-	A153 - A155	-	-	-	0.046	300	4.32	0.68	2.56	0.36	1.04	200	PVC	0.50%	23.192	0.04	0.74	69	0.345
Carrick Street	MH 124G	MH 124C	A158C	RES LOW	0.92	A153 - A155	20.9	19.2	0.019	0.019	300	4.38	0.29	0.92	0.13	0.42	200	PVC	0.50%	23.192	0.02	0.74	69	0.345
Carrick Street	MH 124H	MH 124C	A158B	RES LOW	0.73	A153 - A155	20.9	15.3	0.015	0.015	300	4.40	0.23	0.73	0.10	0.34	200	PVC	0.50%	23.192	0.01	0.74	69	0.345
Carrick Street	MH 124C	MH 124B	A158F	RES LOW	0.97	A153 - A155	20.9	20.3	0.020	0.100	300	4.24	1.48	5.18	0.73	2.20	200	PVC	0.50%	23.192	0.10	0.74	69	0.345
Carrick Street	MH 124B	MH 124	-	RES LOW	-	A153 - A155	-	-	-	0.100	300	4.24	1.48	5.18	0.73	2.20	200	PVC	0.50%	23.192	0.10	0.74	69	0.345
Henry street	**MH 125**	**MH 124**	A55	RES LOW	1.12	A55	16.1	18	0.018	0.018	300	4.39	0.27	1.12	0.39	0.67	200	VC	1.32%	37.68	0.02	1.20	77	1.016
Henry street	MH 124	MH 123B	A56	RES LOW	0.9	A55, A56	16.1	14	0.014	0.133	300	4.21	1.94	7.20	1.43	3.37	200	VC	1.28%	37.11	0.09	1.18	77	0.986
Henry street	MH 123B	Pumping Station			-	A52 - A56	-	-	-	0.171	300	4.17	2.47	9.55	2.25	4.73	200	PVC	0.59%	25.19	0.19	0.80	5.1	0.030

DESIGN PARAMETER

Mannings n =	0.0130	
Average Daily Flow (q)=	300	l/cap/d
Infiltration Rate (I) =	0.35	l/s/ha
New Development Infiltration rate	0.14	l/s/ha

Short-Term Development =
Medium-Term Development =
Full Buildout Development =

Designed By: Owen Perrett

Checked By: Matt Morkem

Dwg. Reference: Report Figures 2, 17, 18, 19

PROJECT: STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION: Stirling, ON, Canada

Project Number: 27931

Date: 30-Oct-23

Short Term Growth Rogers Drive SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION																								
LOCATION	MANHOLE FROM	MANHOLE TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	OUTLET PIPE DATA SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Rodgers Drive	MH 38B	MH 38A	A57	RES LOW	1.08		16.1	17	0.017	0.017	300	4.39	0.26	1.08	0.54	0.80	200	AC	0.43%	21.38	0.04	0.68	91	0.387
Rodgers Drive	MH 38A	MH 38	A58	RES LOW	0.63		16.1	10	0.010	0.028	300	4.36	0.42	1.71	0.86	1.27	200	AC	0.42%	21.26	0.06	0.68	65	0.273
Rodgers Drive	MH 38	MH 37	A59	RES LOW	1.81		16.1	29	0.029	0.057	300	4.30	0.85	3.52	1.76	2.61	200	VC	0.54%	24.10	0.11	0.77	82	0.443
Rodgers Drive	MH 37	Pumping Station			3.52			0	0.000	0.057	300	4.30	0.85	3.52	1.76	2.61	150	VC	0.36%	9.14	0.29	0.52	4	0.014

DESIGN PARAMETER

Mannings n = 0.0130
Average Daily Flow (q)= 300 l/cap/d
Infiltration Rate (I) = 0.5 l/s/ha
New Development Infiltration rate 0.14 l/s/ha

Short-Term Development =
Medium-Term Development =
Full Buildout Development =

Designed By: Owen Perrett

Checked By: Matt Morkem

Dwg. Reference: Report Figures 2, 17, 18, 19

PROJECT: STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION: Stirling, ON, Canada

Project Number: 27931

Date: 30-Oct-23

Short Term Growth George Street SPS Sanitary Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DRAINAGE AREA DESCRIPTION															OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Baker Street	Stub	MH 90	A60	RES LOW	0.52	A60	55.8	29.0	0.029	0.029	300	4.36	0.44	0.52	0.07	0.51	200	VC	4.09%	66.331	0.01	2.11	75	3.068
Baker Street	Stub	MH 90	A60	RES LOW	0.43	A60	16.1	6.9	0.007	0.036	300	4.34	0.54	0.95	0.43	0.97	200	VC	4.09%	66.331	0.01	2.11	75	3.068
Baker Street	MH 90	MH 89	A61	RES MED	0.78	A60, A61	31.2	24.3	0.024	0.060	300	4.30	0.90	1.73	0.78	1.68	200	VC	4.09%	66.331	0.03	2.11	75	3.068
Baker Street	MH 89	MH 88	A62	RES LOW	0.79	A60 - A62	16.1	12.7	0.013	0.073	300	4.28	1.08	2.52	1.13	2.22	200	VC	5.02%	73.486	0.03	2.34	80	4.016
Wellington Street	MH 88	MH 93	A63	RES LOW	0.75	A60 - A63	16.1	12.1	0.012	0.085	300	4.26	1.26	3.27	1.47	2.73	200	VC	0.69%	27.323	0.10	0.87	108	0.750
Stirling Manor Nursing Home	MH 154	MH 95	A64	RES HIGH	1.93	A64	84.0	162.1	0.162	0.162	300	4.1799	2.65	1.93	0.87	3.52	200	VC	0.03	61.27	0.06	1.95	63	2.199
Edward Street	MH 95	MH 94	A65	RES LOW	1.03	A64, A65	16.1	16.6	0.017	0.179	300	4.17	2.58	2.96	1.33	3.92	200	VC	2.11%	47.642	0.08	1.52	78	1.646
Edward Street	MH 94	MH 93	A66	RES LOW	0.74	A64 - A66	16.1	11.9	0.012	0.191	300	4.16	2.75	3.70	1.67	4.42	200	VC	3.02%	56.998	0.08	1.81	78	2.356
Wellington Street	MH 93	MH 98	A67	RES LOW	0.6	A60 - A67	16.1	9.7	0.010	0.285	300	4.09	4.05	7.57	3.41	7.46	200	VC	2.50%	51.859	0.14	1.65	80	2.000
Wellington Street	MH 98	Nancy St.	A68	RES LOW	0.5	A60 - A68	16.1	8.1	0.008	0.293	300	4.08	4.16	8.07	3.63	7.79	200	VC	3.20%	58.672	0.13	1.87	30	0.960
Nancy Street	stub	Nancy St.	A69	RES HIGH	0.83	A69	84.0	69.7	0.070	0.070	300	4.28	1.04	0.83	0.37	1.41	200	VC	N/A					
Wellington Street	Nancy st.	MH 100	-	RES LOW	-	A60 - A69	-	-	-	0.363	300	4.04	5.10	8.90	4.01	9.10	200	VC	3.20%	58.672	0.16	1.87	50	1.600
Wellington Street	MH 100	MH 99	A70	RES LOW	0.11	A60 - A70	16.1	1.8	0.002	0.365	300	4.04	5.12	9.01	4.05	9.17	200	PVC	1.00%	32.798	0.28	1.04	16	0.160
Nancy Street	MH X0	MH X1*	A71	RES LOW	0.17	A71	16.1	2.7	0.003	0.003	300	4.45	0.04	0.17	0.08	0.12	200	PVC	1.00%	32.798	0.00	1.04	36	0.360
Nancy Street	MH X1	MH X2	A72	RES LOW	0.43	A71, A72	16.1	6.9	0.007	0.010	300	4.42	0.15	0.60	0.27	0.42	200	PVC	1.00%	32.798	0.01	1.04	110	1.100
Nancy Street	MH X2	MH X3	A73	RES LOW	1.33	A71 - A73	16.1	21.4	0.021	0.031	300	4.35	0.47	1.93	0.87	1.34	200	PVC	1.00%	32.798	0.04	1.04	90	0.900
Nancy Street	MH X3	MH 99	A74	RES LOW	0.59	A71 - A74	16.1	9.5	0.009	0.041	300	4.33	0.61	2.52	1.13	1.74	200	PVC	1.00%	32.798	0.05	1.04	65	0.650
Wellington Street	MH 99	MH 65	A75	RES LOW	0.24	A60 - A75	16.1	3.9	0.004	0.409	300	4.02	5.72	11.77	5.30	11.02	200	VC	0.55%	24.324	0.45	0.77	45	0.248
North Street	MH 68H	MH 68G	A76	INST	1.24	A76	7.5	9.3	0.009	0.009	300	4.42	0.14	1.24	0.56	0.70	200	PVC	1.58%	41.227	0.02	1.31	60	0.948
North Street	MH 68G	MH 68F	-	-	-	A76	-	-	-	0.009	300	4.42	0.15	1.24	0.56	0.71	200	PVC	1.29%	37.252	0.02	1.19	109	1.406
North Street	MH 68F	MH 68E	A77	INDU	0.36	A76, A77	27.2	9.8	0.010	0.019	300	4.38	0.30	1.60	0.72	1.02	200	PVC	2.55%	52.375	0.02	1.67	70	1.785
North Street	MH 68E	MH 68D	A78	INST	0.39	A76 - A78	7.5	2.9	0.003	0.022	300	4.37	0.35	1.99	0.90	1.25	200	PVC	2.17%	48.315	0.03	1.54	100	2.170
North Street	MH 68D	MH 68C	A79	COMM	0.45	A76 - A79	27.2	12.3	0.012	0.034	300	4.35	0.52	2.44	1.10	1.62	200	PVC	0.60%	25.406	0.06	0.81	103	0.618
North Street	MH 68C	MH 68B	A80	RES LOW	0.49	A76 - A80	16.1	7.9	0.008	0.042	300	4.33	0.63	2.93	1.32	1.95	200	PVC	0.67%	26.847	0.07	0.85	12	0.080
North Street	MH 68B	MH 68A	-	-	-	A76 - A80	-	-	-	0.042	300	4.33	0.65	2.93	1.32	1.97	200	PVC	0.56%	24.544	0.08	0.78	64	0.358
North Street	MH 68A	MH 68	A81	RES LOW	1.17	A76 - A81	16.1	18.8	0.019	0.061	300	4.30	0.93	4.10	1.85	2.78	200	PVC	0.55%	24.324	0.11	0.77	51	0.281
North Street	MH 68	MH 67	A82	RES LOW	0.57	A76 - A82	16.1	9.2	0.009	0.070	300	4.28	1.04	4.67	2.10	3.15	200	PVC	1.47%	39.766	0.08	1.27	100	1.470
North Street	MH 67	MH 66	A83	RES LOW	1.68	A76 - A83	16.1	27.0	0.027	0.097	300	4.25	1.47	6.35	2.86	4.33	200	PVC	0.60%	25.406	0.17	0.81	80	0.480
North Street	MH 66	MH 65A	A84	RES LOW	0.83	A76 - A84	16.1	13.4	0.013	0.111	300	4.23	1.67	7.18	3.23	4.91	200	PVC	0.60%	25.406	0.19	0.81	70	0.420
North Street	MH 65A	MH 65	-	-	-	A76 - A84	-	-	-	0.111	300	4.23	1.67	7.18	3.23	4.91	200	PVC	0.60%	25.406	0.19	0.81	5	0.030
North Street	MH 65	MH 64	A85	COMM	0.13	A60 - A85	27.2	3.5	0.004	0.523	300	3.96	7.20	19.08	8.59	15.79	200	VC	0.40%	20.744	0.76	0.66	60	0.240
North Street	MH 64	MH 63	A86	COMM	0.55	A60 - A86	27.2	15.0	0.015	0.538	300	3.96	7.40	19.63	8.83	16.23	200	VC	0.51%	23.423	0.69	0.75	60	0.306
North Street	MH 63	MH 62	A87	INST	0.36	A60 - A87	7.5	2.7	0.003	0.541	300	3.96	7.43	19.99	9.00	16.43	200	VC	0.69%	27.244	0.60	0.87	55	0.380
North Street	MH 62	MH 61	A88	RES LOW	0.19	A60 - A88	16.1	3.1	0.003	0.544	300	3.96	7.47	20.18	9.08	16.55	200	VC	0.74%	28.214	0.59	0.90	50	0.370
North Street	MH 61	MH 60	A89	COMM	0.62	A60 - A89	27.2	16.9	0.017	0.561	300	3.95	7.82	20.61	9.27	17.10	200	VC	1.60%	41.487	0.41	1.32	110	1.760
North Street	MH 60	MH 59	A90	COMM	0.25	A60 - A90	27.2	6.8	0.007	0.568	300	3.95	7.78	20.86	9.39	17.17	200	VC	1.60%	41.487	0.41	1.32	110	1.760
Gore Street	MH 109	MH 108	A91	RES LOW	0.44	A91	16.1	7.1	0.007	0.007	300	4.43	0.12	0.44	0.20	0.32	200	VC	1.65%	42.130	0.01	1.34	60	0.990
Gore Street	MH 108	MH 61	A92	INST	0.42	A91, A92	7.5	3.2	0.003	0.010	300	4.41	0.19	0.86	0.39	0.57	200	VC	3.83%	64.188	0.01	2.04	91	3.485
James Street	MH 108	MH 104	A93	INST	0.5	A91 - A93	7.5	3.8	0.004	0.014	300	4.40	0.24	1.36	0.61	0.86	200	VC	3.83%	64.188	0.01	2.04	91	3.485
James Street	STUB	MH 104	A94	RES LOW	0.18	A94	16.1	2.9	0.003	0.003	300	4.45	0.05	0.18	0.08	0.14	200	VC	1.65%	42.130	0.00	1.34	60	0.990
Victoria Street	MH 105	MH 104	A95	RES MED	0.43	A95	31.2	13.4	0.013	0.013	300	4.40	0.21	0.43	0.19	0.40	200	PVC	2.53%	52.169	0.01	1.66	74	1.872
Victoria Street	MH 104	MH 103	A96	RES LOW	0.29	A91 - A96	16.1	4.7	0.005	0.035	300	4.34	0.53	2.26	1.02	1.54	200	VC	0.77%	28.780	0.05	0.92	60	0.462
Victoria Street	MH 103	MH 59	A97	RES LOW	0.35	A91 - A97	16.1	5.6	0.006	0.041	300	4.33	0.61	2.61	1.17	1.79	200	VC	0.32%	18.554	0.10	0.59	57	0.182
North Street	MH 59	MH 58	-	-	-	A60 - A97	-	-	-	0.608	300	3.93	8.30	23.47	10.56	18.86	300	VC	1.51%	118.828	0.16	1.68	13.2	0.199

DRAINAGE AREA DESCRIPTION																	OUTLET PIPE DATA								
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)	
Station Street	Stub	MH 153	A98	RES LOW	0.47	A98	16.1	7.6	0.008	0.008	300	4.43	0.12	0.47	0.21	0.33	200	VC	0.40%	20.744	0.02	0.66	50	0.200	
Station Street	MH 153	MH 54	A99	RES LOW	0.46	A98, A99	16.1	7.4	0.007	0.015	300	4.40	0.23	0.93	0.42	0.65	200	VC	0.50%	23.192	0.03	0.74	46	0.230	
Station Street	MH 54	MH 52	A100	RES LOW	0.53	A98 - A100	16.1	8.5	0.009	0.024	300	4.37	0.42	1.46	0.66	1.07	200	VC	0.53%	23.878	0.04	0.76	70	0.371	
Station Street	MH 53	MH 52	A101	RES LOW	0.2	A101	16.1	3.2	0.003	0.003	300	4.45	0.05	0.20	0.09	0.14	200	VC	1.83%	44.369	0.00	1.41	50	0.915	
Church Street	MH 52	MH 56	A102	RES LOW	1.04	A98 - A102	16.1	16.7	0.017	0.043	300	4.33	0.79	2.70	1.22	2.01	200	VC	0.60%	25.406	0.08	0.81	95	0.570	
Church Street	MH 52	MH 56	A102B	RES HIGH	0.74	A98 - A102	108.0	192.3	0.192	0.236	300	4.12	3.51	3.44	0.48	3.99	200	VC	0.60%	25.406	0.16	0.81	95	0.570	
Church Street	MH 56	MH 57	A103	RES LOW	0.56	A98 - A103	16.1	9.0	0.009	0.245	300	4.11	3.50	6.70	1.95	5.45	200	VC	1.14%	35.019	0.16	1.11	54	0.616	
Church Street	MH 57	MH 58	A104	RES LOW	0.34	A98 - A104	16.1	5.5	0.005	0.250	300	4.11	3.57	7.04	2.10	5.67	200	VC	1.44%	39.358	0.14	1.25	50	0.720	
North Street	MH 58	MH 22	A105	COMM	0.23	A60 - A105	27.2	6.3	0.006	0.865	300	3.84	11.56	30.74	12.77	24.33	300	VC	0.65%	77.963	0.31	1.10	103.2	0.671	
Tanner Drive	Stub	MH 166	A106	RES LOW	0.75	A106	16.1	12.1	0.012	0.012	300	4.41	0.18	0.75	0.34	0.52	200	PVC	0.60%	25.406	0.02	0.81	48	0.288	
Tanner Drive	MH 166	MH 165	A107	RES MED	0.5	A106, A107	31.2	15.6	0.016	0.028	300	4.36	0.42	1.25	0.56	0.98	200	PVC	6.00%	80.339	0.01	2.56	61	3.660	
Tanner Drive	MH 165	MH 164	A108	RES MED	0.63	A106 - A108	31.2	19.7	0.020	0.047	300	4.32	0.71	1.88	0.85	1.56	200	PVC	6.00%	80.339	0.02	2.56	61	3.660	
Tanner Drive	MH 164	MH 163	A109	RES LOW	0.48	A106 - A109	16.1	7.7	0.008	0.055	300	4.31	0.82	2.36	1.06	1.89	200	PVC	3.70%	63.089	0.03	2.01	57	2.109	
Tanner Drive	MH 163	MH 162	A110	RES MED	0.8	A106 - A110	31.2	25.0	0.025	0.080	300	4.27	1.19	3.16	1.42	2.61	200	PVC	3.00%	56.808	0.05	1.81	67	2.010	
Tanner Drive	MH 162	MH 155	A111	RES LOW	0.28	A106 - A111	16.1	4.5	0.005	0.085	300	4.26	1.25	3.44	1.55	2.80	200	PVC	0.87%	30.592	0.09	0.97	55	0.479	
William St	MH 158	MH 157	A112	RES LOW	0.84	A112	16.1	13.5	0.014	0.014	300	4.40	0.21	0.84	0.38	0.58	200	PVC	1.10%	34.399	0.02	1.09	36	0.396	
William St	MH 157	MH 156	A113	RES LOW	0.67	A112, A113	16.1	10.8	0.011	0.024	300	4.37	0.37	1.51	0.68	1.05	200	PVC	8.36%	94.832	0.01	3.02	72	6.019	
William St	William Dev.	MH 156	A113	RES MED	2.94	A112, A113	65.3	192.0	0.192	0.192	300	4.15	2.77	2.94	0.41	3.18	200	PVC	0.50%	23.192	0.14	0.74	72	0.360	
William St	MH 156	MH 155	A114	RES LOW	0.64	A112 - A114	16.1	10.3	0.010	0.227	300	4.13	3.25	5.09	1.38	4.63	200	PVC	3.00%	56.808	0.08	1.81	75	2.250	
William St	MH 155	MH 78	A115	RES LOW	0.28	A106 - A115	16.1	4.5	0.005	0.316	300	4.07	4.46	8.81	3.05	7.51	200	PVC	0.50%	23.192	0.32	0.74	75	0.375	
Mill St	MH 79B	MH 79	A116	RES LOW	0.62	A116	16.1	10.0	0.010	0.010	300	4.41	0.15	0.62	0.28	0.43	200	VC	1.65%	42.130	0.01	1.34	90	1.485	
Mill St	MH 79	MH 78	A117	RES LOW	1.13	A116, A117	16.1	18.2	0.018	0.028	300	4.36	0.43	1.75	0.79	1.21	200	VC	1.65%	42.130	0.03	1.34	90	1.485	
Mill St	MH 78	MH 77	A118	RES LOW	1.16	A106 - A118	16.1	18.7	0.019	0.363	300	4.04	5.09	11.72	4.36	9.45	200	VC	2.09%	47.416	0.20	1.51	50	1.045	
Mill St	MH 77	MH 76	A119	RES LOW	0.44	A106 - A119	16.1	7.1	0.007	0.370	300	4.04	5.18	12.16	4.56	9.74	200	VC	1.09%	34.243	0.28	1.09	74	0.807	
Mill St	MH 76	MH 75	A120	RES LOW	0.83	A106 - A120	16.1	13.4	0.013	0.383	300	4.03	5.36	12.99	4.93	10.29	200	VC	0.88%	30.768	0.33	0.98	71	0.625	
Mill St	MH 75	MH 74	A121	RES LOW	0.4	A106 - A121	16.1	6.4	0.006	0.389	300	4.03	5.45	13.39	5.11	10.56	200	VC	0.68%	27.046	0.39	0.86	52	0.354	
Baker St	Stub	MH 74	A122	RES LOW	0.39	A122	16.1	6.3	0.006	0.006	300	4.43	0.10	0.39	0.18	0.27	200	PVC	0.50%	23.192	0.01	0.74	70	0.350	
Mill St	MH 74	MH 73	A123	RES LOW	0.27	A106 - A123	16.1	4.3	0.004	0.400	300	4.02	5.59	14.05	5.41	11.00	200	VC	1.39%	38.669	0.28	1.23	55	0.765	
Mill St	MH 73	MH 72	A124	RES LOW	0.37	A106 - A124	16.1	6.0	0.006	0.406	300	4.02	5.67	14.42	5.58	11.24	200	VC	0.98%	32.469	0.35	1.03	72	0.706	
Edward St	MH 92	MH 91	A125	RES LOW	0.76	A125	16.1	0.0 12.2	0.012	0.012	300	4.41	0.19	0.76	0.34	0.53	200	VC	2.86%	55.467	0.01	1.77	75	2.145	
Edward St	MH 91	MH 72	-	-	-	A125	-	-	-	0.012	300	4.41	0.19	0.76	0.34	0.53	200	VC	3.26%	59.219	0.01	1.89	26	0.848	
Mill St	MH 72	MH 71	A126	RES LOW	0.29	A106 - A126	16.1	4.7	0.005	0.423	300	4.01	5.89	15.47	6.05	11.94	200	VC	0.55%	24.324	0.49	0.77	68	0.374	
Mill St	MH 71	MH 70	A127	RES LOW	0.34	A106 - A127	16.1	5.5	0.005	0.428	300	4.01	5.96	15.81	6.20	12.16	200	VC	0.94%	31.799	0.38	1.01	81	0.761	
Mill St	MH 70	MH 69	A128	COMM	0.77	A106 - A128	27.2	21.0	0.021	0.449	300	4.00	6.39	16.58	6.55	12.94	200	VC	1.42%	39.084	0.33	1.24	90	1.278	
Mill St	MH 69	MH 22	A129	COMM	0.35	A106 - A129	27.2	9.5	0.010	0.459	300	3.99	6.46	16.93	6.71	13.17	200	VC	0.42%	21.256	0.62	0.68	80	0.336	
North St	MH 22	MH 23	-	-	-	A106 - A129	-	-	-	1.324	300	3.72	17.19	16.93	5.64	22.83	300	VC	0.95%	94.252	0.24	1.33	80	0.760	
Front St	MH 23	MH 21	A130	IND	0.18	A60 - A124	12.9	2.3	0.002	1.326	300	3.72	17.12	47.85	19.55	36.67	375	VC	0.43%	114.971	0.32	1.04	37.3	0.160	
Emma St	stub	MH 146	A131	RES LOW	1.04	A131	16.1	16.7	0.017	0.017	300	4.39	0.26	1.04	0.47	0.72	200	VC	0.40%	20.744	0.03	0.66	50	0.200	
Emma St	MH 146	MH 161	A132	RES LOW	0.54	A131, A132	16.1	8.7	0.009	0.025	300	4.37	0.39	1.58	0.71	1.10	200	VC	0.65%	26.443	0.04	0.84	57	0.371	
Emma St	MH 161	MH 145	A133	RES LOW	0.2	A131 - A133	16.1	3.2	0.003	0.029	300	4.36	0.43	1.78	0.80	1.23	200	VC	0.59%	25.193	0.05	0.80	57	0.336	
Front St	Annis St Pumping station (forcemain)	MH 19	-	-	-	ANNIS SPS			-	-	-	-	-	-	-	49.16	100	D.I.	F.M						
Front St	MH 19	MH 145	A134	RES MED	0.48	A134, Annis	31.2	15.0	0.015	0.015	300	4.40	0.23	0.48	0.22	49.61	300	VC	2.24%	144.567	0.34	2.05	37	0.827	
Front St	MH 145	MH 20	A135	RES MED	0.49	A131 - A135, Annis	31.2	15.3	0.015	0.059	300	4.30	0.88	2.75	1.24	51.28	300	VC	0.76%	84.302	0.61	1.19	45	0.342	
Front St	MH 20	MH 21	A136	COMM	0.64	A131 - A136, Annis	27.2	17.4	0.017	0.076	300	4.27	1.13	3.39	1.53	51.82	300	VC	3.06%	169.157	0.31	2.39	79	2.417	
Henry St	MH 21	MH 132	A137	COMM	0.2	A60 - A137, Annis	27.2	5.4	0.005	1.408	300	3.70	18.08	51.44	21.17	88.42	375	VC	0.69%	145.640	0.61	1.32	52.2	0.360	
Henry St	MH 132	MH 131	A138	RES LOW	0.59	A60 - A138, Annis	16.1	9.5	0.009	1.417	300	3.70	18.20	52.03	21.44	88.80	375	VC	1.28%	198.363	0.45	1.80	57.7	0.739	
Highway 14	Rodgers Drive Pumping Station (forcemain)	MH 36	-	-	-	-	-	-	-	-	-	-	-	-	-	6.50	100	D.I.	F.M						

DRAINAGE AREA DESCRIPTION																OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
Highway 14	MH 36	MH35	A139	RES LOW	0.44	A139, Rodgers	16.1	7.1	0.007	0.007	300	4.43	0.11	0.44	0.20	6.81	200	VC	0.62%	25.825	0.26	0.82	67	0.415
Highway 14	MH35	MH 34	A140	RES LOW	0.89	A139, A140, Rodgers	16.1	14.3	0.014	0.021	300	4.38	0.33	1.33	0.60	7.42	200	VC	0.60%	25.427	0.29	0.81	82	0.493
Highway 14	MH 34	MH 33	A141	RES LOW	0.67	A139 - A141, Rodgers	16.1	10.8	0.011	0.032	300	4.35	0.49	2.00	0.90	7.89	200	VC	0.42%	21.154	0.37	0.67	71	0.295
Highway 14	MH 33	MH 32	A142	RES LOW	0.69	A139 - A142, Rodgers	16.1	11.1	0.011	0.043	300	4.33	0.65	2.69	1.21	8.36	200	VC	0.60%	25.469	0.33	0.81	70	0.422
Highway 14	MH 32	MH 31	A143	COMM	2.7	A139 - A143, Rodgers	27.2	73.5	0.074	0.117	300	4.22	1.71	2.69	1.21	9.42	200	VC	0.45%	22.002	0.43	0.70	21	0.095
Highway 14	MH 31	MH 30	-	-	-	A139 - A143, Rodgers	-	-	-		300	4.50	0.00	2.69	1.21	7.71	200	VC	0.87%	30.592	0.25	0.97	92	0.800
Highway 14	MH 30	MH 29	-	-	-	A139 - A143, Rodgers	-	-	-		300	4.50	0.00	2.69	1.21	7.71	200	VC	1.75%	43.388	0.18	1.38	61	1.068
Front St	MH 29	MH 28	144	COMM	1.35	A139 - A144, Rodgers	27.2	36.8	0.037	0.154	300	4.19	2.23	4.04	1.82	10.55	200	VC	0.54%	24.102	0.44	0.77	107	0.578
Front St	MH 28	MH 27	145	RES LOW	0.9	A139 - A145, Rodgers	16.1	14.5	0.014	0.168	300	4.17	2.44	4.94	2.22	11.16	200	VC	0.50%	23.192	0.48	0.74	92	0.460
Front St	MH 27	MH 26	146	RES LOW	0.46	A139 - A146, Rodgers	16.1	7.4	0.007	0.176	300	4.17	2.54	5.40	2.43	11.47	200	VC	1.87%	44.851	0.26	1.43	46	0.860
Front St	MH 26	MH 25	147	COMM	0.46	A139 - A147, Rodgers	27.2	12.5	0.013	0.188	300	4.16	2.71	5.86	2.64	11.85	200	VC	2.35%	50.279	0.24	1.60	61	1.434
Front St	MH 24	MH 25	148	RES LOW	0.21	A148	16.1	3.4	0.003	0.003	300	4.45	0.05	0.21	0.09	0.15	200	VC	0.50%	23.192	0.01	0.74	46	0.230
John St	MH 25	MH 142	149	RES LOW	0.21	A139 - A149, Rodgers	16.1	3.4	0.003	0.195	300	4.15	2.81	6.28	2.83	12.13	200	VC	0.47%	22.485	0.54	0.72	65	0.306
Wright St	MH 143	MH 142	150	RES LOW	0.59	A150	16.1	9.5	0.009	0.009	300	4.42	0.15	0.59	0.27	6.91	200	VC	0.55%	24.324	0.28	0.77	61	0.336
John St	MH 142	MH 141	151	RES LOW	0.5	A139 - A151, Rodgers	16.1	8.1	0.008	0.212	300	4.14	3.05	7.37	3.32	12.87	200	VC	0.47%	22.485	0.57	0.72	53	0.249
John St	MH 141	MH 140	152	RES LOW	0.44	A139 - A152, Rodgers	16.1	7.1	0.007	0.219	300	4.13	3.15	7.81	3.51	13.16	200	VC	0.35%	19.404	0.68	0.62	53	0.186
Berwick Street	MH 166	MH 167	A153	RES LOW	0.66	A153	16.1	10.6	0.011	0.011	300	4.41	0.16	0.66	0.30	0.46	200	PVC	1.00%	32.798	0.01	1.04	44.5	0.445
Berwick Street	MH 167	MH 168	A154	RES LOW	0.62	A153, A154	16.1	10.0	0.010	0.021	300	4.38	0.31	1.28	0.58	0.89	200	PVC	0.51%	23.423	0.04	0.75	67.7	0.345
Berwick Street	MH 168	MH 169	A155	RES LOW	0.41	A153 - A155	16.1	6.6	0.007	0.027	300	4.36	0.41	1.69	0.76	1.17	200	PVC	0.50%	23.192	0.05	0.74	69	0.345
Aberdeen Street	MH 169	MH 170	A156	RES LOW	0.44	A153 - A156	-	-	-	0.027	300	4.36	0.41	2.13	0.96	1.37	200	PVC	0.50%	23.192	0.06	0.74	30	0.150
Aberdeen Street	MH 170	MH 171	-	RES LOW	-	A153 - A156	-	-	-	0.027	300	4.36	0.41	2.13	0.96	1.37	200	PVC	0.50%	23.192	0.06	0.74	61	0.305
Carrick Street	MH 171B	MH 171	A156B, A156C	RES LOW	2.25	A153 - A155	48.0	108.0	0.108	0.108	300	4.23	1.59	2.25	0.32	1.90	200	PVC	0.50%	23.192	0.08	0.74	69	0.345
Aberdeen Street	MH 171	MH 172	-	RES LOW	-	A153 - A156	-	-	-	0.135	300	4.21	1.97	4.38	1.27	3.25	200	PVC	0.50%	23.192	0.14	0.74	79	0.395
Aberdeen Street	MH 172	MH 137	-	RES LOW	-	A153 - A156	-	-	-	0.135	300	4.21	1.97	4.38	1.27	3.25	200	PVC	0.50%	23.192	0.14	0.74	55	0.275
Elizabeth St	MH 135	MH 137	A157	RES LOW	0.9	A157	16.1	14.5	0.014	0.014	300	4.40	0.22	0.90	0.41	0.63	200	VC	2.36%	50.386	0.01	1.60	78	1.841
John St	Stub	MH 136	A158, 158B	RES LOW	1.05	A158	16.1	16.9	0.017	0.017	300	4.39	0.26	1.05	0.47	0.73	200	VC	0.50%	23.192	0.03	0.74	20	0.100
John St	MH 136	MH 137	A159	RES LOW	0.66	A158, A159	16.1	10.6	0.011	0.028	300	4.36	0.42	1.71	0.77	1.19	200	VC	0.50%	23.192	0.05	0.74	63	0.315
John St	MH 137	MH 138	A160	RES LOW	0.85	A153 - A160	16.1	13.7	0.014	0.218	300	4.13	3.13	7.84	2.83	5.96	200	VC	0.74%	28.214	0.21	0.90	64	0.474
John St	MH 138	MH 139	A161	RES LOW	0.69	A153 - A161	16.1	11.1	0.011	0.229	300	4.13	3.28	8.53	3.14	6.42	200	VC	2.64%	53.291	0.12	1.70	55	1.452
John St	MH 139	MH 140	A162	RES LOW	0.37	A153 - A162	16.1	6.0	0.006	0.235	300	4.12	3.37	8.90	3.31	6.67	200	VC	2.30%	49.741	0.13	1.58	55	1.265
Robert St	MH 140	MH 144	A163	RES LOW	0.34	A139 - A163, Rodgers	16.1	5.5	0.005	0.460	300	3.99	6.38	17.05	6.98	19.85	200	VC	2.00%	46.384	0.43	1.48	61	1.220
Robert St	MH 144	MH 130	-	-	-	A139 - A163, Rodgers	-	-	-	0.460	300	3.99	6.38	17.05	6.98	19.85	200	VC	1.44%	39.358	0.50	1.25	85	1.224
Henry St	Henry St Pumping station (forcemain)	MH 127	-	-	-	Henry St. SPS	-	-	-	-	-	-	-	-	-	6.50	100	A.C	F.M					
Holly Drv	MH 133C	MH 133B	A164	RES MED	1.42	A164	31.2	44.3	0.044	0.044	300	4.33	0.67	1.42	0.64	1.30	200	PVC	0.43%	21.407	0.06	0.68	102	0.435
Holly Drv	MH 133B	MH 133A	A165	RES LOW	0.74	A164, A165	16.1	11.9	0.012	0.056	300	4.30	0.84	2.16	0.97	1.81	200	PVC	0.88%	30.803	0.06	0.98	70	0.617
Holly Drv	MH 133A	MH 133	A166	RES LOW	0.84	A164 - A166	16.1	13.5	0.014	0.070	300	4.28	1.04	3.00	1.35	2.39	200	PVC	1.08%	34.069	0.07	1.08	92	0.993
Elizabeth Street	MH 133	MH 127	A167	RES LOW	1.06	A164 - A167	16.1	17.1	0.017	0.087	300	4.26	1.28	4.06	1.83	3.11	200	VC	0.50%	23.192	0.13	0.74	109	0.545
Henry St	MH 127	MH 128	A168	RES LOW	0.81	A164 - A168, Henry St. SPS	16.1	13.0	0.013	0.100	300	4.24	1.47	4.87	2.19	10.16	200	VC	1.00%	32.798	0.31	1.04	49	0.490
Henry St	MH 128	MH 129	A169	RES LOW	0.58	A164 - A169, Henry St. SPS	16.1	9.3	0.009	0.109	300	4.23	1.60	5.45	2.45	10.56	200	VC	1.06%	33.768	0.31	1.07	75	0.795
Henry St	MH 129	MH 130	A170	RES LOW	0.31	A164 - A170, Henry St. SPS	16.1	5.0	0.005	0.114	300	4.23	1.68	5.76	2.59	10.77	200	VC	0.93%	31.630	0.34	1.01	83	0.772
Henry St	MH 130	MH 130B	-	-		A139 - A171, Rodgers, Henry	-	-	-	0.574	300	3.94	7.86	22.81	9.57	30.43	375	VC	0.30%	96.032	0.32	0.87	10.1	0.030
Henry St	MH 130B	MH 131	A171	RES LOW	0.17	A139 - A171, Rodgers, Henry	16.1	2.7	0.003	0.577	300	3.94	7.90	22.98	9.64	30.54	375	VC	0.31%	97.620	0.31	0.88	51.9	0.161

DRAINAGE AREA DESCRIPTION																OUTLET PIPE DATA							
LOCATION	MANHOLE FROM	TO	INCREMENTAL AREA No.		Ha	CONTRIBUTING AREAS	POPULATION Ppha	P	P(1000)	Σ P(1000)	q l/cap/d	M	Peak Flow (l/s)	Σ AREA (ha)	IA (l/s)	Q (l/s)	SIZE (mm)	Type of Pipe	Slope (%)	CAP (l/s)	Q/Qfull	VEL (m/s)	LENGTH (m)	FALL (m)
George Station	MH 131	Pumping Station		-	-	A60 - A171, Annis, Rodgers, Henry	-	-	-	-	-	-	-	-	-	119.34	450	VC	0.50%	201.600	0.59	1.27	19	0.095

DESIGN PARAMETER

Mannings n =	0.0130	
Average Daily Flow (q)=	300	l/cap/d
Infiltration Rate (I) =	0.45	l/s/ha
New Development Infiltration rate	0.14	l/s/ha

Short-Term Development =
Medium-Term Development =
Full Buildout Development =

Designed By:
Owen Perrett

Checked By:
Matt Morkem

Dwg. Reference:
Report Figures 2, 17, 18, 19

PROJECT:
STIRLING INFRASTRUCTURE CAPACITY ASSESSMENT

LOCATION:
Stirling, ON, Canada

Project Number:
27931

Date:
30-Oct-23

APPENDIX E: STORMSEWER DESIGNSHEETS

Storm Sewer Calculation Sheet

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

STREET	MANHOLE		AREA		CONTRIBUTING	RUNOFF DATA						PIPE DATA								
	From	To	No	Ha	AREAS	C	AC	Σ AC	Tc (min.)	I (mm/hr)	Q (L/s)	Size (mm)	Slope (%)	Capacity (L/s)	Q/Q_{full}	Velocity (m/s)	Length (m)	FALL (m)	U/S INVERT	D/S INVERT
William St				1.520		0.4	0.608	0.608	20.0	56	94.55	250	5.00%	133.0	0.7	2.71	100	5.000	141.00	136.00
West St				0.370		0.4	0.148	0.148	20.0	56	23.02	200	6.40%	83.0	0.3	2.64	75	4.800	140.80	136.00
William St				0.940		0.4	0.376	1.132	21.1	54	169.84	350	3.00%	252.6	0.7	2.63	100	3.000	136.00	133.00
William St				0.570		0.4	0.228	1.360	21.7	53	199.99	350	6.00%	357.3	0.6	3.71	100	6.000	133.00	127.00
Tanner Dr				1.550		0.4	0.620	0.620	20.0	56	96.42	250	7.50%	162.9	0.6	3.32	100	7.500	144.00	136.50
Tanner Dr				0.820		0.4	0.328	0.948	20.5	55	144.97	300	7.73%	268.9	0.5	3.80	97	7.500	136.50	129.00
Tanner Dr				0.980		0.4	0.392	1.340	20.9	54	202.09	400	1.74%	274.6	0.7	2.19	115	2.000	129.00	127.00
William St				0.450		0.4	0.180	2.880	23.0	50	406.86	550	1.49%	594.8	0.7	2.50	67	1.000	127.00	126.00
Mill St				1.300		0.4	0.520	0.708	20.0	56	110.10	400	0.40%	131.7	0.8	1.05	100	0.400	126.50	126.10
Mill St				0.890		0.4	0.356	3.944	25.1	48	526.14	550	2.03%	693.2	0.8	2.92	74	1.500	126.00	124.50
Mill St				0.890		0.4	0.356	4.300	25.5	47	567.18	550	2.13%	709.7	0.8	2.99	80	1.700	124.50	122.80
Mill St		**Outlet**		0.000		0.4	0.000	4.300	26.0	47	560.56	550	3.75%	942.8	0.6	3.97	40	1.500	122.80	121.30
Mill St				0.470		0.4	0.188	0.188	20.0	56	29.24	250	0.63%	47.0	0.6	0.96	80	0.500	125.50	125.00
Baker St				0.000		0.4	0.000	0.000	20.0	56	0.00	300	11.67%	330.3	0.0	4.67	30	3.500	148.00	144.50
Baker St				1.410		0.4	0.564	0.564	20.1	55	87.39	300	7.80%	270.1	0.3	3.82	100	7.800	144.50	136.70
Baker St				0.910		0.4	0.364	0.928	20.5	55	141.72	300	3.90%	191.0	0.7	2.70	100	3.900	136.70	132.80
Baker St				0.870		0.4	0.348	1.276	21.2	53	191.01	350	4.41%	306.3	0.6	3.18	93	4.100	132.80	128.70
Baker St				0.550		0.4	0.220	1.496	21.6	53	220.51	350	4.37%	304.8	0.7	3.17	71	3.100	128.70	125.60
Baker St				0.440		0.4	0.176	1.672	22.0	52	243.62	400	4.37%	435.2	0.6	3.46	71	3.100	125.60	122.50
Mill St				0.820		0.4	0.328	0.328	20.0	56	51.01	300	0.56%	72.1	0.7	1.02	90	0.500	123.00	122.50
Baker St				0.000		0.4	0.000	2.000	23.8	49	276.21	400	4.29%	431.1	0.6	3.43	35	1.500	122.50	121.00
Edward St	CB 1	CB 2		1.470		0.4	0.588	0.588	20.0	56	91.44	300	1.58%	121.7	0.8	1.72	120	1.900	135.00	133.10
Robb St	CB 2	CB 3		0.410		0.4	0.164	0.164	20.0	56	25.50	250	3.53%	111.7	0.2	2.28	85	3.000	136.10	133.10
Edward St	CB 4	CB 3		1.030		0.4	0.412	1.164	21.8	52	170.84	350	3.15%	259.0	0.7	2.69	92	2.900	133.10	130.20
Edward St	CB 3	CB 5		1.190		0.4	0.476	1.640	22.6	51	235.12	400	2.00%	294.5	0.8	2.34	100	2.000	130.20	128.20
Wellington St	CB 6	CB 5		0.380		0.4	0.152	0.152	20.0	56	23.64	250	0.63%	47.0	0.5	0.96	80	0.500	128.70	128.20
Edward St	CB 5	CB 7		0.880		0.4	0.352	2.144	24.7	48	289.37	400	3.13%	368.5	0.8	2.93	115	3.600	128.20	124.60
Gore St	CB 9	CB 8		0.320		0.4	0.128	0.128	20.0	56	19.91	200	2.00%	46.4	0.4	1.48	40	0.800	125.40	124.60
Edward St	CB 8	CB 7		0.740		0.4	0.296	2.568	25.8	47	336.46	450	2.55%	454.9	0.7	2.86	110	2.800	124.60	121.80
Mill St	CB 7	CB 10		0.560		0.4	0.224	0.224	20.0	56	34.84	250	0.67%	48.6	0.7	0.99	105	0.700	122.50	121.80
Mill St	CB 11	CB 10		0.000		0.4	0.000	2.792	28.2	44	344.31	450	6.00%	698.4	0.5	4.39	25	1.500	121.80	120.30
Gore St	CB 10	CB 12		0.985		0.4	0.394	0.394	20.0	56	61.27	300	1.00%	96.7	0.6	1.37	100	1.000	125.00	124.00
James St	CB 10	CB 12		0.571		0.4	0.228	0.622	21.2	53	92.99	300	2.20%	143.4	0.6	2.03	91	2.000	124.00	122.00

Victoria St	CB 12	CB 13		0.387		0.4	0.155	0.155	20.0	56	24.07	250	0.45%	40.1	0.6	0.82	110	0.500	122.50	122.00
James St	CB 13	CB 14		0.326		0.4	0.130	0.908	24.2	49	124.02	350	2.15%	213.9	0.6	2.22	93	2.000	122.00	120.00
Mill St	CB 15	CB 14		0.317		0.4	0.127	1.034	24.9	48	138.66	400	0.81%	187.0	0.7	1.49	62	0.500	120.00	119.50
Mill St	CB 14	CB 16		0.349		0.4	0.140	0.140	20.0	56	21.71	200	4.17%	66.9	0.3	2.13	60	2.500	122.00	119.50
Mill St	CB 14	CB 16		0.000		0.4	0.000	1.174	26.1	46	152.58	450	0.45%	192.2	0.8	1.21	22	0.100	119.50	119.40
North St	CB 75	CB 74		2.500		0.4	1.000	1.000	20.0	56	155.52	400	0.83%	190.1	0.8	1.51	120	1.000	135.00	134.00
North St	CB 74	CB 72		0.432		0.4	0.173	1.173	21.3	53	174.65	400	2.08%	300.6	0.6	2.39	120	2.500	134.00	131.50
North St	CB 75	CB 74		1.280		0.4	0.512	1.685	22.2	52	244.45	400	2.08%	300.6	0.8	2.39	120	2.500	131.50	129.00
North St	CB 74	CB 72		1.407		0.4	0.563	2.248	23.0	51	318.03	500	1.25%	422.2	0.8	2.15	120	1.500	129.00	127.50
North St	CB 75	CB 74		1.650		0.4	0.660	2.908	23.9	49	400.52	550	1.50%	596.3	0.7	2.51	100	1.500	127.50	126.00
North St	CB 74	CB 72		0.893		0.4	0.357	3.265	24.6	48	441.47	600	1.30%	700.1	0.6	2.48	100	1.300	126.00	124.70
North St	CB 75	CB 74		1.159		0.4	0.464	3.728	25.3	47	495.02	600	1.30%	700.1	0.7	2.48	100	1.300	124.70	123.40
North St	CB 74	CB 72		0.991		0.4	0.396	4.125	25.9	47	537.99	600	0.90%	582.5	0.9	2.06	100	0.900	123.40	122.50
South Nancy St	CB 72	CB 73		0.835		0.4	0.334	0.334	20.0	56	51.94	300	0.50%	68.4	0.8	0.97	100	0.500	125.00	124.50
Wellington St	CB 73	STM-MH1		0.678		0.4	0.271	0.271	20.0	56	42.18	250	2.63%	96.5	0.4	1.97	95	2.500	127.00	124.50
Wellington St	STM-MH1	DCB 76		0.111		0.4	0.044	0.650	22.5	51	93.20	300	1.43%	115.6	0.8	1.64	35	0.500	124.50	124.00
North Nancy St	DCB 77	DCB 76		1.645		0.4	0.658	0.658	20.0	56	102.33	350	0.70%	122.0	0.8	1.27	100	0.700	126.00	125.30
North Nancy St	DCB 76	DCB 78		1.335		0.4	0.534	1.192	21.3	53	177.56	450	0.70%	238.5	0.7	1.50	100	0.700	125.30	124.60
North Nancy St	DCB 79	DCB 78		0.641		0.4	0.256	1.448	22.4	51	208.45	500	0.60%	292.5	0.7	1.49	100	0.600	124.60	124.00
Wellington St	DCB 78	STM-MH2		0.289		0.4	0.116	2.214	24.0	49	304.24	500	2.50%	597.0	0.5	3.04	60	1.500	124.00	122.50
North St	CB 85	CB 84		1.250		0.4	0.500	6.838	31.2	41	787.48	750	0.83%	1016.3	0.8	2.30	120	1.000	122.50	121.50
Thompson Farmlands	CB 84	CB 82		1.000		0.4	0.400	0.400	20.0	56	62.21	300	1.50%	118.4	0.5	1.68	120	1.800	133.00	131.20
Thompson Farmlands	0	CB 82		1.000		0.4	0.400	0.800	21.2	53	119.62	350	1.50%	178.6	0.7	1.86	120	1.800	131.20	129.40
Thompson Farmlands	CB 82	CB 82		1.000		0.4	0.400	1.200	22.3	52	173.51	350	1.50%	178.6	1.0	1.86	120	1.800	129.40	127.60
Thompson Farmlands	CB 82	CB 82		1.000		0.4	0.400	1.600	23.3	50	224.07	450	1.50%	349.2	0.6	2.20	120	1.800	127.60	125.80
Thompson Farmlands	CB 82	CB 82		1.000		0.4	0.400	2.000	24.3	49	272.93	450	1.50%	349.2	0.8	2.20	120	1.800	125.80	124.00
Thompson Farmlands	CB 82	CB 82		1.000		0.4	0.400	2.400	25.2	48	319.44	600	0.50%	434.2	0.7	1.54	100	0.500	124.00	123.50
Thompson Farmlands	CB 82	CB 82		1.000		0.4	0.400	2.800	26.3	46	362.18	600	0.50%	434.2	0.8	1.54	100	0.500	123.50	123.00
Thompson Farmlands	CB 82	CB 82		0.500		0.4	0.200	3.000	27.3	45	377.55	600	0.50%	434.2	0.9	1.54	100	0.500	123.00	122.50
Thompson Farmlands	CB 82	CB 82		0.250		0.4	0.100	3.100	28.4	44	379.99	600	0.50%	434.2	0.9	1.54	50	0.250	122.50	122.25
Thompson Farmlands	CB 82	CB 82		0.500		0.4	0.200	3.300	29.0	43	399.36	600	0.63%	485.4	0.8	1.72	120	0.750	122.25	121.50
North St	CB 83	CB 82		0.334		0.4	0.134	10.272	42.2	33	963.47	850	0.71%	1313.7	0.7	2.32	105	0.750	121.50	120.75
North St	CB 83	CB 82		0.801		0.4	0.320	10.592	43.0	33	981.66	850	0.68%	1283.5	0.8	2.26	110	0.750	120.75	120.00
Station St	CB 82	CB 80		1.127		0.4	0.451	0.451	20.0	56	70.11	300	1.00%	96.7	0.7	1.37	100	1.000	123.00	122.00
Station St	CB 82	CB 80		0.581		0.4	0.232	0.232	20.0	56	36.14	300	1.05%	99.2	0.4	1.40	95	1.000	123.00	122.00
Church St	CB 82	CB 80		0.778		0.4	0.311	0.994	22.3	52	143.46	400	1.05%	213.7	0.7	1.70	95	1.000	122.00	121.00
Church St	0	CB 80		0.851		0.4	0.340	1.335	23.3	50	187.31	450	1.00%	285.1	0.7	1.79	100	1.000	121.00	120.00
Victoria St	0	CB 80		0.580		0.4	0.232	0.232	20.0	56	36.08	250	1.82%	80.2	0.4	1.63	110	2.000	122.00	120.00
North St	CB 80	CB 80		0.477		0.4	0.191	12.350	49.1	30	1045.26	850	0.89%	1468.7	0.7	2.59	112	1.000	120.00	119.00
Mill St	CB 81	CB 80		0.591		0.4	0.236	0.236	20.0	56	36.76	300	0.59%	74.2	0.5	1.05	85	0.500	120.00	119.50
Mill St	CB 81	0		0.558		0.4	0.223	0.460	21.4	53	68.38	350	0.59%	111.9	0.6	1.16	85	0.500	119.50	119.00
West Front St	CB 80	STM-MH2		0.848		0.4	0.339	0.339	20.0	56	52.75	300	3.16%	171.8	0.3	2.43	95	3.000	125.00	122.00

West Front St	0	CB 84		0.818		0.4	0.327	0.666	20.7	54	101.41	300	3.16%	171.8	0.6	2.43	95	3.000	122.00	119.00
West Front St	0	0		0.195		0.4	0.078	13.554	51.9	29	1105.04	850	1.32%	1783.0	0.6	3.14	38	0.500	119.00	118.50
East Front St	CB 100	CB 101		1.738		0.4	0.695	0.695	20.0	56	108.11	350	0.87%	136.0	0.8	1.41	115	1.000	125.00	124.00
East Front St	CB 101	36 Frankford Rd.		0.431		0.4	0.172	0.868	21.4	53	129.07	350	1.00%	145.9	0.9	1.52	100	1.000	124.00	123.00
Brown Shoe Property	CB 102	36 Frankford Rd.		0.510		0.4	0.204	0.204	20.0	56	31.73	300	0.79%	86.1	0.4	1.22	63	0.500	124.00	123.50
Brown Shoe Property	CB 102	0		0.421		0.4	0.168	0.372	20.9	54	56.28	300	0.83%	88.3	0.6	1.25	60	0.500	123.50	123.00
East Front St	CB 102	36 Frankford Rd.		1.847		0.4	0.739	1.111	21.7	53	163.73	450	0.50%	201.6	0.8	1.27	100	0.500	123.00	122.50
Spry-Cleaver Property	36 Frankford Rd.	CB 103		1.000		0.4	0.400	0.400	20.0	56	62.21	350	0.42%	94.2	0.7	0.98	120	0.500	125.00	124.50
Spry-Cleaver Property	CB 103	42 Frankford Rd.		1.000		0.4	0.400	0.800	22.0	52	116.48	450	0.42%	184.0	0.6	1.16	120	0.500	124.50	124.00
Spry-Cleaver Property	36 Frankford Rd.	CB 103		1.000		0.4	0.400	1.200	23.8	49	166.02	500	0.40%	238.8	0.7	1.22	100	0.400	124.00	123.60
Spry-Cleaver Property	CB 103	42 Frankford Rd.		1.000		0.4	0.400	1.600	25.1	48	213.12	550	0.40%	307.9	0.7	1.30	100	0.400	123.60	123.20
Tuftsville Rd	CB 103	CB 103		0.500		0.4	0.200	1.800	26.4	46	231.79	550	0.45%	326.6	0.7	1.37	100	0.450	123.20	122.75
Tuftsville Rd	CB 103	42 Frankford Rd.		0.500		0.4	0.200	2.000	27.6	45	249.85	550	0.50%	344.3	0.7	1.45	50	0.250	122.75	122.50
East Front St	CB 103	CB 103		0.222		0.4	0.089	3.200	31.2	41	368.04	650	0.59%	583.0	0.6	1.76	85	0.500	122.50	122.00
East Front St	CB 103	42 Frankford Rd.		0.765		0.4	0.306	3.506	32.0	40	396.34	650	0.59%	583.0	0.7	1.76	85	0.500	122.00	121.50
East Front St	CB 103	CB 103		1.230		0.4	0.492	3.998	32.8	40	444.41	650	0.83%	693.9	0.6	2.09	120	1.000	121.50	120.50
John St	CB 103	CB 103		0.865		0.4	0.346	0.346	20.0	56	53.81	300	1.40%	114.4	0.5	1.62	100	1.400	121.70	120.30
Robert St	CB 103	42 Frankford Rd.		0.252		0.4	0.101	0.101	20.0	56	15.68	250	0.60%	46.1	0.3	0.94	50	0.300	120.60	120.30
John St	CB 103	CB 103		0.564		0.4	0.226	0.672	21.9	52	98.28	400	0.48%	143.7	0.7	1.14	105	0.500	120.30	119.80
Wright St	CB 103	42 Frankford Rd.		0.340		0.4	0.136	0.136	20.0	56	21.15	250	0.67%	48.6	0.4	0.99	60	0.400	119.80	119.40
John St	0	CB 103		0.381		0.4	0.152	0.961	24.5	48	130.39	400	0.63%	164.6	0.8	1.31	64	0.400	119.40	119.00
East Front St	CB 103	42 Frankford Rd.		0.823		0.4	0.329	5.288	37.5	36	537.20	650	2.00%	1075.0	0.5	3.24	50	1.000	119.00	118.00
Rogers Dr	CB 104	42 Frankford Rd.		0.638		0.4	0.255	0.255	20.0	56	39.69	300	0.67%	79.0	0.5	1.12	90	0.600	125.00	124.40
Belleville Rd	CB 104	42 Frankford Rd.		0.962		0.4	0.385	0.385	20.0	56	59.84	350	0.50%	103.1	0.6	1.07	120	0.600	125.00	124.40
Belleville Rd	CB 104	CB 103		0.527		0.4	0.211	0.596	23.2	50	83.75	350	0.57%	110.3	0.8	1.15	70	0.400	124.40	124.00
Rogers Dr	42 Frankford Rd.	48 Frankford Rd.		0.941		0.4	0.376	0.376	20.0	56	58.54	300	0.67%	79.0	0.7	1.12	120	0.800	123.30	122.50
Rogers Dr	CB 105	48 Frankford Rd.		1.184		0.4	0.474	0.474	20.0	56	73.65	350	0.61%	113.8	0.6	1.18	115	0.700	123.20	122.50
Aberdeen St	48 Frankford Rd.	54 Frankford Rd.		0.275		0.4	0.110	0.960	23.4	50	134.20	400	2.18%	307.8	0.4	2.45	87	1.900	122.50	120.60
Berwick St	0	54 Frankford Rd.		0.825		0.4	0.330	1.290	24.0	49	177.30	450	0.58%	217.8	0.8	1.37	120	0.700	120.60	119.90
Berwick St	CB 106	54 Frankford Rd.		0.486		0.4	0.194	0.194	20.0	56	30.23	300	0.75%	83.7	0.4	1.18	40	0.300	120.20	119.90
Ryell Subdivision	CB 106	54 Frankford Rd.		0.300		0.4	0.120	1.604	26.0	46	208.76	500	0.70%	316.3	0.7	1.61	57	0.400	119.90	119.50
Ryell Subdivision	CB 106	0		0.154		0.4	0.062	1.666	26.6	46	213.51	550	0.42%	314.3	0.7	1.32	24	0.100	119.50	119.40
John St	54 Frankford Rd.	DCB 107		0.865		0.4	0.346	0.346	20.0	56	53.81	300	1.00%	96.7	0.6	1.37	100	1.000	122.20	121.20
Elizabeth St	0	DCB 107		0.996		0.4	0.398	0.398	20.0	56	61.96	300	0.92%	92.6	0.7	1.31	120	1.100	122.30	121.20
Elizabeth St	0	DCB 107		0.552		0.4	0.221	0.965	22.7	51	137.59	400	0.83%	190.1	0.7	1.51	120	1.000	121.20	120.20
Aberdeen St	0	DCB 107		0.563		0.4	0.225	0.225	20.0	56	35.02	300	0.62%	75.9	0.5	1.07	65	0.400	120.60	120.20
Ryell Subdivision	DCB 107	DCB 107		1.401		0.4	0.560	0.560	20.0	56	87.15	350	0.50%	103.1	0.8	1.07	120	0.600	120.80	120.20
Ryell Subdivision	0	DCB 107		0.781		0.4	0.312	2.063	26.9	45	262.25	550	0.67%	397.5	0.7	1.67	120	0.800	120.20	119.40
Ryell Subdivision	DCB 107	DCB 107		0.232		0.4	0.093	3.822	35.0	38	406.83	600	0.75%	531.7	0.8	1.88	40	0.300	119.40	119.10

John St	CB 109	CB 108		0.935		0.4	0.374	0.374	20.0	56	58.16	350	0.50%	103.1	0.6	1.07	120	0.600	123.00	122.40
Ryell Subdivision	CB 108	DCB 107		1.467		0.4	0.587	0.587	20.0	56	91.26	350	0.75%	126.3	0.7	1.31	80	0.600	123.00	122.40
Ryell Subdivision	DCB 107	CB 110		1.183		0.4	0.473	0.473	20.0	56	73.59	300	3.10%	170.3	0.4	2.41	100	3.100	125.50	122.40
Ryell Subdivision	CB 110	99 Frankford Rd.		1.607		0.4	0.643	2.077	23.6	50	288.96	500	1.33%	436.0	0.7	2.22	90	1.200	122.40	121.20
Ryell Subdivision	99 Frankford Rd.	99 Frankford Rd.		0.205		0.4	0.082	2.159	24.2	49	294.68	500	1.40%	446.8	0.7	2.28	50	0.700	121.20	120.50
Henry St	CB 111	99 Frankford Rd.		1.305		0.4	0.522	0.522	20.0	56	81.18	350	0.80%	130.5	0.6	1.36	100	0.800	122.00	121.20
Henry St	99 Frankford Rd.	103 Frankford Rd.		0.782		0.4	0.313	0.313	20.0	56	48.65	300	1.87%	132.1	0.4	1.87	75	1.400	124.00	122.60
Henry St	99 Frankford Rd.	103 Frankford Rd.		0.882		0.4	0.353	0.666	20.7	54	101.23	300	1.87%	132.1	0.8	1.87	75	1.400	122.60	121.20
Henry St	99 Frankford Rd.	103 Frankford Rd.		0.000		0.4	0.000	1.188	22.6	51	170.19	400	1.64%	266.4	0.6	2.12	55	0.900	121.20	120.30
Henry St	CB 112	103 Frankford Rd.		0.973		0.4	0.389	0.389	20.0	56	60.53	250	4.00%	118.9	0.5	2.42	100	4.000	126.00	122.00
Henry St	CB 112	103 Frankford Rd.		0.000		0.4	0.000	0.389	20.7	54	59.16	250	2.33%	90.7	0.7	1.85	43	1.000	122.00	121.00
Holly Dr	103 Frankford Rd.	96 Frankford Rd.		1.199		0.4	0.480	0.480	20.0	56	74.59	400	0.50%	147.3	0.5	1.17	80	0.400	121.00	120.60
Holly Dr	103 Frankford Rd.	96 Frankford Rd.		1.125		0.4	0.450	0.930	21.1	53	139.25	450	0.50%	201.6	0.7	1.27	100	0.500	120.60	120.10
Holly Dr	0	96 Frankford Rd.		0.922		0.4	0.369	1.298	22.5	51	186.72	500	0.50%	267.0	0.7	1.36	100	0.500	120.10	119.60
Elizabeth St	CB 113	96 Frankford Rd.		1.072		0.4	0.429	1.727	23.7	50	239.60	500	0.80%	337.7	0.7	1.72	100	0.800	119.60	118.80
Henry St	96 Frankford Rd.	STM-MH3		0.837		0.4	0.335	0.335	20.0	56	52.07	250	4.42%	125.0	0.4	2.55	95	4.200	123.00	118.80
Henry St	CB 114	STM-MH3		0.810		0.4	0.324	2.386	25.3	47	316.74	600	0.56%	457.7	0.7	1.62	90	0.500	118.80	118.30
Henry St	STM-MH3	123 Frankford Rd.		0.732		0.4	0.293	3.014	26.2	46	390.41	600	0.65%	494.8	0.8	1.75	77	0.500	118.30	117.80
Emma St	DCB 116	DCB 115		1.193		0.4	0.477	0.477	20.0	56	74.21	300	1.00%	96.7	0.8	1.37	75	0.750	121.00	120.25
Emma St	DCB 115	123 Frankford Rd.		0.685		0.4	0.274	0.274	20.0	56	42.61	250	3.75%	115.2	0.4	2.35	100	3.750	124.00	120.25
George St	0	0		0.376		0.4	0.150	0.902	21.6	53	132.99	350	1.88%	199.7	0.7	2.08	120	2.250	120.25	118.00
Henry St	0	DCB 115		0.692		0.4	0.277	0.277	20.0	56	43.05	300	2.00%	136.8	0.3	1.93	100	2.000	120.00	118.00
Henry St	0	0		0.646		0.4	0.258	1.437	23.4	50	200.63	500	0.67%	308.3	0.7	1.57	75	0.500	118.00	117.50
Church St	123 Frankford Rd.	CB 117		2.281		0.4	0.912	0.912	20.0	56	141.89	450	0.50%	201.6	0.7	1.27	90	0.450	124.00	123.55
Church St	0	CB 117		0.688		0.4	0.275	1.188	21.2	53	177.64	500	0.50%	267.0	0.7	1.36	90	0.450	123.55	123.10
Church St	0	CB 117		2.032		0.4	0.813	2.000	22.3	52	289.11	550	0.50%	344.3	0.8	1.45	90	0.450	123.10	122.65
Allan St	DCB 115	CB 117		0.539		0.4	0.216	2.216	23.3	50	310.58	600	0.50%	434.2	0.7	1.54	115	0.575	122.65	122.08
West Front St	CB 123	CB 122		1.598		0.4	0.639	0.639	20.0	56	99.41	350	1.00%	145.9	0.7	1.52	100	1.000	125.00	124.00
West Front St	CB 122	CB 120		0.939		0.4	0.376	1.015	21.1	54	152.20	400	1.00%	208.3	0.7	1.66	100	1.000	124.00	123.00
West Front St	CB 120	CB 120		1.020		0.4	0.408	1.423	22.1	52	206.77	450	0.93%	274.2	0.8	1.72	100	0.925	123.00	122.08
Allan St	CB 120	CB 120		0.491		0.4	0.196	3.835	28.2	44	472.42	700	0.50%	654.9	0.7	1.70	100	0.500	122.08	121.58
Rosco St	CB 121	CB 120		0.352		0.4	0.141	0.141	20.0	56	21.90	300	0.50%	68.4	0.3	0.97	85	0.425	124.00	123.58
St James St	CB 120	150 Frankford Rd.		0.572		0.4	0.229	0.229	20.0	56	35.58	300	0.71%	81.4	0.4	1.15	60	0.425	124.00	123.58
St James St	0	150 Frankford Rd.		0.491		0.4	0.196	0.566	20.9	54	85.52	300	1.53%	119.6	0.7	1.69	65	0.995	123.58	122.58
St James St	150 Frankford Rd.	150 Frankford Rd.		0.852		0.4	0.341	0.907	30.9	41	104.96	350	1.44%	174.8	0.6	1.82	70	1.005	122.58	121.58
St James St	150 Frankford Rd.	150 Frankford Rd.		0.985		0.4	0.394	5.136	31.6	41	586.25	750	0.50%	787.2	0.7	1.78	80	0.400	121.58	121.18
St James St	DCB 119	DCB 118		0.780		0.4	0.312	0.312	20.0	56	48.52	300	0.64%	77.5	0.6	1.10	35	0.225	121.40	121.18
St James St	DCB 118	150 Frankford Rd.		0.000		0.4	0.000	5.448	32.9	40	605.35	750	0.70%	931.4	0.6	2.11	25	0.175	121.18	121.00

Church St	150 Frankford Rd.	CB 117		1.031		0.4	0.412	0.412	20.0	56	64.13	300	1.87%	132.1	0.5	1.87	75	1.400	127.00	125.60
Church St	0	CB 117		1.735		0.4	0.694	1.106	20.7	54	168.27	400	1.30%	237.4	0.7	1.89	100	1.300	125.60	124.30
Church St	0	CB 117		1.155		0.4	0.462	1.568	21.6	53	231.88	450	1.44%	342.7	0.7	2.15	90	1.300	124.30	123.00
Church St	CB 125	CB 124		1.748		0.4	0.699	0.699	20.0	56	108.74	350	1.00%	145.9	0.7	1.52	100	1.000	124.00	123.00
Annis St	CB 124	CB 126		0.482		0.4	0.193	2.460	23.3	50	344.58	550	1.00%	486.9	0.7	2.05	100	1.000	123.00	122.00
West Front St	CB 127	0		0.966		0.4	0.386	0.386	20.0	56	60.09	300	1.00%	96.7	0.6	1.37	100	1.000	123.00	122.00
West Front St	CB 127	CB 124		0.322		0.4	0.129	2.976	25.4	47	393.85	650	0.50%	537.5	0.7	1.62	40	0.200	122.00	121.80
Green St	CB 130	6 Henry St.		0.700		0.4	0.280	0.280	20.0	56	43.54	300	2.50%	152.9	0.3	2.16	100	2.500	125.00	122.50
West Front St	CB 130	6 Henry St.		0.935		0.4	0.374	0.654	20.0	56	101.71	300	3.13%	170.9	0.6	2.42	80	2.500	125.00	122.50
West Front St	CB 127	CB 126		1.339		0.4	0.536	0.536	21.3	53	79.76	350	0.58%	111.4	0.7	1.16	120	0.700	122.50	121.80
West Front St	CB 127	0		0.094		0.4	0.038	3.549	28.8	43	431.00	650	0.79%	677.2	0.6	2.04	63	0.500	121.80	121.30
Cambellford Rd Development	CB 130	6 Henry St.		1.000		0.4	0.400	0.400	20.0	56	62.21	300	0.59%	74.2	0.8	1.05	85	0.500	132.00	131.50
Cambellford Rd Development	CB 130	6 Henry St.		1.000		0.4	0.400	0.800	21.4	53	119.03	400	0.59%	159.7	0.7	1.27	85	0.500	131.50	131.00
Cambellford Rd Development	CB 130	6 Henry St.		1.000		0.4	0.400	1.200	22.5	51	172.50	450	0.59%	218.7	0.8	1.37	85	0.500	131.00	130.50
Cambellford Rd Development	CB 130	6 Henry St.		1.000		0.4	0.400	1.600	23.5	50	223.12	500	0.56%	281.4	0.8	1.43	90	0.500	130.50	130.00
Cambellford Rd	CB 130	6 Henry St.		0.310		0.4	0.124	0.124	20.0	56	19.28	250	2.00%	84.1	0.2	1.71	50	1.000	131.00	130.00
Cambellford Rd	CB 130	6 Henry St.		0.710		0.4	0.284	2.008	25.0	48	268.29	500	1.00%	377.6	0.7	1.92	70	0.700	130.00	129.30
Cambellford Rd	CB 130	6 Henry St.		0.749		0.4	0.300	2.308	25.6	47	303.36	500	0.96%	369.8	0.8	1.88	73	0.700	129.30	128.60
Cambellford Rd	CB 130	6 Henry St.		0.887		0.4	0.355	2.662	26.3	46	344.15	600	1.22%	678.8	0.5	2.40	90	1.100	128.60	127.50
Church St	CB 130	6 Henry St.		1.124		0.4	0.450	0.450	20.0	56	69.92	350	0.50%	103.1	0.7	1.07	100	0.500	128.00	127.50
Cambellford Rd	CB 130	6 Henry St.		0.766		0.4	0.306	3.418	28.5	44	418.67	600	2.78%	1024.2	0.4	3.62	115	3.200	127.50	124.30
West Front St	CB 130	6 Henry St.		1.187		0.4	0.475	1.129	20.0	56	175.55	400	1.00%	208.3	0.8	1.66	100	1.000	125.00	124.00
West Front St	CB 130	6 Henry St.		0.128		0.4	0.051	4.598	30.0	42	543.52	600	1.43%	733.9	0.7	2.60	21	0.300	124.00	123.70
Harvest Glen Subdivision	CB 130	6 Henry St.		1.000		0.4	0.400	0.400	20.0	56	62.21	300	1.05%	99.2	0.6	1.40	95	1.000	127.00	126.00
Harvest Glen Subdivision	CB 130	6 Henry St.		1.000		0.4	0.400	0.800	21.1	54	119.88	350	1.00%	145.9	0.8	1.52	100	1.000	126.00	125.00
Harvest Glen Subdivision	CB 130	6 Henry St.		1.000		0.4	0.400	1.200	22.2	52	173.74	400	1.18%	225.9	0.8	1.80	85	1.000	125.00	124.00
West Front St	CB 130	6 Henry St.		0.358		0.4	0.143	0.143	20.0	56	22.27	300	0.79%	85.9	0.3	1.22	38	0.300	124.30	124.00
West Front St	CB 130	6 Henry St.		0.329		0.4	0.132	1.475	23.5	50	205.42	500	0.52%	271.6	0.8	1.38	58	0.300	124.00	123.70
West Front St	CB 130	6 Henry St.		0.780		0.4	0.312	1.787	24.2	49	243.99	600	0.55%	453.5	0.5	1.60	55	0.300	123.70	123.40
West Front St	CB 130	6 Henry St.		0.000		0.4	0.000	6.385	35.5	38	673.33	750	0.67%	909.0	0.7	2.06	60	0.400	123.40	123.00
West Front St	80 Rogers Dr. Intlet	STM-MH5		4.365		0.4	1.746	1.746	20.0	56	271.53	550	0.55%	359.6	0.8	1.51	110	0.600	125.00	124.40
West Front St	CB 180	0		5.015		0.4	2.006	3.752	21.2	53	560.72	700	0.52%	669.0	0.8	1.74	115	0.600	124.40	123.80
West Front St	CB 180	STM-MH5		1.357		0.4	0.543	4.295	22.3	52	620.19	750	0.50%	787.2	0.8	1.78	100	0.500	123.80	123.30
West Front St	CB 181	STM-MH5		0.000		0.4	0.000	4.295	23.2	50	603.19	750	0.50%	787.2	0.8	1.78	60	0.300	123.30	123.00
Weaver St	STM-MH5	STM-MH6		0.316		0.4	0.126	0.126	20.0	56	19.66	250	0.67%	48.6	0.4	0.99	75	0.500	122.00	121.50
Frankford Rd	STM-MH6	CB 182		1.504		0.4	0.602	0.602	20.0	56	93.56	350	1.30%	166.6	0.6	1.73	115	1.500	123.00	121.50
Frankford Rd	0	CB 182		0.726		0.4	0.290	1.018	22.4	51	146.81	400	1.39%	245.4	0.6	1.95	72	1.000	121.50	120.50
Hilden Homes Subdivision	CB 182	CB 182		0.931		0.4	0.372	0.372	20.0	56	57.91	300	0.57%	73.1	0.8	1.03	70	0.400	122.00	121.60

Hilden Homes Subdivision	0	CB 182		1.133		0.4	0.453	0.826	21.1	54	123.71	400	0.53%	152.1	0.8	1.21	75	0.400	121.60	121.20
Hilden Homes Subdivision	CB 182	CB 182		0.404		0.4	0.162	0.987	22.2	52	143.22	450	0.58%	217.8	0.7	1.37	120	0.700	121.20	120.50
Frankford Rd	CB 182	CB 182		0.835		0.4	0.334	2.340	26.5	46	300.38	500	1.11%	398.0	0.8	2.03	90	1.000	120.50	119.50
Weaver St	CB 182	CB 182		0.602		0.4	0.241	0.241	20.0	56	37.45	250	1.00%	59.5	0.6	1.21	50	0.500	122.50	122.00
Gordon Ave	0	CB 182		0.535		0.4	0.214	0.455	20.7	54	69.13	300	1.11%	101.9	0.7	1.44	90	1.000	122.00	121.00
Gordon Ave	CB 182	CB 182		0.804		0.4	0.322	0.776	21.7	53	114.15	350	1.11%	153.8	0.7	1.60	90	1.000	121.00	120.00
Woods Dr	CB 182	CB 182		0.573		0.4	0.229	1.006	22.7	51	143.68	450	0.53%	206.8	0.7	1.30	95	0.500	120.00	119.50
Frankford Rd	CB 182	CB 182		1.233		0.4	0.493	3.838	30.8	41	445.60	650	0.56%	566.6	0.8	1.71	90	0.500	119.50	119.00
Creekside Dr	CB 183	CB 182		0.525		0.4	0.210	0.210	20.0	56	32.66	250	0.71%	50.0	0.7	1.02	85	0.600	120.60	120.00
Frankford Rd	CB 184	CB 183		0.883		0.4	0.353	0.353	20.0	56	54.93	300	2.00%	136.8	0.4	1.93	100	2.000	122.00	120.00
Frankford Rd	CB 183	CB 182		0.489		0.4	0.196	0.759	22.3	52	109.78	300	2.00%	136.8	0.8	1.93	50	1.000	120.00	119.00
Frankford Rd	CB 182	CB 182		0.214		0.4	0.086	4.683	34.2	39	506.33	700	0.50%	654.9	0.8	1.70	120	0.600	119.00	118.40
Dorann Holmes Subdivision	CB 184	CB 183		0.560		0.4	0.224	0.224	20.0	56	34.84	250	0.67%	48.6	0.7	0.99	75	0.500	119.50	119.00
Dorann Holmes Subdivision	CB 182	CB 185		0.897		0.4	0.359	0.583	21.3	53	86.95	350	0.50%	103.1	0.8	1.07	100	0.500	119.00	118.50
Dorann Holmes Subdivision	CB 186	CB 185		1.024		0.4	0.410	0.410	20.0	56	63.70	350	0.42%	94.2	0.7	0.98	120	0.500	119.00	118.50
Dorann Holmes Subdivision	CB 185	CB 187		0.254		0.4	0.102	0.102	20.0	56	15.80	250	1.00%	59.5	0.3	1.21	50	0.500	119.00	118.50
Dorann Holmes Subdivision	0	CB 187		0.610		0.4	0.244	1.338	25.5	47	176.29	500	0.50%	267.0	0.7	1.36	100	0.500	118.50	118.00
Frankford Rd	CB 188	CB 187		0.810		0.4	0.324	0.324	20.0	56	50.39	300	4.00%	193.4	0.3	2.74	75	3.000	121.00	118.00
Frankford Rd	CB 188	CB 187		1.141		0.4	0.456	2.118	27.2	45	267.32	500	0.83%	344.7	0.8	1.76	120	1.000	118.00	117.00

DESIGN PARAMETER

Mannings n = 0.013

1:5 Year Design Flow

i = A*T^B

A= 26.4

B= -0.677

Designed By:

Owen Perrett, E.I.T.

Checked By:

Matt Morkem, P.Eng.

Dwg. Reference:

PROJECT:

Stirling Infrastructure Capacity Assessment

LOCATION:

Stirling, ON

Project Number:	Date:	Sheet Number:
27931	19-Dec-23	01

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