City of Saint John
Overflow Mitigation Strategy

Final Report

202919.00 • March 2021

Your Environment Trust Fund at Work

03	Final Report	L. Bolton	2021 03 15	J. Van Beelen
02	Draft-Final Report	L. Bolton	2021 02 22	J. Van Beelen
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Issue or Revision		**Reviewed By:**	**Date**	**Issued By:**

Report: 202919.00

March 15, 2021

Kendall Mason, P. Eng.
Deputy Commissioner
City of Saint John
PO BOX 1971
Saint John, NB
E2L4L1

Dear Mr. Mason:

RE: ***Long-Term Overflow Monitoring and Mitigation Strategy***

The City of Saint John has engaged CBCL to conduct a study on advanced monitoring of combined sewer overflows (CSO) and sanitary sewer overflows (SSO) across the city to support an ongoing overflow mitigation initiative. This study provides a preliminary methodology for implementation of enhanced long-term monitoring of CSOs and SSOs in the City of Saint John. Locations that required a targeted strategy where monitoring alone is not possible, such as at Spar Cove Road as well as locations where separation may be preferred over monitoring, are identified.

Overflows were investigated and prioritized through a risk-based analysis. Commentary on cost-benefit for each overflow is provided. Based on this information, a priority system was created to identify locations for advanced overflow monitoring, as presented in this report.

If you have any questions or comments on the attached report, please do not hesitate to contact the undersigned.

Yours very truly,

CBCL Limited

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Project No: 202919.00

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Executive Summary

To improve overflow monitoring and reporting, the City of Saint John is analyzing the sewer collection system to identify locations for advanced monitoring using a risk-based prioritization approach created for this project. Prioritization of overflow monitoring sites is required as monitoring all overflow locations in the City would cost more than $1.2M based on high level estimates. The risk-based approach to overflow prioritization presented in this report evaluates the impacts of overflow events under the following main categories:

1. Risk of Primary and Secondary Contact;
2. Social and Aesthetic Considerations; and
3. Environmental Considerations.

A scoring methodology for these three categories is described within this report. The availability and cost of implementation of SCADA (supervisory control and data acquisition) monitoring equipment was determined for each site to support a cost-benefit analysis. By weighing the risk profile of each overflow location against monitoring implementation cost, top priority overflow locations were determined based on a high cost-benefit. Further, a climate lens was applied through a combination of coastal and/or Saint John River flood risk, as well as sewer capacity flood risk profiling. Overflow and water level monitoring at overflow locations within the flood risk boundary will provide useful data for model calibration to better quantify flood risk across the sewer collection system with climate change.

A total of 118 sewer overflow structures were analyzed at a desktop level. The risk-based analysis resulted in the following key findings:

Structure Characterization	Number of Structures	Key Finding
Overflow structures not requiring new infrastructure for monitoring.	53	There are 53 overflow locations across the city that do not require additional infrastructure to begin calculating overflows based on readily available SCADA data. Methods for calculation of these overflow events can be completed.
Overflow structures requiring new infrastructure for monitoring.	56	Sites requiring additional infrastructure at an average opinion of probable cost of $25,000 per site (site specific cost estimates required).
Overflow structures noted with alternative recommendations to monitoring.	8	Candidates for sewer separation or alternative strategies for overflow reporting as monitoring if not feasible based on accessibility or system dynamics.
Total number of structures analyzed.	**117**	**All overflow locations analyzed as part of this study**.

Chapter 1 Background

The following chapter provides a brief introduction to the project and the work done to date, with a summary of current reporting requirements.

1.1 Introduction

At present, the City of Saint John is reporting overflow events to both the Provincial and Federal government on an annual basis. The overflow report provides estimated values for both the volume and duration of overflows in the previous calendar year. The reported volume and duration of overflow events is currently estimated by use of a basic system calculation. Following changes to the Federal reporting regulations, the City of Saint John has engaged CBCL to develop a feasible methodology for implementation of enhanced long-term monitoring and reporting of combined sewer overflows (CSOs) and sanitary sewer overflows (SSOs).

The City has completed the following work to date:

- Inventory of sewer overflow and discharge points across the city;
- Preliminary investigation into methods used by other municipalities to monitor/ estimate and report on bypasses; and
- Identification of easily accessible locations for monitoring.

Based on the number of overflow locations across the City, installation of overflow monitoring equipment at each overflow site is not feasible. This project includes a risk-based prioritization of candidates for advanced overflow monitoring. More specifically, this project includes the following key tasks:

- Determine potential water quality, environmental, and primary or secondary contact recreational impacts of each overflow.
- Identifying locations where SCADA infrastructure is readily available to support advanced monitoring.
- Identify locations where SCADA hook-up and monitoring is practical and cost-effective.
- Prioritize up to 10 locations, based on the overflow characterization, to install infrastructure required for real time overflow monitoring and SCADA integration.

The final portion of this work involves the use of the City's hydrologic and hydraulic sewer model as a potential reporting tool for locations where monitoring is not available.

1.2 Current Reporting Regulations

Current Federal Regulations are outlined in the Water Systems Effluent Regulations (WSER). As of February 15th, 2014, regulations require reporting to be submitted annually, indicating all overflow occurrences from the previous year[1]. This reporting is submitted through the

[1] https://www.canada.ca/en/environment-climate-change/services/wastewater/system-effluent-regulations-reporting/important-dates.html

Effluent Regulatory Reporting Information System (ERRIS) for the federal government. Based on the regulations, each annual report is required to contain the following information:

- The number of days effluent was deposited (monthly); and
- The volume (or estimated volume) of effluent deposited at each discharge point in each overflow event (m^3).

A detailed bypass report is to be given to New Brunswick Department of Environment and Local Government (NBDELG) within five days following the overflow event:

- The day in which an overflow occurred (date); and
- The duration (or estimated duration) of the overflow event.

Keeping a record of the equipment used to monitor overflow events is also required, in case of auditing by NBDELG. Equipment reporting includes the following information:

- Description and type of equipment used to monitor flow;
- Manufacturers specifications including year and model number;
- Calibration dates and degree of accuracy; and
- Installation date and date removed from service (if applicable)[2].

The New Brunswick Approval to Operate, in reference to the Water Quality Regulation – Clean Environment Act, outlines reporting requirement for CSO and SSO overflow events to the New Brunswick Department of Environment and Local Government (DELG). Any discharge at an overflow point must report the same information as outlined by the *Water System Effluent Regulations* listed above[3]. However, the National Environmental Emergencies Center needs to be informed immediately with each overflow event, and a detailed report is required to be submitted to the approval Engineer at the NBDELG within five (5) days of an overflow event.

[2] https://www.canada.ca/en/environment-climate-change/services/wastewater/system-effluent-regulations-reporting/overview.html
[3] http://www.transaqua.ca/sites/default/files/downloads/2019/2019-2020_coa_ww_works.pdf

Chapter 2 Overflow Characterization and Methodology

Each of the SSO and CSO structures identified throughout the city have been analysed at their discharge outfall (where the sewer discharges into the environment) to characterize the overall risk profile of each overflow. The risk profile is a method to narrow down highest-priority locations for improved monitoring and reporting. The risk profile is based on the likelihood that the public could encounter the overflow, with consideration of the amount of people potentially affected and the receiving water.

This chapter summarizes the four key factors used to create the overall risk profile for each overflow, by providing a unique scoring system for each consideration and a weighting factor. The follow four factors are described in more detail in the following chapter:

- Risk of Primary and Secondary Contact;
- Social and Aesthetic Considerations;
- Environmental Considerations; and
- Infrastructure Availability (SCADA).

2.1 Risk of Primary and Secondary Contact

Untreated sanitary effluent typically contains fecal coliform bacteria, surface, and/or ground water, as well as potentially chemicals, products, and/or debris that are either flushed down the drains or enter the system through a catch basin. Debris and other harmful substances would typically be removed during the wastewater treatment process.

Bacteria can be harmful to the environment and detrimental to the health and well-being of the public if contact occurs, typically through primary or secondary contact recreational activities. Even if contact is not anticipated, debris or floatables from the sewer collection system found in the environment is unpleasant and is potentially an environmental concern.

Each overflow was ranked and categorized based on the following criteria:

Table 2.1 Scoring Matrix for Risk of Primary and Secondary Contact

Exposure	Quantitative Score	Qualitative Score	Example
None	0	There is no risk of contact by the public under everyday conditions.	
Possible	1	Overflow is not easily accessible by the public.	Overflow enters the environment at a location that is private or gated off to the public.

Exposure	Quantitative Score	Qualitative Score	Example
Minimal	2	Overflow is in a non-recreational isolated location.	Overflow discharges onto land in a forested area with no apparent footpaths.
Probable	3	Overflow is in a non-recreational public location.	Overflow discharges into a roadside ditch or within the general facility of a frequented walking trail.
Likely	4	Overflow location is upstream of a recreational site. Primary and secondary contact possible.	Overflow discharges upstream into a waterbody where swimming / boating is common or probable.
High	5	Overflow directly near a recreational site. Primary and secondary contact possible.	Overflow discharges directly to a beach or a known swimming/ boating location.

2.2 Social and Aestetic Considerations

The general concern of Saint John residents was taken into consideration when developing the priority matrix. This risk profile factor is not intended to be an identifier of primary or secondary contact activities or public health, but instead is an indicator of the potential aesthetic and/or social considerations related to each overflow locations.

Table 2.2 Scoring Matrix for Social and Aesthetic Considerations

Consideration	Quantitative Score	Qualitative Score
None	0	Overflow is in not in a high-profile location.
Possible	1	Overflow is in a location that has low pedestrian traffic and combines with the storm system prior to release to the environment.
Minimal	2	Overflow is in a location that has moderate to high pedestrian traffic and combines with the storm system prior to release to the environment
Probable	3	Overflow is in a location that has low pedestrian traffic without combining with the storm sewer system
Likely	4	Overflow is in a location that has moderate pedestrian traffic without combining with the storm sewer system
High	5	Overflow is in a location that has high pedestrian traffic without combining with the storm sewer system

2.3 Environmental Considerations

Each of the SSO and CSO structures identified throughout the city have been analysed at their discharge outfall to determine environmental considerations of the receiving area. This was evaluated based on the following criteria:

- Provincially protected areas (e.g. ecological significant areas);
- Municipal zoning (environmental protection, parks, etc.);
- Stream order (From the Canadian Rivers institute - Strahler method) and geological obstructions to flow (e.g. inlet, cove, or bay) for discharges to water bodies; and
- Vegetation for overland discharges (e.g. barren/grasses or treed).

Table 2.3 Scoring Matrix for Environmental Considerations

Environmental Consideration	Quantitative Score	Qualitative Score
Low	1	In general, scores of 1 include discharges onto land or into watercourses with stream orders > 5.
Low to Moderate	2	In general, scores of 2 include discharges into high stream orders > 5 where there is an obstruction to flow (e.g. inlet).
Moderate	3	In general, scores of 3 include discharges directly into or within the 30 m buffer zone of a regulated wetland outside the main channel of its associated watercourses.
Moderate to High	4	In general, scores of 4 include discharges directly into or within the 30 m buffer of a regulated wetland.
High	5	In general, scores of 5 include discharges directly into or within the 30 m buffer zone of a provincially significant wetland.

2.4 SCADA Availability

The current availability, as well as the difficulty/cost to install level monitoring instrumentation in conjunction with SCADA monitoring was analysed at each overflow structure throughout the city. This portion of the ranking matrix allows the City of Saint John to more effectively develop a capital plan to address high-risk locations.

Many of the CSOs and SSOs identified as part of this project are located very close to sanitary lift stations (SLSs). In some cases, the wet well level sensors located within these lift stations can be correlated to sewer levels within the overflow structures. Using this information, overflow occurrences as well as volume estimates can be recorded without the need to install additional instrumentation within the overflow structures, and additional SCADA infrastructure is not required.

It is recognized that when the water level in the wet well approaches the sensor, level data can be lost for a period until the water level lowers. In this circumstance, it can be reasonably assumed that the water level within wet well is at the elevation of the sensor. Sensor elevations can be confirmed in the field or checked using record drawing information for each SLS, where available.

In locations where the levels within the wet wells of near-by lift stations can not be directly correlated to the levels within the overflow structures, additional infrastructure is required. The structures were ranked regarding SCADA availability based on the following criteria:

Table 2.4 Scoring Matrix for SCADA Availability

Consideration	Quantitative Score	Qualitative Score
New Infrastructure Required with Challenges	1	In some locations, the overflow structures are located within the travel lane of a roadway, and available land is minimal. The installation of overflow monitoring equipment at these locations would incur additional costs due the potential of requiring land acquisition.
New Infrastructure Required	2	The overflow structure is isolated away from infrastructure connected to SCADA. In addition to requiring a level sensor, a SCADA antenna, electrical box, and power connection would be required.
Moderate Work Required	3	The levels within the overflow structure can not be directly correlated to the levels within the wet well of an in-line lift station but is close to a lift station with SCADA installed. These structures would require level sensors and could be wired to the existing SCADA network.
No Work Required	4	The levels within the overflow structure can be directly correlated to the levels within the wet well of an in-line lift station that is currently recording and reporting through SCADA.

Within the overall ranking matrix, the value used from the SCADA availability score shown above has an inverse relationship to the other “risk bases” categories. This SCADA availability scoring does not contribute to the assets “risk level”, rather it indicates the ease of monitoring of each structure. The higher numerical ranking that an overflow structure has in the SCADA availability category, the higher priority the structure will receive.

A detailed breakdown of information summarized in this section on all overflow locations is presented in Appendix A.

Chapter 3 Results

The following chapter outlines the risk assessment results and work plan. 117 overflow locations were analyzed, and the qualitative scores are presented in this chapter. A map of the overflow structures throughout the city can be seen in **Figure 1: Combined/Sanitary Sewer Overflow Locations** presented on the following page.

3.1 Overflow Ranking

The total risk rating for each structure was developed using the following risk profile:

$$Risk\ Scoring = 2(contact\ scoring) + (social\ and\ aestetic\ score) + (environemtnal\ score)$$

Scoring methodology, as summarized in Chapter 2, is presented below:

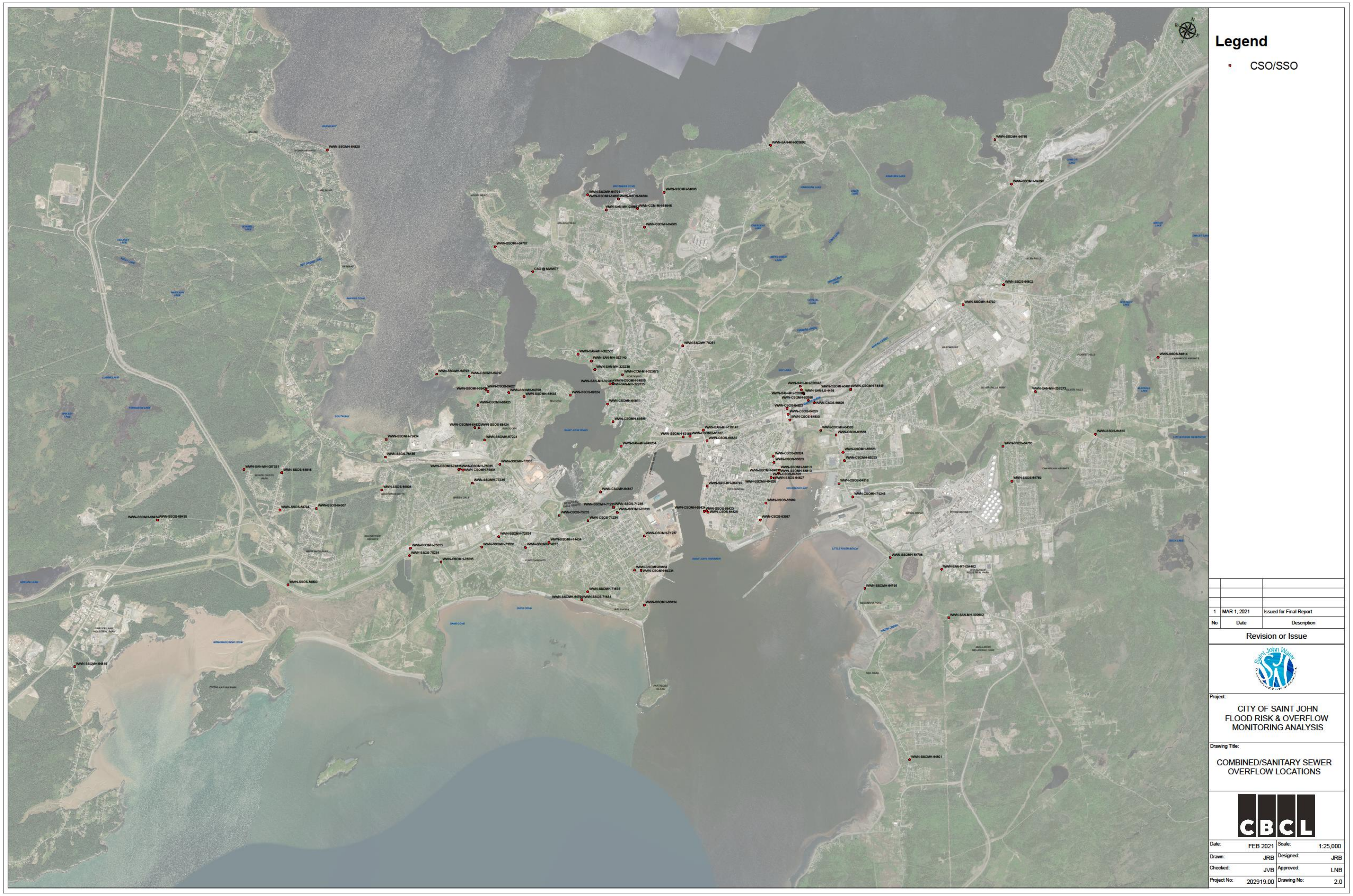
Table 3.1 Qualitative Analysis of High Scoring Structures

Factor	Ranking System	Scaling Factor	Summary of Results
Risk of Primary and Secondary Contact	1 – 5	2	13% structures with a rating of 5 (15 structures)
Social and Aesthetic Considerations	1 - 5	1	14% structures with a rating of 5 (16 structures)
Environmental Implications	1 - 5	1	6% structures with a rating of 5 (7 structures)
Infrastructure Availability (SCADA)	1 - 4	1	45% structures with a rating of 4 (53 structures)

Sorting the structures by their total overall ranking outlines the high-risk areas with minimal required work/cost for installation of monitoring equipment (highest cost-benefit locations) to be determined. The following three categories are defined for risk prioritization:

- **Priority 1: High Cost-Benefit** – Location has a high-risk profile and installation of monitoring equipment is low cost and/or readily available.
- **Priority 2: Low Cost-Benefit** – Location has a high-risk profile; however, installation of monitoring equipment is high cost and/or not readily available.
- **Priority 3: Special Case** - Location may still be considered due to the receiving environment, although installation is high cost.

A climate lens was applied through a combination of coastal and/or Saint John River flood risk, as well as sewer capacity flood risk profiling. Overflow and water level monitoring at overflow locations within the flood risk profile will provide useful data for model calibration to better quantify flood risk across the sewer collection system with climate change.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Project:
CITY OF SAINT JOHN
FLOOD RISK & OVERFLOW
MONITORING ANALYSIS
Drawing Title:
COMBINED/SANITARY SEWER
OVERFLOW LOCATIONS
CBCL
Date: FEB 2021 Scale: 1:25,000
Drawn: JRB Designed: JRB
Checked: JVB Approved: LNB
Project No: 202919.00 Drawing No: 2.0

Priority 1: High Cost-Benefit

Through this ranking system, 10 structures were highlighted as high priority, with a total quantitative score exceeding 60. These locations all exhibited high risk factors while not requiring the installation of additional infrastructure to be monitored. In addition to the 10 high risk structures, two medium risk structures were noted as having a High Cost-Benefit as the SLS is currently planned to be replaced. These structures are summarized in the table 3.2 on the following page.

Table: 3.2: Priority 1 Structures for Overflow Monitoring

Reporting ID	CSO/SSO ID	Overflow Description	Risk Profile (Contact/ Social / Environmental) *	Total
WWN-SSDP-13849	WWN-SAN-MH-98486	Bayside Drive Lift Station 2 Sanitary Sewer Overflow	10/ 4/ 4	72
WWN-CSDP-17884	WWN-CSOMH-64811	Combined Sewer Overflow at Bridge Street Lift Station 23	10/ 5/ 2	68
WWN-SSDP-17869	WWN-SSOS-64804	Millidge Avenue Lift Station Overflow 1	10/ 5/ 2	68
WWN-SSDP-17874	WWN-SSOMH-64806	Kennebecasis Drive Lift Station 2 Overflow	10/ 5/ 2	68
WWN-CSDP-17885	WWN-CSOMH-63585	Kennedy Street Lift Station 24 Combined Sewer Overflow	10/ 5/ 1	64
WWN-CSDP-3009	WWN-COM-MH-68646	Beach Crescent Combined Sewer Overflow	10/ 5/ 1	64
WWN-CSDP-505	WWN-SSOMH-64786	Fox Point Drive	10/ 5/ 1	64
WWN-SSDP-17467	WWN-SSOMH-64799	Sea Street Lift Station Combined Sewer Overflow	10/ 5/ 1	64
WWN-SSDP-17873	WWN-SAN-MH-003692	Kennebecasis Drive Lift Station 1 Overflow	10/ 5/ 1	64
WWN-SSDP-62384	WWN-SSOS-71634	Sea Street Lift Station Sanitary Sewer Overflow	10/ 5/ 1	64

Reporting ID	CSO/SSO ID	Overflow Description	Risk Profile (Contact/ Social / Environmental) *	Total
WWN-CSDP-22277	WWN-CSOMH-64819	One Mile Lift Station	8/3/1**	36
WWN-CSDP-92935	WWN-CSOMH-78845	One Mile Lift Station Overflow	8/3/1**	36

*SCADA availability is a score of 4 for each location.
**SCADA availability for is currently 3 – Special case due to the fact that the SLS is being upgraded in the short term.

The One Mile SLS overflow(s) were ranked as category 2 for cost-benefit under its current configuration. This lift station however is currently undergoing re-design. Overflow monitoring associated with this sanitary lift station can be addressed through the design process. The City's GIS currently shows two CSOs, WWN-CSOMH-78845 and WWN-CSOMH-64819, directly upstream of the One Mile SLS. Records regarding the overflow structures are conflicting as it is unclear whether both of these structures are active. Due to hydraulic losses over these two structures, all overflows on this property can not be easily correlated to the levels within the current configuration. It is recommended that the CSOs directly upstream of the lift station undergo review to determine if one of the overflow structures can be abandoned. The overflow structure(s) should be designed to include level monitoring equipment, along with connections to SCADA.

Figure 2: Existing One Mile SLS Configuration

Priority 2: Low Cost-Benefit

In addition to the 12 structures noted in Table 3.2 above, there are other overflow structures that were noted to have a high risk profile that are not capable of being monitored through existing SCADA infrastructure and will require the installation of level monitoring equipment and SCADA instrumentation.

Table 3.3 below lists the structures that were noted to discharge in locations where recreational activities may occur that can not be linked to the existing infrastructure.

Table: 3.3 Priority 2 Structures for Overflow Monitoring (Contact Scores of 4-5)

Reporting ID	CSO/SSO ID	Overflow Description	Ease of Installation	Risk Profile (Contact/ Social/ Environmental)*	Total
WWN-SSDP-13858	WWN-SSOMH-64796	Red Head Road Lift Station 1 Overflow	3	10/4/4	54
WWN-SSDP-60784	WWN-SSOMH-68834	City Line Lift Station Overflow	3	10/5/1	48
WWN-SSDP-13853	WWN-SSOMH-64795	Red Head Road Lift Station 50 Overflow	3	10/4/1	45
WWN-SSDP-17467	WWN-SSOMH-71635	Sea Street Lift Station Combined Sewer Overflow	2	10/5/2	34
WWN-SOO-21478	WWN-SSOMH-69234	Market Place	2	10/5/1	32
WWN-CSDP-19469	WWN-CSOS-64830	Overflow into Marsh Creek @ Marco Polo	2	8/5/1	28
WWN-CSDP-19470	WWN-CSOS-64829	Overflow into Marsh Creek @ Munro	2	8/3/1	24
WWN-CSDP-588	WWN-CSOMH-63586	Overflow to Marsh Creek between Tilley St SLS and Municipal ops SLS	2	8/3/1	24
WWN-CSDP-101839	WWN-CSOMH-69634	Germain Street West Overflow	1	8/2/1	11

Priority 3: Special Case - Environmentally Sensitive

Overflows that discharge to Provincially and environmentally protected areas delivered the highest risk scoring for environmental considerations. A detailed breakdown of this ranking matrix can be seen in Appendix B. Table 3.4 below summarizes overflows locations that were ranked Moderate to High, and High under environmental considerations.

Table: 3.4 Priority 3 Structures for Overflow Monitoring (Environmental Scores in the 4-5 Range)

Reporting ID	CSO/SSO ID	Overflow Description	Ease of Installation	Risk Profile (Contact/ Social/ Environmental)*	Total
WWN-SSDP-16667	WWN-CSOMH-64797	Lift Station A Overflow	4	4/3/5	48
WWN-SSDP-17881	WWN-CSOMH-64822	Lift Station X Overflow	4	4/1/5	40
WWN-CSDP-60378	WWN-SSOMH-68425	Greenhead Rd Combined Overflow	2	4/2/5	22
WWN-SSDP-70841	WWN-SSOMH-72434	Ridgewood Lift Station Sanitary Overflow	4	2/1/5	32
WWN-SSDP-70841	WWN-SSOS-76435	Ridgewood Lift Station Sanitary Overflow	4	2/1/5	32
WWN-SSDP-17068	WWN-SSOMH-68423	MRG Lift Station C Sanitary Sewer Overflow East of Bridge	Septic tank at MRG C – not in service.		
WWN-SSDP-13849	WWN-SAN-MH-98486	Bayside Drive Lift Station 2 Sanitary Sewer Overflow	4	10/4/4	72
WWN-SSDP-13858	WWN-SSOMH-64796	Red Head Road Lift Station 1 Overflow	3	10/4/4	54
WWN-SSDP-2608	WWN-SSOMH-64791	Off of Yacht Haven Lane	1	6/5/4	15
WWN-CSDP-594	WWN-SAN-RT-004462	880 Bayside Drive (snow dump) Combined Sewer Overflow	2	4/1/4	18

Reporting ID	CSO/SSO ID	Overflow Description	Ease of Installation	Risk Profile (Contact/ Social/ Environmental)*	Total
WWN-SSDP-67238	WWN-SSOS-68424	Overflow into Septic tank upstream of SLS X	2	4/3/5	24
WWN-SSDP-37489	GREEN-WOOD WWTF	WWN-SSDP-37489	SCADA is connected. Require additional information at this location.		

3.2 Readily Avaialble for Monitoring

Based off of a desktop review, the water levels within 53 overflow structures can be correlated to an adjacent sanitary lift station's wet well elevation. These structures may be monitored for overflow events as well as approximating overflow volumes from the lift stations existing SCADA instrumentation. Appendix C lists these structures.

3.3 Sewer Seperation Canditates

There are locations in the city that are not practical to monitor overflow discharges based on current sewer configuration. In these locations, alternative work (including separation) is recommended to address the overflows individually. These locations include:

- Allison Grounds Overflow Structures;
- Hillyard St. Overflow Structures;
- Greenwood WWTF and Millidgeville WWTF CSO (currently under review); and
- Spar Cove Road tributaries.

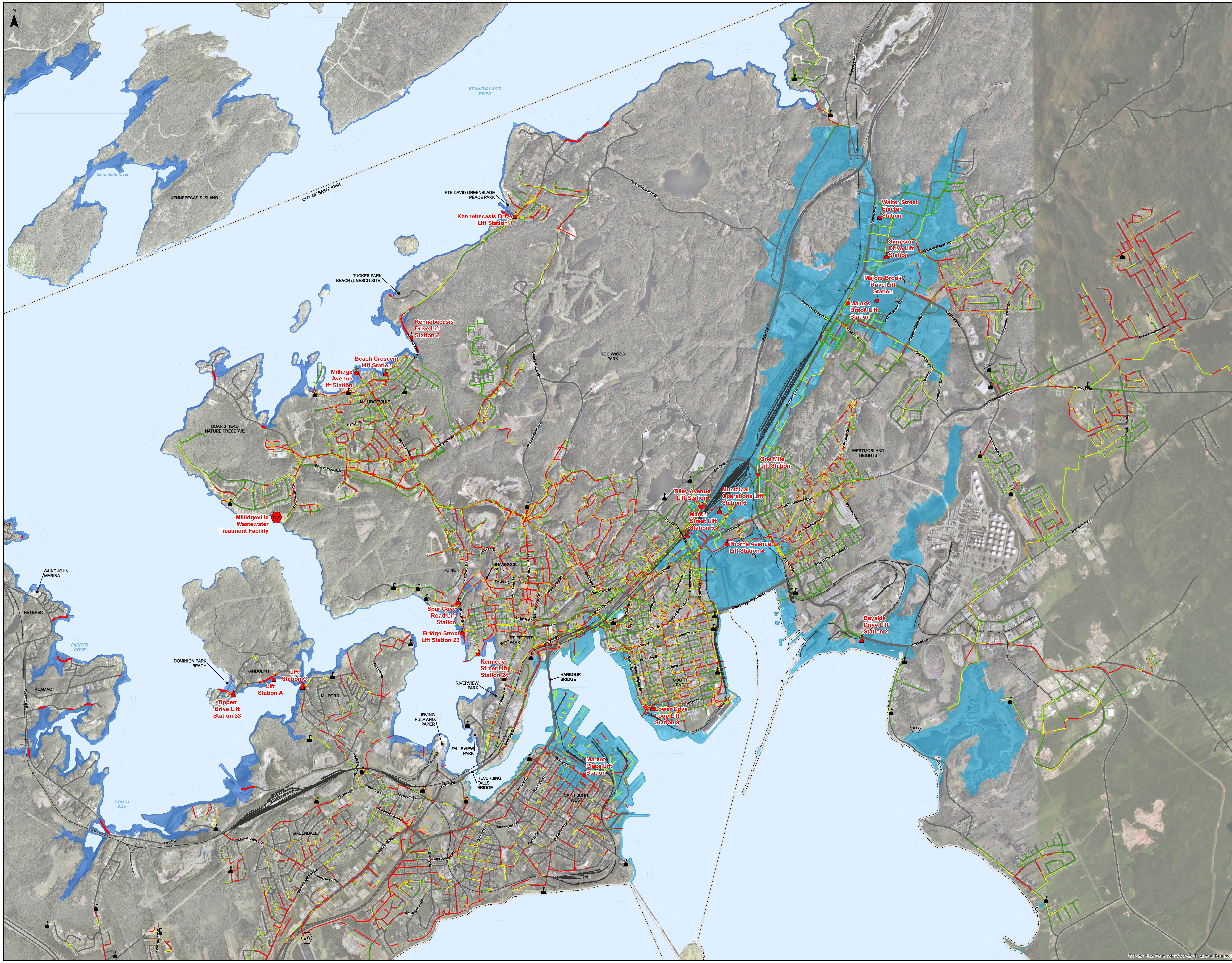
More information on these locations can be found in Appendix D.

3.4 Climate Change

Management of sewer collection system infrastructure will become more complex in the future with sea level rise and increased coastal flood risk. With climate change, flood risk along the Saint John River and in combined sewers may increase.

A climate lens was applied through a combination of coastal flood risk, riverine flood risk along the Saint John River, as well as sewer capacity. A summary of flood risk is presented on **Drawing 1** on the following page. Flood risk areas highlighted on Drawing 1 includes the following components:

- **Coastal Flood Risk**: Extreme water levels are the main factor influencing coastal flooding hazards. Intermediate and High sea level rise (SLR) scenarios were derived from various data sources as well as in-house modeling for the purposes of the risk assessment. SLR will accelerate due to climate change, causing increased risks of coastal erosion and flooding. As a result, extreme water levels with a low return period today will be common



Legend:

- Submerged Wastewater Treatment Plant
- Submerged Wastewater Treatment Plant
- Submerged Sanitary Lift Station
- Private Sanitary Lift Station
- Sanitary Lift Station
- Railway
- Submerged Streets
- Municipal Boundary
- Coastal Flood Level (6.2m CGVD28)
- Peak 2018 Flood Level

Pipe Capacity 1 in 100 Year Rainfall Event

- 0 - 25%
- 26 - 50%
- 51 - 75%
- 76 - 100%
- >100%

No	Date	Issue/Revision
1	MAR 1, 2021	ISSUED FOR FINAL REPORT

Saint John Water
Our Business is Your Water • Votre eau, c'est notre affaire.

Project:

CITY OF SAINT JOHN
FLOOD RISK & OVERFLOW
MONITORING ANALYSIS

Drawing Title:

SAINT JOHN
MASTER FLOOD RISK ANALYSIS

CBCL

Date: MAR 2021		Scale:	1:20,000
Drawn:	JRB	Designed:	SMO
Checked:	JVB	Approved:	LNB
Project No:	182876.00	Drawing No:	1

in a few decades. The coastal flood line plotted on Drawing 1 represents a flood level of 10% cumulative probability up to year 2060, based on a high SLR projection from DFO of 0.6 m.

- **Saint John River Flood Risk**: plotted on Drawing 1 as the peak recorded 2018 spring freshet flood level.
- **Sewer Collection System Capacity**: Changes in precipitation intensity can be related to a warmer atmosphere, changes to aerosol distribution, and changes to cloud formation processes. An increase in precipitation intensity is expected in the coming decades in Saint John. For example, the current 1 in 50 year 24-hour duration rainfall amount is projected to occur more frequently, becoming the 1 in 20 year storm by late century. This is based on precipitation data recorded from two ECCC climate stations in Saint John, which have 20 to 40 years of recorded measurements. Sewer system capacity presented in Drawing 1 is color coded based on the 1 in 100 year return period rainfall event simulated using the City's sewer collection system models.

Extreme Water Levels

Extreme water levels are the main factor influencing coastal flooding hazards. Estimates for various return period events (ex. 1 in 100-year storm surge) and future time horizons for extreme water levels are derived as the combination of tidal elevations, storm surges, and sea level rise (SLR). More specifically, they are measured as the sum of:

- **Tide** – Based on tidal elevations from the Canadian Hydrographic Service (DFO Saint John Harbour tide gauge). Mean water level at Saint John is 4.4m CD (0.2m CGVD 28) and higher high-water large tide (HHWLT) is 8.9m CD (4.7m CGVD 28).
- **Storm Surge** – Storm surges are created by meteorological effects on sea level, such as wind set-up[4] and low atmospheric pressure, and can be defined as the difference between the observed water level during a storm and the predicted astronomical tide. Return periods for storm surge presented in Table 3.5 were derived from an extreme value analysis on the storm peaks of total water levels measured by the DFO Saint John tide gauge. Calculated extreme values were based on the time-series of measured total water level peaks that was de-trended to the 2019 mean sea level.
- **Wave Run-up** – Wave run-up is the vertical distance a wave travels up the shoreline above the still water level. An overall increase in storminess is possible over the coming decades, which may increase overall wave agitation, wave run-up and erosion. For this preliminary coastal flood analysis, wave run-up was not included and therefore presented results are representative of still water levels.
- **Sea-Level Rise (SLR)** – SLR will accelerate due to climate change, causing increased risks of coastal erosion and flooding. As a result, extreme water levels with a low return period today will be common in a few decades. Data sources for SLR estimates included in this analysis are DFO CAN-EWLAT RCP8.5, DFO James et al 2014, and NOAA 2017 (High estimate). The intermediate SLR estimate is close to 1 m by late century, while the high estimate is up to 2 m by late century. These projected increases in sea level will

[4] Wind set-up refers to the increase in mean water level along the coast due to shoreward wind stresses on the water surface.

mean that flooding of some City of Saint John sewer structures, CSOs, and SLS at their present elevations is nearly certain to occur by late century.

Table 3.5: Estimated Extreme Coastal Water Levels at Saint John

Extreme Values by Return Period	m Chart Datum	m CGVD28	m CGVD2013
100-yr	9.3	5.1	4.5
50-yr	9.2	5.0	4.4
25-yr	9.1	4.9	4.3
10-yr	9.1	4.9	4.3
5-yr	9.0	4.8	4.2

Static storm surge flood lines for a flood level of 10% cumulative probability for year 2060, based on a high sea level rise projection from DFO of 0.6 m from 2010 to 2060 (James et al 2014) is presented on Drawing 1. Under this rapid SLR assumption, flood mapping shows the 10% encounter probability for a coastal flood event from storm surge between today and year 2060. Under a more moderate climate change scenario than assumed in Drawing 1, the 0.6 m SLR amount may be reached somewhat later than 2060, likely before 2100 though. Despite the relative uncertainty in the timeline, the figure still provides valuable information on future vulnerability.

Flood Risk Area Mapping

Provincial LiDAR elevations were used to generate a contour map and flood lines as shown on Drawing 1. Although flood risk area extents along the Saint John River and City of Saint John coastlines are represented on one figure, the 2018 Saint John River spring freshet flooding event did not coincide with a storm surge event or a 1 in 100 year rainfall event. These events are simply shown on the same drawing to provide a master summary of all flood risk areas considered as part of this project.

The location of infrastructure and buildings in relation to the flood lines is presented on Drawing 1 and SLSs within the flood risk areas are further highlighted red. Water level monitoring at overflow locations within the flood risk area will provide useful data for model calibration to better quantify flood risk across the sewer collection system with climate change. Planning and design of future resilient infrastructure will need to include provisions for adaptation to continuously rising seas and coastal flooding risk, as well as increased precipitation.

Chapter 4 Conclusion and Recommendations

Following the risk assessment and cost-benefit analysis presented with this report, locations for SCADA integration have been prioritized through the following approach:

- **Priority 1: High Cost-Benefit** – Overflows have a high-risk profile and installation of monitoring equipment is low cost and/or readily available.
- **Priority 2: Low Cost-Benefit** – Overflows have a high-risk profile; however, installation of monitoring equipment is high cost and/or not readily available.
- **Priority 3: Special Case** - Location may still be considered due to the receiving environment, although installation is high cost. on has environmental considerations.

A total of 108 overflow structures were analyzed at a desktop level. The risk-based analysis resulted in the following key findings:

Table: 4.1 Summary of Key Findings

Structure Characterization	Number of Structures	Key Finding
Overflow structures not requiring new infrastructure for monitoring.	53	There are 53 overflow locations across the city that do not require additional infrastructure to begin calculating overflows today based on readily available SCADA data. Methods for calculation of the volumes of these overflow events can be completed.
Overflow structures requiring new infrastructure for monitoring.	56	Sites requiring additional infrastructure at an average opinion of probable cost of $25,000 per site (site specific cost estimates required).
Overflow structures noted with alternative recommendations to monitoring.	8	Candidates for sewer separation or alternative strategies for overflow reporting as monitoring if not feasible based on accessibility or dynamics.
Total number of structures analyzed.	**117**	**All overflow locations analyzed as part of this study**.

Flood risk areas were analyzed as a combination of Saint John River flood risk, coastal extreme water level flood risk, and sewer collection system capacity. Water level monitoring at sites within the flood risk area is recommended to provide valuable data for calibration of the City's sewer models as well as for application in flood resilient design solutions.

Final Report

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APPENDIX A

Characterization and Profiling of CSO and SSO Locations

Reporting ID	CSO/SSO ID	Overflow Description	Ease of installation	Risk from Primary and Secondary Contact	Risk from Social and Aesthetics	Environmental Considerations	Total
WWN-SSDP-13849	WWN-SAN-MH-98486	Bayside Drive Lift Station 2 Sanitary Sewer Overflow	4	10	4	4	72
WWN-CSDP-17884	WWN-CSOMH-64811	Combined Sewer Overflow at Bridge Street Lift Station 23	4	10	5	2	68
WWN-SSDP-17869	WWN-SSOS-64804	Millidge Avenue Lift Station Overflow	4	10	5	2	68
WWN-SSDP-17874	WWN-SSOMH-64806	Kennebecasis Drive Lift Station 2 Overflow	4	10	5	2	68
WWN-CSDP-17885	WWN-CSOMH-63585	Kennedy Street Lift Station 24 Combined Sewer Overflow	4	10	5	1	64
WWN-CSDP-3009	WWN-COM-MH-68646	Beach Crescent Combined Sewer Overflow	4	10	5	1	64
WWN-CSDP-505	WWN-SSOMH-64786	Fox Point Drive	4	10	5	1	64
WWN-SSDP-17467	WWN-SSOMH-64799	Sea Street Lift Station Combined Sewer Overflow	4	10	5	1	64
WWN-SSDP-17873	WWN-SAN-MH-003692	Kennebecasis Drive Lift Station 1 Overflow	4	10	5	1	64
WWN-SSDP-62384	WWN-SSOS-71634	Sea Street Lift Station Sanitary Sewer Overflow	4	10	5	1	64
WWN-SSDP-10650	WWN-SSOS-67624	Milford Rd Liftstation 32 overflow	4	8	4	1	52
WWN-SSDP-586	WWN-SSOMH-64787	Cedar Point Lift Station Overflow	4	8	4	1	52
WWN-SSDP-16667	WWN-CSOMH-64797	Lift Station A Overflow	4	4	3	5	48
WWN-SSDP-17867	WWN-SSOMH-64801	Woodlawn Park Lift Station Overflow	4	6	4	2	48
WWN-CSDP-17890	WWN-CSOS-66826	Municipal Operations Lift Station 6 Combined Sewer Overflow	4	8	3	1	48
WWN-CSDP-17890	WWN-CSOMH-63587	Municipal Operations Lift Station 6 Combined Sewer Overflow	4	8	3	1	48
WWN-CSDP-582	WWN-CSOS-64823	Marsh Street Lift Station 5 CSO	4	8	3	1	48
WWN-CSDP-588	WWN-SAN-LS-4458	Allison Grounds Combined Sewer Overflow	4	8	3	1	48
WWN-SSDP-17868	WWN-SSOS-64802	Simpson Drive Lift Station Combined Sewer Overflow	4	8	3	1	48
SF-110972	WWN-SAN-MH-249204	Douglas Avenue SLS Overflow	4	8	3	1	48
WWN-CSDP-11848	WWN-CSOS-75235	Fallsview Drive Lift Station Combined Sewer Overflow	4	8	3	1	48
WWN-SOO-3008	WWN-SAN-MH-038662	Manners Sutton Rd SLS Overflow	4	8	3	1	48
WWN-SSDP-17881	WWN-CSOMH-64822	Lift Station X Overflow	4	4	1	5	40
WWN-SSDP-17891	WWN-SSOS-64814	Pauline Street Lift Station Overflow	4	4	3	3	40
WWN-SSDP-596	WWN-SSOS-64789	Champlain Drive South Lift Station Sanitary Overflow	4	6	2	2	40
WWN-SOO-67241	WWN-CSOMH-74834	MRG Lift Station Y Combined Sewer Overflow	4	6	3	1	40
WWN-SOO-67241	WWN-CSOMH-76035	Overflow upstream of SLS Y	4	6	3	1	40
SF-133460	WWN-SAN-MH-323238	Pokiok Road SLS overflow	4	6	1	2	36
WWN-SSD-17069	WWN-SSOMH-64798	MRG Lift Station B Combined Sewer Overflow	4	4	3	2	36
WWN-SSDP-17469	WWN-SSOS-68435	Colpitts Lift Station Sanitary Sewer Overflow	4	4	3	2	36
WWN-SSDP-17469	WWN-SSOMH-68434	Colpitts Lift Station Sanitary Sewer Overflow	4	4	3	2	36
WWN-SSDP-17470	WWN-SAN-MH-007331	Monte Cristo Lift Station Overflow	4	4	3	2	36
WWN-SSDP-18267	WWN-SSOMH-64815	Lorneville Lift Station Overflow	4	4	3	2	36

WWN-CSDP-12248	WWN-SSOS-71236	Riverview Drive Combined Sewer Overflow	4	6	2	1	36
WWN-SOO-234	WWN-SSOS-64816	Gault Rd Lift Station Overflow	4	4	4	1	36
WWN-SSDP-6244	WWN-SSOMH-64792	Overflow on Rothesay Avenue near recycling street	4	4	4	1	36
WWN-SSDP-70841	WWN-SSOMH-72434	Ridgewood Lift Station Sanitary Overflow	4	2	1	5	32
WWN-SSDP-70841	WWN-SSOS-76435	Ridgewood Lift Station Sanitary Overflow	4	2	1	5	32
WWN-SSDP-11448	WWN-SSOMH-64793	Tippett Drive Lift Station Overflow	4	4	2	2	32
WWN-CSDP-12248	WWN-SSOMH-71235	Riverview Drive Combined Sewer Overflow	4	4	3	1	32
WWN-SSDP-17067	WWN-CSOS-64821	MRG Lift Station C Sanitary Sewer Overflow West of Bridge	4	4	3	1	32
WWN-SSDP-17879	WWN-SSOS-64808	West Side Estates Lift Station Overflow	4	2	3	2	28
WWN-SSDP-17883	WWN-SSOS-64810	Hickey Road Lift Station Overflow	4	4	2	1	28
WWN-SOO-52347	WWN-SAN-MH-259273	Forest Hills SLS Overflow	4	4	2	1	28
WWN-SSDP-13449	WWN-SSOS-64794	Hitachi Crescent Lift Station Overflow	4	4	2	1	28
WWN-CSDP-17887	WWN-SSOMH-64826	King Street East Lift Station 7A Combined Sewer Overflow	4	4	2	1	28
WWN-CSDP-17887	WWN-SSOS-64827	King Street East Lift Station 7A Combined Sewer Overflow	4	4	2	1	28
WWN-CSDP-17888	WWN-SSOMH-64813	Elliott Row Lift Station (flap gates) Combined Sewer Open End Outfall	4	4	2	1	28
WWN-SSDP-589	WWN-SSOS-64788	York Street Lift Station Sanitary Overflow	4	4	1	1	24
WWN-SSDP-40702	WWN-SSOS-75234	Overflow before Lancaster Treatment Facility	4	2	1	2	20
WWN-SSDP-17878	WWN-SSOS-64807	Westgate Lift Station Overflow	4	2	2	1	20
WWN-SSDP-17871	WWN-SAN-MH-009692	McAllister Industrial Park Lift Station Combined Sewer Overflow	4	2	1	1	16
WWN-SOO-199	WWN-SSOMH-77635	Busby Street Lift Station Overflow	4	0	1	1	8
WWN-SSDP-13858	WWN-SSOMH-64796	Red Head Road Lift Station 1 Overflow	3	10	4	4	54
WWN-SSDP-60784	WWN-SSOMH-68834	City Line Lift Station Overflow	3	10	5	1	48
WWN-SSDP-13853	WWN-SSOMH-64795	Red Head Road Lift Station 50 Overflow	3	10	4	1	45
WWN-CSDP-22277	WWN-CSOMH-64819	One Mile Lift Station	3	8	3	1	36
WWN-CSDP-92935	WWN-CSOMH-78845	One Mile Lift Station Overflow	3	8	3	1	36
WWN-CSDP-17882	WWN-CSOMH-64809	Spar cove rd overflow	3	4	4	2	30
WWN-CSDP-17882	WWN-COM-MH-022658	Spar cove rd overflow	3	4	4	2	30
WWN-CSDP-10649	WWN-SAN-MH-052140	Highland Road Lift Station 21 Combined Overflow	3	6	3	1	30
WWN-SOO-67241	WWN-CSOMH-74835	MRG Lift Station Y Combined Sewer Overflow	3	6	3	1	30
WWN-SOO-54756	WWN-SAN-MH-322835	Spar cove rd overflow	3	4	2	2	24
WWN-SSDP-16267	WWN-SSOMH-64820	Bay Crescent Drive - Morna Overflow	3	4	3	1	24
WWN-CSDP-17875	WWN-CSOS-64818	Bayside Drive Lift Station 3 Combined Sewer Overflow	3	4	1	1	18
WWN-CSDP-18667	WWN-CSOS-63989	Mecklenburg Street Combined Sewer Overflow	3	4	1	1	18
WWN-CSDP-19468	CSO @ MWWTF	Millidgeville WWTP overflow	3	0	0	1	3
WWN-CSDP-556	WWN-CSOMH-71237	Rodney Terminal Combined Sewer Overflow	3	0	0	1	3
WWN-SSDP-17467	WWN-SSOMH-71635	Sea Street Lift Station Combined Sewer Overflow	2	10	5	2	34

WWN-SOO-21478	WWN-SSOMH-69234	Market Place	2	10	5	1	32
WWN-CSDP-19469	WWN-CSOS-64830	Overflow into Marsh Creek @ Marco Polo	2	8	5	1	28
WWN-SSDP-67238	WWN-SSOS-68424	Overflow into Septic tank upstream of SLS X	2	4	3	5	24
WWN-CSDP-19470	WWN-CSOS-64829	Overflow into Marsh Creek @ Munro	2	8	3	1	24
WWN-CSDP-588	WWN-CSOMH-63586	Oferflow to Marsh Creek between Tilley St SLS and Municipal ops SLS	2	8	3	1	24
WWN-CSDP-590	WWN-CSOS-64824	Harbour Station Lift Station 10 Combined Sewer Overflow	2	6	5	1	24
WWN-CSDP-590	SAN-MH-116147	Harbour Station Lift Station 10 Combined Sewer Overflow	2	6	5	1	24
WWN-CSDP-60378	WWN-SSOMH-68425	Greenhead Rd Combined Overflow	2	4	2	5	22
WWN-SSDP-599	WWN-SSOMH-64790	Ashburn Rd / Drury Cove Rd overflow	2	6	4	1	22
WWN-SSDP-17872	WWN-SSOMH-64805	Rowan Berry Terrace Ejector Station Overflow	2	4	4	2	20
WWN-CSDP-594	WWN-SAN-RT-004462	880 Bayside Drive (snow dump) Combined Sewer Overflow	2	4	1	4	18
WWN-SOO-63213 / WWN-SGO-553	WWN-SSOMH-72834	Alderwood Street Overflow & Honeysuckle Drive Overflow	2	4	3	2	18
WWN-SOO-63213 / WWN-SGO-553	WWN-SSOMH-73636	Alderwood Street Overflow & Honeysuckle Drive Overflow	2	4	3	2	18
WWN-CSDP-72463	WWN-CSOMH-78035 / WWN-CSOMH-74435	Overflow upstream of Lancaster Sweage Lagoon	2	4	3	2	18
WWN-CSDP-12248	WWN-SSOMH-70836	Riverview Drive Combined Sewer Overflow	2	6	2	1	18
WWN-SSDP-67237	WWN-SSOMH-67223	Overflow upstream of Lift Station X	2	4	2	2	16
WWN-SOO-60380	WWN-SSOMH-68433	Lift Station B Overflow	2	4	3	1	16
WWN-CSDP-21877	WWN-CSOMH-64385	End of egbert street (off Thorne)	2	4	1	2	14
WWN-SSDP-17468	WWN-SSOS-64800	Carpenter Place Combined Sewer Overflow	2	4	2	1	14
WWN-CSDP-17888	WWN-CSOS-66824	Crown Street Overflow	2	4	2	1	14
WWN-CSDP-19467	WWN-COM-MH-022675	Pokiok Road Combined Sewer Overflow	2	4	0	2	12
WWN-CSDP-17887	WWN-CSOS-64828	King Street East Lift Station 7A Combined Sewer Overflow	2	4	1	1	12
WWN-CSDP-17888	WWN-CSOS-66823	Elliott Row Lift Station (flap gates) Combined Sewer Open End Outfall	2	4	1	1	12
WWN-CSDP-17889	WWN-SSOMH-64812	Elliott Row	2	4	1	1	12
WWN-CSDP-18670	WWN-CSOS-63987	Britain Street Combined Sewer Overflow	2	4	1	1	12
WWN-SSDP-10648	WWN-SAN-MH-002563	Highland Rd Liftstation 21A overflow	2	4	1	1	12
WWN-CSDP-93335	WWN-CSOMH-79245	Bayside Drive Overflow at Willet Ave.	2	4	1	1	12
WWN-CSDP-587	WWN-CSOS-63588	Dutchmans Creek Combined Open End	2	2	1	2	10
WWN-SOO-323	WWN-SSOMH-75635	Lancaster WWTF Overflow	2	2	1	2	10
WWN-SOO-64407/ WWN-SOO-324/ WWN-SOO-63213	WWN-SSOMH-74035	Sherbrooke St Overflow	2	2	1	2	10
WWN-SOO-64407/ WWN-SOO-324/ WWN-SOO-63213	WWN-SSOMH-74434	Young Street Overflow	2	2	1	2	10
WWN-SOO-49104	WWN-CSOMH-63187	Overflow at Long Warf	2	2	1	1	8
WWN-SOO-49104	WWN-SSOMH-63186	Overflow at Long Warf	2	2	1	1	8
WWN-CSDP-17886	WWN-CSOMH-66424	Lower Cove Loop Lift Station 9 Combined Sewer Overflow	2	0	1	1	4

WWN-CSDP-17886	WWN-CSOS-64825	Lower Cove Loop Lift Station 9 Combined Sewer Overflow	2	0	1	1	4
WWN-CSDP-17886	WWN-SSOS-66423	Lower Cove Loop Lift Station 9 Combined Sewer Overflow	2	0	1	1	4
WWN-SSDP-2608	WWN-SSOMH-64791	off yacht haven lane	1	6	5	4	15
WWN-CSDP-101839	WWN-CSOMH-69634	Germain Street West Overflow	1	8	2	1	11
WWN-CSDP-17882	WWN-SSOMH-79251	Summerset Street Overflow @ Churchill Boulivard	1	4	4	2	10
WWN-CSDP-587	WWN-CSOMH-65223	Dutchmans Creek Combined Open End	1	2	1	2	5
WWM-CSDP-587	WWN-CSOMH-65623	Bayside Drive Overflow at Edith Ave.	1	2	1	2	5
WWN-SOOP-60786	WWN-SAN-MH-004749	Duke Street	1	0	1	1	2
WWN-SSDP-17068	WWN-SSOMH-68423	MRG Lift Station C Sanitary Sewer Overflow East of Bridge				5	0
WWN-SSDP-37489	GREENWOOD WWTF	WWN-SSDP-37489				4	0
WWN-CSDP-588	WWN-SAN-MH-328044	Allison Grounds Combined Sewer Overflow				1	0
WWN-CSDP-588	WWN-SAN-MH-328043	Allison Grounds Combined Sewer Overflow				1	0
WWN-CSDP-588	WWN-SAN-MH-328048	Allison Grounds Combined Sewer Overflow				1	0
WWN-CSDP-588	WWN-SAN-MH-328046	Allison Grounds Combined Sewer Overflow				1	0

APPENDIX B

Environmental Risk Rating

Reporting ID	CSO/SSO ID	Overflow Description	Location		Provincially Protected Areas			Municipal Zoning Areas					Stream Order					Geological		Vegetation Cover		Total
			Latitude	Longitude	Ecological Significant Area (15)	Provincially Significant Wetland (15)	Regulated Wetland (10)	Environmental Protection (5)	Park (4)	Residential/Community Facility (3)	Commercial/ Utility Services (2)	Industrial/ Transportation (1)	One (5)	Two (4)	Three (3)	Four (2)	> 5 or Discharges into a Water Body (1)	Inlet (2)	Inland Bay/Cove (1)	Barren/Grass (1)	Trees (2)	
SF-133460	WWN-SAN-MH-323238	Pokiok Road SLS overflow	45.2775	-66.0893						3							1	2				2
SF-110972	WWN-SAN-MH-249204	Douglas Avenue SLS Overflow	2532794.389	7363357.216						3											2	1
WWN-CSDP-10649	WWN-SAN-MH-052140	Highland Road Lift Station 21 Combined Overflow	45.2788	-66.0956						3							1		1			1
WWN-CSDP-11848	WWN-CSOS-75235	Fallsview Drive Lift Station Combined Sewer Overflow	45.2565	-66.0874					4								1					1
WWN-CSDP-12248	WWN-SSOMH-70836	Riverview Drive Combined Sewer Overflow	45.2611	-66.0782						3							1					1
WWN-CSDP-17875	WWN-CSOS-64818	Bayside Drive Lift Station 3 Combined Sewer Overflow	45.2779	-66.0398								1					1		1			1
WWN-CSDP-17882	WWN-CSOMH-64809	Spar cove rd overflow	45.2773	-66.0892					4								1	2				2
WWN-CSDP-17884	WWN-CSOMH-64811	Combined Sewer Overflow at Bridge Street Lift Station 23	45.2746	-66.0888					4								1	2				2
WWN-CSDP-17885	WWN-CSOMH-63585	Kennedy Street Lift Station 24 Combined Sewer Overflow	45.2714	-66.0882						3							1					1
WWN-CSDP-17886	WWN-SSOS-66423	Lower Cove Loop Lift Station 9 Combined Sewer Overflow	45.2655	-66.0608								1					1					1
WWN-CSDP-17887	WWN-SSOMH-64826	King Street East Lift Station 7A Combined Sewer Overflow	45.2749	-66.0486						3							1		1			1
WWN-CSDP-17888	WWN-SSOMH-64813	Elliott Row Lift Station (flap gates) Combined Sewer Open End Outfall	45.2767	-66.0473						3							1		1			1
WWN-CSDP-17890	WWN-CSOS-66826	Municipal Operations Lift Station 6 Combined Sewer Overflow	45.2878	-66.0488							2					2						1
WWN-CSDP-18667	WWN-CSOS-63989	Mecklenburg Street Combined Sewer Overflow	45.2713	-66.0481						3							1					1
WWN-CSDP-18670	WWN-CSOS-63987	Britain Street Combined Sewer Overflow	45.2687	-66.0474						3							1		1			1
WWN-CSDP-19467	WWN-COM-MH-022675	Pokiok Road Combined Sewer Overflow	45.27746556	-66.08929054						3							1	2				2
WWN-CSDP-19468	CSO @ MWWTF	Millidgeville WWTP overflow	2530130.272	7365210.788							2						1					1
WWN-CSDP-19469	WWN-CSOS-64830	Overflow into Marsh Creek @ Marco Polo	45.28397185	-66.05176889							2					2						1
WWN-CSDP-19470	WWN-CSOS-64829	Overflow into Marsh Creek @ Munro	45.28461002	-66.05255431							2					2						1
WWN-CSDP-21877	WWN-CSOMH-64385	End of egbert street (off Thorne)	45.28421941	-66.04484289								1	5									2
WWN-CSDP-22277	WWN-CSOMH-64819	One Mile Lift Station	45.2918	-66.043							2					2						1
WWN-CSDP-3009	WWN-COM-MH-68646	Beach Crescent Combined Sewer Overflow	45.3037	-66.1003						3							1		1			1

WWN-CSDP-505	WWN-SSOMH-64786	Fox Point Drive	2536262.507	7370538.029						3											2	1
WWN-CSDP-556	WWN-CSOMH-71237	Rodney Terminal Combined Sewer Overflow	45.2633	-66.0653								1					1					1
WWN-CSDP-582	WWN-CSOS-64823	Marsh Street Lift Station 5 CSO	2535095.971	7365083.18							2						1					1
WWN-CSDP-587	WWN-CSOMH-65223	Dutchmans Creek Combined Open End	45.2846	-66.0419								1	5									2
WWN-CSDP-588	WWN-SAN-MH-328044	Allison Grounds Combined Sewer Overflow	45.2876	-66.0499								1				2						1
WWN-CSDP-588	WWN-COM-MH-141078	Overflow to Marsh Creek between Tilley St SLS and Municipal ops SLS	2535313.534	7365345.69								1					1					1
WWN-CSDP-590	SAN-MH-116147	Harbour Station Lift Station 10 Combined Sewer Overflow	45.2747	-66.0679							2						1	2				1
WWN-CSDP-594	WWN-SAN-RT-004462	880 Bayside Drive (snow dump) Combined Sewer Overflow	2538382.07	7363555.986			10					1		4								4
WWN-CSDP-60378	WWN-SSOMH-68425	Greenhead Rd Combined Overflow	45.26667991	-66.1138701		15				3							1		1			5
WWN-CSDP-92935	WWN-CSOMH-78845	One Mile Lift Station Overflow	45.29189846	-66.04293972							2					2						1
WWN-SOO-199	WWN-SSOMH-77635	Busby Street Lift Station Overflow	45.2635055	-66.09885776								1					1		1			1
WWN-SOO-21478	WWN-SSOMH-69234	Market Place	45.25371562	-66.06258099								1					1					1
WWN-SOO-234	WWN-SSOS-64816	Gault Rd Lift Station Overflow	2527870.681	7360630.695						3											2	1
WWN-SOO-3008	WWN-SAN-MH-038662	Manners Sutton Rd SLS Overflow	2530835.283	7366811.999						3							1		1			1
WWN-SOO-323	WWN-SSOMH-75635	Lancaster WWTF Overflow	45.24181896	-66.11344825						3			5									2
WWN-SOO-49104	WWN-SSOMH-63186	Overflow at Long Wharf	2533637.528	7363549.139							2						1					1
WWN-SOO-52347	WWN-SAN-MH-259273	Forest Hills SLS Overflow	2538630.935	7367015.161						3										1		1
WWN-SOO-60380	WWN-SSOMH-68433	Lift Station B Overflow	2530909.523	7363667.433						3											2	1
WWN-SOO-63213 / WWN-SGO-553	WWN-SSOMH-73636	Alderwood Street Overflow & Honeysuckle Drive Overflow	45.24322755	-66.10319641						3			5									2
WWN-SOO-67241	WWN-CSOMH-74834	MRG Lift Station Y Combined Sewer Overflow	45.2569	-66.1116								1								1		1
WWN-SOOP-60786	WWN-SAN-MH-004749	Duke Street	2534304.469	7363315.136								1					1					1
WWN-SSD-17069	WWN-SSOMH-64798	MRG Lift Station B Combined Sewer Overflow	45.2733	-66.1053						3							1					1
WWN-SSDP-10648	WWN-SAN-MH-002563	Highland Rd Liftstation 21A overflow	2531526.029	7364368.903						3											2	1
WWN-SSDP-10650	WWN-SSOS-67624	Milford Rd Liftstation 32 overflow	2531709.806	7363771.47						3							1					1
WWN-SSDP-11448	WWN-SSOMH-64793	Tippett Drive Lift Station Overflow	2529534.413	7363132.974					4								1		1			2
WWN-SSDP-13449	WWN-SSOS-64794	Hitachi Crescent Lift Station Overflow	2528106.015	7359986.833						3										1		1

WWN-SSDP-13849	WWN-SAN-MH-98486	Bayside Drive Lift Station 2 Sanitary Sewer Overflow	45.2736	-66.0265		15						1					1					4
WWN-SSDP-13853	WWN-SSOMH-64795	Red Head Road Lift Station 50 Overflow	2537456.688	7362928.293						3							1					1
WWN-SSDP-13858	WWN-SSOMH-64796	Red Head Road Lift Station 1 Overflow	2537621.382	7363579.701		15						1					1					4
WWN-SSDP-16267	WWN-SSOMH-64820	Bay Crescent Drive - Morna Overflow	2526324.386	7365768.616							2						1		1			1
WWN-SSDP-16667	WWN-CSOMH-64797	Lift Station A Overflow	2530037.521	7363311.387		15				3												5
WWN-SSDP-17067	WWN-CSOS-64821	MRG Lift Station C Sanitary Sewer Overflow West of Bridge	45.2692	-66.1128						3							1					1
WWN-SSDP-17068	WWN-SSOMH-68423	MRG Lift Station C Sanitary Sewer Overflow East of Bridge	45.269	-66.1131		15				3							1					5
WWN-SSDP-17467	WWN-SSOMH-71635	Sea Street Lift Station Combined Sewer Overflow	45.24611999	-66.07588759					4								1			1		2
WWN-SSDP-17468	WWN-SSOS-64800	Carpenter Place Combined Sewer Overflow	45.2295	-66.1339					4											1		1
WWN-SSDP-17469	WWN-SSOMH-68434	Colpitts Lift Station Sanitary Sewer Overflow	45.2312	-66.165						3			5									2
WWN-SSDP-17470	WWN-SAN-MH-007331	Monte Cristo Lift Station Overflow	2527270.094	7360355.917							2			4								2
WWN-SSDP-17867	WWN-SSOMH-64801	Woodlawn Park Lift Station Overflow	45.24495013	-65.99860547						3				4								2
WWN-SSDP-17868	WWN-SSOS-64802	Simpson Drive Lift Station Combined Sewer Overflow	45.3157	-66.0226						3						2						1
WWN-SSDP-17869	WWN-SSOMH-64803	Millidge Avenue Lift Station Overflow	2531022.019	7367062.107					4								1		1			2
WWN-SSDP-17871	WWN-SAN-MH-009692	McAllister Industrial Park Lift Station Combined Sewer Overflow	2538827.84	7363084.861								1									2	1
WWN-SSDP-17872	WWN-SSOMH-64805	Rowan Berry Terrace Ejector Station Overflow	2531615.775	7366809.26						3				4								2
WWN-SSDP-17873	WWN-SAN-MH-003692	Kennebecasis Drive Lift Station 1 Overflow	2532927.348	7368942.076							2										2	1
WWN-SSDP-17874	WWN-SSOMH-64806	Kennebecasis Drive Lift Station 2 Overflow	2531655.386	7367446.818					4								1		1			2
WWN-SSDP-17878	WWN-SSOS-64807	Westgate Lift Station Overflow	2528652.659	7360268.73						3										1		1
WWN-SSDP-17879	WWN-SSOS-64808	West Side Estates Lift Station Overflow	2529496.975	7361020.128						3			5									2
WWN-SSDP-17881	WWN-CSOMH-64822	Lift Station X Overflow	45.2632759	-66.11195627		15			4													5
WWN-SSDP-17883	WWN-SSOS-64810	Hickey Road Lift Station Overflow	2539938.942	7366898.151						3							1					1
WWN-SSDP-17891	WWN-SSOS-64814	Pauline Street Lift Station Overflow	2540226.45	7368520.25			10			3												3
WWN-SSDP-18267	WWN-SSOMH-64815	Lorneville Lift Station Overflow	2526144.878	7356169.529								1	5									2

WWN-SSDP-2608	WWN-SSOMH-64791	off yacht haven lane	2530527.616	7366906.095			10			3							1		1			4
WWN-SSDP-37489	GREENWOOD WWTF	WWN-SSDP-37489	2542776.318	7369408.619			10				2		5									4
WWN-SSDP-40702	WWN-SSOS-75234	Overflow before Lancaster Treatment Facility	45.2415579	-66.11330675							2		5									2
WWN-SSDP-586	WWN-SSOMH-64787	Cedar Point Lift Station Overflow	2529407.05	7365472.15						3							1					1
WWN-SSDP-589	WWN-SSOS-64788	York Street Lift Station Sanitary Overflow	45.2933	-66.009								1									2	1
WWN-SSDP-596	WWN-SSOS-64789	Champlain Drive South Lift Station Sanitary Overflow	45.2891	-66.004					4				5									2
WWN-SSDP-599	WWN-SSOMH-64790	Ashburn Rd / Drury Cove Rd overflow	2536850.157	7370033.089							2					2						1
WWN-SSDP-60784	WWN-SSOMH-68834	City Line Lift Station Overflow	2534277.03	7361142.933						3							1					1
WWN-SSDP-62384	WWN-SSOS-71634	Sea Street Lift Station Sanitary Sewer Overflow	2533287.099	7360739.424						3							1					1
WWN-SSDP-6244	WWN-SSOMH-64792	Overflow on Rothesay Avenue near recycling street	45.2908	-66.0438							2					2						1
WWN-SSDP-67237	WWN-SSOMH-67223	Overflow upstream of Lift Station X	45.26224859	-66.10920076					4												2	2
WWN-SSDP-70841	WWN-SSOMH-72434	Ridgewood Lift Station Sanitary Overflow	2529205.686	7361846.613		15				3							1		1			5
	WWN-SSOMH-64812		2535432.681	7364052.719						3									1			1
WWN-CSOMH-65623	WWM-CSDP-587	Bayside Drive Overflow at Edith Ave.	2,535,938.162	7365019.857								1	5									2
WWN-CSOMH-79245	WWN-CSDP-93335	Bayside Drive Overflow at Willet Ave.	2,536,145.757	7363982.738								1					1		1			1
WWN-CSOS-66824	WWN-CSDP-17888	Crown Street Overflow	2,535,519.336	7364140.349								1					1		1			1
WWN-SSOMH-79251	WWN-CSDP-17882	Summerset Street Overflow @ Churchill Boulivard	2,532,236.750	7364193.25						3							1	2				2
WWN-SSOS-68424	WWN-SSDP-67238	Overflow into Septic tank upstream of SLS X	2,530,515.350	7362619.85		15			4													5
WWN-CSOMH-76035	WWN-SOO-67241	Overflow upstream of SLS Y	2,530,394.485	7362145.66								1								1		1
WWN-CSOMH-78035 / WWN-CSOMH-74435	WWN-CSDP-72463	Overflow upstream of Lancaster Sweage Lagoon	2,531,001.622	7360447.553						3			5									2
WWN-CSOMH-69634	WWN-CSDP-101839	Germain Street West Overflow	2,534,361.027	7361561.654								1					1					1
WWN-SSOMH-74035	WWN-SOO-64407	Sherbrooke St Overflow	2,531,407.253	7360895.17						3			5									2
	WWN-SOO-324		2,531,399.229	7360880.791						3			5									2
	WWN-SOO-63213		2531155	7360395.35						3			5									2
WWN-SSOMH-74434	WWN-SOO-64407	Young Street Overflow	2,531,407.253	7360895.17						3			5									2
	WWN-SOO-324		2,531,399.229	7360880.791						3			5									2
	WWN-SOO-63213		2,531,155.000	7360395.35						3			5									2

APPENDIX C

Structures with Existing Overflow Monitoring Capability

Reporting ID	CSO/SSO ID	Overflow Description	Total
WWN-SSDP-13849	WWN-SAN-MH-98486	Bayside Drive Lift Station 2 Sanitary Sewer Overflow	72
WWN-CSDP-17884	WWN-CSOMH-64811	Combined Sewer Overflow at Bridge Street Lift Station 23	68
WWN-SSDP-17869	WWN-SSOS-64804	Millidge Avenue Lift Station Overflow	68
WWN-SSDP-17874	WWN-SSOMH-64806	Kennebecasis Drive Lift Station 2 Overflow	68
WWN-CSDP-17885	WWN-CSOMH-63585	Kennedy Street Lift Station 24 Combined Sewer Overflow	64
WWN-CSDP-3009	WWN-COM-MH-68646	Beach Crescent Combined Sewer Overflow	64
WWN-CSDP-505	WWN-SSOMH-64786	Fox Point Drive	64
WWN-SSDP-17467	WWN-SSOMH-64799	Sea Street Lift Station Combined Sewer Overflow	64
WWN-SSDP-17873	WWN-SAN-MH-003692	Kennebecasis Drive Lift Station 1 Overflow	64
WWN-SSDP-62384	WWN-SSOS-71634	Sea Street Lift Station Sanitary Sewer Overflow	64
WWN-SSDP-10650	WWN-SSOS-67624	Milford Rd Liftstation 32 overflow	52
WWN-SSDP-586	WWN-SSOMH-64787	Cedar Point Lift Station Overflow	52
WWN-SSDP-16667	WWN-CSOMH-64797	Lift Station A Overflow	48
WWN-SSDP-17867	WWN-SSOMH-64801	Woodlawn Park Lift Station Overflow	48
WWN-CSDP-17890	WWN-CSOS-66826	Municipal Operations Lift Station 6 Combined Sewer Overflow	48
WWN-CSDP-17890	WWN-CSOMH-63587	Municipal Operations Lift Station 6 Combined Sewer Overflow	48
WWN-CSDP-582	WWN-CSOS-64823	Marsh Street Lift Station 5 CSO	48
WWN-CSDP-588	WWN-SAN-LS-4458	Allison Grounds Combined Sewer Overflow	48
WWN-SSDP-17868	WWN-SSOS-64802	Simpson Drive Lift Station Combined Sewer Overflow	48

SF-110972	WWN-SAN-MH-249204	Douglas Avenue SLS Overflow	48
WWN-CSDP-11848	WWN-CSOS-75235	Fallsview Drive Lift Station Combined Sewer Overflow	48
WWN-SOO-3008	WWN-SAN-MH-038662	Manners Sutton Rd SLS Overflow	48
WWN-SSDP-17881	WWN-CSOMH-64822	Lift Station X Overflow	40
WWN-SSDP-17891	WWN-SSOS-64814	Pauline Street Lift Station Overflow	40
WWN-SSDP-596	WWN-SSOS-64789	Champlain Drive South Lift Station Sanitary Overflow	40
WWN-SOO-67241	WWN-CSOMH-74834	MRG Lift Station Y Combined Sewer Overflow	40
WWN-SOO-67241	WWN-CSOMH-76035	Overflow upstream of SLS Y	40
SF-133460	WWN-SAN-MH-323238	Pokiok Road SLS overflow	36
WWN-SSD-17069	WWN-SSOMH-64798	MRG Lift Station B Combined Sewer Overflow	36
WWN-SSDP-17469	WWN-SSOS-68435	Colpitts Lift Station Sanitary Sewer Overflow	36
WWN-SSDP-17469	WWN-SSOMH-68434	Colpitts Lift Station Sanitary Sewer Overflow	36
WWN-SSDP-17470	WWN-SAN-MH-007331	Monte Cristo Lift Station Overflow	36
WWN-SSDP-18267	WWN-SSOMH-64815	Lorneville Lift Station Overflow	36
WWN-CSDP-12248	WWN-SSOS-71236	Riverview Drive Combined Sewer Overflow	36
WWN-SOO-234	WWN-SSOS-64816	Gault Rd Lift Station Overflow	36
WWN-SSDP-6244	WWN-SSOMH-64792	Overflow on Rothesay Avenue near recycling street	36
WWN-SSDP-70841	WWN-SSOMH-72434	Ridgewood Lift Station Sanitary Overflow	32
WWN-SSDP-70841	WWN-SSOS-76435	Ridgewood Lift Station Sanitary Overflow	32
WWN-SSDP-11448	WWN-SSOMH-64793	Tippett Drive Lift Station Overflow	32

WWN-CSDP-12248	WWN-SSOMH-71235	Riverview Drive Combined Sewer Overflow	32
WWN-SSDP-17067	WWN-CSOS-64821	MRG Lift Station C Sanitary Sewer Overflow West of Bridge	32
WWN-SSDP-17879	WWN-SSOS-64808	West Side Estates Lift Station Overflow	28
WWN-SSDP-17883	WWN-SSOS-64810	Hickey Road Lift Station Overflow	28
WWN-SOO-52347	WWN-SAN-MH-259273	Forest Hills SLS Overflow	28
WWN-SSDP-13449	WWN-SSOS-64794	Hitachi Crescent Lift Station Overflow	28
WWN-CSDP-17887	WWN-SSOMH-64826	King Street East Lift Station 7A Combined Sewer Overflow	28
WWN-CSDP-17887	WWN-SSOS-64827	King Street East Lift Station 7A Combined Sewer Overflow	28
WWN-CSDP-17888	WWN-SSOMH-64813	Elliott Row Lift Station (flap gates) Combined Sewer Open End Outfall	28
WWN-SSDP-589	WWN-SSOS-64788	York Street Lift Station Sanitary Overflow	24
WWN-SSDP-40702	WWN-SSOS-75234	Overflow before Lancaster Treatment Facility	20
WWN-SSDP-17878	WWN-SSOS-64807	Westgate Lift Station Overflow	20
WWN-SSDP-17871	WWN-SAN-MH-009692	McAllister Industrial Park Lift Station Combined Sewer Overflow	16
WWN-SOO-199	WWN-SSOMH-77635	Busby Street Lift Station Overflow	8

APPENDIX D

Overflow Locations where Monitoring is Not Feasible

Allison Grounds Overflow Structures

In the East side of the city along Tilley Avenue and connected streets, there are a total of 3 overflow structures as well as one sanitary pipe that discharges into a storm sewer causing it to become a combined sewer which by-passes Tilley Avenue SLS. This lift station also has an emergency overflow within the lift station that flows into this combined sewer towards flowing towards Municipal Operations SLS 6 (M.O. SLS #6). Prior to reaching M.O. SLS 6, there is another overflow structure that discharges into Marsh Creek during high rainfall events. This combined sewer takes on storm water from the Provincial Highway and is all pumped at Municipal Operations SLS 6.

It is recommended that this sewer network be placed on the Capital program for sewer separation rather than installing level sensors and SCADA infrastructure. The separation of this combined sewer will not only reduce the discharge of untreated sanitary effluent, but also reduce the pumping demand at the down stream M.O. SLS #6

Figure A-1: Allison Grounds Overflow Structures

Figure A-2: Overflow Structure Upstream of MO SLS #6 - WWN-COM-MH-141078

Hillyard St. Overflow Stuctures

The two overflow structures located on Hillyard Street, WWN-SSOMH-63186 and WWN-CSOMH-63187, appear to have been installed as a second phase to the sewer network of the property between Hillyard Street and Main Street. A flow study could be completed to determine if the flows created from this property cause the sanitary main on Hillyard Street to become surcharged. If this study indicated that the sewer main could take these flows, the two overflows at this location could be abandoned in place. Prior to the removal of WWN-SSOMH-63186, the storm and sanitary system entering this structure would need to be separated and an additional structure would likely be required.

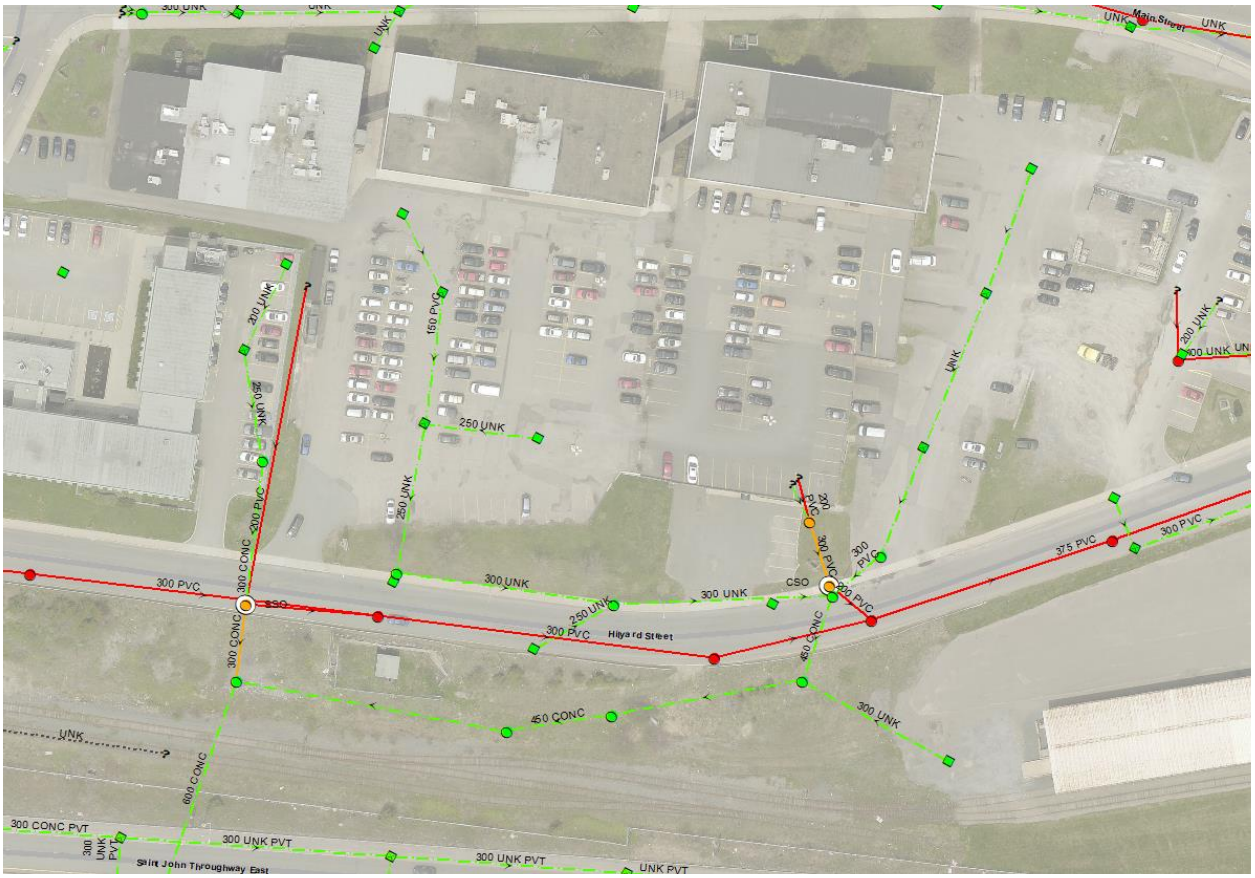

Figure A-3: Hillyard Street Overflow Structures

Greenwood WWTF and Millidgeville WWTF CSO

Greenwood Wastewater Treatment Facility was noted by the City of Saint John to have level monitoring infrastructure as well as SCADA instrumentation, however, the data transmitted is not relied upon due to known inaccuracies. The CSO chamber upstream of the Millidgeville Wastewater Treatment Facility is equipped with a level sensor, and SCADA instrumentation, but is currently not recording levels within the structure due to the level monitor being physically disconnected within the chamber. It is recommended that these two structures, although not ranking high within the developed risk matrix, be addressed as the infrastructure is already in place.

Spar Cove Road

An in-depth investigation and strategy for overflow monitoring upstream of the Spar Cove Road SLS may prove that sewer separation is preferred. The SCR overflow structures were included within the 108 structures analyzed in this report.

Figure A-4: Spar Cove SLS

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