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CSO Master Plan

Polson District Plan

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City of Winnipeg

CSO Master Plan

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2	07/2019	Final Draft Submission	DT/MF	MF	MF
3	08/20/2019	Final Submission For CSO Master Plan	MF	MF	SG

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1. Polson District

1.1 District Description

Polson district is located in the northern section of the combined sewer (CS) area west of the Red River and north of St Johns district. Polson is approximately bounded by Church Avenue and Atlantic Avenue to the south, Tinniswood Street and McPhillips Street to the west, Polson Avenue, Carruthers Avenue and McAdam Avenue to the north, and the Red River to the east.

The district is mainly a residential area with a mix of single and two-family land use. The single-family homes are located in the west, east and north part of the district, while the two-family homes are located in the south-central portion around Main Street. Approximately 20 ha of greenspace is distributed throughout the district at schools and various parks and playgrounds.

The Canadian Pacific Railway (CPR) Winnipeg Beach passes through the Polson district parallel with Sinclair Street running north-south. Regional transportation routes in the district include Main Street, Salter Street, McGregor Street, Arlington Street and McPhilips Street in a north-south direction and Inkster Boulevard in the east-west direction.

1.2 Development

A portion of Main Street is located within the Polson District. Main Street is identified as Regional Mixed Use Corridor as part of the OurWinnipeg future development plans. As such, focused intensification along Main Street is to be promoted in the future.

1.3 Existing Sewer System

Polson district encompasses an approximate area of 242 ha[1] based on the district boundary and includes a CS system and a storm relief sewer (SRS) system. This district does not include any areas that may be identified as LDS separated or separation ready. The interceptor pipe from the Polson district also receives intercepted combined sewage flow from the Munroe sewage pump station (SPS) via river crossing across the Red River. The flow from Munroe SPS connects into the interceptor pipe for the Polson district, immediately upstream of the diversion off-take pipe for the Polson outfall.

The CS system includes a diversion structure, flood pump station (FPS) and outfall gate chamber. The CS system drains towards the Polson CS outfall and diversion chamber, located at the eastern end of Polson Avenue and Scotia Street adjacent to the Red River. There are three primary routes for CS to flow to the diversion chamber. A 1750 mm by 2175 mm CS trunk collects all flow from the district areas west of Main Street and runs primarily along Polson Avenue. A 750 mm CS services the northeastern areas of Polson east of Main Street which runs south along Scotia Street. Finally, a 750 mm CS services the southeastern section of Polson from Emsue Street to Scotia Street and also runs north along Scotia Street. At the outfall, combined sewage is diverted to the Polson secondary interceptor and back to the Main Street interceptor, or may be discharged by gravity/via the FPS adjacent to the CS outfall directly into the Red River. Intercepted combined sewage flow from the Munroe district enters the Polson district from across the Red River via a 450mm/300mm steel force main river crossing, and discharges into the 750 mm diameter secondary interceptor adjacent to the flood pump station, which also received the intercepted combined sewage from the Polson district as a whole. The SRS system within the Polson district includes various interconnections to the CS system and an outfall gate chamber. The SRS system is installed throughout most of the district and connects to the CS system via various interconnections which consist of overflow pipes and weirs. During runoff events, the SRS system provides relief to the CS

[1] City of Winnipeg GIS information relied upon for area statistics. The GIS records may vary slightly from the city representation in the InfoWorks sewer model. Therefore, minor discrepancies in the area values reported in Section 1.3 Existing Sewer System, and in Section 1.8 Performance Estimate may occur.

system in the Polson district. Most catch basins are still connected into the CS system, so no partial separation has been completed and the SRS system acts as an overflow conduit for the CS to prevent basement surcharge. The SRS system discharges directly to the Red River through the Inkster SRS outfall located near the intersection of Inkster Boulevard and Scotia Street. Upstream of the Inkster SRS outfall is an SRS offtake pipe which will divert all collected CS in the SRS system into the Polson secondary interceptor and back into the CS system, under DWF and minor WWF conditions. A flap gate and sluice gate is installed on the Inkster SRS outfall pipe to control backflow into the SRS system.

During dry weather flow (DWF), the SRS is not required; sanitary sewage is diverted by the weir within the Polson FPS, through a 500 offtake to the 750 mm Polson secondary interceptor pipe and back to the Main Street interceptor by gravity and on to the North End Sewage Treatment Plant (NEWPCC) for treatment.

During wet weather flow (WWF), any flow that exceeds the diversion capacity overtops the weir and is discharged through the gate chamber to the Polson CS outfall to the Red River. Sluice and flap gates are installed on the CS outfall to prevent back-up of the Red River into the CS system. When the Red River levels are particularly high the flap gate prevents gravity discharge from the Polson CS outfall. Under these conditions the excess flow is pumped by the Polson FPS to a point in the Polson CS Outfall downstream of the flap gate, where it can be discharged to the river by gravity.

The two outfalls to the Red River (one CS, and one SRS) are as follows:

- ID30 (S-MA00017967) – Polson CS Outfall
- ID32 (S-MA00017939) – Inkster SRS Outfall

1.3.1 District-to-District Interconnections

There are several district-to-district interconnections between Polson and the surrounding districts. Each interconnection is shown on Figure 33 and shows locations where gravity and pumped flow can cross from one district to another. Each interconnection is listed as follows:

1.3.1.1 Interceptor Connections - Downstream of Primary Weir

Jefferson E

- The 2250 mm Main Interceptor flows north by gravity on Main Street from Polson district into Jefferson East district:
  - Invert at Jefferson East district boundary 218.03 m (S-MA70008112)

St Johns

- The 750 mm Interceptor flows west by gravity on Polson Street from Polson district into St Johns district into the 2250 mm Main Interceptor on Main Street:
  - Invert at St Johns district boundary 219.54 m (S-MA00018028)

1.3.1.2 Interceptor Connections - Upstream of Primary Weir

Munroe

- Two force mains river crossings flow by gravity from the Munroe diversion chamber and cross the Red River to connect to the Polson CS diversion chamber on Polson Avenue, where it flows to the Main Interceptor:
  - 450 mm force main sewer on Polson Avenue – 222.5 m (S-MA70017149)
  - 300 mm force main sewer on Polson Avenue – 222.5 m (S-MA70017147)

1.3.1.3 District Interconnections

St Johns

CS to CS

- The main 1675 mm by 2150 mm CS trunk in Polson district flows by gravity into St Johns district at the corner of Polson Avenue and Main Street:
  - Invert at Polson district boundary 222.99 m (S-MA00009348)
- The main 1750 mm by 2175 mm CS trunk flows east by gravity back into Polson district at the corner of Polson Avenue and Main Street:
  - Invert at St Johns district boundary 223.07 m (S-MA00009318)
- A 925 mm by 1200 mm CS flows southbound on Main Street servicing sections of Polson district and crosses into St Johns district where it connects to the main CS trunk at the corner of Polson Avenue and Main Street:
  - Invert at St Johns district boundary 223.45 m (S-MA00009340)
- High point manhole:
  - Tinniswood Street – 229.48 m (S-MH00008542)
  - Radford Street – 229.45 m (S-MH00008556)
  - Monreith Street at Church Avenue – 229.24 m (S-MH00008543)
  - Robertson Street at Church Avenue – 228.90 m (S-MH00010474)
  - Kildarroch Street – 229.08 m (S-MH00010481)
  - Airlies Street at Church Avenue – 228.78 m (S-MH00010493)
  - Minnigaffe Street at Church Avenue – 229.271 m (S-MH00010536)
  - Penninghame Street at Church Avenue – 228.82 m (S-MH00010604)
  - Luxton Avenue – 228.34 m (S-MH00011069)
  - Atlantic Avenue – 227.71 m (S-MH00014025)
  - Bannerman Avenue at Emslie Street – 228.19 m (S-MH00014033)
  - Cathedral Avenue at Emslie Street – 227.68 m (S-MH00014021)
- High sewer overflow:
  - Dalton Street at Machray Avenue – 229.35 m (S-MH00010407)
  - Bannerman Avenue – 227.96 m (S-MH00006413)

SRS to CS

- A 750 mm SRS flows northbound by gravity on Salter Street and connects to the CS system in Polson district at the intersection of Salter Street and Polson Avenue:
  - Invert at Polson district boundary 224.55 m (S-MA00009212)
- A 450 mm SRS provides relief from the manhole at the intersection of Atlantic Avenue and Aikins Street in St Johns district and flows by gravity to connect to the main CS in Polson district:
  - Invert at Polson district boundary 224.21 m (S-MA00009270)
- A 450 mm SRS flows by gravity from a manhole at the intersection of Main Street and Luxton Avenue where it relieves the CS and connects to the 925 mm by 1200 mm CS in Polson district:
  - Invert at Polson district boundary 224.05 m (S-MA00009352)

SRS to SRS

- A 375 mm SRS flows southeast by gravity at Cathedral Avenue and Emslie Street from Polson district into St Johns district:

   – Invert at St Johns district boundary 225.69 m (S-MA00016728)

- A 450 mm SRS flows south by gravity on Emslie Street from Polson district into St Johns district:
   – Invert at St Johns district boundary 225.43 m (S-MA00015777)
- A 750 mm SRS relieves the CS system on Machray Avenue in Polson district and flows by gravity southbound on Kildarroch Street into St Johns district where it connects to the main 2900 mm SRS on Mountain Avenue:
   - Invert at St Johns district boundary 225.20 m (S-MA00012123)

Jefferson West

CS to CS

- High point manhole:
   – Machray Avenue at McPhillips Street – 228.74 m (S-MH00007230)

Jefferson East

CS to CS

- High point manhole
   – Polson Avenue – 229.11 m (S-MH00009095)
- High sewer overflow:
   – McGregor Street at Carruthers Avenue – 228.60 m (S-MH00006709)

SRS to SRS

- An 2950 mm SRS flows by gravity on Inkster Boulevard from Jefferson East district into Polson district SRS system:
   – Invert at Polson district boundary 223.00 m (S-MA00008238)

SRS to CS

- An 1800 mm SRS relieves the main CS trunk on Polson Avenue and flows by gravity northbound on Airlies Street from Polson district to Jefferson East district. It connects with the Jefferson East CS network at the corner of Inkster Boulevard and Airlies Street before continuing onto Inkster Boulevard:
   – Invert at Jefferson East district boundary 224.01 m (S-MA00011342)

A district interconnection schematic is included as Figure 1-1. The drawing illustrates the collection areas, interconnections, pumping systems, and discharge points for the existing system.

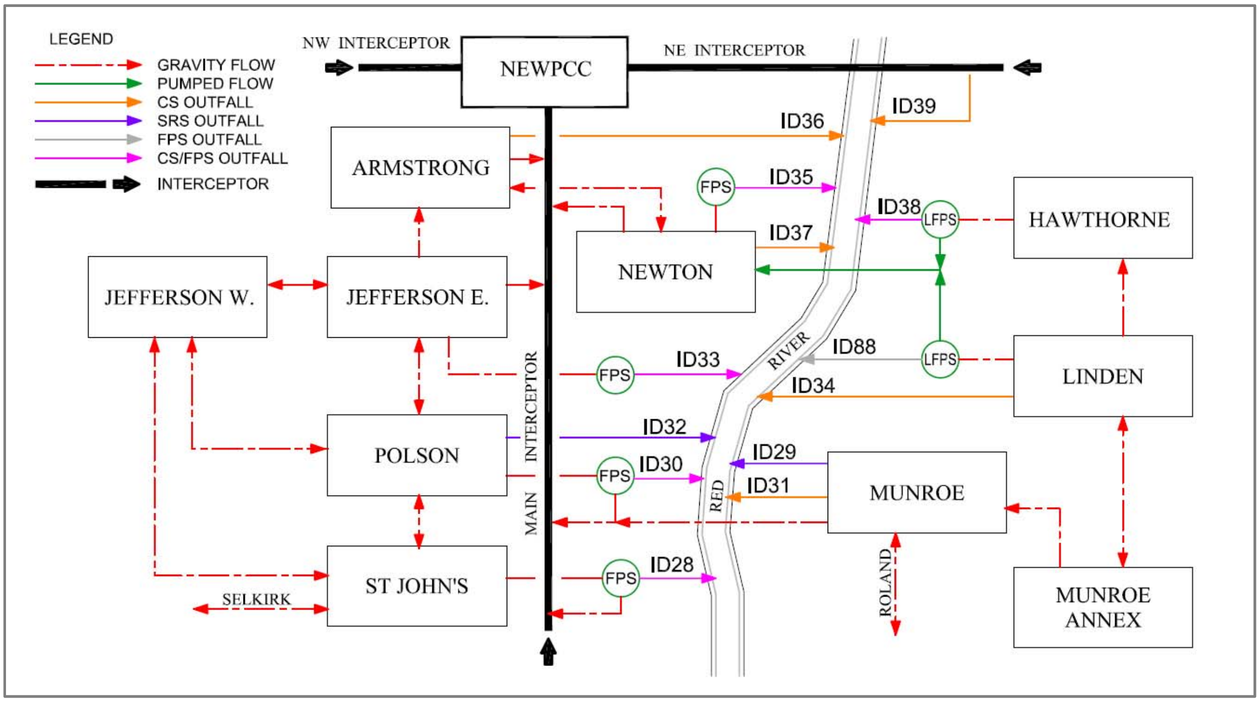


Figure 1-1. District Interconnection Schematic

1.3.2 Asset Information

The main sewer system features for the district are shown on Figure 33 and listed in Table 1-1.

Table 1-1. Sewer District Existing Asset Information

Asset	Asset ID (Model)	Asset ID (GIS)	Characteristics	Comments
Combined Sewer Outfall (ID30)	S-AC00007716.1	S-MA00017967	1750 x 2175 mm – 1800 mm	Red River Invert: 222.38 m
Flood Pumping Outfall (ID30)	S-AC00007716.1	S-MA00017967	1750 x 2175 mm – 1800 mm	Red River Invert: 222.38 m
Other Overflows	N/A	N/A	N/A	
Main Trunk	Polson Flood PS.1	S-MA70016460	1750 x 2175 mm	Egg-shaped Invert: 222.38 m
SRS Outfalls (ID32)	S-AC00007709.1	S-MA00017939	2900 mm	Red River Invert: 220.60 m
SRS Interconnections	N/A	N/A	N/A	38 SRS - CS
Main Trunk Flap Gate	S-CG00001045.1	S-CG00001045	2000 mm	Invert: 222.92 m
Main Trunk Sluice Gate	S-CG00001046.1	S-CG00001046	2000 x 2000 mm	Invert: 222.76 m
Off-Take	S-AC70007899.1	S-MA00017968	500 mm	Invert: 222.53 m
Dry Well	N/A	N/A	N/A	
Lift Station Total Capacity	N/A	S-MA00017968 (1)	500 mm (1)	1.578 m^3/s (1)
ADWF	N/A	N/A	0.170 m^3/s	
Lift Station Force Main	N/A	N/A	N/A	
Flood Pump Station Total Capacity	N/A	N/A	1.82 m^3/s	1 x 0.74 m^3/s 2 x 0.54 m^3/s
Pass Forward Flow – First Overflow	N/A	N/A	0.298 m^3/s	

Notes:

Table 1-1. Sewer District Existing Asset Information

Asset	Asset ID (Model)	Asset ID (GIS)	Characteristics	Comments

(1) – gravity pipe replacing the Lift Station as Polson is a gravity discharge district

ADWF = average dry-weather flow
GIS = geographic information system
ID = identification
N/A = not applicable

The critical system elevations for the existing system relevant to the development of the CSO control options are listed in Table 1-2. Critical elevation reference points are identified on the district overview and detailed maps.

Table 1-2. Critical Elevations

Reference Point	Item	Elevation (m)[a]
1	Normal Summer River Level	Polson – 223.67 Inkster – 223.67
2	Trunk Invert at Off-Take	222.53
3	Top of Weir	223.12
4	Relief Outfall Invert at Flap Gate	221.85
5	Low Relief Interconnection (S-TE70023427)	223.98
6	Sewer District Interconnection (St Johns)	222.96
7	Low Basement	229.82
8	Flood Protection Level	229.04

[a] City of Winnipeg Data, 2013

1.4 Previous Investment Work

Table 1-3 provides a summary of the district status in terms of data capture and study. The most recent study completed in the Polson district was the Flood Relief Study (IDE, 1980). An SRS system was installed in the district as a result of this study. No other work has been completed on the district sewer system since that time.

Between 2009 and 2015, the City invested $12 million in the CSO Outfall Monitoring Program. The program was initiated to permanently install instruments in the primary CSO outfalls. The outfall from the Polson CS district was included as part of this program. Instruments installed at each of the 39 primary CSO outfall locations have a combination of inflow and overflow level meters and flap gate inclinometers if available.

Table 1-3. District Status

District	Most Recent Study	Flow Monitoring	Hydraulic Model	Status	Planned Completion
33 – Polson	1980 I.D. Engineering	Future Work	2013	SRS Relief Sewer Installed	N/A

Source: Report on Flood Relief Study, 1980

1.5 Ongoing Investment Work

There is ongoing maintenance and calibration of permanent instruments installed within the primary outfall within the Polson district. This consists of monthly site visits in confined entry spaces to ensure physical readings concur with displayed transmitted readings and replacing desiccants where necessary.

1.6 Control Option 1 Projects

1.6.1 Project Selection

The proposed projects selected to meet Control Option 1 – 85 Percent Capture in a Representative Year for the Polson sewer district are listed in Table 1-4. The proposed CSO control projects will include gravity flow control and an alternative floatable management approach. Program opportunities including green infrastructure (GI) and real time control (RTC) will also be included as applicable.

Table 1-4. District Control Option

Control Limit	Latent Storage	Flap Gate Control	Gravity Flow Control	Control Gate	In-line Storage	Off-line Storage Tank	Off-line Storage Tunnel	Sewer Separation	Green Infrastructure	Real Time Control	Floatable Management
85 Percent Capture in a Representative Year	-	-	✓	-	-	-	-	-	✓	✓	✓ [a]

Notes:

- = not included
✓ = included

[a] = proposed alternative floatables management approach

The existing SRS system is suitable for use as latent storage. An existing drain from the SRS system to the CS system already provides the necessary dewatering of the latent storage by gravity. Further improvements in the latent storage arrangements could be made with the addition of a latent flood pumping station (LFPS) but it was determined this would not be required to meet the Control Option 1 performance target.

The existing CS system was found to already provide sufficient in-line storage capture based on the outfall and CS LS elevations relative to the Red River. From modeling the sewer system in the Polson district, it was found that the NSWL at this location was well above the primary weir. The NSWL was found to be approximately 100mm above the half pipe diameter height, which would have been provided by the control gate installation. The NSWL bears against the flap gate on the CS outfall at this location, and essential behaves as a weir with this height under these conditions. Under these conditions the installation of a control gate would not provide any further improvement to the volume of in-line storage volume capture, and was therefore not recommended as a solution for the Polson district. It should be noted that if modifications to the modelling methods dictate a river level other than the NSWL be applied this should be further evaluated. If it is found through these modifications that the river level no longer impacts CS discharges from this outfall, then further evaluation of the potential to construct a control gate to provide additional in-line storage should be completed.

The Polson district discharges to the interceptor by gravity; therefore, it will also require a method of gravity flow control to optimize and control the discharge rate to the interceptor for future dewatering Real Time Controls (RTCs).

Floatable control will be necessary to capture any undesirable floatables in the sewage overflows. Floatables are typically captured via a screening facility, however, the hydraulic constraints within the Polson district do not allow sufficient positive head to be achieved and an alternative floatables management approach will be necessary.

GI and RTC will be applied within each district on a system-wide basis with consideration of the entire CS area. The level of implementation for each district will be determined through evaluations completed through district level preliminary design.

1.6.2 Gravity Flow Control

Polson district does not include a LS and discharges to the Main Interceptor by gravity. A flow control device will be required to control and monitor the diversion rate for future RTC and dewatering. The controller will include flow measurement and a gate to control the discharge flow rate. Due to the interaction with the upstream Munroe district, this control would also have to account for the pumped flows from the Munroe district. Any flow restriction will have to be fully assessed to minimize the risk to both districts.

A standard flow control device was selected as described in Part 3C. This has been taken as part of the City's future vision to develop a fully integrated CS system network and will be needed to review flows during spatial rainfall WWF scenarios. The CSO Master Plan assessment utilized a uniform rainfall event and no further investigative work has been completed within the CSO Master Plan.

The gravity flow controller would be installed at an optimal location on the connecting sewer between the existing diversion chamber and the Main Street interceptor. Figure 33-01 identifies a conceptual location for flow controller installation. A small chamber or manhole with access for cleaning and maintenance will be required. The flow controller will operate independently and require minimal operation interaction. The work proposed will take place within the boulevard of a minor residential collector street, with minimal disruption to the local area expected.

A gravity flow controller has been included as a consideration in developing a fully optimized CS system as part of the City's long-term objective. The operation and configuration of the gravity flow controller will have to be further reviewed for additional flow and rainfall scenarios.

1.6.3 Floatables Management

Floatables management for the Polson district, due to the existing hydraulic constraints, is proposed to be an alternative floatables management approach. This approach is to ensure that the proposed required floatable management requirements outlined within the Environment Act Licence 3042 can be maintained.

This alternative approach to floatables management will be achieved by targeting floatables source control. This will be achieved by implementing more focused efforts towards street cleaning and catch-basin cleaning, to remove floatable material from surface runoff before it enters the combined sewer system. The second broad component of this alternative approach will focus on public education in an effort to reduce the sanitary components from ever entering plumbing systems. This is expected to achieve similar or better results while eliminating the end-of-pipe screening. The proposed approach will be similar to the program currently carried out in the City of Ottawa to meet their CSO mitigation requirements.

The alternative approach will be further investigated and demonstrated during the interim period between the submission of the CSO Master Plan (August 2019) and the revised CSO Master Plan submission (April 2030), and is discussed in further detail in Part 2 of the CSO Master Plan. It is recommended that as part of this work these measures will be undertaken in the Polson district, due to screening limitations mentioned above.

1.6.4 Green Infrastructure

The approach to GI is described in Section 5.2.1 of Part 2 of the CSO Master Plan. Opportunities for the application of GI will be evaluated and applied with any projects completed in the district. Opportunistic GI will be evaluated for the entire district during any preliminary design completed. The land use, topography, and soil classification for the district will be reviewed to identify applicable GI controls.

Polson has been classified as a medium GI potential district. The district is mainly a residential area with a mix of single and two-family land use. This means the district would be an ideal location for bioswales, permeable paved roadways, cisterns/rain barrels.

1.6.5 Real Time Control

The approach to RTC is described in Section 5.2.2 of Part 2 of the CSO Master Plan. The application of RTC will be evaluated and applied on a district by district basis through the CSO Master Plan projects with long term consideration for implementation on a system wide basis.

1.7 System Operations and Maintenance

System operations and maintenance (O&M) changes will be required to address the proposed control options. This section identifies general O&M requirements for each control option proposed for the district. More specific details on the assumptions used for quantifying the O&M requirements are described in Part 3C of the CSO Master Plan.

The flow controller will require the installation of a chamber and flow control equipment. Monitoring and control instrumentation will be required. The flow controller will operate independently and require minimal operation interaction. Regular maintenance of the flow controller chamber and appurtenances will be required.

The alternative floatable management control is based on implementing additional operating and maintenance measures, in an effort to match the performance of the capital construction projects to meet the floatables management requirements. As such dedicated additional operating and maintenance costs should be allocated to this district. The goal however is for this work to overall be more cost effective from a life cycle perspective, considering the upfront capital and operating and maintenance costs associated with screening facilities.

1.8 Performance Estimate

An InfoWorks CS hydraulic model was created as part of the CSO Master Plan development. An individual model was created to represent the sewer system baseline as represented in the year 2013 and a second model was created for the CSO Master Plan evaluation purposes, with all the control options recommended for the district to meet Control Option 1 implemented in the year 2037. A summary of relevant model data is provided in Table 1-5.

Table 1-5. InfoWorks CS District Model Data

Model Version	Total Area (ha)	Contributing Area (ha)	Population	% Impervious	Control Options Included in Model
2013 Baseline	242	242	10,500	70	N/A
2037 Master Plan – Control Option 1	242	242	10,500	70	N/A

Notes:

No change to the future population was completed as from a wastewater generation perspective from the update to the 2013 Baseline Model to the 2037 Master Plan Model. The population generating all future wastewater will be the same due to Clause 8 of Environment Act Licence 3042 being in effect for the CS district.

City of Winnipeg hydraulic model relied upon for area statistics. The hydraulic model representation may vary slightly from the City

Table 1-5. InfoWorks CS District Model Data

Model Version	Total Area (ha)	Contributing Area (ha)	Population	% Impervious	Control Options Included in Model

of Winnipeg GIS Records. Therefore, minor discrepancies in the area values reported in Section 1.3 Existing Sewer System, and in Section 1.8 Performance Estimate may occur.

The performance results listed in Table 1-6 are for the hydraulic model simulations using the year-round 1992 representative year. This table lists the results for the Baseline, for each individual control option and for the proposed CSO Master Plan - Control Option 1. The Baseline and Control Option 1 performance numbers represent the comparison between the existing system and the proposed control options. Note that as a result of the CSO Master Plan Assessments, all Control Options which would provide a volume capture benefit were not recommended. As a result, there be no improvements in terms of overflow reduction. Due to issues surrounding dewatering of the district, the performance results are in fact increased above the baseline results. This is further detailed below.

Table 1-6. District Performance Summary – Control Option 1

Control Option	Preliminary Proposal Annual Overflow Volume (m^3)	Master Plan Annual Overflow Volume (m^3)	Overflow Reduction (m^3)	Number of Overflows	Pass Forward Flow at First Overflow [b]
Baseline (2013)	436,714	455,282	-	20	0.373 m^3/s
In-line Storage	317,812 [a]	N/A [c]	N/A [c]	N/A [c]	N/A [c]
Off-line Storage		N/A [c]	N/A [c]	N/A [c]	N/A [c]
Tunnel Storage		N/A [c]	N/A [c]	N/A [c]	N/A [c]
Control Option 1	**317,812**	**455,282** [d]	**N/A** [d]	**20**	**0.295 m^3/s**

[a] In-line, Off-line and Tunnel storage not simulated independently during the Preliminary Proposal assessments.

[b] Pass forward flows assessed on the 1-year design rainfall event

[c] This control option not recommended as part of the Master Plan assessment.

[d] Modelled increase in overflow volume found due to dewatering constraints in the Polson district, interaction with adjacent districts and high water levels within the Main Interceptor during peak rainfall events.

The district performance summary indicates the high level of interaction between the Polson district and the existing CS system, resulting in erroneous performance. This is primarily due to the additional CS contained within the Main Interceptor at the point the Polson district ties in. All of the additional volume capture from the solutions recommended throughout the CSO Master Plan result in insufficient capacity available in the Main Interceptor to accommodate the captured volume from the Polson district. As a result from the system-wide modelling assessments the volume captured would surcharge within the Polson secondary interceptor, and ultimately spill over the primary weir and result in CSOs. The issue that must be corrected to allow for the existing in-line storage arrangement to provide volume capture is to ensure the Main Interceptor has sufficient capacity to accommodate this flow. Therefore the Polson district should be prioritized to be implemented in tandem with Real Time Control (RTC), as part of the dewatering strategy. By implementing RTC with the dewatering strategy, neighboring districts dewatering can be delayed sufficiently to allow the volume capture from the Polson district to be collected within the interceptor system and sent to treatment.

The percent capture performance measure is not included in Table 1-6, as it is applicable to the entire CS system and not for each district individually.

1.9 Cost Estimates

Cost estimates were prepared during the development of the Preliminary Proposal and have been updated for the CSO Master Plan. The CSO Master Plan cost estimates have been prepared for each control option, with overall program costs summarized and described in Section 3.4 of Part 3A. The cost estimate for each control option relevant to the district as determined in the Preliminary Proposal and updated for the CSO Master Plan are identified in Table 1-7. The cost estimates are AACE Class 5 planning level estimates with a level of accuracy of minus 50 percent to plus 100 percent.

Table 1-7. Cost Estimates – Control Option 1

Control Option	2014 Preliminary Proposal Capital Cost	2019 CSO Master Plan Capital Cost	2019 Annual Operations and Maintenance Cost	2019 Total Operations and Maintenance (Over 35-year period)
In-line Control Gate	N/A [a]	N/A	N/A	N/A
Screening		N/A	N/A	N/A
Latent Storage	$1,670,000	N/A	N/A	N/A
Gravity Flow Control	N/A	$1,290,000	$34,000	$740,000
Off-line Tank Storage	$16,430,000	N/A	N/A	N/A
Off-line Tunnel Storage	$7,400,000	N/A	N/A	N/A
Floatables Management Allowance	N/A	$2,540,000 [b]	$40,000	$860,000 [b]
Subtotal	**$25,490,000**	**$3,830,000**	**$74,000**	**$1,600,000**
Opportunities	N/A	$380,000	$7,000	$160,000
District Total	**$25,490,000**	**$4,210,000**	**$81,000**	**$1,760,000**

[a] Solution developed as refinement to Preliminary Proposal work following submission of Preliminary Proposal costs. Costs for the In-Line Storage and Screening items of work found to be $2,330,000 in 2014 dollars

[b] Cost allowance to account for the alternative floatable management measures. This allowance is based on a typical district control gate cost.

The estimates include changes to the control option selection since the Preliminary Proposal, updated construction costs, and the addition of GI opportunities. The calculations for the CSO Master Plan cost estimate includes the following:

- Capital costs and O&M costs are reported in terms of present value.
- Refinements in solutions selected from analysis during Master Plan phase.
- A fixed allowance of 10 percent has been included for GI, with no additional costs for RTC. This has been listed as part of the Opportunities costs.
- The Preliminary Proposal capital cost is in 2014-dollar values.
- The CSO Master Plan capital cost is based on the control options presented in this plan and in 2019-dollar values:
- The 2019 Total Annual Operations and Maintenance (over 35-year period) cost component is the present value costs of each annual O&M cost under the assumption that each control option was initiated in 2019.
- The 2019 Annual Operations and Maintenance Costs were based on the estimated additional O&M costs annually for each control option in 2019 dollars.

- Future costs will be inflated to the year of construction.

Cost estimates were prepared during the development of the Preliminary Proposal and updated for Phase 3 during the CSO Master plan development. The differences identified between the Preliminary Proposal and the CSO Master Plan are accounting for the progression from an initial estimate used to compare a series of control options, to an estimate focusing on a specific level of control for each district. Any significant differences between the Preliminary Proposal and CSO Master Plan estimates are identified in Table 1-8.

Table 1-8. Cost Estimate Tracking Table

Changed Item	Change	Reason	Comments
Control Options	Removal of Control Gate	The Master Plan assessment found that in-line storage was sufficiently provided by the existing outfall based on the river level in that location.	
	Removal Of Screening	Screening determined to not be feasible due to hydraulic constraints.	
	Alternative Floatables Management	Added to Master Plan cost, assumed to be comparable to typical control gate projected cost.	
	Removal Of Latent Storage	Minor latent storage arrangement currently in place by gravity, therefore no cost added to Master Plan	
	Removal Of Off-line Tunnel Storage	The Master Plan assessment found that off-line tunnel storage was not a preferred control solution for CO1.	
	Removal Of Off-line Tank Storage	The Master Plan assessment found that off-line tank storage was not a preferred control solution for CO1.	
Opportunities	A fixed allowance of 10 percent has been included for program opportunities such as Green Infrastructure.	Preliminary estimate did not include a cost for opportunities	
Lifecycle Cost	The lifecycle costs have been adjusted to 35 years	City of Winnipeg Asset Management Approach	
Cost escalation from 2014 to 2019	Capital Costs have been inflated to 2019 values based on an assumed value of 3 percent per for construction inflation.	Preliminary estimates were based on 2014-dollar values.	

1.10 Meeting Future Performance Targets

The regulatory process requires consideration for upgrading Control Option 1 to another higher-level performance target. For the purposes of this CSO Master Plan, a future performance target of 98 percent capture for the representative year measured on a system-wide basis was evaluated. This target will permit the number of overflows and percent capture to vary by district to meet 98 percent capture. Table 1-9 provides a description of how the regulatory target adjustment could be met by building off the proposed work identified for Control Option 1.

Overall the Polson district would be classified as a low potential for implementation of complete sewer separation as the only feasible approach to achieve the 98 percent capture future performance target in the representative year. The interactions with upstream Jefferson West SRS system would result in continued CSOs at the Polson district (via the Inkster SRS outfall) and this would require assessment and quantifying prior to selection of appropriate future control options. Off-line storage was previously recommended for the district as part of the Preliminary Proposal, and could be utilized once the interactions with the Jefferson West SRS is evaluated. Focused use of green infrastructure, and reliance on said green infrastructure as well can provide volume capture benefits and could be utilized to meet future performance targets.

A future monitoring program is recommended to establish the flow linkage between Polson, Jefferson West, Jefferson East and Munroe districts as well as the Main Interceptor sewer.

Table 1-9. Upgrade to 98 Percent Capture in a Representative Year Summary

Upgrade Option	Viable Migration Options
98 Percent Capture in a Representative Year	• Off-line Storage (Tank or Tunnel) • Increased use of GI

The control options for the Polson district have been aligned for the requirement to provide screening on each of the primary outfalls and not specifically for the 85 percent capture performance target on a system wide basis, although district hydraulic issues result an alternative floatables management approach being recommended. The gravity discharge and interaction with the upstream Munroe and Jefferson West districts, and the downstream Main Interceptor sewer system result in a negative impact at this location, once all other Control Option 1 proposals have been implemented.

The cost for upgrading to meet an enhanced performance level depends on the summation of all changes made to control options in individual districts and has not been fully estimated at this stage of master planning. The Phase In approach is to be presented in detail in a second submission for 98 percent capture in a representative year, due on or before April 30, 2030.

1.11 Risks and Opportunities

The CSO Master Plan and implementation program are large and complex, with many risks having both negative and positive effects. The objective of this section is to identify significant risks and opportunities for each control option within a district.

The CSO Master Plan has considered risks and opportunities on a program and project delivery level, as described in Section 5 of Part 2 of the CSO Master Plan. A Risk And Opportunity Control Option Matrix covering the district control options has been developed and is included as part of Appendix D in Part 3B. The identification of the most significant risks and opportunities relevant to this district are provided in Table 1-10.

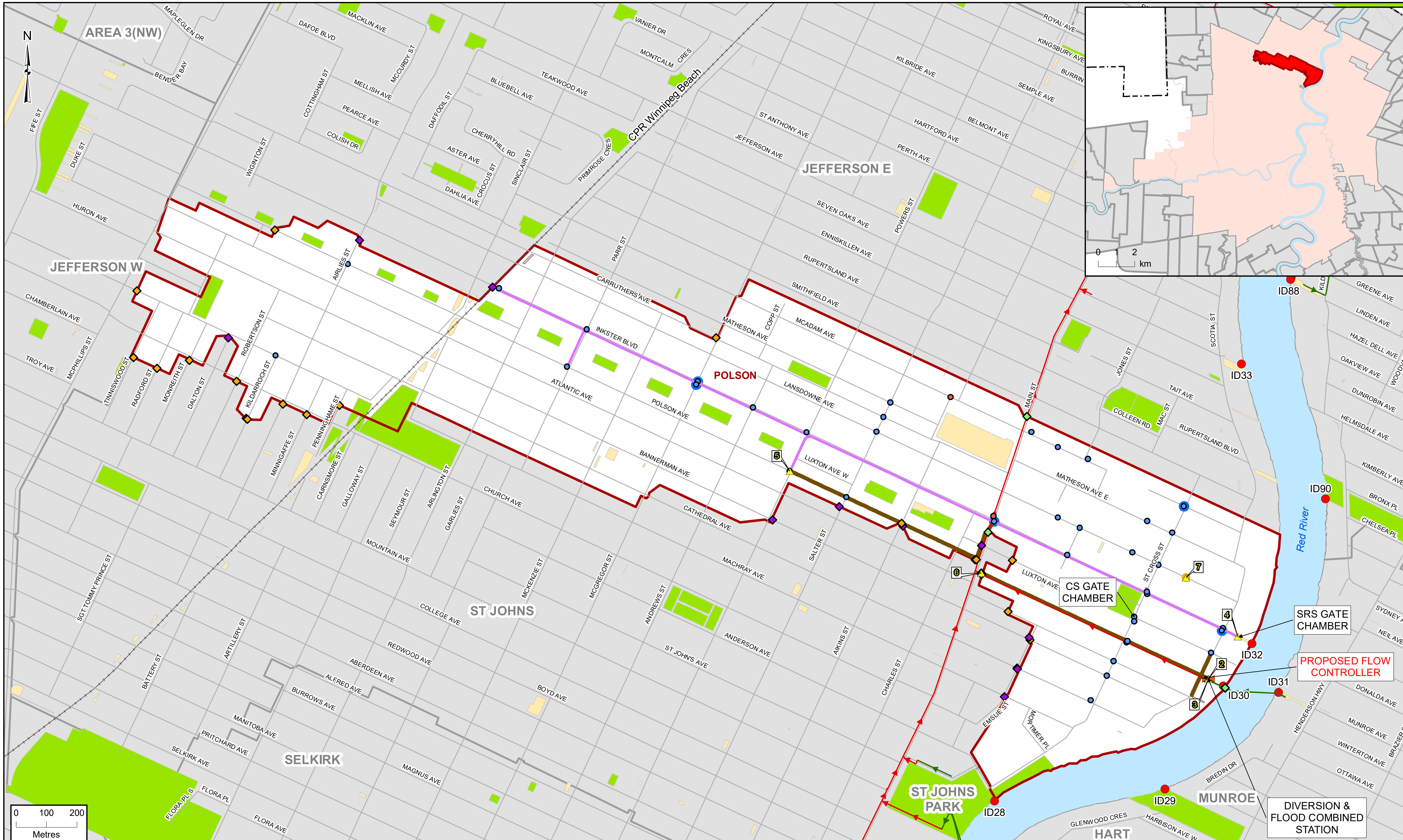
Table 1-10. Control Option 1 Significant Risks and Opportunities

Risk Number	Risk Component	Latent Storage / Flap Gate Control	In-line Storage / Control Gate	Off-line Storage Tank	Off-line Storage Tunnel	Sewer Separation	Green Infrastructure	Real Time Control	Floatable Management
1	Basement Flooding Protection	-	-	-	-	-	-	-	-
2	Existing Lift Station	-	-	-	-	-	-	R	-
3	Flood Pumping Station	-	-	-	-	-	-	-	-
4	Construction Disruption	-	-	-	-	-	-	-	-
5	Implementation Schedule	-	-	-	-	-	-	R	-
6	Sewer Condition	-	-	-	-	-	-	-	-
7	Sewer Conflicts	-	-	-	-	-	-	-	-
8	Program Cost	-	-	-	-	-	-	-	O
9	Approvals and Permits	-	-	-	-	-	R	-	-
10	Land Acquisition	-	-	-	-	-	R	-	-
11	Technology Assumptions	-	-	-	-	-	O	O	R
12	Operations and Maintenance	-	-	-	-	-	R	O	R
13	Volume Capture Performance	-	-	-	-	-	O	O	-
14	Treatment	-	-	-	-	-	O	O	R

Risks and opportunities will require further review and actions at the time of project implementation.

1.12 References

I.D. Engineering. 1980. Flood relief study - St. John's and Polson districts and the Sisler ward. Prepared for the City of Winnipeg.



LEGEND

Primary Weir
Critical Elevation
CSO Outfall
Low CS Manhole
Low SRS Connection

Inter-System Connection
CS - WWS
SRS - CS

District Boundary Crossing
CS
SRS
WWS

Existing Latent Storage Limit
Extent of Existing In-line Storage
Interceptor Sewer
Force Main
Street
Railway

District Boundary
Watercourse
Greenspace
City Owned Land

CSO MASTER PLAN PROPOSED SOLUTIONS

Note: Alternative Floatables Management Approach to be tested prior to implementation.

ALL PROPOSED SOLUTIONS SHOWN IN RED TEXT

JACOBS

Notes:
1. Map data source - City of Winnipeg, 2013

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

FIGURE 33
District Overview Map
Sewer District: Polson
City of Winnipeg
Combined Sewer Overflow Master Plan

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LEGEND

- Primary Weir
- Critical Elevation
- CSO Outfall
- Manhole
- Flap Gate
- Sluice Gate
- Pump Location
- Force Main
- Sewer By Type
  - CS
  - WWS
- Pump Station Type
  - Diversion & Flood Combined Station

CSO MASTER PLAN
PROPOSED SOLUTIONS

- Flow Controller

ALL PROPOSED SOLUTIONS SHOWN IN RED TEXT

JACOBS

Notes:
1. Map data source - City of Winnipeg, 2013

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

FIGURE 33-01
Control Gate, Screening and Flow Control
Sewer District: Polson
City of Winnipeg
Combined Sewer Overflow Master Plan

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