CSO Master Plan

Hawthorne District Plan

August 2019

City of Winnipeg

CSO Master Plan

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1. Hawthorne District

1.1 District Description

Hawthorne district is in the northeast sector of the combined sewer (CS) area along the eastern edge of the Red River and north of Linden and Munroe Annex districts. Hawthorne is approximately bounded by Fraser's Grove, Colvin Avenue, and Cameo Crescent to the south, the Red River to the west, Springfield Road to the north, and Raleigh Street to the east.

Most of the Hawthorne district is residential with portions of commercial and greenspace land use. Most of the residential units consist of single-family dwellings; multi-family and two-family units are located along Edison Avenue and Henderson Highway. Several parks are located throughout the district, with greenspace areas and parks bounding portions of the district. Approximately 17 ha of the district is classified as greenspace.

Henderson Highway, running in the north-south direction, is the only regional roadway in the district. Other main transportation routes include Roch Street, Rothesay Street, and Raleigh Street in a north-south direction and Kingsford Avenue, Edison Avenue, Oakland Avenue, Mcleod Avenue, and Hawthorne Avenue in the east-west direction.

1.2 Development

A portion of Henderson Highway is located within the Hawthorne District. Henderson Highway is identified as a Regional Mixed-Use Corridors as part of the OurWinnipeg future development plans. As such, focused intensification along Henderson Highway is to be promoted in the future.

1.3 Existing Sewer System

Hawthorne district encompasses an area of 245 ha[1] based on the district boundary and includes a CS system with a relatively small portion of separated wastewater sewer (WWS) and land drainage sewer (LDS) in the southwestern corner of the district. As shown in Figure 18, there is approximately 11 ha (4 percent) already separated. There are no identifiable separation ready areas. Hawthorne district does not have an SRS system.

The CS system includes a dual lift and flood pump station (LFPS), and one combined CS/FPS outfall. All of the CS from the district flows towards to the primary CS outfall, located at the intersection of Hawthorne Avenue and Kildonan Drive. Two main CS trunk sewers collect flow from the district. The larger of the two trunks is a 1050 mm increasing to 1650 mm CS, which extends east to west along Hawthorne Avenue and Kingsford Avenue. The second CS trunk sewer is a 600 mm increasing to 1350 mm sewer that generally extends east to west along Mcleod Avenue, Rowandale Avenue, Larchdale Crescent, and Kildonan Drive. Multiple secondary sewers connect to the CS trunks from the north and south to service the entire district.

During dry weather flow (DWF), the Hawthorne primary weir diverts flow to the lift section of the Hawthorne LFPS through a 525 mm off-take pipe, where it is pumped under pressure through a force main crossing the Red River and to the Newton district. From here, the intercepted combined sewage ties into the secondary sewer in the Newton district, which ties into the Main Interceptor, and eventually on to the North End Sewage Treatment Plant (NEWPCC) for treatment.

During wet weather flow (WWF), any flows that exceeds the diversion capacity overtops the primary weir and is discharged to the Red River through the Hawthorne CS outfall. Sluice and flap gates are installed

[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

on the outfall to prevent back-up of the Red River into the system under high river level conditions. However not only does the flap gate prevent river water intrusion, but it also prevents gravity discharge from the Hawthorne CS outfall. Under these conditions the excess flow is pumped by the flood pumps of the Hawthorne LFPS to a point in the Hawthorne CS Outfall downstream of the flap gate, where it can be discharged to the river by gravity once more.

The WWS system in the southwest corner of the Hawthorne district, and directs flow to a small WWS lift Station (LS) on Rowandale Avenue and Larchdale Crescent, where sewage is pumped into the CS system.

The LDS system is predominately in the southwestern corner of the Hawthorne district, and directs the surface runoff flow received from this area to the Red River via a dedicated LDS outfall located near the intersection of Rowandale Crescent and Kildonan Drive. Sluice and flap gates are installed on this LDS outfall to prevent back-up of the Red River into the LDS system under high river level conditions.

There is also an older LDS system, which flows through what was previously McLeod Creek in the northwestern corner of Hawthorne district. To allow for development over this existing creek, LDS pipes were installed where the creek originally existed to still allow for drainage of surface runoff to the Red River. Two distinct LDS systems exist surrounding McLeod Creek, one north of Hawthorne Avenue and another south. The LDS system north of Hawthorne drains north via a combination of buried pipes and open channel ditch arrangements, and eventually discharges into the Red River immediately north of Chief Peguis Trail. The LDS system south of Hawthorne collects in a 750 mm corrugated metal pipe, which then ties into the Hawthrone CS trunk sewer at Hawthorne Avenue immediately east of Kildonan Drive.

There is one CS outfall to the Red River:

- ID38 (S-MA70062167) – Hawthorne CS Outfall

1.3.1 District-to-District Interconnections

There are several district-to-district interconnections between Hawthorne and the surrounding districts. Each interconnection is shown on Figure 18 and shows locations where gravity flow can cross from one district to another. Each interconnection is listed as follows:

1.3.1.1 Interceptor Connections – Downstream of Primary Weir

Newton

- Two 350 mm force mains carry flow from the sewage pump stations in the Linden and Hawthorne districts across the Red River to the Newton district. These force mains are connected back assumed isolated from each other within the current system and the Linden force main is added for information:
    - Invert at manhole on Newton Avenue at Newton district boundary (Hawthorne force main) – 225.66 m (S-MA70021128)
    - Invert at manhole on Newton Avenue at Newton district boundary (Linden force main) – 225.63 m (S-MA00017639)

1.3.1.2 District Interconnections

Linden

<u>CS to CS</u>

- A 300 mm CS on Brazier Avenue and Colvin Avenue is diverted into the CS system in the Hawthorne from the 375 mm CS flowing by gravity westbound on Colvin Avenue:
    - Invert at Linden district boundary 226.68 m (S-MH40001749)

- High Point Manhole
  - 300 mm CS on Colvin Avenue and Roch Street – 227.71 m (S-MH40005627)

Whellams (Area 2 (NE))

WWS to CS

- A 200 mm WWS is diverted from the WWS system in Whellams district on Springfield Road and flows by gravity into the CS system in the Hawthorne district:
  - Invert at Hawthorne district boundary 226.94 m (S-MA40002474) LDS to LDS

LDS to LDS

- A 550X900 mm LDS flows north from the Hawthorne district into Whellams district:
  - Invert at Whellams district boundary 224.07 m (S-MA70133155)

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 district.

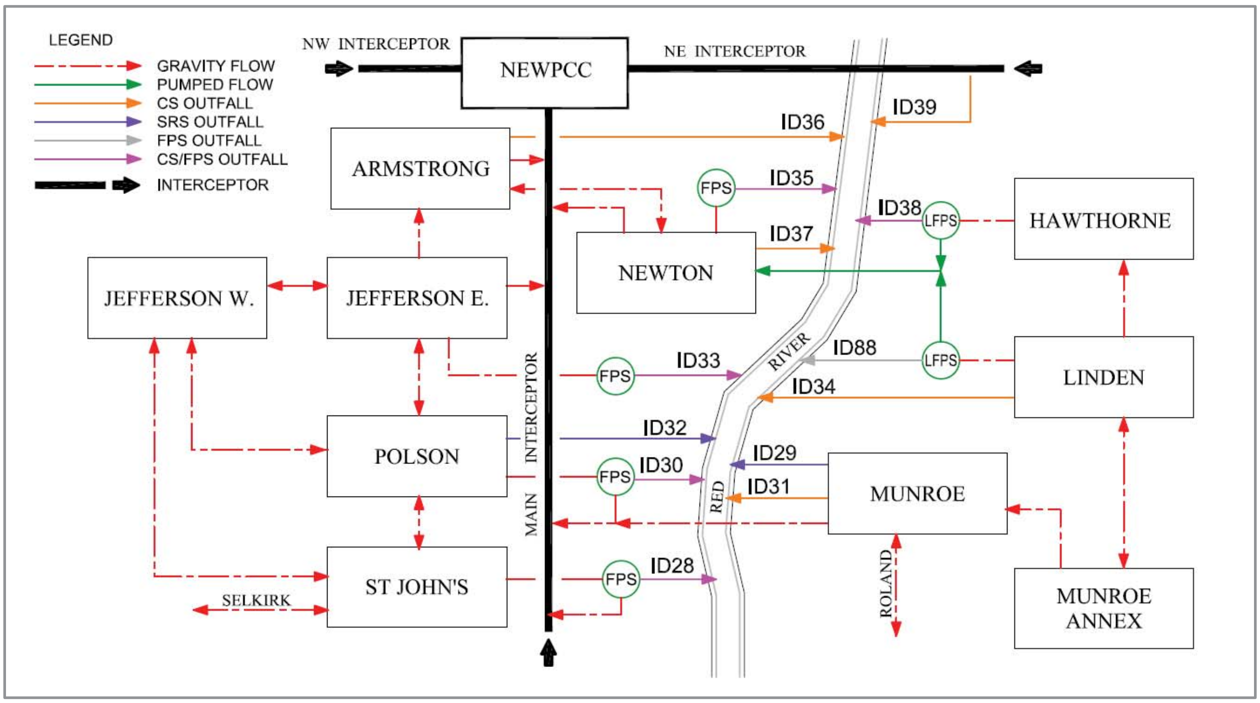

Figure 1-1. District Interconnection Schematic

1.3.2 Asset Information

The main sewer system features for the district are shown on Figure 18 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 (ID38)	S-CO70033943.1	S-MA70062167	2100 mm	Red River Invert: 222.19 m
Flood Pumping Outfall (ID38)	S-CO70033943.1	S-MA70062167	2100 mm	Red River Invert: 222.19 m

Table 1-1. Sewer District Existing Asset Information

Asset	Asset ID (Model)	Asset ID (GIS)	Characteristics	Comments
Other Overflows	N/A	N/A	N/A	
Main Trunk	S-TE40000580.1	S-MA40003335 S-MA40002190	1650 mm 1350 mm	Invert: 223.73 m Invert: 223.86 m
SRS Outfalls	N/A	N/A	N/A	No SRS within the district.
SRS Interconnections	N/A	N/A	N/A	No SRS within the district.
Main Trunk Flap Gate	S-TE70026151.2	S-CG00000954	1650 mm	Invert: 223.74 m
Main Trunk Sluice Gate	S-CG00000813.1	S-CG00000813	1500 x 1500 mm	Invert: 223.43 m
Off-Take	HAWTHORNE_WEIR.1	S-MA70021133	525 mm	223.76 m
Dry Well	N/A	N/A	N/A	
Lift Station Total Capacity	N/A	N/A	0.116 m^3/s	2 x 0.058 m^3/s
ADWF	N/A	N/A	0.054 m^3/s	
Lift Station Force Main	S-RE70009952.1	S-MA70021119	250 mm	Upstream invert: 223.40 m
Flood Pump Station Total Capacity	N/A	N/A	2 x 0.58 m^3/s	
Pass Forward Flow – First Overflow	N/A	N/A	0.159 m^3/s	

Notes:

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	Hawthorne – 223.64
2	Trunk Invert at Off-Take	223.76
3	Top of Weir	224.27
4	Relief Outfall Invert at Flap Gate	N/A
5	Low Relief Interconnection	N/A
6	Sewer District Interconnection (Newton)	226.67 m
7	Low Basement	225.40
8	Flood Protection Level (Munroe, Linden, Hawthorne)	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 LDS system was installed in the late 1970s. The most recent study completed in Hawthorne was the *Linden and Hawthorne Districts Combined Sewer Relief Study Conceptual Design Report* (Wardrop Engineering Inc., 1994). The study's purpose was to develop a sewer relief system to protect the Linden and Hawthorne districts against basement flooding to a 5-year and 10-year level of service. An analysis to reduce overflows from the CS system to the Red River was also completed. No other studies have 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 Hawthorne 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	Expected Completion
18 – Hawthorne	1994	2015 Summer Flow Monitoring Campaign	2013	Conceptual Study Complete	N/A

Source: Report on *Linden and Hawthorne Districts combined sewer relief study*, 1994

1.5 Ongoing Investment Work

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

Repair and investigation work is ongoing within part of the LDS system, which flows through what was previously McLeod Creek, in the northwestern corner of Hawthorne District. This work includes repairing collapsed sewers, cross connections, and other issues found within this LDS system.

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 Hawthorne sewer district are listed in Table 1-4. The proposed CSO control projects will include in-line storage via a control gate, gravity flow control, and floatable management via screening. 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	-	-	-	✓	✓	-	-	-	✓	✓	✓

Notes:

- = not included
✓ = included

The existing CS system is suitable for use as in-line storage. These control options will take advantage of the existing CS pipe networks for additional storage volume. Existing DWF from the collection system will remain the same, and overall district operations will remain the same. The installation of a control gate will provide the mechanism for capture of the additional in-line storage.

Floatable control will be necessary to capture any undesirable floatables in the sewage. Floatables will be captured with all implemented control options to some extent, but screening may be added as required to reach the desired level of capture. A screen will be installed on the primary outfall located at the west end of Hawthorne Avenue. The control gate utilized for in-line storage will also be required to provide the necessary hydraulic head for the screen operation.

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.

1.6.1 In-Line Storage

In-line storage has been proposed as a CSO control for Hawthorne district. In-line storage will require the installation of a control gate at the CS outfall. The gate will increase the storage level in the existing CS and provide an overall higher volume capture and provide additional hydraulic head for screening operations. The existing lift section of the LFPS will provide the dewatering for the in-line storage.

A standard design was assumed for the control gate, as described in Part 3C. A standard approach was used for conceptual gate sizing by assuming it to be the lesser of the height of half of the site-specific trunk diameter or the maximum height of the gate available. The design criteria for the in-line storage are listed in Table 1-5.

Table 1-5. In-Line Storage Conceptual Design Criteria

Item	Elevation/Dimension	Comment
Invert Elevation	223.73 m	
Trunk Diameter	1650 mm	
Gate Height	0.33 m	Gate height based on half trunk diameter assumption
Top of Gate Elevation	224.60 m	
Bypass Weir Elevation	224.50 m	
Maximum Storage Volume	565 m^3	
Nominal Dewatering Rate	0.116 m^3/s	Based on existing CS LS capacity
RTC Operational Rate	TBD	Future RTC/dewatering review on assessment

Note:
RTC = Real Time Control

TBD = to be determined

It should be noted that while the in-line storage arrangement design will only provide a minor additional volume capture, this performance is still acceptable for the solution to be considered cost effective compared to other control options for the district.

The proposed control gate will cause combined sewage to back-up within the collection system to the extent shown on Figure 18. The extent of the in-line storage and volume is related to the top elevation of the bypass side weir. The level of the top of the bypass side weir and adjacent control gate level are determined in relation to the critical performance level in the system for basement flooding protection: when the system level increases the flow overtops the bypass weir and is screened prior to discharging to the river. If the system level continues to rise, it will reach the critical level where the control gate drops out of the way. This allows for a free discharge as per existing system conditions and all excess CS would flow over the weir and discharge to the river. After the level in the system drops back below the bypass side weir critical performance level, the control gate moves back to its original position to capture the receding limb of the WWF event. The CS LS will continue with its current operation while the control gate is in either position , with all DWF being diverted to the river crossing via pumping. The CS LS will further dewater the in-line storage provided during a WWF event as downstream capacity becomes available.

Figure 18-01 provides an overview of the conceptual location and configuration of the control gate and screening chambers. The proposed control gate will be installed in a new chamber within the existing trunk sewer alignment downstream from the off-take pipe that connects to the LFPS and upstream of the existing outfall gate chamber. The dimensions of a new chamber to provide an allowance for a side weir for floatables control are 5.0 m in length and 3.0 m in width. The existing sewer configuration including the off-take and the force main may have to be modified to accommodate the new chamber. This will be confirmed in future design assessments. It is envisaged that the construction of the gate and screen chambers will be within the City owned land around the existing Hawthorne LS. There would be minimal disruptions to the local area from the proposed construction activities, as this would involve access via local minor residential streets.

The Larchdale wastewater LS connects into the CS system along the length that will be used for in-line storage. The operation and interaction of this lift station with the in-line storage will not be affected by the in-line storage extent due to the higher level of the force main connection level with the existing CS sewer. This assessment would be further confirmed/evaluated during the next stage of design although not expected to influence any changes to the system.

The nominal rate for dewatering is set at the existing LS capacity. This allows dewatering through the existing interceptor system within 24 hours following the runoff event, allowing it to recover in time for a subsequent event. Any future considerations, for RTC improvements, would be completed with spatial rainfall as any reduction to the existing pipe capacity/LS operation for large events will adversely affect the overflows at this district. This future RTC control will provide the ability to capture and treat more volume for localized storms by using the excess interceptor capacity where the runoff is less.

1.6.2 Floatables Management

Floatables management will require installation of a screening system to capture floatable materials. ,The off-line screens would be designed to maintain the current level of basement flooding protection.

The type and size of screens depend on the specific station configurations and the hydraulic head available for operation. A standard design was assumed for screening and is described in Part 3C. The design criteria for screening with gate control implemented, are listed in Table 1-6.

Table 1-6. Floatables Management Conceptual Design Criteria

Item	Elevation/Dimension/Rate	Comment
Top of Gate	224.60 m	
Bypass Weir Crest	224.50 m	
NSWL	223.64 m	
Maximum Screen Head	0.86 m	
Peak Screening Rate	0.35 m^3/s	
Screen Size	1.5 m x 1.0 m	Modelled Screen Size

The proposed side overflow weir and screening chamber will be located adjacent to the proposed control gate and the existing CS, as shown on Figure 18-01. The screens will operate with the control gate in its raised position. A side bypass weir upstream of the gate will direct the overflow to the screens located in the new screening chamber, with screened flow discharged to the downstream side of the gate to the river. The screening chamber will include screenings pumps with a discharge returning the screened material back to the CS system and on to the NEWPCC for removal. As the screening chamber would be constructed with the control gate chamber, the construction activities will be similar in that minimal disruption with the location being on City owned land have been envisaged.

The dimensions for the screen chamber to accommodate influent from the side weir, the screen area, and the routing of discharge downstream of the gate are 3.0 m in length and 3.0 m in width. The existing sewer configuration may have to be modified to accommodate the new chamber**.**

1.6.3 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 the most applicable GI controls.

Hawthorne has been classified as a medium GI potential district. Land use in Hawthorne is residential with portions of commercial and greenspace. The west end of the district is bounded by the Red River. This district would be an ideal location for cisterns/rain barrels, and rain garden bioretention within the residential areas. Commercial areas are suitable to green roofs and parking lot areas are ideal for paved porous pavement.

1.6.4 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.

In-line storage will impact the existing sewer and will require the addition of a new chamber and a moving gate at the outfall. In-line storage dewatering will be controlled with the existing Clifton CS LS, which will require more frequent and longer duration pump run times. Lower velocities will occur in the CS trunk in the vicinity of the control gate due to lower pass forward flows, and may create additional debris deposition requiring cleaning. Additional system monitoring, and level controls will be installed, which will require regular scheduled maintenance.

Floatable control with outfall screening will require the addition of another chamber with screening equipment installed. The chamber will be installed adjacent to the control gate chamber and will operate in conjunction with it. Screening operation will occur during WWF events that surpass the in-line storage control level. WWF will be directed from the main CS trunk, over the side weir in the control gate chamber and through the screens to discharge into the river. The screens will operate intermittently during wet weather events and will likely require operations review and maintenance after each event. The frequency of a screened event will correlate to the number overflows identified for the district. Having the screenings pumped back to the interceptor system via a small LS and force main will be required. The screenings return will require O&M inspection after each event to assess the performance of the return pump system.

1.8 Performance Estimate

An InfoWorks CS hydraulic model was created as part of the CSO Master Plan development. Two versions of the sewer system model were created and used to measure system performance. The 2013 Baseline model represents the sewer system baseline in the year 2013 and the 2037 Master Plan – Control Option 1 model, which includes the proposed control options in the year 2037. A summary of relevant model data is provided in Table 1-7.

Table 1-7. InfoWorks CS District Model Data

Model Version	Total Area (ha)	Contributing Area (ha)	Population	% Impervious	Control Options Included in Model
2013 Baseline	238	238	8,886	15	N/A
2037 Master Plan – Control Option 1	238	238	8,886	15	IS,

Notes:

IS = In-line Storage

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 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 1-8 are for the hydraulic model simulations using the year-round 1992 representative year. The 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. The table also includes overflow volumes specific to each individual control option; these are listed to provide an indication of benefit gained only and are independent volume reductions.

Table 1-8. Performance Summary – Control Option 1

Control Option	Preliminary Proposal	Master Plan			
	Annual Overflow Volume (m^3)	Annual Overflow Volume (m^3)	Overflow Reduction (m^3)	Number of Overflows	Pass Forward Flow at First Overflow [a]
Baseline (2013)	33,395	33,245	-	18	0.159 m^3/s
In-Line Storage	26,616	30,493	2,752	17	0.159 m^3/s
Control Option 1	**26,616**	**30,493**	**2,752**	**17**	**0.159 m^3/s**

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

The percent capture performance measure is not included in Table 1-8, 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 **Error! Reference source not found.**. The cost estimates are a Class 5 planning level estimates with a level of accuracy of minus 50 percent to plus 100 percent.

Table 1-9. Cost Estimate – 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 Cost (Over 35-year period)
Separation	$144,110,000	N/A [a]	N/A	N/A
In-Line Storage	N/A [b]	$2,650,000 [c]	$44,000	$940,000
Screening		$1,990,000 [d]	$50,000	$1,080,000
Subtotal	**$144,110,000**	**$4,640,000**	**$94,000**	**$2,020,000**
Opportunities	N/A	$460,000	$9,000	$200,000
District Total	**$144,110,000 [b]**	**$5,100,000**	**$103,000**	**$2,220,000**

a Sewer Separation recommendation as part of Preliminary Proposal was eliminated during the Master Plan percent capture assessment

[b] Solution developed as refinement to Preliminary Proposal work following submission of Preliminary Proposal costs. Preliminary Proposal recommended in-line storage and screening for CO1 PP. Costs for these items of work found to be $2,010,000 in 2014 dollars

[c] Costs associated with new off-take construction, as required, to accommodate control gate and screening chambers in location and allow intercepted CS flow to reach existing Hawthorne CS LS was not included in Master Plan

[d] Cost for bespoke screenings return/force main not included in Master Plan as will depend on selection of screen and type of screening return system selected

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 reported in terms of present value.
- A fixed allowance of 10 percent has been included for GI, with no additional cost 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 1-10.

Table 1-10. Cost Estimate Tracking Table

Changed Item	Change	Reason	Comments
Control Options	Removal Of Separation	Determined to not be required to achieve the capture requirement during the Master Plan assessments.	
	In-Line Storage	A control gate was not included in the preliminary estimate.	Added for the MP to further reduce overflows and optimize existing in-line storage.
	Screening	Screening was not included in the Preliminary Proposal estimate.	Added in conjunction with the Control Gate.
Opportunities	A fixed allowance of 10 percent has been included for program opportunities	Preliminary Proposal estimate did not include a cost for GI opportunities	
Lifecyle 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 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, the future performance target is 98 percent capture for the representative year measured on a system-wide basis. This target will permit the number of overflows and percent capture to vary by district to meet 98 percent capture. Table 1-11 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 Hawthorne 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 City however has previously identified Hawthorne as a district where sewer separation would be preferable. This is due to existing land drainage runoff concerns surrounding the McLeod Creek, previous basement risks, and operational issues with the lift station and outfall structure. The modelled existing overflow volume overall though indicates that a more cost-effective solution would involve off-line tank or tunnel storage. The provision for opportunistic sewer separation within a portion of the district may be completed in conjunction with other major infrastructure work to address future performance targets. In addition, green infrastructure may be utilized in key locations to provide additional storage and increase capture volume to meet future performance targets.

Table 1-11. Upgrade to 98 Percent Capture in a Representative Year Summary

Upgrade Option	Viable Migration Options
98 Percent Capture in a Representative Year	• Opportunistic sewer separation • Increased GI • Off-line Storage (Tank/Tunnel)

The control options selected for the Hawthorne district have been aligned for the 85 percent capture performance target based on the system wide basis. The expandability of this district to meet the 98 percent capture would not be aligned if the district went to complete separation based on the City's potential preferred separation district nominations. However, this district could also be considered for recommendation to the alternative floatables management approach, where this is achieved by targeting floatables source control as a replacement to screening facilities.

The cost for upgrading to meet an enhanced performance target 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 Appendix D in Part 3B. The identification of the most significant risks and opportunities relevant to this district are provided in Table 1-12.

Table 1-12. Control Option 1 Significant Risks and Opportunities

ID Number	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	-	R	-	-	-	-	-	-
2	Existing Lift Station	-	R	-	-	-	-	R	-
3	Flood Pumping Station	-	-	-	-	-	-	-	-
4	Construction Disruption	-	-	-	-	-	-	-	-
5	Implementation Schedule	-	-	-	-	-	-	R	-
6	Sewer Condition	-	R	-	-	-	-	-	-
7	Sewer Conflicts	-	R	-	-	-	-	-	-
8	Program Cost	-	O	-	-	-	-	-	O
9	Approvals and Permits	-	-	-	-	-	R	-	-
10	Land Acquisition	-	-	-	-	-	R	-	-
11	Technology Assumptions	-	-	-	-	-	O	O	-
12	Operations and Maintenance	-	R	-	-	-	R	O	R
13	Volume Capture Performance	-	O	-	-	-	O	O	-
14	Treatment	-	R	-	-	-	O	O	R

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

1.12 References

Wardrop Engineering Inc, TetrES Consultants Inc. 1994. *Linden and Hawthorne Districts Combined Sewer Relief Study Conceptual Design Report.* Prepared for the City of Winnipeg, Waterworks, Waster and Disposal Department. May.

LEGEND

Primary Weir
Critical Elevation
CSO Outfall
Low CS Manhole

Inter-System Connection
CS - WWS

District Boundary Crossing
CS
WWS

Interceptor Sewer
Force Main
Street

District Boundary
Watercourse
Greenspace

CSO MASTER PLAN PROPOSED SOLUTIONS

Proposed Control Gate
Extent of In-line Storage
Sewer Separation - Complete

ALL PROPOSED SOLUTIONS SHOWN IN RED TEXT

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

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

FIGURE 18
District Overview Map
Sewer District: Hawthorne
City of Winnipeg
Combined Sewer Overflow Master Plan

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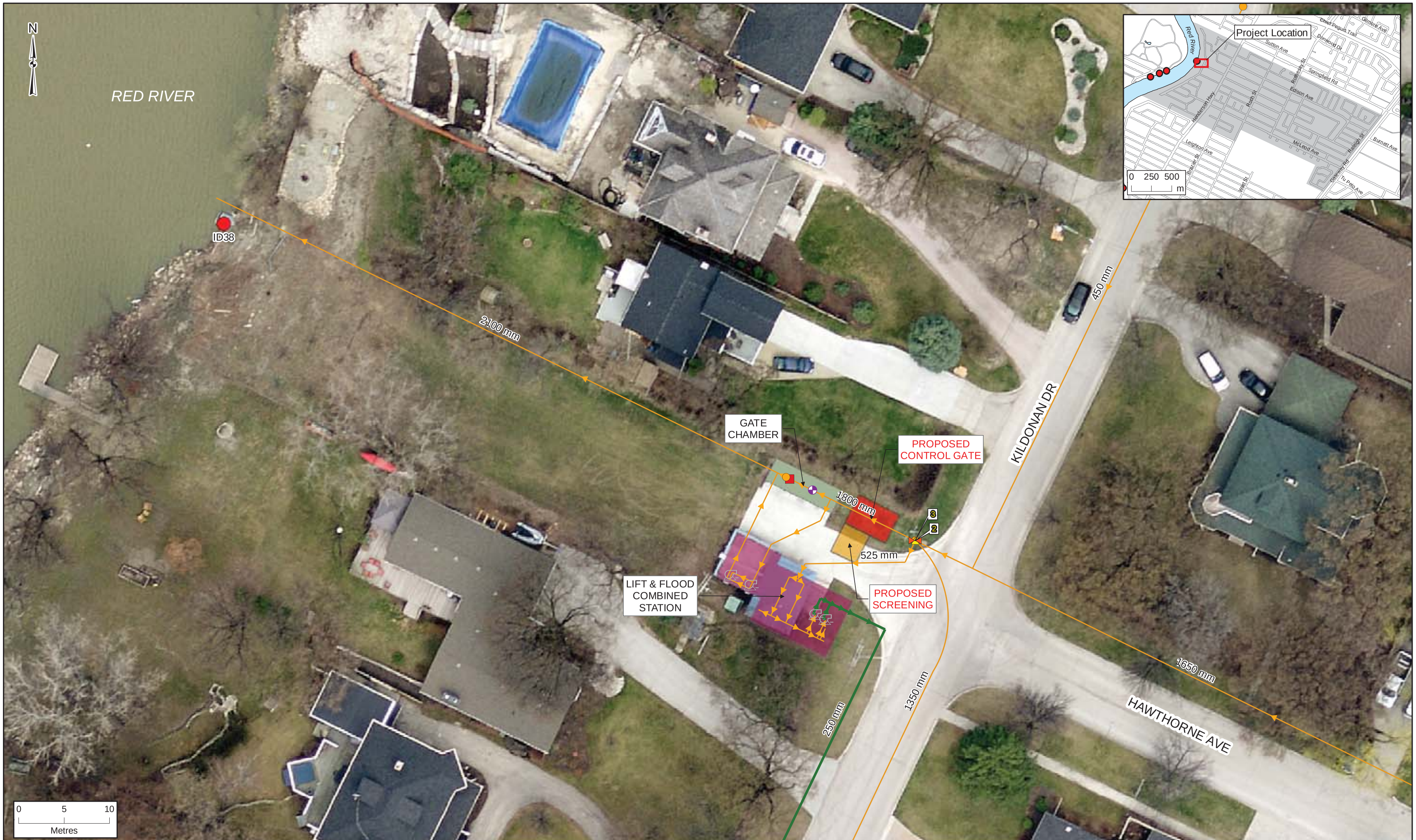

LEGEND

- Primary Weir
- Critical Elevation
- CSO Outfall
- Manhole
- Flap Gate
- Sluice Gate
- Pump Location
- Force Main

Sewer By Type
- CS
- WWS

Control Structure Type
- Gate Chamber

Pump Station Type
- Lift & Flood Combined Station

CSO MASTER PLAN
PROPOSED SOLUTIONS
- Control Gate
- Screening

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 18-01
Flood Pumping Station
Sewer District: Hawthorne
City of Winnipeg
Combined Sewer Overflow Master Plan

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