CSO Master Plan

Woodhaven District Plan

August 2019

City of Winnipeg

CSO Master Plan

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2	06/2019	Final Draft Submission	JT	MF	MF
3	08/15/2019	Final Submission For CSO Master Plan	MF	MF	SG

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1. Woodhaven District

1.1 District Description

Woodhaven is a small district located on the western perimeter of the combined sewer area. It is bounded by Ainslie district and Sturgeon Creek to the north and east, Westwood and Parkdale districts to the west, and the Assiniboine River to the south. Portage Avenue runs along the northern border of this district and is the only significant transportation route that connects with Woodhaven.

This district consists mostly of single family residential, with no industrial or commercial land use. This was one of the first districts to be developed in the history of Winnipeg's west end. Woodhaven also includes approximately 20 ha of greenspace which consists of the Woodhaven Park Community Club and a portion of the St. Charles Country Club on the eastern and western borders, respectively.

1.2 Development Potential

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

1.3 Existing Sewer System

The Woodhaven district has a drainage area of an approximate size of 55 ha[1] based on the district boundary. There is approximately 4 percent (2 ha) considered separated and no separation-ready areas.

The district is predominantly serviced by a CS system with a runoff collection ditch system surrounding the majority of homes, which collects the majority of rainfall runoff from the street right-of-way in the district. The surrounding districts all have separate sewer systems, isolating Woodhaven from the other CS districts. This district has only one CS outfall that goes to the Assiniboine River and no storm relief sewer system. The outfall is serviced by a 1200 mm by 900 mm egg-shaped sewer trunk that receives sewage from three connecting pipes at the intersection of Assiniboine Avenue and Woodhaven Boulevard. The district does not have a flood pump station (FPS).

During dry weather flow (DWF) the Woodhaven primary weir diverts flow at the 300 mm off-take pipe to the CS lift station (LS). Two pumps transport the combined sewage via a short stretch of 150 mm force main to the St James Interceptor sewer that runs through the district along Assiniboine Avenue and eventually transports it to the West End Sewer Treatment Plant (WEWPCC) for treatment.

During wet weather flow (WWF) events, any flow that exceeds the diversion capacity of the primary weir overtops the weir and is discharged to the river via a 900 x 1200 mm primary outfall. The Woodhaven outfall does not have a flap or sluice gate present. A review of the outfall specifically for the CSO Master Plan evaluation found that the normal summer water level (NSWL) is low relative to the invert of the CS outfall.

The single CS outfall to the Assiniboine River is as follows:

- ID40 (S-MA70019662) – Woodhaven CS Outfall

[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.

1.3.1 District-to-District Interconnections

There are three district-to-district interconnections between Woodhaven and the surrounding districts. Each interconnection is shown on Figure 43 and shows gravity and pumped flow from one district to another. The known district-to-district interconnections are as follows:

1.3.1.1 Interceptor Connections – Downstream of Primary Weir

Westwood

- The 1350 mm St. James Interceptor sewer flows by gravity into Westwood District and eventually to the WEWPCC for treatment:
  - St. James interceptor invert at Westwood/Woodhaven district boundary -231.03 m (S-MH20002594)

1.3.1.2 Interceptor Connections – Upstream of Primary Weir

Ainslie

- The St. James interceptor system splits into two 450 mm steel river crossing pipes under Sturgeon Creek, and flow into a single 900 mm pipe in the Woodhaven district at Assiniboine Avenue and Woodbridge Road:
  - St. James interceptor invert at Ainslie/Woodhaven district boundary - 231.93 m (S-MH20004628)

A process and flow control drawing is included as Figure 1-1. The drawing illustrates the collection areas, interconnections, flow controls, pumping systems, and discharge points for the existing system.

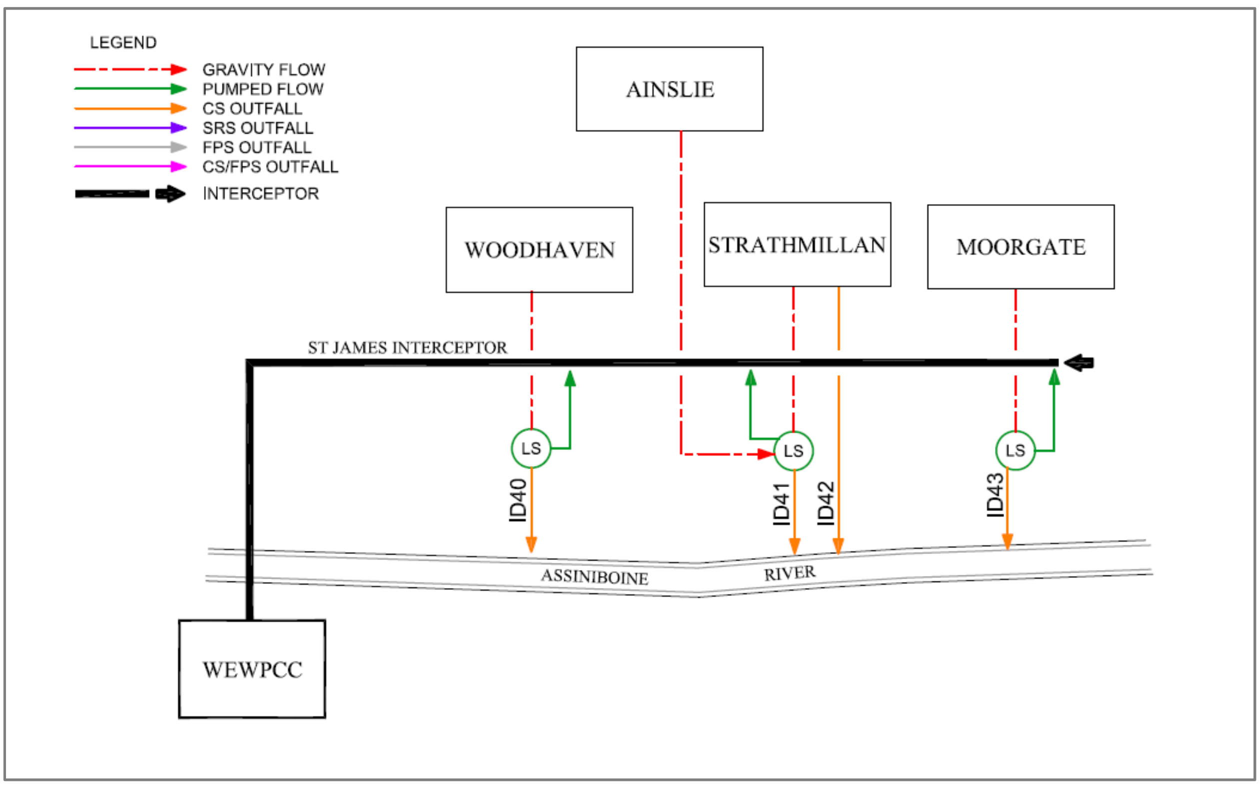


Figure 1-1. District Interconnection Schematic

1.3.2 Asset Information

The main sewer system features for the district are shown on Figure 43 and are 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 (ID40)	S-MH70021569.1	S-MA70019662	900 x 1200 mm	Egg-shaped Invert: 229.59 m
Flood Pumping Outfall	N/A	N/A	N/A	No flood pumping station in this district.
Other Overflows	N/A	N/A	N/A	
Main Sewer Trunk	S-TE20000744.2	S-MA70019661	900 x 1200 mm	Egg-shaped Invert: 229.82 m
Storm Relief Sewer Outfalls	N/A	N/A	N/A	No SRS within district.
Storm Relief Sewer Interconnections	N/A	N/A	N/A	No SRS within district.
Main Trunk Flap Gate	N/A	N/A	N/A	No flap gate constructed on primary outfall.
Main Trunk Sluice Gate	N/A	N/A	N/A	No sluice gate constructed on primary outfall.
Off-Take	S-TE20000744.1	S-MA70019650	300 mm	Invert 229.85 m
Wet Well	Woodhaven PS	S-PS00000294	3.5 m^2 chamber area	
Lift Station Total Capacity	N/A	N/A	0.054 m^3/s	2 x 0.027 m^3/s pumps
Lift Station ADWF	N/A	N/A	0.004 m^3/s	
Lift Station Force Main	WoodhavenPS_RM.1	S-MA20005021	150 mm	Connects to St. James Interceptor Invert: 230.48 m
Flood Pump Station Total Capacity	N/A	N/A	N/A	No flood pumping station in this district.
Pass Forward Flow – First Overflow	N/A	N/A	0.054 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	Woodhaven – 226.92
2	Trunk Invert at Off-Take	229.85
3	Top of Weir	230.28
4	Relief Outfall Invert at Flap Gate[b,c]	N/A
5	Low Relief Interconnection[b]	N/A
6	Sewer District Interconnection (Interceptor at Ainslie district)	Invert at district boundary: 43-01 = 228.90

Table 1-2. Critical Elevations

Reference Point	Item	Elevation (m)[a]
7	Low Basement	231.98
8	Flood Protection Level	231.43

[a] City of Winnipeg Data, 2013

[b] There is no SRS system in Woodhaven. The Woodhaven CS outfall does not have a positive gate or flap gate.

[c] The normal summer water level (NSWL) is low relative to the CS outfall, so a flap gate is not required to prevent back-up of water from the river.

1.4 Previous Investment Work

Table 1-3 provides a summary of the district status in terms of data capture and study. No work has been completed on the district sewer system since the 1986 Basement Flood Relief Study (Girling,1986).

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 Woodhaven Combined Sewer District was included as part of this program. Instruments installed at each of the 39 primary CSO outfall locations has 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
43 - Woodhaven	1986	Future Work	2013	Study Complete	N/A

Source: Report on Basement Flooding Relief Program, 1986

1.5 Ongoing Investment Work

There is ongoing maintenance and calibration of permanent instruments installed within the primary outfall within the Woodhaven 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.

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 Woodhaven sewer district are listed in Table 1-4. The proposed CSO control projects will include in-line storage via a control gate and floatables 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	Storage / Transport Tunnel	Sewer Separation	Green Infrastructure	Real Time Control	Floatable Management
85 Percent Capture in a Representative Year	-	-	-	✓	✓	-	-	-	✓	✓	✓

Notes:

- = not included
✓ = included

The Woodhaven district plan includes implementing floatable control and in-line storage to meet the CSO Control Option 1 performance target.

Floatable management will be necessary to capture floatables in the sewage. The primary CS overflow for the district is to be screened under the current CSO control plan to address the floatables management requirements. The installation of a control gate at the primary CS outfall will be required for the screen operation in the Woodhaven district. This control gate installation will also provide the mechanism for capture of minor additional in-line storage. It should be noted however that in-line storage for the Woodhaven district is not a cost-effective solution, specifically for additional volume capture. The control gate installation is recommended primarily to provide the necessary hydraulic head for screen operations. Should the screening no longer be required in the Woodhaven district, it is recommended that alternative measures to in-line storage such as off-line storage be investigated in the Woodhaven district to provide the additional volume capture required to meet the 85 percent capture target in a more cost effective manner.

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. RTC is not included in detail within each plan and is described further in Section 3 of Part 3A.

1.6.2 In-Line Storage

In-line storage has been proposed as a CSO control for Woodhaven district. The in-line storage will require the installation of a control gate at the CS outfall. The control gate will primarily be used to maximize the available hydraulic head in the district CS system, such that screening can be effectively operated. The gate will also provide a secondary benefit in a minor increase in the storage level in the existing CS to provide an slight increase to the volume capture. The lack of a flap gate at the Woodhaven outfall was also evaluated and found to not impact the in-line storage arrangement recommended in any way.

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 in-line storage are listed in Table 1-5. .

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

Item	Elevation/Dimension	Comment
Invert Elevation	229.82 m	
Trunk Diameter	900 x 1200 mm	
Gate Height	0.24 m	Gate height based on half trunk diameter assumption
Top of Gate Elevation	230.52 m	
Maximum Storage Volume	19 m^3	Option has small storage volume as by-product of screening installation requirement
Nominal Dewatering Rate	0.05 m^3/s	Based on capacity of existing CS LS
RTC Operational Rate	To Be Determined	Future RTC/dewatering review on assessment

Notes:

NSWL – normal summer water level
RTC = Real Time Control

The proposed control gate will cause combined sewage to back-up in the collection system to the extent shown on Figure 43. 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 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 above the bypass weir crest and proceeds above the top of the control gate during high flow events, the gate drops out of the way. At this point, the district will only provide its original interception capacity via the primary weir for the district, and all excess CS would flow over the weir and discharge to the river. After the sewer levels 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 CS LS and pumped. The CS LS will further dewater the in-line storage provided during a WWF event as downstream capacity becomes available.

Figure 43-01 provides an overview of the ideal conceptual location and configuration of the control gate, bypass weir, and screening chambers. The proposed control gate will be installed in a new chamber within the existing trunk sewer alignment upstream of the existing CS LS. The dimensions of the chamber will be 5 m in length and 2 m in width to accommodate the gate, with an allowance for a longitudinal overflow weir. Due to the physical location of the existing infrastructure within the boulevard of Assiniboine Avenue, this does not fully allow the control gate and screening chambers to be located adjacent to the existing off-take (located within residential driveway) and CS LS. Therefore, to accommodate the two chambers, the conceptual location is upstream on the existing sewer on Woodhaven Boulevard. This would require the diversion of the two existing sewers (from east and west along Assiniboine Avenue) to upstream of the proposed control gate chamber, to ensure they are still intercepted. This would increase the construction activities in this area, the work required for the control gate construction is located within a residential street with minor disruptions expected. Further optimization of the gate chamber size may be provided if the decision is made not to include screening.

The physical requirements for the off-take and station sizing for a modification to pumping capacity have not been considered in detail, but they will be required in the future as part of an RTC program or CS LS rehabilitation or replacement project.

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/operation for large events will adversely affect the overflows at this district. Similar basis for the rate matching the LS philosophy of two times nominal dewatering rate could be adopted. 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.

1.6.3 Floatables Management

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

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

Table 1-6. Floatables Management Conceptual Design Criteria

Item	Elevation/Dimension/Rate	Comment
Top of Gate	230.52 m	
Bypass Weir Crest	230.42 m	
Normal Summer River Level	226.92 m	
Maximum Screen Head	0.52 m	
Peak Screening Rate	0.3 m^3/s	
Screen Size	1.5 m x 1 m	Modelled Screen Size

The proposed side bypass overflow weir and screening chamber will be located adjacent to the proposed control gate and existing CS trunk, as shown on Figure 43-01. The screens will operate when the sewer levels surpass the bypass weir elevation. A side bypass weir upstream of the gate will direct initial 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 may include screenings pumps with a discharge returning the screened material to the CS LS for routing to the WEWPCC for removal. The provision of screening pumps is dependent on final level assessment within the existing infrastructure and the Woodhaven trunk. This will be confirmed during future assessment stage.

The dimensions for the screen chamber to accommodate influent from the side weir, the screen area, and the routing of the discharge piping downstream of the gate are 2.5 m in length and 3 m in width. The existing sewer configuration including the off-take, and the CS LS force main will have to be modified to accommodate the new chambers as the control gate will also be located in this location.

If an alternative floatables management approach is pursued in this district, both the control / screening chambers would not be required. This control gate chamber will only provide minor additional volume capture for the district, and has been primarily recommended to provide the necessary hydraulic head for screening operation.

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 was reviewed to identify the most applicable GI controls.

Woodhaven has been classified as a high GI potential district, the land use mainly consists of single family residential land use, meaning it would be an ideal location for permeable paved roadways, cisterns/rain barrels, and rain gardens. Woodhaven already has a ditch and culvert land drainage system in place that could potentially be further used for bioswale projects further increasing the GI potential.

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.

In-line storage will impact the existing sewer system 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 Woodhaven CS LS, which may 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 Added To Model
2013 Baseline	43	43	984	37	N/A
2037 Master Plan – Control Option 1	43	43	984	37	IS, SC

Notes:

IS = In-line Storage
SC = Screening

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 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 [a]
Baseline (2013)	12,321	12,117	-	18	0.052 m^3/s
In-line Storage	12,874	11,900	217	17	0.054 m^3/s
Control Option 1	**12,874**	**11,900**	**217**	**17**	**0.054 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.

The Woodhaven district has an extensive ditch drainage system, that although not specifically modelled for the CSO Master Plan performance assessment, would be an ideal area for improvement to the hydraulic model when assessing the impact of green infrastructure with a selected district. This would require additional survey, monitoring and modelling to ensure that the parameters are closely matched for conditions prior to and following GI infrastructure construction.

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 1-9. 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 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 Cost (Over 35-year period)
In-line Control Gate	N/A [a]	$2,190,000 [b]	$39,000	$840,000
Screening		$1,840,000 [b c]	$48,000	$1,040,000
Subtotal	**$0**	**$4,030,000**	**$87,000**	**$1,880,000**
Opportunities	N/A	$400,000	$9,000	$190,000
District Total	**$0**	**$4,430,000**	**$96,000**	**$2,070,000**

[a] In-Line and Screening not assessed in this district for the Preliminary Proposal. Solution developed as refinement to Preliminary Proposal work following submission of Preliminary Proposal costs. Costs for these items of work found to be $1,290,000 in 2014 dollars

[b] Cost associated with the new off-take construction, and re-routing of existing sewers to accommodate control gate and screening chamber location s proposed was not included in Master Plan cost assessments for control gate or screening chamber work.

[c] 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 and O&M costs are reported in terms of present value.
- 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 1-10.

Table 1-10. Cost Estimate Tracking Table

Changed Item	Change	Reason	Comments
Control Options	Control Gate	A control gate was not included in the Preliminary Proposal estimate	Added for the MP to further reduce overflows
	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	
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 Proposal 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 Woodhaven district would be classified as a low potential for implementation of complete sewer separation as the only feasible approach to achieve the future performance targets. However, 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 and off-line tank or tunnel storage may be utilized in key locations to provide additional storage and increase capture volume.

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	• Increased use of GI • Opportunistic Separation • Off-line Storage (Tank / Tunnel)

The control options selected for the Woodhaven district has been aligned for the requirement to provide screening on each of the primary outfalls and not specifically 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 involve a system wide basis analysis to be completed to determine the next phase for the relatively small district of Woodhaven.

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 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 1-12.

Table 1-12. 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	-	R	-	-	-	-	-	-
2	Existing Lift Station	-	R	-	-	-	-	R	-
3	Flood Pumping Station	-	-	-	-	-	-	-	-
4	Construction Disruption	-	-	-	-	-	-	-	-
5	Implementation Schedule	-	-	-	-	-	-	R	-

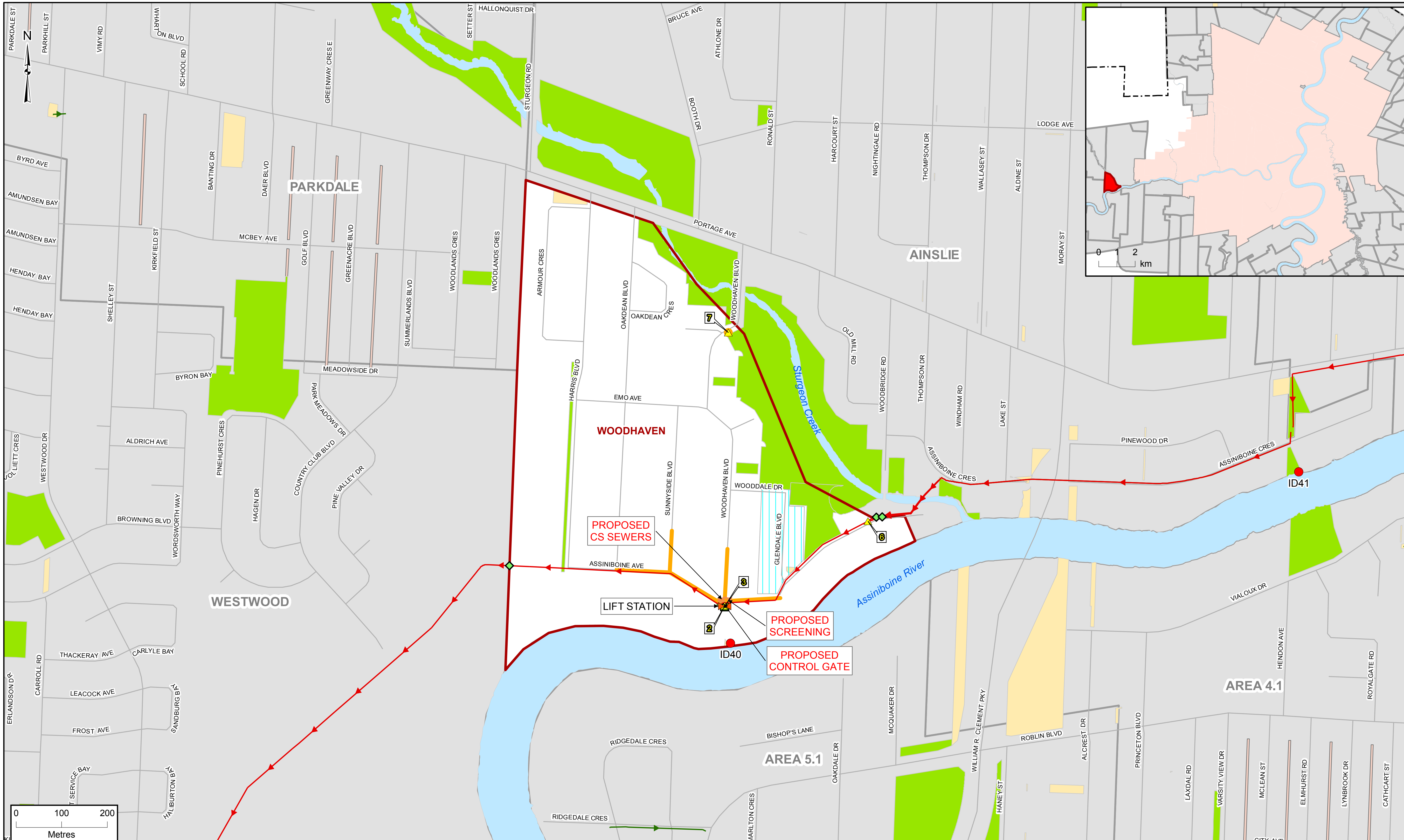
Table 1-12. Control Option 1 Significant Risks and Opportunities

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
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

Girling, R.M. 1986. *Basement Flooding Relief Program Review – 1986*.



LEGEND

- Primary Weir
- Critical Elevation
- CSO Outfall
- Low CS Manhole
- Inter-System Connection
- CS - WWS
- District Boundary Crossing
- WWS
- Interceptor Sewer
- Force Main
- Street
- District Boundary
- Watercourse
- Greenspace
- City Owned Land

CSO MASTER PLAN PROPOSED SOLUTIONS

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

ALL PROPOSED SOLUTIONS SHOWN IN RED TEXT

JACOBS

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

Winnipeg

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

FIGURE 43
District Overview Map
Sewer District: Woodhaven
City of Winnipeg
Combined Sewer Overflow Master Plan

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LEGEND

- Primary Weir
- Critical Elevation
- CSO Outfall
- Manhole
- Pump Location
- Force Main
- Sewer By Type
  - CS
  - WWS
- Pump Station Type
  - Lift Station
- Land Parcel

CSO MASTER PLAN
PROPOSED SOLUTIONS

- Proposed Manhole
- Proposed CS Sewer
- Control Gate
- Screening

ALL PROPOSED SOLUTIONS
SHOWN IN RED TEXT

JACOBS

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

Winnipeg

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FIGURE 43-01
Control Gate and Screening
Sewer District: Woodhaven
City of Winnipeg
Combined Sewer Overflow Master Plan