CSO Master Plan

Newton District Plan

August 2019

City of Winnipeg

JACOBS

CSO Master Plan

Project No:	470010CH
Document Title:	Newton District Plan
Revision:	03
Date:	August 19, 2019
Client Name:	City of Winnipeg
Project Manager:	John Berry
Author:	Jack Tinker
File Name:	Newton_Plan_Final_CO1MP_08192019_Tracked

Jacobs Engineering Group Inc.

1301 Kenaston Boulevard
Winnipeg, MB R3P 2P2
Canada
www.jacobs.com

Document History and Status

Revision	Date	Description	By	Review	Approved
0	09/14/2018	Version 1 DRAFT	JT	SB, MF, SG	
1	02/15/2019	DRAFT 2 for City Review	JT	SG	MF
2	07/2019	Final Draft Submission	DT	MF	MF
3	08/19/2019	Final Submission For CSO Master Plan	MF	MF	SG

Contents

Tables

Figure

1. Newton District

1.1 District Description

Newton district is located in the northern section of the combined sewer (CS) area to the west of the Red River. This district is approximately bounded by Margaret Avenue to the north, Main Street to the west, Kilbride Avenue to the south, and the Red River to the east.

Newton district primarily includes residential, parks and recreation land use areas. Kildonan Park is a large park located in the north end of the district which takes up approximately 40% of the district by area. Overall, the district includes approximately 40 ha of greenspace. Single family residential is located south of Kildonan Park between Main Street and the Red River. Commercial land use is located along Main Street and Partridge Avenue

Main Street, Partridge Avenue and Leila Avenue are the regional transportation routes in the district. Main Street runs north-south through the district. Partridge and Leila Avenue are one-way segments that run east-west and join up to Main Street.

1.2 Development

A portion of Main Street is located within the Newton 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

Newton district encompasses an area of 102 ha[1] based on the district GIS boundary information and primarily includes a CS system. This district does not include any areas identified as LDS separated or separation ready.

The CS system includes a flood pumping station (FPS), diversion structure and outfall gate chamber. The system flows towards the Newton outfall located at the east end of Newton Avenue at the intersection of Newton Avenue and Scotia Street, where it is intercepted and diverted into the Main Interceptor. The diversion structure includes a weir and a 525 mm off-take pipe which reduces to 450 mm and then connects to a 1350 mm secondary interceptor that flows by gravity west along Newton Avenue to tie back into the Main Interceptor. The intercepted CS from the Linden and Hawthorne districts is conveyed across the Red River via two river crossing pipe and both also tie into this 1350 mm secondary interceptor sewer.

There are two main routes for CS to flow to the diversion structure. An 1800 mm CS trunk flows east on Newton Avenue, servicing the district area west of Main Street; a 900 mm CS trunk on Scotia Street south of the outfall services the district area south of Leila Avenue. An interconnection with the Armstrong district is present near the Armstrong diversion structure near the intersection of Armstrong Avenue and Main Street, which allows flow from Armstrong to flow into Newton. This provides the ability to utilize the Newton FPS to dewater the Armstrong CS system during wet weather flow (WWF) and high river level conditions.

During dry weather flow (DWF), sanitary sewage from the Newton district flows into the diversion chamber located at the intersection of Newton Avenue and Scotia Street upstream of the CS outfall. The

[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.

sanitary sewage is then diverted by the weir to a 450 mm off-take pipe and flows by gravity back to the Main Interceptor to be treated at the North End Sewage Treatment Plant (NEWPCC).

During WWF, flows that exceed the diversion capacity overtop the primary weir and is discharged into the river via the CS primary outfall located near the intersection of Newton Avenue and Scotia Street. Sluice and flap gates are installed on this CS outfall to prevent river water from backing up into the CS system when the Red River levels are particularly high. However not only does the flap gate prevent river water intrusion, but it also prevents gravity discharge from the Newton CS outfall. Under these conditions the excess flow is pumped by the Newton FPS to a point in the Newton CS Outfall downstream of the flap gate, where it can be discharged to the river by gravity once more.

A CS relief outfall acts an emergency overflow for the Rainbow Stage lift station (LS), which services the Rainbow Stage and other properties located in Kildonan Park east of Riverview Drive. This includes a sewage control structure with a LS and 150 mm force main that pumps sewage from some of the park facilities into a 375 mm CS pipe which then flows by gravity back towards the Newton diversion structure.

The two outfalls to the Red River (CS):

- ID35 (S-MA00017645) – Newton CS Outfall
- ID37 (S-MA70069313) – Kildonan Park CS Outfall

1.3.1 District-to-District Interconnections

There are several district-to-district interconnections between Newton and the surrounding districts. Each interconnection is shown on Figure 31 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

Armstrong

- The 2250 mm Main Interceptor pipe flows north by gravity on Main Street out of the Newton district into the Armstrong district:
  - Invert at Newton district boundary 215.85 m (S-MA00000900)

1.3.1.2 Interceptor Connections – Upstream of Primary Weir

Jefferson East

- The 2250 mm Main Interceptor pipe flows north by gravity on Main Street into the Newton district out of the Jefferson East district:
  - Invert at Jefferson East district boundary 217.61 m (S-MA00017587)

1.3.1.3 District Interconnections

Jefferson East

<u>CS to CS</u>

- The 375 mm CS pipe flows south on Main Street out of the Newton district:
  - Invert at Newton district boundary 226.90 m (S-MA00017220)
- The 250 mm CS pipe flows east by gravity on Kingsbury Avenue out of the Newton district:
  - Invert at Newton district boundary 226.59 m (S-MA00017588)
- The 225 mm CS pipe flows west by gravity on Burrin Avenue into the Jefferson East district:

- Invert at Newton district boundary 228.68 m (S-MA00001001)

Armstrong

CS to CS

- The 2700 mm CS main sewer trunk flows east on Armstrong Avenue out of the Armstrong district towards the Armstrong CS outfall located at the far end of Armstrong Avenue:
  - Invert at Armstrong district boundary 223.58 m (S-MA00000802)
- The 1350 mm CS pipe diverts south onto Main Street into the Newton district and connects to the Newton CS network:
  - Invert at Armstrong district boundary 225.03 m (S-MA00000789)
- The 600 mm CS pipe flows south by gravity on Main Street out of the Newton district:
  - Invert at Armstrong district boundary 224.64 m (S-MA00000784)
- The 450 mm CS pipe flows south by gravity on Main Street into the Newton district:
  - Invert at Armstrong district boundary 225.55 m (S-MA00000930)
- The 450 mm CS pipe flows south by gravity on Main Street out of the Newton district:
  - Invert at Armstrong district boundary 225.55 m (S-MA00000779)
- The 600 mm CS pipe flows east by gravity though Beeston Drive onto Main Street into the Newton district:
  - Invert at Newton district boundary 225.67 m (S-MA00000869)

Hawthorne

WWS to WWS

- The 350 mm WWS pipe flows north by pump into the Newton district:
  - Newton Avenue – 225.66 m (S-MA70021128)
- The 350 mm WWS pipe flows north by pump into the Newton district:
  - Newton Avenue – 222.63 m (S-MA00017639)

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

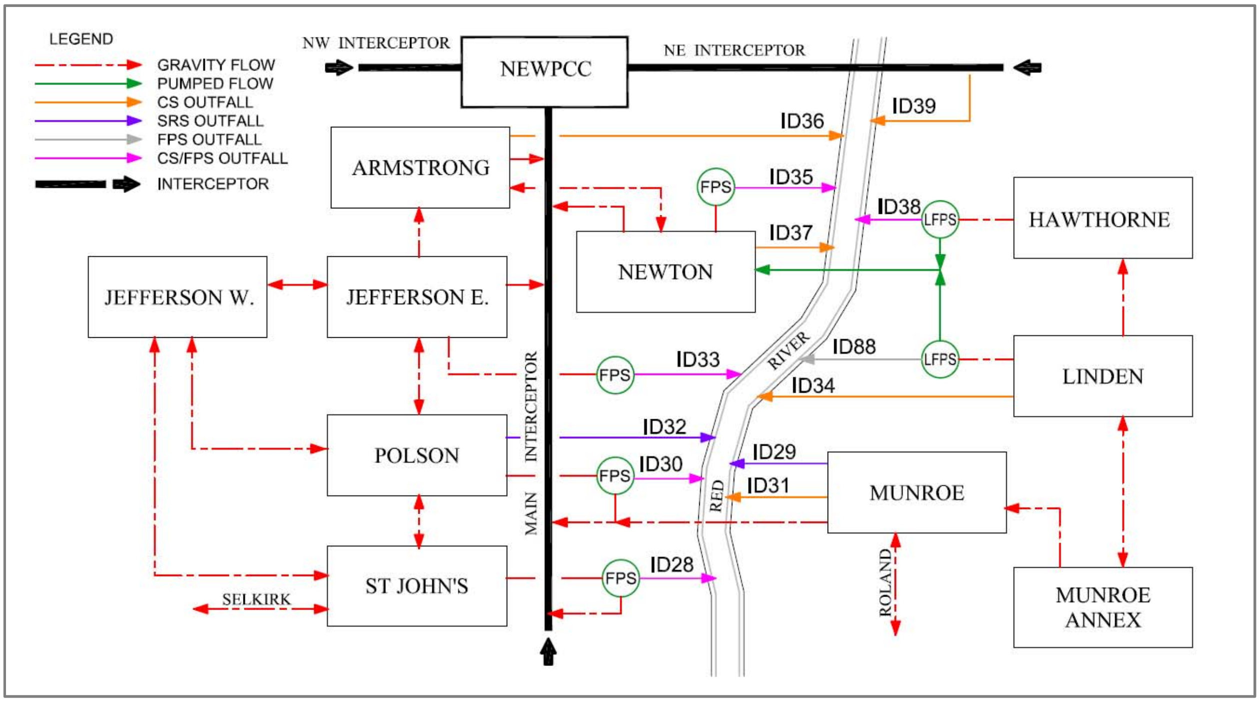

Figure 1-1. District Interconnection Schematic

1.3.2 Asset Information

The main sewer system features for the district are shown on Figure 31 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 (ID35)	S-CO70003176.1.1	S-MA00017645	1850 mm	Red River Invert: 223.55 m
Flood Pumping Outfall (ID35)	S-CO70003176.1.1	S-MA00017645	1850 mm	Red River Invert: 223.55 m
Other Overflows (ID37)		S-MA70069313	250 mm	Invert: 223.05 m
Main Trunk	S-TE70000766.1	S-MA00001804	1800 mm	Invert: 223.59 m
SRS Outfalls	N/A	N/A	N/A	No SRS system within the district.
SRS Interconnections	N/A	N/A	N/A	No SRS system within the district.
Main Trunk Flap Gate	S-TE70026554.1	S-CG00000773	1800 mm	Invert: 224.14 m Circular
Main Trunk Sluice Gate	NEWTON_GC1.1	S-CG00000772	1800 x 1800 mm	Invert: 224.02 m
Off-Take	S-TE70000754.2	S-MA00017635	525	Invert: 223.81 m
Dry Well	N/A	N/A	N/A	
Lift Station Total Capacity	N/A	S-MA00017635 (1)	525 mm (1)	0.35 m^3/s (1)
ADWF	N/A	N/A	0.002 m^3/s	
Lift Station Force Main	N/A	N/A	N/A	

Table 1-1. Sewer District Existing Asset Information

Asset	Asset ID (Model)	Asset ID (GIS)	Characteristics	Comments
Flood Pump Station Total Capacity	N/A	N/A	2.17 m^3/s	1 x 1.35 m^3/s 1 x 0.82 m^3/s
Pass Forward Flow – First Overflow	N/A	N/A	0.64 m^3/s	

Notes:

(1) – Gravity pipe replacing lift station as Newton 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[a] (m)
1	Normal Summer River Level	Newton – 223.65 Kildonan Park – 223.65
2	Trunk Invert at Off-Take	223.81
3	Top of Weir	223.90
4	Relief Outfall Invert at Flap Gate	N/A
5	Low Relief Interconnection	N/A
6	Sewer District Interconnection (Armstrong)	224.64
7	Low Basement	226.64
8	Flood Protection Level	228.80

[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 Newton was the *Newton Combined Sewer District Sewer Relief Study* (IDG Stanley Inc, 1994). The study's purpose was to develop sewer relief options that provide a 5-year level of protection against basement flooding and to develop alternatives for reducing and eliminating pollutants from CSOs. 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 Newton 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
31 – Newton	1994	Planned in Next 5 Years	2013	Study Complete	N/A

Source: Report on *Newton Combined Sewer District Sewer Relief Study*, 1994

1.5 Ongoing Investment Work

District flow monitoring is planned to be undertaken within the next 5 years due to its interaction with the Armstrong district.

There is ongoing maintenance and calibration of permanent instruments installed within the primary outfall within the Newton 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 Newton sewer district are listed in Table 1-4. The proposed CSO control projects will include in-line storage via a control gate, 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. A gravity flow controller is proposed on the CS system to optimize the dewatering rate from the district back into the Main Interceptor.

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 east end of Newton Avenue.

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 In-Line Storage

In-line storage has been proposed as a CSO control for Newton 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.

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	223.59 m	N/A
Trunk Diameter	1800 mm	N/A
Gate Height	0.69 m	Gate height based on half trunk diameter assumption
Top of Gate Elevation	224.59 m	N/A
Maximum Storage Volume	330 m^3	N/A
Nominal Dewatering Rate	0.35 m^3/s	Based on existing pipe system pipe full capacity
RTC Operational Rate	TBD	Future RTC/dewatering review on performance

Note:
RTC = Real Time Control
TBD = to be determined

The proposed control gate will cause combined sewage to back-up within the collection system to the extent shown on Figure 31. 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 levels 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 drop 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 down 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 gravity discharge will continue with its current operation while the control gate is in either position, , with all DWF being diverted to the Main Interceptor.

Figure 31-01 provides an overview of the conceptual location and configuration of the control gate and screening chambers. The control gate will be installed in a new chamber within the trunk sewer alignment. The dimensions of a new chamber to provide an allowance for a side weir for floatables control are 5.5 m in length and 3.5 m in width. The existing sewer configuration including the construction of an additional off-take pipe will have to be completed to allow for CS captured by the control gate to be intercepted to the Newton diversion structure. The existing primary weir would remain in place to allow flow diversion to continue when the control gate is in its lowered position. The work proposed is located within a residential street with minor disruptions expected.

The nominal rate for dewatering is determined by the performance of the existing pipe capacity as the district is a gravity discharge district. As such the flows will vary over the duration of a rainfall event and has been nominated for a gravity flow control device. Any future consideration, 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 overflow at this district. The control device would be set to a rate similar to the existing pipe full capacity to allow the set limit to be known. This would allow the future RTC control the ability to capture and treat more volume for localized storms in other districts by using the excess interceptor capacity made available by restricting the pass forward flows through the control device where the runoff is less.

1.6.3 Gravity Flow Control

Newton district does not include a LS and discharges to the Main Interceptor by gravity. A flow control device will be required to control the diversion rate for future RTC and dewatering. The controller will include flow measurement and a gate to control the discharge flow rate. A standard flow control device was selected as described in Part 3C.

The 1350 mm sewer connecting into the Main Interceptor also receives flow from the Hawthorne and Linden districts. The flow control would be installed at an optimal location between the diversion structure and the connection into the Main Street interceptor. Figure 31-01 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 flow controller would operate independently during DWF and WWF and would require only minimal operational interaction. The impact of the flow controller on the force main connections to Hawthorne and Linden districts must also be considered during preliminary design.

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.

1.6.4 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 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 **Error! Reference source not found.**.

Table 1-6. Floatables Management Conceptual Design Criteria

Item	Elevation/Dimension/Rate	Comment
Top of Gate	224.59	
Bypass Weir Crest	224.49	
NSWL	223.649	
Maximum Screen Head	0.84	
Peak Screening Rate	0.29 m^3/s	
Screen Size	1.5 m wide x 1 m high	Modelled Screen Size

The side overflow weir and screening chamber will be located adjacent to the existing combined trunk sewer, as shown on Figure 31-01. The screens will operate once levels within the sewer surpassed the in-line control elevation. A side 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 interceptor.

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 2.5 m in length and 3.5 m in width.

1.6.5 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.

Newton has been classified as a high GI potential district, the land use mainly consists of greenspace and single family residential land use, meaning it would be an ideal location for bioswales, permeable paved roadways, cisterns/rain barrels, and rain gardens. There are some commercial buildings that would be suitable for green roof projects.

1.6.6 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.

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.

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. 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 **Error! Reference source not found.**.

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	93	93	2,539	36	N/A
2037 Master Plan – Control Option 1	93	88	2,539	35	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

	Preliminary Proposal	Master Plan			
Control Option	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)	7,218	8,614	-	6	0.315 m^3/s
In-line Storage	2,771	2,994	5,620	2	0.315 m^3/s
Control Option 1	**2,771**	**2,994**	**5,620**	**2**	**0.315 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 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	$7,740,000 [a]	$2,550,000 [c]	$40,000	$860,000
Screening		$1,840,000 [d]	$31,000	$660,000
Gravity Flow Controller	N/A	$1,280,000	$34,000	$740,000
Off-line Storage Tank	$6,870,000 [b]	N/A	N/A	N/A
Subtotal	**$14,610,000**	**$5,670,000**	**$105,000**	**$2,260,000**
Opportunities	N/A	$570,000	$11,000	$230,000
District Total	**$14,610,000**	**$6,240,000**	**$116,000**	**$2,490,000**

[a] Screening and In-line cost was combined in the Preliminary Proposal. Solution development as refinement to Preliminary Proposal work following submission of Preliminary Proposal costs. Costs for these items of work found to be $1,000,000 in 2014 dollars

[b] Offline storage tank part of Armstrong assessment during Preliminary Proposal (however located within the Newton district).

[c] Cost associated with new off-take construction, as require, to accommodate control gate and screening chambers in location and allow intercepted CS flow to reach existing Newton gravity discharge was not included in Master Plan cost estimates.

[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 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 Master Plan to further reduce overflows
	Screening	Screening was not included in the Preliminary Proposal estimate	Added in conjunction with the Control Gate
	Removal Of Off-line Storage Tank	The Master Plan assessment found that off-line tank storage not a preferred control solution.	
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 Newton 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. 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	• Opportunistic Sewer Separation • Increased use of GI • Off-line Storage (Tank/Tunnel)

The control options selected for the Newton 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 be based on a stepped approach from the system wide basis. The proposed control options at the adjacent Armstrong district provide overflow reduction to this district and would be programmed to be completed prior to any work commenced in this district.

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

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	-
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

IGD Stanley Inc. 1994. *Newton Combined Sewer District Sewer Relief Study*. Prepared for the City of Winnipeg, Waterworks, Waster and Disposal Department. September.

LEGEND

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

CSO MASTER PLAN PROPOSED SOLUTIONS

- Proposed Control Gate
- Extent of In-line Storage

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 31
District Overview Map
Sewer District: Newton
City of Winnipeg
Combined Sewer Overflow Master Plan

\\WPGFSP01\PROJ\WINNIPEGCITYOF\470010MASTERPLANCSO\500DESIGNWORKFILES\503STUDIES\MASTER PLAN CONCEPTUAL DEVELOPMENT\MAPPING\MAPS\PACKAGE6\NEWTON\NEWTON_DISTRICT_OVERVIEW_MAP.MXD SBEGG1 7/29/2019 9:38:58 AM

LEGEND

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

CSO MASTER PLAN
PROPOSED SOLUTIONS
- Control Gate
- Screening
- 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 31-01
Control Gate, Screening and Flow Control
Sewer District: Newton
City of Winnipeg
Combined Sewer Overflow Master Plan

\\WPGFSP01\PROJ\WINNIPEGCITYOF\470010MASTERPLANCSO\500DESIGNWORKFILES\503STUDIES\MASTER PLAN CONCEPTUAL DEVELOPMENT\MAPPING\MAPS\PACKAGE6\NEWTON\NEWTON_DISTRICT_DETAIL.MXD SBEGG1 7/29/2019 9:38:03 AM