CSO Master Plan

Douglas Park District Plan

August 2019

City of Winnipeg

CSO Master Plan

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Document History and Status

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1	02/2019	DRAFT 2 for City Review	MF	SG	MF
2	08/2019	Final Draft Submission	DT	MF	MF
3	08/16/2019	Final Submission For CSO Master Plan	MF	MF	SG

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1. Douglas Park District

1.1 District Description

Douglas Park is a small district located on the western edge of the north end treatment area of the combined sewer (CS) area. It is bounded by Ferry Road district to the north and east, Moorgate district to the west, and the Assiniboine River to the south. Portage Avenue forms the northern border, Deer Lodge Place forms the western border, and Library Place forms the eastern border.

Douglas Park district land use is classified primarily as residential and parks, with a commercial area located on Portage Avenue. The residential homes are classified mostly as single-family homes. Bruce Park is a green space located in the centre of the district. Truro Creek runs through Bruce Park to the Assiniboine River.

Portage Avenue is the only regional transportation route that passes through Douglas Park along the northern border running parallel to the Assiniboine River.

1.2 Development

A portion of Portage Avenue is located within the Douglas Park 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

Douglas Park encompasses an area of 23 hectares (ha)[1] and consists of a CS system with one outfall located on the southern end of Douglas Park Road. The combined sewage is collected from three residential blocks including Douglas Park Road to Deer Lodge Place and flows to the 300-millimetre (mm) interceptor pipe that connects to the Douglas Park CS outfall. The western section of Douglas Park district flows beneath the Truro Creek using a 300-mm siphon. The area west of Bruce Park has undergone sewer separation with a separate land drainage sewer (LDS) to collect the overland runoff and the decommissioning of the Douglas Park secondary outfall.

During dry weather flow (DWF), combined sewage is diverted by the primary weir, through a 375 mm interceptor pipe that flows west to tie into the Ferry Road CS system. The intercepted CS from the Douglas Park district is then intercepted once more within the Ferry Road district, where it enters the Ferry Road LS. The CS is then pumped into the Portage Interceptor, and flows by gravity to the North End Sewage Treatment Plant (NEWPCC).

During wet weather flow (WWF) events, high flow in the system may cause the level in the trunk sewer to increase above the primary weir and overflow by gravity to the Assiniboine River via the Douglas Park CS outfall. This CS outfall consists of a sluice gate that may be closed during high river conditions to prevent backflow from the river entering the system. There is no flap gate at this outfall; thus, the response to high river conditions is not immediate and requires response and monitoring from the collections system operators for the district. There is also no flood station at this location; however, in the case where high river levels are predicted and overflow operation will be prevented by the positive gate during a WWF event, temporary flood pumping can be put in place.

The two CS outfalls to the Assiniboine River are as follows:

- ID44 (S-MA70028291) – Deer Lodge CS Outfall - Decommissioned

[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.

- ID45 (S-MA20008519) – Douglas Park CS Outfall

1.3.1 District-to-District Interconnections

There is one district-to-district interconnection between the Douglas Park and Ferry Road districts. This interconnection is shown on Figure 14 and shows the location where gravity flow crosses from one district to another Each interconnection is listed in the following subsections.

1.3.1.1 Interceptor Connections – Downstream of Primary Weir

Ferry Road

- Diverted wastewater sewage crosses into Ferry Road district from Douglas Park district through the 375 mm interceptor pipe. It flows through Bourkevale Park (east of Douglas Park Road), to be discharged to the Ferry Road LS:
  - Invert at district boundary - 226.1 m (S-MA20008531)

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.

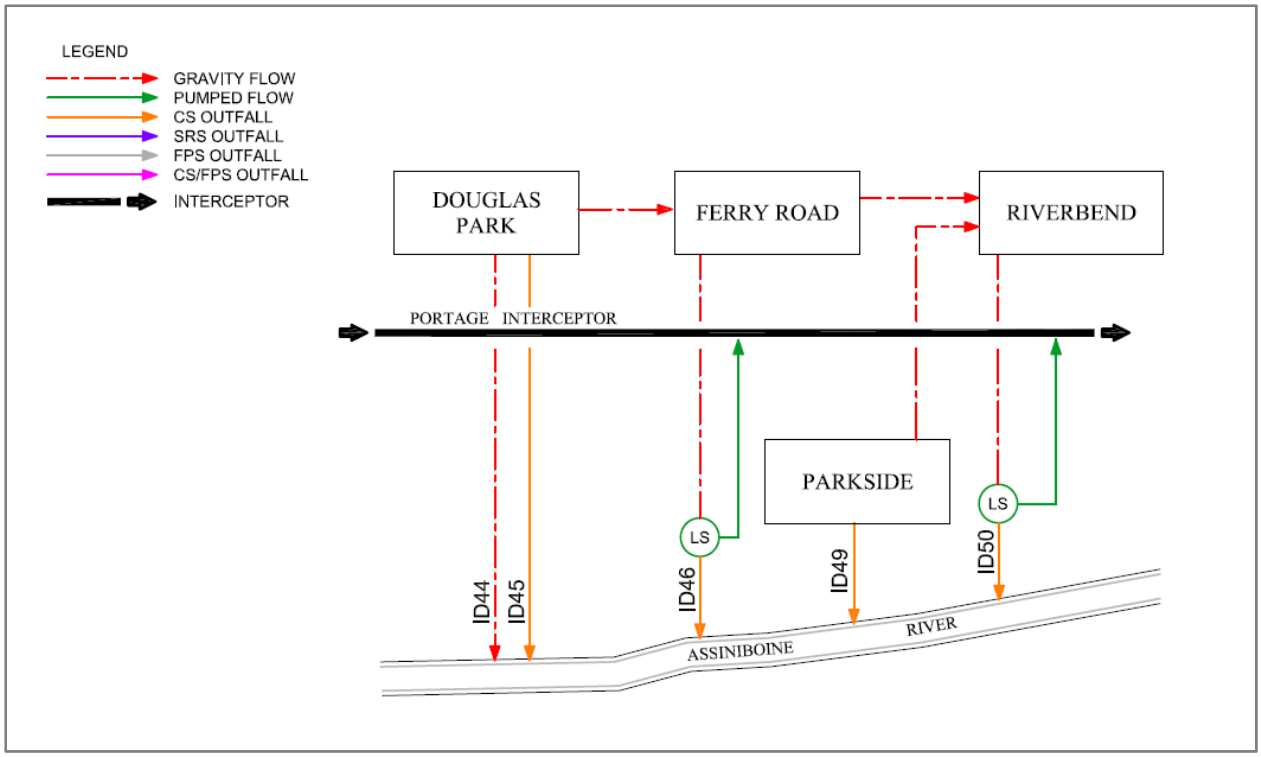

Figure 1-1. District Interconnection Schematic

1.3.2 Asset Information

The main sewer system features for the district are shown on Figure 14 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 (ID45)	S-MH20007846.1	S-MA20008519	300 mm	Circular Invert: 225.75 m

Table 1-1. Sewer District Existing Asset Information

Asset	Asset ID (Model)	Asset ID (GIS)	Characteristics	Comments
Flood Pumping Outfall	N/A	N/A	N/A	No flood pump station within the district.
Other Overflows	N/A	N/A	N/A	
Main Sewer Trunk	S-MH20007855.1	S-MA20008525	300	Circular Invert: 226.35 m
Storm Relief Sewer Outfalls	N/A	N/A	N/A	No SRS within the district.
Storm Relief Sewer Interconnections	N/A	N/A	N/A	No SRS within the district.
Main Trunk Flap Gate	N/A	N/A	N/A	No flap gate on the primary CS outfall.
Main Trunk Sluice Gate	DOUGLAS_PARK_GC.1	S-CG00001141	300 x 300 mm	Invert: 226.00 m
Off-Take (Interceptor)	S-MH20007847.2	S-MA20008518	375 mm	Circular Invert: 226.34 m
Dry Well	N/A	N/A	N/A	No lift station within the primary CS outfall.
Lift Station Total Capacity	N/A	S-MA20008518 (1)	375mm (1)	0.078 m^3/s (1)
Lift Station ADWF	N/A	N/A	0.004 m^3/s	
Lift Station Force Main	N/A	S-MA70017062	200 mm	Invert: 229.30 m
Flood Pump Station Total Capacity	N/A	N/A	N/A	No flood pump station within the district.
Pass Forward Flow – First Overflow	N/A	N/A	0.053 m^3/s	

Note:
(1) – Gravity pipe replacing Lift Station as Douglas Park is a gravity discharge district
ADWF = average dry-weather flow
GIS = geographic information system
ID = identification
N/A = not applicable

The critical 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	Douglas Park – 224.55
2	Trunk Invert at Off-Take	226.34
3	Top of Weir	226.78
4	Relief Outfall Invert at Flap Gate	N/A
5	Low Relief Interconnection	N/A
6	Sewer District Interconnection (Ferry Road)	226.10
7	Low Basement	228.86

8	Flood Protection Level	230.68

[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 for Douglas Park was in 2006 with the *Ferry Road and Riverbend Combined Sewer Relief Works* (Wardrop, 2006). This study discussed the possible separation work available for both the Ferry Road and Riverbend CS systems to reduce the incidence of basement flooding. To date, the separation work within the Douglas Park district located west of Bruce Park has been completed and the Deer Lodge outfall (ID 44) has been decommissioned.

Table 1-3. District Status

District	Most Recent Study	Flow Monitoring	Hydraulic Model	Status	Expected Completion
14 – Douglas Park	2006 - Conceptual	Future Work Following Complete Separation	2013	Study Complete Separation Ongoing	2018

1.5 Ongoing Investment Work

The Ferry Road and Riverbend basement flooding relief (BFR) work began in 2013 with ongoing separation work being completed within the districts. Once completed, it will provide complete road drainage separation of Ferry Road and Douglas Park.

The separation work within the Douglas Park district has been ongoing since 2016 and has been integrated into the CSO Master Plan. The remainder of the district is anticipated to be separated in the next 5-10 years.

There is no further study or construction proposed for the Douglas Park district at this time.

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 Douglas Park district are listed in Table 1-4. The proposed CSO control is complete sewer separation to align with the work currently underway. 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 decision to include complete separation of Douglas Park under the basement flooding relief work will remove a volume of land drainage from the CS system, thereby completely removing CSO occurrences for the Douglas Park district. The intent of complete separation was to eliminate all CSOs from the district under the 1992 representative year rainfall conditions. Post separation flow monitoring is required to confirm the sewer system performance and remaining wet weather response in the district from existing building foundation drainage connections to the CS system.

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 Sewer Separation

Sewer separation is proposed for Douglas Park district as part of the CSO Master Plan and is underway as part of the Ferry Road and Riverbend separation projects.

The work to date includes installation of a new independent LDS system to collect road drainage. New LDSs have been installed along Deer Lodge Place as east and west legs with connection to Truro creek in Bruce Park. The collected stormwater runoff was routed through the new LDS to a new outfall discharging to the Truro Creek. This separates the west section of the Douglas Park district. The remainder of the district is anticipated to be separated in the next 5-10 year.

The flows to be collected after separation will be as follows:

- DWF will remain the same – with it being diverted by gravity to the Ferry Road CS LS via the primary weir for the district.
- WWF will consist of sanitary sewage combined with foundation drainage.

This has resulted in a reduction in combined sewage flow received at Ferry Road CS LS since the separation project was complete. Future monitoring of the district will be completed to verify that the sewer separation is fully compliant with the goal of elimination of all CSO overflows under 1992 rainfall conditions. The monitored data will also be used to determine if a raise to the static weir elevation is necessary. Any weir elevation raise will also be evaluated in terms of existing basement flood protection to ensure the existing level of basement flood protection remains.

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.

Douglas Park has been classified as a high GI potential district. The land usage is categorized as mainly residential. This means the district would be an ideal location for bioswales, permeable paved roadways, cisterns/rain barrels, and rain gardens. The higher area of greenspace in Douglas Park district is suitable for biorientation garden projects.

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 Systems Operations and Maintenance

Systems operations and maintenance (O&M) changes were required to address the completed control options. This section identifies general O&M requirements for each control option completed 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.

Sewer separation included the installation of additional sewers that require inspection, cleaning and rehabilitation. This will result in additional maintenance costs over the long term, but operational costs will be minimal. The existing larger CS pipes within the district may also receive insufficient flow with the separation work for proper scouring velocities in the sewer pipes. This could result in solids settling within the sewers, and requiring more frequent cleaning operations. The impacts of the reduced flows in larger CS pipes will be evaluated as part of the sewer separation design for the district.

The primary CS outfall is believed to be either collapsed or plugged with river silt. Physical access to the outfall structure is also limited, previous City inspections have been attempted but unsuccessful. The separation of the district will greatly reduce the operation of this outfall and any post separation monitoring and impact assessment undertaken, may result in this outfall being decommissioned in the future. This will reduce this aspect of operations and maintenance requirements for the district.

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 model for the CSO Master Plan with the control options implemented in the year 2037. A summary of relevant model data is summarized in Table 1-5.

Table 1-5. InfoWorks CS District Model Data

Model Version	Total Area (ha)	Contributing Area (ha)	Population	% Impervious	Control Options Included in Model
2013 Baseline	13	13	698	32	N/A
2037 Master Plan – Control Option 1	13	8	698	2	SEP

Notes:

Total area is based on the model subcatchment boundaries for the district.
SEP = Separation
% = percent

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. While this district is to be separated and as a result Clause 8 of Licence No. 3042 will not be in effect, the wet weather response of the district overall will still need to be assessed.

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 1-6, are for the hydraulic model simulations using the year-round 1992 representative year applied uniformly. 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 1-6. 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)	754	739	-	5	0.053 m^3/s
Separation	0	0	739	0	TBD
Control Option 1	**0**	**0**	**739**	**0**	**TBD**

[a] Pass forward flows assessed up to 5-year design rainfall event. Possible overflow for larger design events to be confirmed.

The percent capture performance measure is not included in the table above as it is applicable to the entre CS system, and not for each district individually. However, the full capture of overflows volumes for the Douglas Park district would represent a 100 percent capture rate on a district level.

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

Table 1-7. Cost Estimates – Control Option 1

Control Option	2014 Preliminary Proposal Capital Cost	2019 CSO Master Plan Capital Cost [a]	2019 Annual Operations and Maintenance Cost [b]	2019 Total Operations and Maintenance Cost (Over 35-year period) [b]
Sewer Separation	$11,000,000	$0	$0	$0
Subtotal	**$11,000,000**	**$0**	**$0**	**$0**
Opportunities	N/A	$0	$0	$0
District Total	**$11,000,000**	**$0**	**$0**	**$0**

[a] Douglas Park separation work has yet to be fully completed, with the separation of the area along Douglas Park Road to be finalized within the near future (5-10 year period). This cost was not included for the CO1MP submission cost breakdown. Costs for this item of work found be $3,200,00 in 2019 dollars.

[b] O&M costs within the Cost Estimation Breakdown are based on future proposed control option and not on previously completed work. Since the Douglas Park district is not completely separated, additional O&M costs should be attributed to the overall cost program. Cost for the Annual O&M Costs in 2019 dollars found to be $6,400. Total O&M Cost (Over 35-year Period) found to be $150,000 in 2019 dollars. Both O&M costs include opportunities allowance of 10%.

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 (depending on future monitoring of post separation WWF impacts).

- The Preliminary Proposal capital cost is in 2014-dollar values.
- The CSO Master Plan capital cost is based on the control options presented in this plan and in 2019-dollar values.
- The 2019 Total Annual Operations and Maintenance (over 35-year period) cost component is the present value costs of each annual O&M cost under the assumption that each control option was initiated in 2019.
- The 2019 Annual Operations and Maintenance Costs were based on the estimated additional O&M costs annually for each control option in 2019 dollars.
- Future costs will be inflated to the year of construction.

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

Table 1-8. Cost Estimate Tracking Table

Changed Item	Change	Reason	Comments
Control Options	Sewer Separation	Updated Unit costs	Separation of part of district still ongoing.
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 proposed complete separation of the Douglas Park district will achieve the 100 percent capture figure and no further work will be required to meet the future performance target. It is recommended to complete post separation modelling to confirm the target is fully achieved.

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 as part of the CSO Master Plan 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 1-9.

Table 1-9. 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	-	-	-	-	**O**	-	-	-
2	Existing Lift Station	-	-	-	-	-	-	-	-
3	Flood Pumping Station	-	-	-	-	**O**	-	-	-
4	Construction Disruption	-	-	-	-	**R**	-	-	-
5	Implementation Schedule	-	-	-	-	**R**	-	-	-
6	Sewer Condition	-	-	-	-	-	-	-	-
7	Sewer Conflicts	-	-	-	-	**R**	-	-	-
8	Program Cost	-	-	-	-	**R**	-	-	-
9	Approvals and Permits	-	-	-	-	-	**R**	-	-
10	Land Acquisition	-	-	-	-	-	**R**	-	-
11	Technology Assumptions	-	-	-	-	**O**	**O**	-	-
12	Operations and Maintenance	-	-	-	-	**R / O**	**R**	-	-
13	Volume Capture Performance	-	-	-	-	-	**O**	--	-
14	Treatment	-	-	-	-	**O**	**O**	-	-

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

1.12 References

Wardrop. 2006. *Ferry Road and Riverbend Combined Sewer Relief Works*. Prepared for the City of Winnipeg Water and Waste Department. November.

LEGEND

- Primary Weir
- Critical Elevation
- Decommissioned Outfall
- CSO Outfall
- Low CS Manhole
- Inter-System Connection: CS - WWS
- District Boundary Crossing: WWS
- Force Main
- Street
- District Boundary
- Watercourse
- Greenspace

CSO MASTER PLAN PROPOSED SOLUTIONS

- Sewer Separation - Underway
- Sewer Separation - Complete

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 14
District Overview Map
Sewer District: Douglas Park
City of Winnipeg
Combined Sewer Overflow Master Plan

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