CSO Master Plan

Jefferson West District Plan

August 2019

City of Winnipeg

CSO Master Plan

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2	08/12/2019	Final Draft Submission	DT	MF	MF
3	08/20/2019	Final Submission For CSO Master Plan	MF	MF	SG

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1. Jefferson West District

1.1 District Description

Jefferson West district is located towards the northwestern section of the combined sewer (CS) area. This district is approximately bounded by McPhillips Street to the east, The Canadian Pacific Railway (CPR) Winnipeg Yards to the south, Keewatin Street to the west, and Inkster Boulevard to the north.

Jefferson West primarily includes industrial land use with a mix of commercial, residential, and greenspace within the district. The industrial land includes general and heavy manufacturing with the general manufacturing facilities located north of Burrows Avenue and west of Fife Street, while the heavy manufacturing includes the CPR Winnipeg Yards on the southern perimeter of Jefferson West district. The residential area includes both single and multi-family residential buildings, with the majority of multi-family buildings located on Burrows Avenue. The single-family residential homes are located between Selkirk Avenue and Burrows Avenue and east of Fife Street. The commercial businesses can be found along Keewatin Street and McPhillips Street.

The southern end of the CPR Winnipeg Beach passes through Jefferson West and the CPR Arborg passes through the industrial sections of the district. McPhillips Street, Keewatin Street, and Inkster Boulevard are the major transportation routes within Jefferson West. Approximately 44 ha is identified as greenspace: this includes Shaughnessy Park, Northwood Park, and Fort Whyte Park.

1.2 Development

There are several areas within the Jefferson West combined sewer district which have been identified as a General Manufacturing Lands as part of OurWinnipeg. Focused intensification within these areas is to be promoted in the future, with a particular focus on mixed use development. This is to ensure adequate employment lands available to support future population growth.

1.3 Existing Sewer System

The Jefferson West district has an approximate area of 600 hectares (ha)[1] based on the GIS district boundary data. This district does not include any areas identified as land drainage sewer (LDS) separated or separation-ready.

The CS system is connected to the Jefferson East CS network, which includes a diversion structure, flood pump station (FPS), and outfall gate chamber. The CS system drains along the main CS trunk on Inkster Boulevard with combined sewers from the northern and western portions of the district connecting to the main trunk. The remainder of CS system in the Jefferson West district connects to the large CS on McPhillips Street, which in turn flows north and connects to the main trunk on Inkster Boulevard. These describe the two main paths that the combined sewage flows to connect to Jefferson East district.

During dry weather flow (DWF), the system flows by gravity throughout the district, where it connects to the Jefferson East CS system. Within the Jefferson East CS system, sanitary sewage flows into the diversion chamber located at the intersection of Jefferson Avenue and Main Street upstream of the CS outfall. The sanitary sewage is diverted by the weir to a 1520 mm interceptor pipe and into the Main Interceptor. Sewage from the areas east of Main Street flow to the FPS weir and is allowed to back up until reaching the diversion chamber at Jefferson Avenue and Jones Street. This diversion has a 450 mm off-take pipe, which connects into the Main Street diversion and the 1520 mm off-take pipe to the North End Sewage Treatment Plant (NEWPCC) for treatment.

[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.

During wet weather flow (WWF), any flows from the Jefferson West district which reaches the Jefferson East outfall and exceeds the diversion capacity will overtop the weir and is discharged into the Red River. Sluice and flap gates are installed on the Jefferson East CS outfall to prevent river water from backing up into the CS system. When the river level is high such as this gravity discharge from the CS outfall is not possible; under these conditions the excess flow is pumped by the Jefferson FPS to a point downstream of the flap gate to allow gravity discharge to the river once more.

Additionally, during WWF the SRS system provides relief to the southern CS system in the Jefferson West district. The SRS system extends through certain routes and has multiple interconnections with the CS system.. Most catch basins are still connected to the CS system, so no partial separation has been completed. The SRS system connects to the 2150 mm SRS on Burrows Avenue. The SRS on Burrows then connects to the St. Johns SRS system on Burrows Avenue and ultimately uses the SRS outfall in the Selkirk district to discharge directly the Red River. A flap gate is located on this SRS outfall pipe to prevent river water from backing up into the SRS system.

There is also an overflow weir arrangement on the McPhillips CS trunk sewer that relieves the overall CS system from the Jefferson West district, and ties to the Inkster SRS system in the Polson district. This SRS system discharges directly to the Red River through the Inkster SRS outfall located near the intersection of Inkster Boulevard and Scotia Street. Upstream of the Inkster SRS outfall is an SRS off-take pipe, which will divert all collected CS in the SRS system into the Polson secondary interceptor and back into the CS system, under DWF and minor WWF conditions.

There are no CS outfalls in the Jefferson East district.

1.3.1 District-to-District Interconnections

There are several district-to-district interconnections between Jefferson West and the surrounding districts. Each interconnection is shown on Figure 19 and shows locations where gravity flow can cross from one district to another. Each interconnection is listed as follows:

St. Johns

SRS to SRS

- A 2900 mm SRS trunk flows by gravity from Jefferson West district into St Johns district on Mountain Avenue and connects to the SRS network in St Johns district:
  - Invert at St Johns district boundary 224.78 m (S-MA00010486)
- A 2150 mm SRS diverts from the CS system in Jefferson West district and flows eastbound by gravity on Burrows Avenue into St. Johns district:
  - Invert at Jefferson West district boundary 224.50 m (S-MA70015831)
- High sewer overflow:
  - Selkirk Avenue and McPhillips Street – 229.68 m (S-MH00008715)
  - Manitoba Avenue and McPhillips Street – 229.43 m (S-MH00008744)
  - Alfred Avenue and McPhillips Street – 229.49 m (S-MH00008303)
  - Aberdeen Avenue and McPhillips Street – 229.19 m (S-MH00008304)
  - McPhillips Street and Mountain Avenue – 225.46 m (S-MH00008426)
  - McPhillips Street and Mountain Avenue – 225.43 m (S-MH00008425)

Jefferson East

CS to CS

- The 2400 mm CS pipe flows by gravity east on Inkster Boulevard into Jefferson East district:

  - Inkster Boulevard at McPhillips Street 224.53 m (S-MH00009032)
- The 450 mm CS pipe flows by gravity west on Polson Avenue into Jefferson West district:
  - Invert at Jefferson West district 225.27 m (S-MA00007321)
- The 375 mm CS pipe flows west by gravity on Lansdowne Avenue into Jefferson West district:
  - Invert at Jefferson West district boundary 227.02 m (S-MA00011271)

Manitoba

WWS to WWS

- High Point manhole:
  - Selkirk Avenue at Arrow Street – 230.16 m (S-MH00007585)

Burrows

LDS to CS

- A 375 mm LDS overflows by gravity along Burrows Avenue from Burrows district into the 900 mm CS on Burrows Avenue:
  - Invert at Jefferson West district boundary 227.77 m (S-MA00006842)

King Edward

LDS to LDS

- A 750 mm LDS flows by gravity on Inkster Boulevard from Jefferson West district into King Edward district:
  - Invert at King Edward district boundary 228.44 (S-MA70106301)

Polson

CS to CS

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

A district interconnection schematic is included as Figure 1-1**Error! Reference source not found.**. The drawing illustrates the collection areas, interconnections, pumping systems, and discharge points for the existing system.

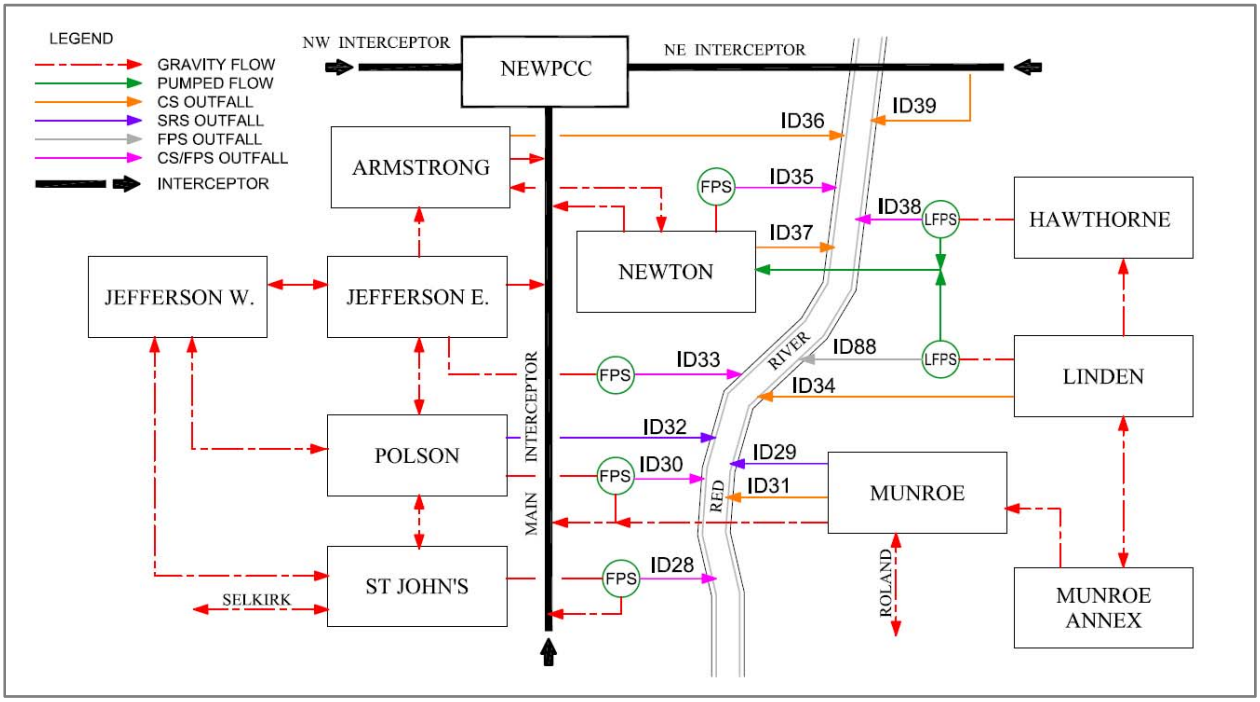


Figure 1-1. District Interconnection Schematic

1.3.2 Asset Information

The main sewer system features for the district are shown on Figure 20 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	N/A	N/A	N/A	No CS outfall within the district.
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 Trunk	S-MH00007387.1	S-MA00007312	2400 mm	Circular CS as it enters Jefferson East Invert: 224.53 m
SRS Outfalls	N/A	N/A	N/A	
SRS Interconnections	N/A	N/A	N/A	29 SRS-CS
Main Trunk Flap Gate	N/A	N/A	N/A	No CS outfall within the district.
Main Trunk Sluice Gate	N/A	N/A	N/A	No CS outfall within the district.
Off-Take	N/A	N/A	N/A	No CS outfall within the district.
Dry Well	N/A	N/A	N/A	
Lift Station Total Capacity	N/A	S-MA00011232 (1)	2400 mm (1)	3.7 m^3/s (1)

Table 1-1. Sewer District Existing Asset Information

Asset	Asset ID (Model)	Asset ID (GIS)	Characteristics	Comments
ADWF	N/A	N/A	0.2075 m^3/s	
Lift Station Force Main	N/A	N/A	N/A	No Lift station within the district.
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	No spill	No CS outfall and primary overflow arrangement within the district.

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

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

Table 1-2. Critical Elevations

Reference Point	Item	Elevation (m) [a]
1	Normal Summer River Level	N/A
2	Trunk Invert at Off-Take	N/A
3	Top of Weir	N/A
4	Relief Outfall Invert at Flap Gate	N/A
5	Low Relief Interconnection (S-MH00008425 & S-MH00008426)	Invert – 225.46
6	Sewer District Interconnection (St Johns)	224.50
7	Low Basement	226.47
8	Flood Protection Level (Jefferson East)	228.92

[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 Jefferson West was the *Jefferson Combined Sewer Districts Sewer Relief and CSO Abatement Study* (AECOM Canada Ltd, 2009). The study's purpose was to determine the most cost-effective means to upgrade the hydraulic capacity of the combined sewer system to reduce basement flooding during extreme rainfall events. No other study or district evaluation work has been completed on the district sewer system since that time.

Table 1-3. District Status

District	Most Recent Study	Flow Monitoring	Hydraulic Model	Status	Expected Completion
20 – Jefferson West	2009	Future Work – Following Sewer	2013	Study Complete	N/A

		Separation			

Source: Report on *Jefferson Combined Sewer Districts Sewer Relief and CSO Abatement Study*, 2009

1.5 Ongoing Investment Work

There is not any current or proposed CSO or sewer relief investment work occurring in Jefferson West district.

1.6 Control Option 1 Projects

1.6.1 Project Selection

There are no proposed projects selected to meet Control Option 1 – 85 Percent Capture in a Representative Year for the Jefferson West sewer district. Program opportunities including green infrastructure (GI) and real time control (RTC) will also be included as applicable as part of the Jefferson East district performance.

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

A portion of the existing CS trunk for Jefferson East extends into Jefferson West and will be impacted by the proposed in-line storage project recommended for Jefferson East. The in-line storage extends upstream from the control gate within Jefferson East and into the CS trunk in Jefferson West as shown in Figure 20.

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.

Floatable controls with screening will not be required. Inter-system floatables management programs like catch basin cleaning and public education programs would impact this district.

1.6.2 In-Line Storage

The proposed in-line storage in Jefferson East extends into Jefferson West district. The design criteria for the in-line storage can be found in the Jefferson East plan. The amount of storage that extends into Jefferson West is 8815 m^3. The proposed extent of the in-line storage is shown on Figure 19-01 and Figure 20.

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 LS rehabilitation or replacement project.

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 applicable GI controls.

Jefferson West has been classified as a medium GI potential district. Land use in Jefferson West primarily includes industrial land use with a mix of commercial, residential, and greenspace within the district. This means the district would be an ideal location for bioswales, permeable paved roadways, cisterns/rain barrels. The flat roof commercial buildings make for an ideal location for green roofs.

1.6.4 Real Time Control

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

1.7 System Operations and Maintenance

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

The impact of the in-line storage proposed in Jefferson East may impact the existing sewers in Jefferson West. Additional system monitoring, and level controls will be installed which will require regular scheduled maintenance.

It is noted that the current pipe configuration associated with the Mountain SRS system has attributed to O&M issues. This SRS system includes interconnections between the Jefferson West and the St Johns districts, at manholes S-MH00008425 and S-MH00008426. The location is problematic and has led to frequent DWF flows entering the Mountain SRS due to siphon blockages. The system allows the DWF flows to be diverted back to the Main Interceptor system, but it is noted as not ideal. Any proposed work in the Jefferson West district as part of the CSO Master Plan should also investigation the operation of this SRS system, and correct this to reduce the operational burden on the City.

1.8 Performance Estimate

1.8.1 InfoWorks Model

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

Table 1-5. InfoWorks CS District Model Data

Model Version	Total Area (ha)	Contributing Area (ha)	Population	% Impervious	Control Options Included in Model
2013 Baseline	528	528	7,277	68	N/A

Table 1-5. InfoWorks CS District Model Data

Model Version	Total Area (ha)	Contributing Area (ha)	Population	% Impervious	Control Options Included in Model
2037 Master Plan – Control Option 1	528	528	7,277	68	N/A

Notes:

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

City of Winnipeg hydraulic model relied upon for area statistics. The hydraulic model representation may vary slightly from the City 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 of this district has been included in the Jefferson East district engineering plan, as this district does not have an overflow discharge point directly to the river.

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 of the CSO Master Plan. 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 1-6. 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 1-6: 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	2019 Total Operations and Maintenance Cost (Over 35-year period) [a]
Subtotal	**$0**	**$0**	**$0**	**$0**
Opportunities	N/A	$0	$0	$0
District Total	**$0**	**$0**	**$0**	**$0**

[a] No work is proposed in the Jefferson West district and therefore zero costs have been included for the Master Plan capital cost and O&M costs.

The estimates include updated construction costs based on level of completion of work to date. The calculations for the CSO Master Plan cost estimate include 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. As there are no capital costs allocated to this district as the work to align with the CSO Master Plan is complete, there has also been no capital costs in this district allocated to GI or RTC opportunities.
- The Preliminary Proposal capital cost is in 2014-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 1-7.

Table 1-7. Cost Estimate Tracking Table

Changed Item	Change	Reason	Comments
Opportunities	A fixed allowance of 10 percent has been included for program opportunities	Preliminary Proposal estimate did not include a cost for GI opportunities	No costs allocated opportunities as capital costs for district removed.
Lifecycle Costs	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 1-8 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 Jefferson West 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 to meet future performance targets.

Table 1-8. Upgrade to 98 Percent Capture in a Representative Year Summary

Upgrade Option	Viable Migration Options
98 Percent Capture in a Representative Year	• Opportunistic Separation • Increased use of GI

The control options selected for the Jefferson West district were aligned for the system wide target of 85 percent capture and covered the downstream district of Jefferson East. The migration of the control options to meet the 98 percent capture target will be in conjunction with the requirements of Jefferson East and on a system wide basis. The existing SRS systems that extent into this district may be able to

be utilized for opportunistic future sewer separation. A further investigation into the performance of these SRS pipes would be needed prior to increasing the runoff flows to these systems.

The district performance and cost for upgrading to 98 percent capture will depend 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 approach to moving the program to an increased level of performance to meet regulatory requirements will be presented in detail in the CSO Master Plan update due on or before April 30, 2030.

1.11 Risks and Opportunities

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

The CSO Master Plan has considered risks and opportunities on a program and project delivery level, as described in Section 5 of Part 2 of the CSO Master Plan. A Risk And Opportunity Control Option Matrix covering the district control options has been developed and is included as part of Appendix D in Part 3B. The identification of the most significant risks and opportunities relevant to this district are provided in Table 1-9.

A specific acceptable risk for the Jefferson West district is associated with no proposed work measures being required for this district. As a result, no costs for GI opportunities have been allocated, since this cost is a percentage of future capital costs. However, this does not restrict any GI or RTC opportunities from occurring in this district, as in this situation the 10% allowance attributed to other districts will be utilized.

Table 1-9. Control Option 1 Significant Risks and Opportunities

Risk Number	Risk Component	Latent Storage / Flap Gate Control	In-line Storage / Control Gate [a]	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	-	-	-	-	-	-
9	Approvals and Permits	-	-	-	-	-	R	-	-
10	Land Acquisition	-	-	-	-	-	R	-	-
11	Technology Assumptions	-	-	-	-	-	O	O	-
12	Operations and Maintenance	-	R	-	-	-	R	O	-

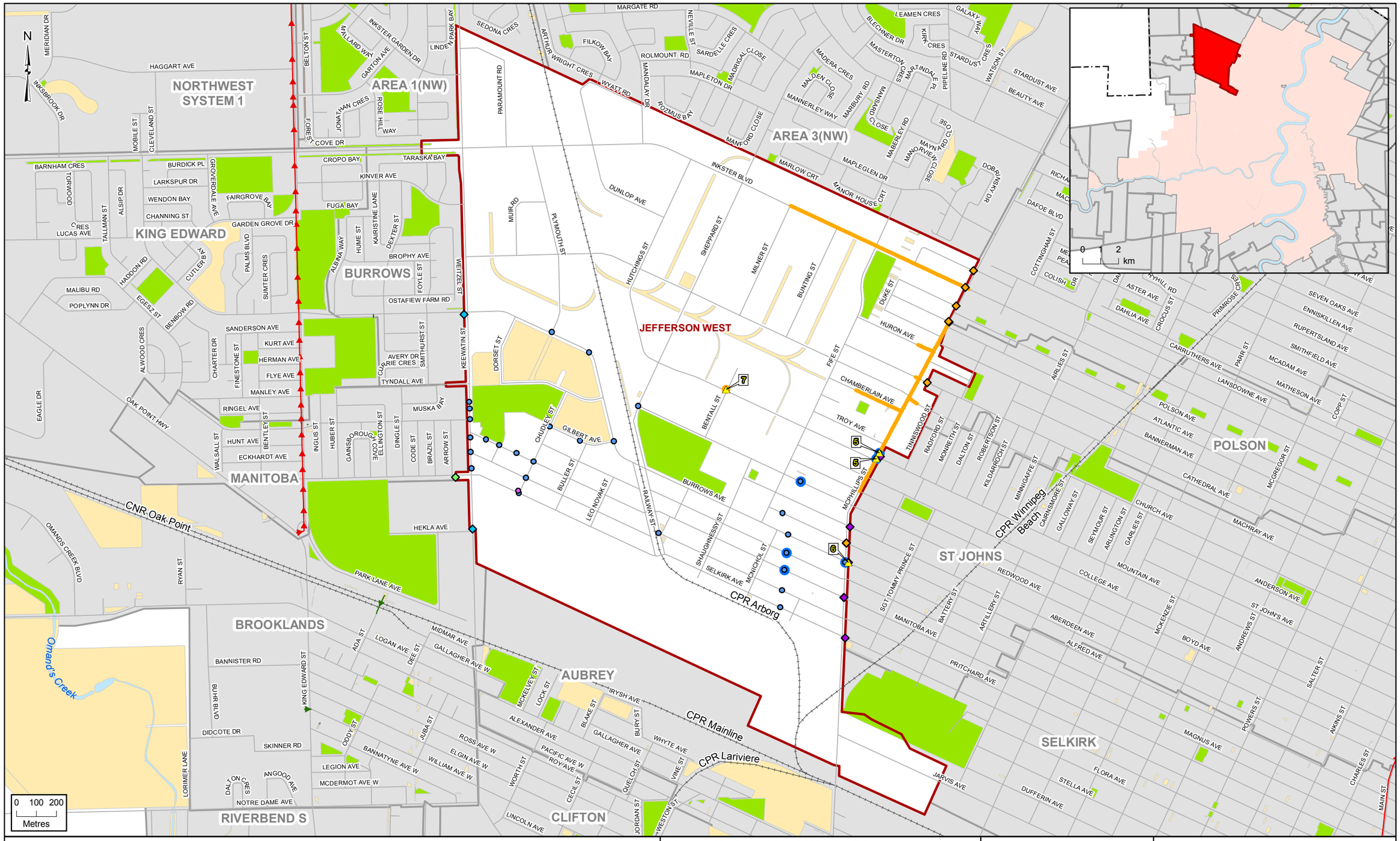
Table 1-9. Control Option 1 Significant Risks and Opportunities

Risk Number	Risk Component	Latent Storage / Flap Gate Control	In-line Storage / Control Gate [a]	Off-line Storage Tank	Off-line Storage Tunnel	Sewer Separation	Green Infrastructure	Real Time Control	Floatable Management
13	Volume Capture Performance	-	O	-	-	-	O	O	-
14	Treatment	-	R	-	-	-	O	O	-

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

1.12 References

AECOM Canada Ltd. 2009. *Jefferson Combined Sewer Districts Sewer Relief and CSO Abatement Study.* Prepared for the City of Winnipeg, Waterworks, Waster and Disposal Department. March.



LEGEND

- Critical Elevation
- Low CS Manhole
- Low SRS Connection
- Inter-System Connection: SRS - CS, SRS - LDS
- District Boundary Crossing: CS, LDS, SRS, WWS
- Interceptor Sewer
- Force Main
- Street
- Railway
- District Boundary
- Watercourse
- Greenspace
- City Owned Land

CSO MASTER PLAN PROPOSED SOLUTIONS

- 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 20
District Overview Map
Sewer District: Jefferson West
City of Winnipeg
Combined Sewer Overflow Master Plan

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