JACOBS

# CSO Master Plan

## La Verendrye District Plan

August 2019

City of Winnipeg

# CSO Master Plan

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| | | | | | |

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# 1. La Verendrye District

## 1.1 District Description

La Verendrye district is located near the centre of the combined sewer (CS) area in the northern section of St. Boniface community. La Verendrye is bounded by Mission district to the east, Dumoulin district to the south, and the Red River to the north and west. Notre Dame Street forms the southern boundary, and the Seine River runs along the eastern boundary.

The Canadian National Railway (CNR) Mainline and CNR Sprague railway pass through the district. The CNR Mainline passes east-west and crosses the Red River to the west. The CNR Sprague railway splits from the CNR Mainline and travels south parallel with Thibault Street into Dumoulin district.

The land use in La Verendrye district is a split between residential and parks and recreation with some commercial businesses interspersed throughout the district. The residential area is located on the western and southern areas of the district and consists of mainly single-family homes with some two-family residences. Most of the district consists of greenspace located along the edge of the Red River. Approximately 40 ha of the district is classified as greenspace. Lagimodiere-Gaboury Park and Whittier Park can be found in La Verendrye district and are divided by the CNR Mainline.

## 1.2 Development

There is limited land area available for new development within La Verendrye district due to its location and residential land use. As such, no significant developments that would impact the Combined Sewer Overflow (CSO) Master Plan are expected.

## 1.3 Existing Sewer System

La Verendrye district encompasses an area of 81 ha[1] based on the GIS district boundary information and includes combined sewer (CS), wastewater sewer (WWS) and land drainage sewer (LDS) systems. As shown in Figure 22, there is approximately 84 percent (34 ha) of the district already separated and no separation-ready areas.

The La Verendrye sewer system includes the primary diversion weir, CS primary outfall, a flood pump station (FPS), FPS outfall, and a CS outfall gate chamber located adjacent to the Red River at Tache Avenue and La Verendrye Street. A flap and sluice gate are in place on the CS outfall to prevent river water from flowing into the CS under high river level conditions. There is a WWS lift station (LS) located on St. Jean Baptist Street and Thibault Street (referred to as the Thibault WWS LS) which serves a small portion of the district north of Aubert Street. Sewage flows collected in La Verendrye district converge to a single 450 mm CS trunk sewer flowing south on Tache Avenue and draining towards the outfall.

During dry weather flow (DWF), the primary diversion weir diverts flow south by gravity through a 300 mm CS off-take pipe along Taché Avenue and into the Dumoulin district. The Dumoulin primary weir then diverts the intercepted flow from the La Varendrye district in addition to the CS from the Dumoulin district to the lift section of the Dumoulin lift and flood pumping station (LFPS). The Dumoulin LFPS pumps across the Red River into the Bannatyne district and on to the North End Sewage Treatment Plant (NEWPCC).

During wet weather flow (WWF) events, a parallel 450 mm overflow pipe immediately upstream of the diversion weir diverts some of the additional WWF southbound along Tache Avenue by gravity, also entering into the Dumoulin district and being intercepted by the Dumoulin primary weir. Any flow that

[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.

exceeds the diversion capacity overtops the primary weir and is discharged to the Red River via the CS outfall. When the river levels are high gravity flow is not possible in the CS outfall due to the flap gate in place, as mentioned above. Under these conditions the FPS pumps are activated, and redirect the flow which has spilt over the primary weir through the FPS outfall, at which point it can discharge by gravity into the river. The FPS outfall contains no flap or sluice gate.

An LDS system is installed throughout the majority of the district. Figure 22 shows a small section located in the northwest that remains unseparated along Herbert, Darveau, Messager Streets and Tache Avenue. Three independent LDS systems with dedicated LDS outfalls collect the surface runoff and discharge to the rivers adjacent to the district. In the southwestern portion of the district runoff flows to a 1200 mm LDS outfall located adjacent to the CS outfall at La Verendrye Street and discharges to the Red River. The eastern portion of the district flows to a 1200 mm outfall on Notre Dame Street and into the Seine River. The northwestern portion of the district with LDS installed flows through a 750 mm outfall located off Messager Street and into the Red River. Each LDS outfall includes a sluice and flap gate to prevent river water from backing up into the system under high river level conditions.

The outfalls to the Red River (one CS and one FPS) are listed as follows:

- ID15 (S-MA70017688) – La Verendrye CS Outfall
- ID86 (S-MA70017667) – La Verendrye FPS Outfall

### 1.3.1 District-to-District Interconnections

There are four district-to-district interconnections between La Verendrye and Dumoulin districts. Each interconnection is shown on Figure 22 and identifies locations where gravity and pumped flow can cross from one district to another. Each interconnection is listed as follows:

#### 1.3.1.1 Interceptor Connections

No interceptor connections are found in this district.

#### 1.3.1.2 District Interconnections

**Dumoulin**

<u>CS to CS</u>

- A 300 mm CS pipe carries the intercepted CS diverted by the primary weir from the La Verendrye district, and flows by gravity southbound on Tache Avenue and connects to the CS system in the Dumoulin district.
    - Tache Avenue and Dumoulin Street invert – 222.53 m (S-MH50008804)
- A 450 mm CS high overflow pipe diverts CS from the La Varendrye trunk sewer upstream of the primary weir, and flows by gravity southbound on Tache Avenue and connects to the CS system in the Dumoulin district.
    - Tache Avenue and Dumoulin Street invert – 225.49 m (S-MH50004016)

<u>WWS to CS</u>

- A 600 mm WWS overflow pipe from La Verendrye flows by gravity southbound on Langevin Street and connects into the CS system in Dumoulin district.
    - Langevin Street and Notre Dame Street overflow pipe invert – 227.09 m (S-MH-50003880)

<u>LDS to LDS</u>

- A 600 mm LDS pipe from Dumoulin district flows by gravity northbound into La Verendrye district at the intersection of Thibault Street and Notre Dame Street and is discharged into the outfall at the Seine River and does not interact with the CS system.
  - Thibault Street and Notre Dame Street invert – 226.62 m (S-MH50009369)

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 system.

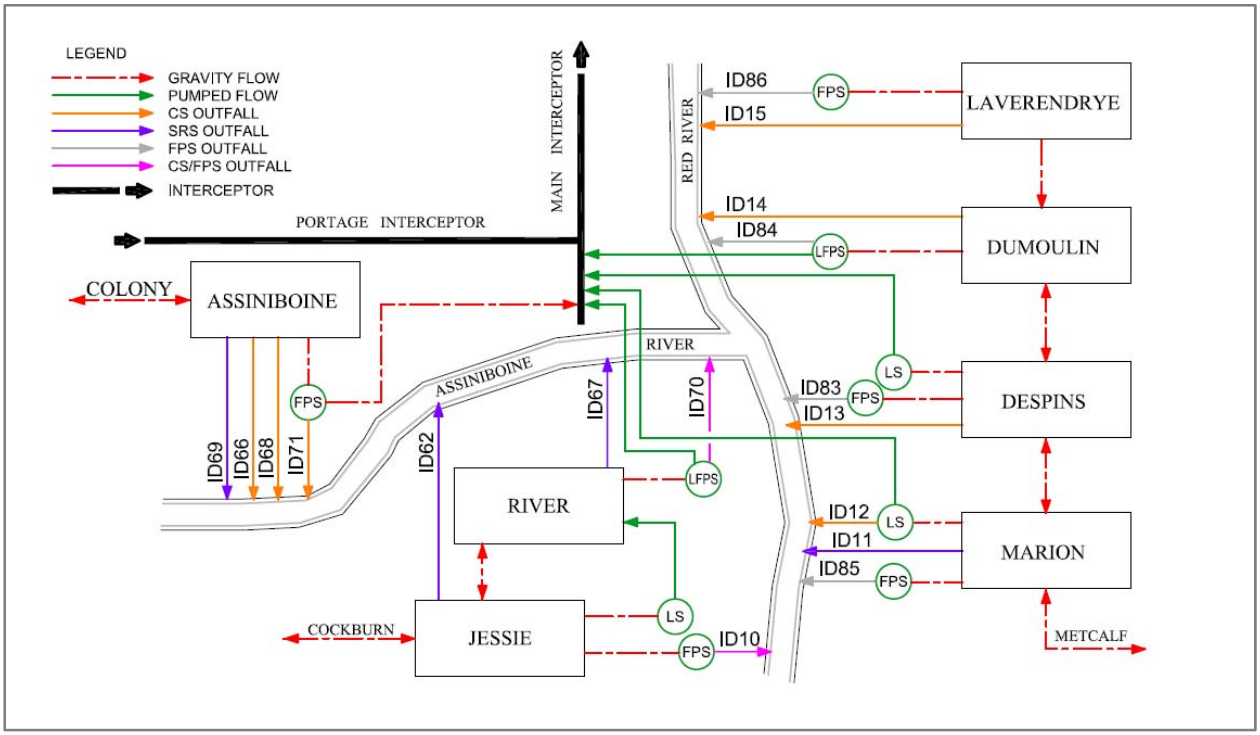



**Figure 1-1. District Interconnection Schematic**

### 1.3.2 Asset Information

The main sewer system features for the district are shown on Figure 22 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 (ID15) | S-AC70008179.1 | S-MA70017688 | 600 mm | Red River<br>Invert: 221.40 m |
| Flood Pumping Outfall (ID86) | S-CO70017960.1 | S-MA70017667 | 600 mm | Red River<br>Invert: 225.65 m |
| Other Overflows | N/A | N/A | N/A | |
| Main Trunk | S-MH50003874.1 | S-MA70028293 | 450 mm | Invert: 223.19 m |
| SRS Outfalls | N/A | N/A | N/A | No SRS within the district. |
| SRS Interconnections | N/A | N/A | N/A | No SRS within the district. |
| Main Trunk Flap Gate | S-AC70008178.1 | S-CG00000827 | 750 mm | Invert: 223.00 m |
| Main Trunk Sluice Gate | S-CG00000828.1 | S-CG00000828 | 750 x 750 mm | Invert: 223.00 m |
| Off-Take | S-MH70010257.1 | S-MA50004821 | 300 mm | Circular<br>Invert: 223.08 m<br>CS that takes sewage to |

| | | | | |
|---|---|---|---|---|
| | | | | Dumoulin LS |
| Dry Well | N/A | N/A | N/A | |
| Lift Station Total Capacity | N/A | S-MA50004821 (1) | 300 mm (1) | 0.043 m3/s (1)<br>This is based on the Thibault WWS LS |
| Lift Station ADWF | N/A | N/A | 0.012 $m^3/s$ | This is based on the Thibault WWS LS |
| Lift Station Force Main | N/A | N/A | N/A | |
| Flood Pump Station Total Capacity | N/A | N/A | 0.24 $m^3/s$ | 1 x 0.24 $m^3/s$ |
| Pass Forward Flow – First Overflow | N/A | N/A | 0.017 $m^3/s$ | |

Notes:

(1) – Gravity Pipe replacing Lift Station as La Vernedrye 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 (m)[a] |
|---|---|---|
| 1 | Normal Summer River Level | La Verendrye – 223.73 |
| 2 | Trunk Invert at Off-Take | 223.08 |
| 3 | Top of Weir | 224.00 |
| 4 | Relief Outfall Invert at Flap Gate | N/A |
| 5 | Low Relief Interconnection | N/A |
| 6 | Sewer District Low Interconnection (Dumoulin) | 222.53 |
| 7 | Low Basement | 227.38 |
| 8 | Flood Protection Level [District(s) Included] | 229.72 |

[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 La Verendrye district was the Dumoulin and La Verendrye Districts Combined Sewer Relief Study (Wardrop, 2006). This study provided for relief works of the existing CS systems to alleviate basement flooding. The CS district relief was completed at the same time for both Dumoulin and La Verendrye districts from 2002 to 2004. No other sewer work has been completed 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 La Verendrye 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 | Planned Completion |
|---|---|---|---|---|---|
| 22 – La Verendrye | 2006 - Conceptual | Future Work Following Complete Separation | 2013 | Study Complete | N/A |

Source: Report on Dumoulin and La Verendrye Districts Combined Sewer Relief Study, 2006

## 1.5 Ongoing Investment Work

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

## 1.6 Control Option 1 Projects

### 1.6.1 Project Selection

The La Verendrye district has complete sewer separation and tunnel storage proposed to meet CSO Control Option 1. Table 1-4 provides an overview of the control options to be included in the 85 percent capture in a representative year option. 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

For the assessment, this district was assessed in conjunction with the downstream Dumoulin district.

The existing CS system was originally reviewed for in-line storage and found to already be in place. The existing weir level is already close to full-pipe providing in-line storage capacity. The marginal evaluation indicated that complete sewer separation will be similar to the screening option in terms of initial capital costs. The capital cost of sewer separation was similar to that required for construction a screening chamber since the majority of the La Verendrye district has already been separated. The O&M costs are reduced for the sewer separation proposed option however in comparison to the construction of screening, which therefore resulted in sewer separation having a lower overall lifecycle cost.

The hydraulic capacity downstream in the Dumoulin district is limited which increases the occurrence of CS overflows within La Verendrye. Overflows can be alleviated in La Verendrye once the proposed

control options are implemented along with the Dumoulin future control options. The system wide assessment resulted in the Dumoulin control options being deferred to future conditions and this resulted in minor overflowing being predicted at the La Verendrye outfall in the interim until future work in the Dumoulin district is complete. It was found however that a static weir height raise would not be feasible to provide the necessary additional volume capture to eliminate overflows from the district. Tunnel Storage and flap gate installation on the main CS sewer to the downstream Dumoulin district was therefore proposed as an additional item for La Verendrye to eliminate the overflows from the district.

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

The sewer separation project for La Verendrye will provide immediate benefits to the CSO program when complete. Current LDS systems will be extended on Darveau Street and Herbert Street to collect road drainage. Collected stormwater runoff will be routed to the existing 750 mm LDS outfall discharging to the Red River at Messager Street. The approximate area of sewer separation is shown on Figure 22.

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

- Dry weather flows will remain the same for La Verendrye district (and Dumoulin district).
- La Verendrye weather flow (WWF) will consist of sanitary sewage combined with foundation drainage from the existing old housing stock. All new homes will be constructed with foundation drainage disconnected from the CS system.

The separation project would provide the full reduction of overflows for the 1992 representative year when assessed as an individual district. However, based on the capacity of the downstream Dumoulin district the hydraulic model stills predicts overflowing at this district after sewer separation control option is implemented.

In addition to reducing the CSO volume, the benefits of La Verendrye separation include a reduction of pumped flows entering both the immediate downstream Dumoulin district, as well as reducing the amount of flood pumping required at the La Verendrye FPS. After further measures are implemented to eliminate the overflows from the district the FPS will be no longer be required to operate. This will provide an additional benefit to the long term operating and maintenance costs.

It is proposed that future monitoring of the district is completed to verify that the sewer separation is fully compliant with the modelled simulated elimination of all CSO overflows. If the modelled wet weather response for the district is found to be overly conservative, and the actual wet weather response is sufficient to eliminate overflows from the district, then the tunnel storage and flap gate installation items will no longer be required.

### 1.6.3 Tunnel Storage

Tunnel storage is proposed as a control option for the La Verendrye district to alleviate the remaining overflows found to occur after complete separation is implemented. This control option will include the addition of a sewer storage tunnel to provide additional storage capacity. Tunnel storage requires connections from the existing system into the tunnel and will be able to empty via gravity.

The design criteria for tunnel storage are listed in Table 1-5.

**Table 1-5. Tunnel Storage Conceptual Design Criteria**

| Item | Elevation/Dimension | Comment |
|---|---|---|
| Number of Connections | 2 | |
| Diameter | 900 mm | |

| | | |
|---|---|---|
| Length | 200 m | |
| Storage Volume | 127 $m^3$ | |
| Nominal Dewatering Rate | 0.043 $m^3/s$ | Based on existing gravity pipe capacity |
| RTC Operational Rate | TBD | Future RTC/ dewatering assessment |

Notes:

RTC = real time control

The proposed location for the tunnel storage is shown in Figure 22. A tunnel 900 mm in diameter and approximately 200 m in length connecting at manhole S-MH50003792 along Tache Avenue at Grandin Street and La Verendrye Street and then discharges to manhole S-MH70010257. To ensure the isolation of the La Vernedrye district from the downstream Dumoulin district it was also proposed to install a flap gate within manhole S-MH50008804 as part of this work.

As mentioned above, following the complete separation of the district flow monitoring of the La Verendrye district will be completed. If the modelled wet weather response for the district is found to be overly conservative, and the actual wet weather response is sufficient to eliminate overflows from the district, then the tunnel storage and flap gate work recommended will no longer be required. As well the green infrastructure and real time control opportunities may be pursued in the La Verendrye district to sufficiently eliminate any overflows remaining after complete separation is implanted. This would also remove the requirement for the off-line tunnel/flap gate work.

The nominal rate for dewatering is determined by the performance of the existing pipe capacity as the tunnel is able to discharge back into the CS system by gravity. As such the flows will vary over the duration of a rainfall event but due to the small nature of the district and interaction with the downstream Dumoulin has not been nominated for a gravity flow control device, since it discharges via lift station pumps. Any future consideration, for RTC improvements, would be assessed in conjunction with the downstream Dumoulin district.

### 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 will be reviewed to identify applicable GI controls.

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

### 1.6.5 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

Systems 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.

Sewer separation will include the installation of additional sewers that will 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. There will also be a future reduction on FPS operational requirements, as the overflows in the district will be greatly reduced.

Tunnel storage includes the installation of a large diameter sewer and flap gate, as well as monitoring and control instrumentation to dewater the tunnel. System monitoring and level controls will be installed which will require regular scheduled maintenance. The tunnel will operate intermittently during wet weather events and may require operational review and maintenance after each event.

## 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 1-6.

**Table 1-6. InfoWorks CS District Model Data**

| Model Version | Total Area (ha) | Contributing Area (ha) | Population | % Impervious | Control Options Included in Model |
|---|---|---|---|---|---|
| 2013 Baseline | 38 | 38 | 843 | 38 | N/A |
| 2037 Master Plan – Control Option 1 | 38 | 8 | 843 | 3 | SEP, TS, FG |

Notes:

SEP - Sewer Separation

TS - Tunnel Storage

FG - Flap Gate

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 1-7 are for the hydraulic model simulations using the year-round 1992 representative year. This 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, Table 1-7 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 1-7. District Performance Summary – Control Option 1**

| Control Option | Preliminary Proposal | Master Plan | | | |
|---|---|---|---|---|---|
| | Annual Overflow Volume ($m^3$) | Annual Overflow Volume ($m^3$) | Overflow Reduction ($m^3$) | Number of Overflows | Pass Forward Flow at First Overflow |
| Baseline (2013) | 14,855 | 13,191 | - | 18 | 0.017 $m^3/s$ [b] |
| Sewer Separation | N/A [a] | 722 | 12,469 | 11 | 0.017 $m^3/s$ [b] |

| | | | | | |
|---|---|---|---|---|---|
| Separation & Tunnel Storage | | 0 | 722 | 0 | 0.025 $m^3/s$ [c] |
| **Control Option 1** | **14,997** | **0** | **0** | **0** | **0.025 m3/s** [c] |

[a] Separation and Tunnel Storage were not simulated during the Preliminary Proposal assessment.

[b] Pass forward flows assessed with the 1-year design rainfall event.

[c] Pass forward flows assessed with the 5-year design rainfall event.

The percent capture performance measure is not included in Table 1-7, 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 1-8. The cost estimates are a Class 5 planning level estimates with a level of accuracy of minus 50 percent to plus 100 percent.

**Table 1-8. District Cost Estimate – Control Option 1**

| Control Option | 2014 Preliminary Proposal Capital Cost | 2019 CSO Master Plan Capital Cost | 2019 Annual Operations and Maintenance Cost | 2019 Total Operations and Maintenance (Over 35-year period) |
|---|---|---|---|---|
| Screening | $ - [a] | N/A | N/A | N/A |
| Sewer Separation | N/A | $2,080,000 | $1,000 | $30,000 |
| Tunnel Storage | | $1,060,000 | $10,000 | $210,000 |
| **Subtotal** | **$0** | **$3,140,000** | **$11,000** | **$240,000** |
| Opportunities | N/A | $310,000 | $1,000 | $20,000 |
| **District Total** | **$0** | **$3,450,000** | **$12,000** | **$260,000** |

[a] Solution developed as refinement to Preliminary Proposal work following submission of Preliminary Proposal costs. Cost for this item of work found to be $550,000 in 2014 dollars.

[b] Sewer separation and tunnel storage not assessed in this district for the Preliminary Proposal

[c] Item does not include the cost for the flap gate installation

The estimates include changes to the control option selection since the Preliminary Proposal, updated construction costs, and the addition of GI opportunities. The impacts of extending the implementation schedule to 2045 are included in are included in the program development and program summary in Section 5 of Part 3A.

The calculation of the cost estimate for the CSO Master Plan 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 cost for RTC. This has been listed as part of the Opportunities costs.
- The Preliminary Proposal capital cost is in 2014 dollar values.

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

Cost estimates were prepared during the development of the Preliminary Proposal and updated for Phase 3 during the CSO Master plan development. The differences identified between the Preliminary Proposal and the CSO Master Plan are accounting for the progression from an initial estimate used to compare a series of control options, to an estimate focusing on a specific level of control for each district. Any significant differences between the Preliminary Proposal and CSO Master Plan estimates are identified in Table 1-9.

**Table 1-9. Cost Estimate Tracking Table**

| Changed Item | Change | Reason | Comments |
|---|---|---|---|
| Control Options | Tunnel Storage | Tunnel Storage was not included in the Preliminary Proposal estimate | Added for the MP to further reduce overflows |
| | Sewer Separation | Sewer Separation was not included in the preliminary estimate | The Master plan identified sewer separation as the most cost effective control option over in-line storage. |
| | Removal of Screening | Screening was not included in the Master Plan. | With sewer separation and tunnel storage recommended all CSO events will be removed, and there will no longer be a requirement for screening. |
| 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 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 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 1-10 provides a description of how the regulatory target adjustment could be met by building off the proposed work identified for Control Option 1.

**Table 1-10. Upgrade to 98 Percent Capture in a Representative Year Summary**

| Upgrade Option | Viable Migration Options |
|---|---|
| 98 Percent Capture in a Representative Year | • Assessment of performance in conjunction with Dumoulin district |

For the La Verendrye district, the complete separation option will not change if the control limit is increased from 85 percent to 98 percent capture. The full implementation of the Control Options for the 85 percent capture target (including construction of tunnel storage and a flap gate on off-line tunnel storage) will be excessive and no longer required when the Dumoulin district control options are implemented for the future 98 percent capture target. Therefore this work should not be prioritized, and instead evaluated following the implementation of the Dumoulin work.

The cost for upgrading to 98 percent capture 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 part of Appendix D in Part 3B. The identification of the most significant risks and opportunities relevant to this district are provided in Table 1-11**Error! Reference source not found.**.

**Table 1-11. 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 | O | - | - | - |
| 2 | Existing Lift Station | - | - | - | - | - | - | R | - |
| 3 | Flood Pumping Station | - | - | - | O | O | - | - | - |
| 4 | Construction Disruption | - | - | - | - | R | - | - | - |
| 5 | Implementation Schedule | - | - | - | - | R | - | R | - |
| 6 | Sewer Condition | - | - | - | - | - | - | - | - |
| 7 | Sewer Conflicts | - | - | - | R | R | - | - | - |
| 8 | Program Cost | - | - | - | O | R | - | - | - |
| 9 | Approvals and Permits | - | - | - | - | - | R | - | - |

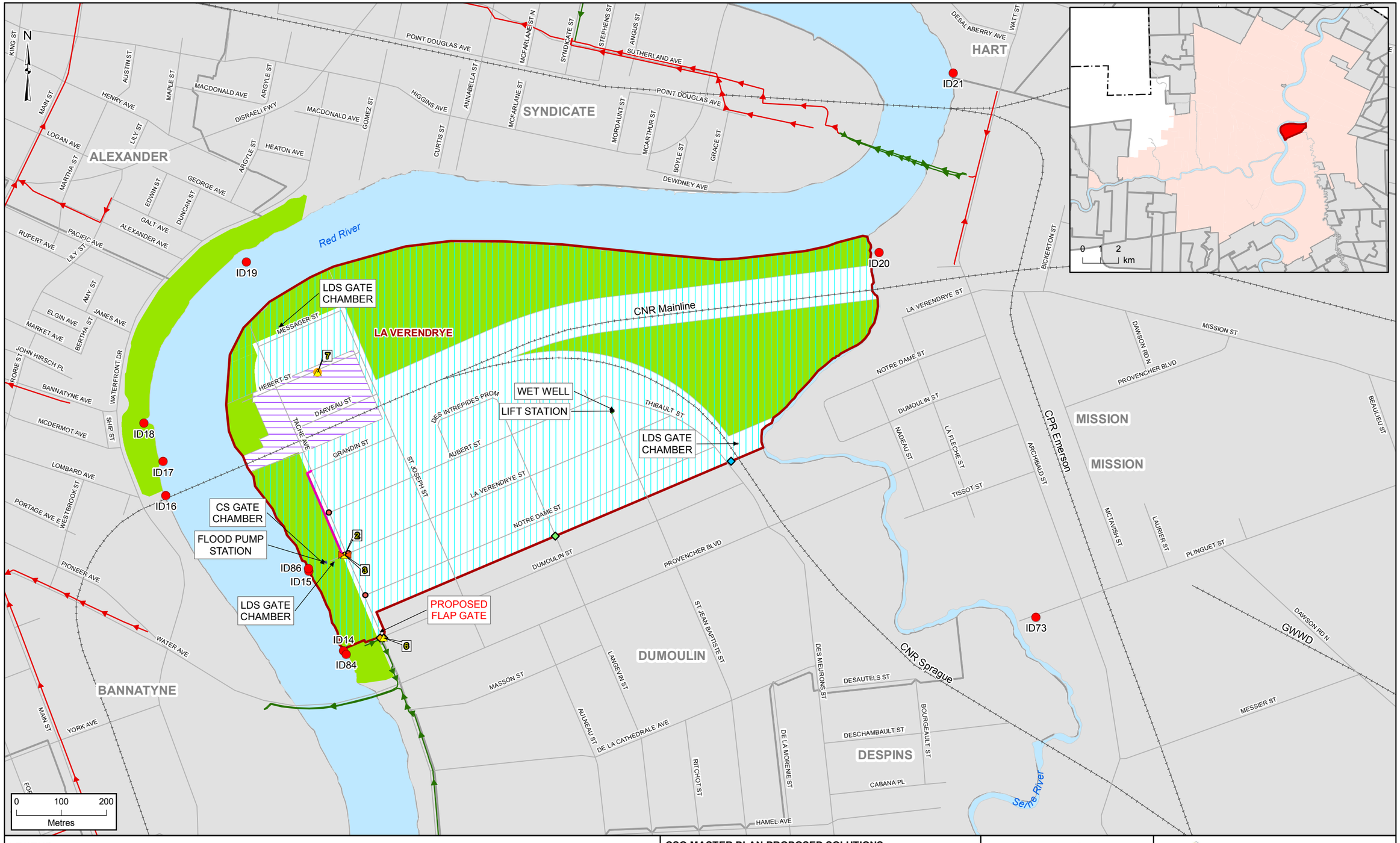
**Table 1-11. Control Option 1 Significant Risks and Opportunities**

| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 10 | Land Acquisition | - | - | - | O | - | R | - | - |
| 11 | Technology Assumptions | - | - | - | O | O | O | O | - |
| 12 | Operations and Maintenance | - | - | - | R | R / O | R | O | - |
| 13 | Volume Capture Performance | - | - | - | O | - | O | O | - |
| 14 | Treatment | - | - | - | R | O | O | O | - |

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

## 1.12 References

Wardrop Engineering Consultants. 2006. *Dumoulin and La Verendrye Districts Combined Sewer Relief Study*. Report to the City of Winnipeg. December.




**LEGEND**

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

**CSO MASTER PLAN PROPOSED SOLUTIONS**

- Tunnel Storage
- Sewer Separation - Planning
- Sewer Separation - Complete

ALL PROPOSED SOLUTIONS SHOWN IN RED TEXT

JACOBS

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

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**FIGURE 22**
**District Overview Map**
**Sewer District: La Verendrye**
City of Winnipeg
*Combined Sewer Overflow Master Plan*

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**LEGEND**

- Primary Weir
- Critical Elevation
- CSO Outfall
- Manhole
- Flap Gate
- Sluice Gate
- Pump Location
- Sewer By Type: CS, LDS, WWS
- Control Structure Type: Gate Chamber
- Pump Station Type: Flood Pump Station

**CSO MASTER PLAN PROPOSED SOLUTIONS**

- Tunnel Storage

ALL PROPOSED SOLUTIONS SHOWN IN RED TEXT

JACOBS

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

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**FIGURE 22-01**
**Tunnel Storage**
**Sewer District: La Verendrye**
City of Winnipeg
*Combined Sewer Overflow Master Plan*

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