



**FUNCTIONAL SERVICING STUDY  
LEBRETON FLATS PLAN OF SUBDIVISION**

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Prepared for:  
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**Functional Servicing Study LeBreton Flats Plan of Subdivision**

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## Functional Servicing Study LeBreton Flats Plan of Subdivision

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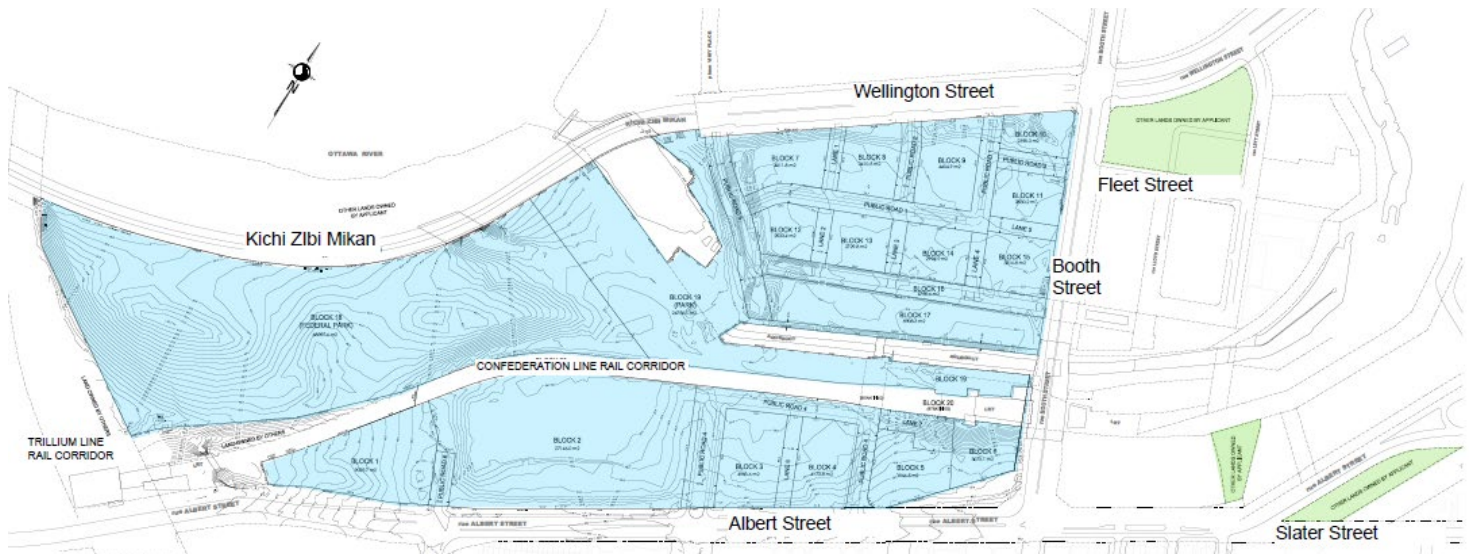
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## 1 Introduction

Stantec Consulting Ltd. has been retained by the National Capital Commission (NCC) to prepare a Functional Servicing Study for the LeBreton Flats Plan of Subdivision in support of a Draft Plan of Subdivision application. The subdivision lands are currently zoned Parks and Open Space (O1), General Mixed-Use Zone (GM7), and Residential Fifth Density Zone (R5), and is bordered by Wellington Street and the Kichi Zibi Mikan Parkway to the north, the O-Train Trillium Line rail corridor and Trillium Pathway to the west, Albert Street to the south, and Booth Street to the east. The subdivision lands are shown in blue in **Figure 1.1** below. Other lands owned by the NCC subject to the LeBreton Flats Master Concept Plan are identified in green. These lands fall outside of the plan of subdivision and development of the parcels will be approved in the future through Site Plan Control.



**Figure 1.1: LeBreton Flats Subdivision Lands**

The 21.5 ha subdivision development comprises of a total of 19 blocks, with public roadways and private lanes. The subdivision will include a block for an NCC park, a block for a municipal park and a block over the covered aqueduct to be conveyed to the City of Ottawa. The Confederation Line rail corridor and the open aqueduct bisect the subdivision lands. The draft plan of subdivision has been prepared by Stantec Geomatics Ltd. dated March 12, 2024, and density tables are included **Appendix A.1**.

The intent of this report is to build on the servicing principals outlined in the earlier master servicing studies to develop a servicing strategy specific to the subject site. The report will establish criteria for future detailed design of the subdivision in accordance with the associated background studies, City of Ottawa Design Guidelines, and all other relevant regulations.



## **1.1 Master Plan Context**

In 1962, pursuing the modernist vision set out in the 1950 Gréber Plan, the federal government expropriated lands and cleared much of LeBreton Flats. The plan was to use the site as a federal office campus, but it was never fully realized. In subsequent years, efforts were undertaken to determine a suitable future for this important site.

In 1989, the NCC, the former Regional Municipality of Ottawa-Carleton (RMOC), and the City of Ottawa launched a joint planning process. The issues that were addressed and recommendations that were endorsed by all three parties included:

- the Transitway alignment;
- the condition of the heritage aqueduct and related bridge crossings;
- the reinforcement of the street grid;
- environmental assessment processes; and
- the sanitary sewer servicing capacity.

This process led to a land agreement that consolidated land ownership under the NCC and created the 1997 LeBreton Flats Master Plan. It analyzed and developed policies for density, land uses, urban design, servicing, roads, and the environment. The master plan was approved by Official Plan amendment in 1997, adopted following the Ontario Municipal Board decision in 1999, and zoning was updated by the City of Ottawa in 2000. The 1997 Plan still forms much of the policy basis that applies to the site today.

In 2002, the NCC hired Dessau-Soprin to complete a Master Servicing Study for LeBreton Flats and the Master Servicing Plan (LeBreton Flats Infrastructure and Remediation Project: Master Servicing Report, 2004) was submitted and approved under the Municipal Class EA Process. The Site Development Plan from the 2004 Master Servicing Report is included in **Figure 1.2** below.

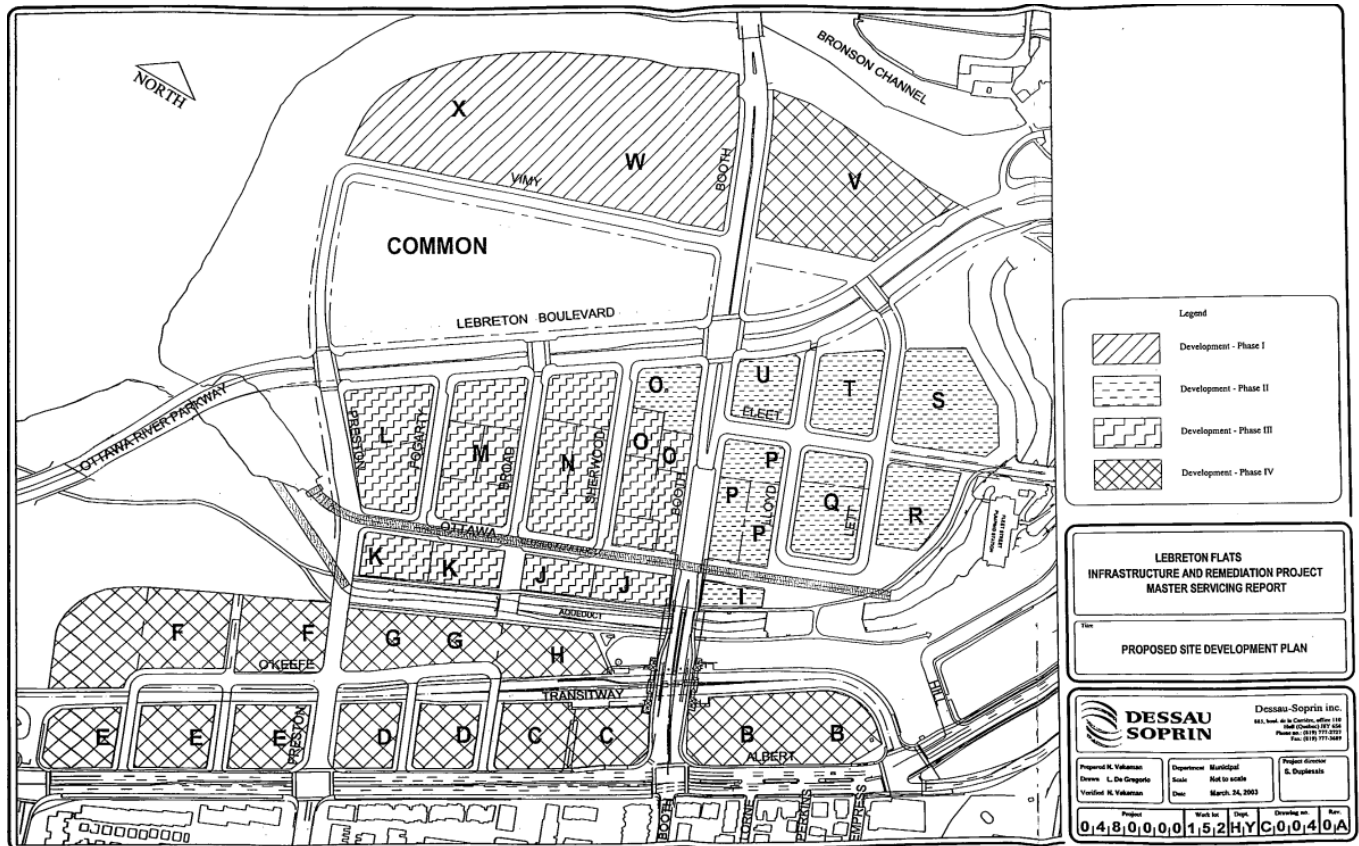
Based on that 2004 Master Servicing Study, in 2005 the NCC and the City entered into a servicing agreement to construct a new sanitary pumping station at LeBreton Flats. Pursuant to the agreement, the NCC undertook the environmental assessment in accordance with the Canadian Environmental Assessment Act and financed the design and construction of the facility, while the City obtained the provincial requirements. In 2008, the NCC built the LeBreton Flats Sanitary Pumping Station to accommodate the anticipated servicing requirements for the full build-out of LeBreton Flats. The NCC then transferred ownership of the pumping station to the City for operation and maintenance.





# Functional Servicing Study LeBreton Flats Plan of Subdivision

## 1 Introduction



**Figure 1.1.2: Proposed Site Development Plan (Appendix D, LeBreton Flats Infrastructure and Remediation Project: Master Servicing Report, Dessau-Soprin, 2004)**

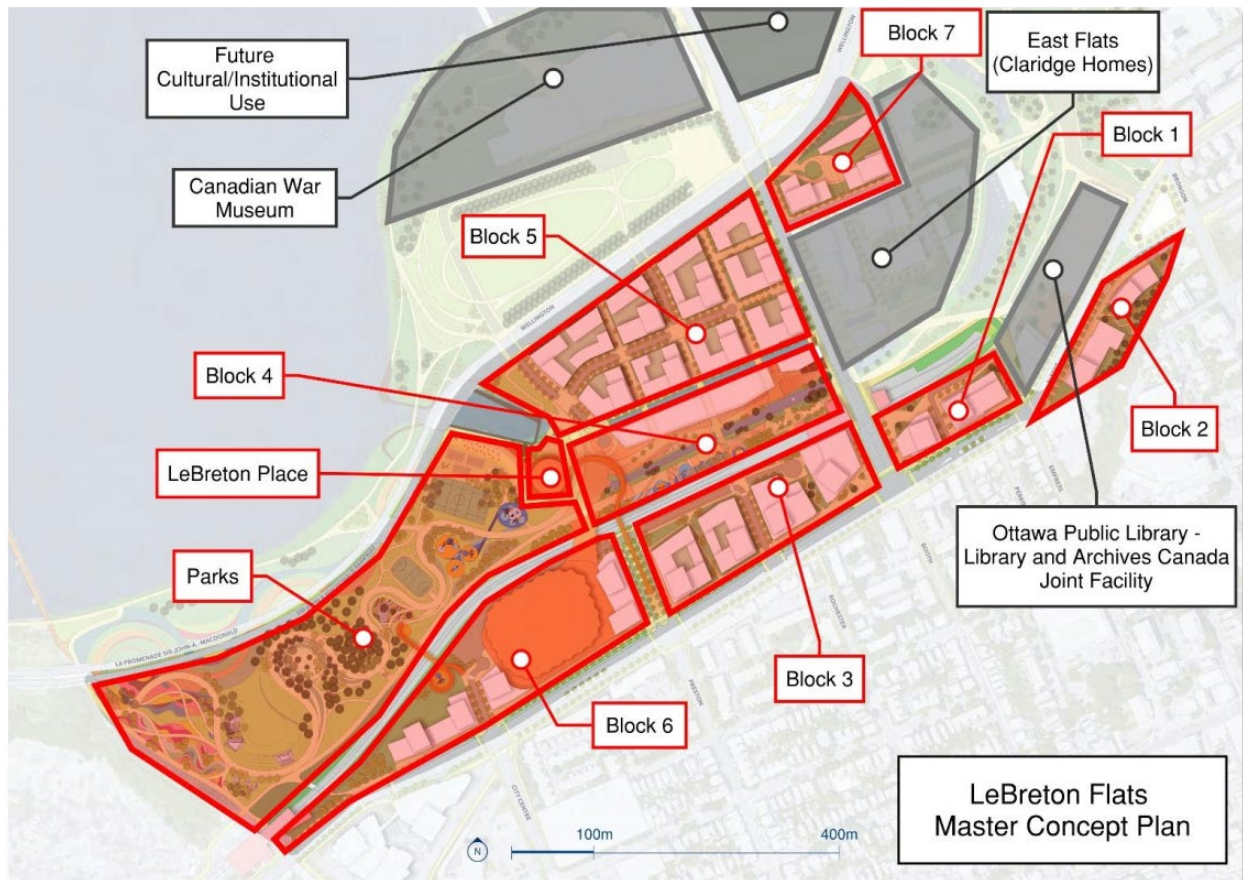
In 2014, motivated to enhance the attractiveness of the Capital and bring civic life back to LeBreton Flats, the NCC launched a competitive process seeking a development proposal for the entire site. With the cancellation of that process in 2019, the NCC chose to lead a new approach that would establish a comprehensive vision for LeBreton Flats, re-establishing the area as a Capital destination and a vibrant community. That new vision finds its expression in the 2021 LeBreton Flats Master Concept Plan (MCP), which serves as the guiding document for the draft plan of subdivision.

Supporting development of the LeBreton Flats MCP, the Master Servicing Report: Renewed Master Concept Plan & Development Strategy by CIMA+ was completed in 2021. The report is based on the 2004 Dessau-Soprin report and incorporates minor updates to reflect updated site conditions and the updated vision and plan for LeBreton Flats. While the CIMA+ report was not formally approved by the City of Ottawa, City staff reviewed the report and contributed to its development in support of the Master Concept planning process. See figure below of the block layout used in the master servicing report (CIMA+, 2021).



# Functional Servicing Study LeBreton Flats Plan of Subdivision

## 1 Introduction



**Figure 1.3: Master Servicing Plan Block Layout of LeBreton Flats Master Concept Plan (Master Servicing Report: Renewed Master Concept Plan & Development Strategy, CIMA+, 2021)**

As required under the West Downtown Core Secondary Plan, the master servicing study is to be updated for the LeBreton Flats MCP area prior to development as outlined by Policy 7 under Section 10.2 from the Pimisi and LeBreton Flats District chapter:

*The City shall require an updated master servicing study for the district, prior to development of lands within the LeBreton Flats Master Concept Plan area, west of Booth Street.*

The intent of this report is to fulfill this policy condition by preparing a Functional Servicing Study for the subdivision lands west of Booth Street, maintaining the overall intent of the 2004 Dessau-Soprin report while building on the servicing principles outlined in the LeBreton Flats Master Servicing Report (CIMA+, 2021) to develop a servicing strategy specific to the subject site to support the draft plan of subdivision.

This report demonstrates that the municipal servicing can support the proposed development, establishes the functional design for future detailed design of the subdivision and the design criteria for the detailed design of the subdivision development blocks subject to future Site Plan Control approval.



# Functional Servicing Study LeBreton Flats Plan of Subdivision

## 1 Introduction

The overall development plan for LeBreton Flats has evolved from the 1997 LeBreton Flats Master Plan to reflect the current vision and address the impacts of the Confederation Line. The West Downtown Core Secondary Plan was developed based on the current MCP for LeBreton Flats and this update to the Master Servicing Study addresses the land uses, road network, and densities established in the master plans while meeting current design criteria.



## 2 References

The following documents were referenced in the preparation of this report:

- *City of Ottawa Sewer Design Guidelines*, City of Ottawa, October 2012 (and all subsequent technical bulletins).
- *City of Ottawa Design Guidelines – Water Distribution*, Infrastructure Services Department, City of Ottawa, First Edition, July 2010 (and all subsequent technical bulletins).
- *LeBreton Flats Master Concept Plan, NCC, 2021**LeBreton Flats Infrastructure and Remediation Project, Master Servicing Report*, Dessau Soprin, February 2004
- *LeBreton Flats Redevelopment Infrastructure Needs Study*, Ainley Group, January 2002
- *LeBreton Flats Master Servicing Report Amendment (Draft)*, Parsons, June 2019
- *Building LeBreton Master Servicing Report – Renewed Master Concept Plan & Development Strategy*, CIMA+, March 2021
- *Geotechnical Desktop Review: The LeBreton Flats Plan of Subdivision*, Stantec Consulting Ltd., May 7, 2024.
- *Draft Phase One Environmental Site Assessment, LeBreton Flats*, Stantec Consulting Ltd., February 2024.
- *LeBreton Flats Hydrogeological Memo*, Stantec Consulting Ltd., July 4, 2024.
- *LeBreton Flats Master Concept Plan*, National Capital Commission, 2021
- *Cave Creek Collector Realignment (Preliminary Design Drawings)*, Robinson Consultants, January 23, 2024.
- *Albert/Queen/Slater Renewal (Construction Drawings)*, Parsons, June 20, 2022.
- *Albert Street Reconstruction (Drawings)*, Robinson Consultants, August 28, 2014.
- *Low Pressure Transmission Main Replacement Program – Lemieux Island WPP to Fleet Street (As-built Drawing)*, Stantec Consulting Ltd., March 2007.
- *Confederation Line Guideway Design – Segment 1 (As-built Drawings)*, RTGE Joint Venture / MMM Group, July 22, 2019.
- *The Canada Central Railway Bridge – General Arrangement (Record Drawing)*, Stantec Consulting Ltd. / Morrison Hershfield, November 12, 2001.



## 3 Water Servicing

### 3.1 Background

The proposed development is located within Pressure Zone 1W of the City of Ottawa's water distribution system. The development will be serviced with proposed connections to existing watermains along the boundaries of the development. These include the 406 mm diameter PVC watermains in Albert Street and Booth Street, and the 305 mm diameter PVC watermain in Wellington Street. A 1676 mm concrete backbone watermain is located within the open aqueduct and a 1220 mm diameter backbone watermain is located within Albert Street. These are critical components of the City of Ottawa water infrastructure that are not to be impacted as part of the subdivision development.

### 3.2 Functional Water Servicing Design

#### 3.2.1 WATER DISTRIBUTION LAYOUT

The functional layout of the municipal water distribution system ensures the servicing of all development blocks based on the NCC Master Concept Plan, planned densities and applicable design criteria. The functional layout of the water distribution system is shown on **Drawing WTR-1**.

Watermains within the new public roads will be fed through connections to the existing watermains Albert Street, Booth Street and Wellington Street. Watermain stubs were installed with the construction of the 305 mm watermain in Wellington Street and the 406 mm watermain in Albert Street in anticipation of future connections for the servicing of the LeBreton Flats Subdivision. It is assumed that these stubs will be used as connection points for the municipal servicing where possible and will be confirmed through the detailed design phase.

The water distribution layout ensures that development blocks can be designed with redundant supply through secondary connections to the proposed distribution system. Block 6 can be provided with redundancy with a service connection to the 406 mm Albert Street watermain. The detailed design of each block will form part of future site plan development applications. The NCC park does not have frontage on a public watermain, as such, a private water service will be required to cross the Block 19 park to service the NCC park. Size and alignment of the services will be established as part of the future detailed design of the parks.

The watermains have been sized to meet City of Ottawa design criteria for pressure and flow for both domestic and fire flow demands.

#### 3.2.2 DOMESTIC WATER DEMANDS

Preliminary water demands were estimated based on the assumed development densities and gross parcel areas established by the NCC in accordance with the West Downtown Core Secondary Plan. The density table is included in **Appendix A.1**.



## Functional Servicing Study LeBreton Flats Plan of Subdivision

### 3 Water Servicing

The City of Ottawa's Water Distribution Guidelines (July 2010), ISD-2010-02 and ISTB 2021-03 Technical Bulletins were used to determine water demands based on projected population densities for residential areas and peaking factors. The population was estimated using an occupancy of 1.8 persons per apartment unit and 2.7 persons per townhome.

A daily rate of 280 L/cap/day has been used to estimate average daily (AVDY) potable water demand for residential areas, 28000 L/gross floor ha/day for commercial areas, 225 L/bedspace/day for hotels. A density of 185.3 persons/ha was assumed for the park blocks with a water demand of 20 L/persons/day based on the picnic and flush toilet demands from the City of Ottawa Sewer Design Guidelines.

Maximum day (MXDY) demands were determined by multiplying the AVDY demands by a factor of 2.5 for residential areas and 1.5 for commercial areas, hotels, and parks. Peak hourly (PKHR) demands were determined by multiplying the MXDY by a factor of 2.2 for residential areas and 1.8 for commercial areas, hotels, and parks. The estimated demands are shown in **Table 3.1** below and detailed in **Appendix B.1**.

**Table 3.1: Water Demands**

Demand Type	Area (ha)	Total Units	Population	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
Residential	-	4448	8276	26.8	67.0	147.5
Commercial	6.7	-	-	2.3	3.5	6.3
Hotel	-	305	-	1.6	2.4	4.3
Parks	9.3	-	-	0.5	0.8	1.4
<b>Total</b>	<b>16.5</b>	<b>4448</b>	<b>8276</b>	<b>30.3</b>	<b>72.3</b>	<b>156.9</b>

### 3.2.3 FIRE FLOW DEMANDS

At the draft plan level, no details pertaining to the building footprints for each block are available. Therefore, a fire flow demand of 200 L/s (12,000 L/min) was assumed based on the Simple Method for a typical family dwelling in a subdivision summarized in Table 8 of the 2020 FUS, in which the 200 L/s is the worst-case scenario. This conservative estimate, which is applied to all blocks, exceeds the fire flow demands of non-combustible and sprinklered buildings that are anticipated for the development. Further details of the fire flow demands will be provided once the building construction and floor area details are made available at the detailed design stage for each site plan block.

### 3.2.4 BOUNDARY CONDITIONS

The estimated domestic water and fire flow demands were used to define the supply required for the proposed development from the existing watermains. **Table 3.2** below summarizes the boundary conditions received from the City of Ottawa on June 24, 2024. A copy of the boundary condition correspondence and the accompanying schematic received from the City of Ottawa is included in **Appendix B.2**.



Table 3.2: Boundary Conditions

Street	Wellington			Booth	Albert			
Connection	1	2	3	4	5	6	7	8
Min. HGL (m)	107.4	107.4	107.4	107.5	107.6	107.6	107.6	107.6
Max. HGL (m)	115.2	115.2	115.2	115.2	115.1	115.0	115.0	114.9
MXDY + FF (200 L/s) (m)	105.0	106.5	107.1	108.4	110.1	109.9	110.0	110.0

### 3.3 Hydraulic Assessment

#### 3.3.1 LEVEL OF SERVICE

A preliminary watermain network was compiled and modeled on PCSWMM to verify adequacy of watermain pressures to service the subdivision, based on the provided boundary conditions from the City. Through the City of Ottawa Design Guidelines, the normal demand conditions (average day, maximum day and peak hour) should be in the range of 350 kPa to 480 kPa (50 psi to 70 psi) and no less than 275 kPa (40 psi) at the ground elevation on the streets (i.e., at hydrant level).

As per the Ontario Building Code (OBC) & Guide for Plumbing, if pressures greater than 550 kPa (80 psi) are anticipated, pressure relief measures are required. The maximum pressure at any point in the distribution system in unoccupied areas shall not exceed 689 kPa (100 psi). Under emergency fire flow conditions, the minimum pressure objective in the distribution system is 138 kPa (20 psi).

Hazen-Williams coefficients (“C-Factors”) are applied to the simulated watermains in accordance with the City of Ottawa’s Water Distribution Design Guidelines and as shown in **Table 3.3** below.

Table 3.3: Proposed Watermain C-Factors

Pipe Diameter (mm)	C-Factor
150	100
200 to 250	110
300 to 600	120
> 600	130

Results of the preliminary watermain hydraulic analysis is available in **Appendix B.3**.

#### 3.3.2 AVERAGE DAY DEMAND (AVDY)

The hydraulic modeling results indicate that under the average day demand, the pressure in the proposed watermain ranges from 550 kPa to 614 kPa (79.8 psi to 89.1 psi). These pressures exceed the serviceable limit of 276 kPa to 550 kPa (40 psi to 80 psi) as specified in the City of Ottawa Design Guidelines - Water Distribution, indicating that pressure reducing valves may be required for the development. Results are shown in **Figure 3.1** below. Requirements for pressure-reducing measures will



# Functional Servicing Study LeBreton Flats Plan of Subdivision

## 3 Water Servicing

be confirmed by the mechanical or civil engineering consultant at the future detailed design phase for the residential and park development blocks.

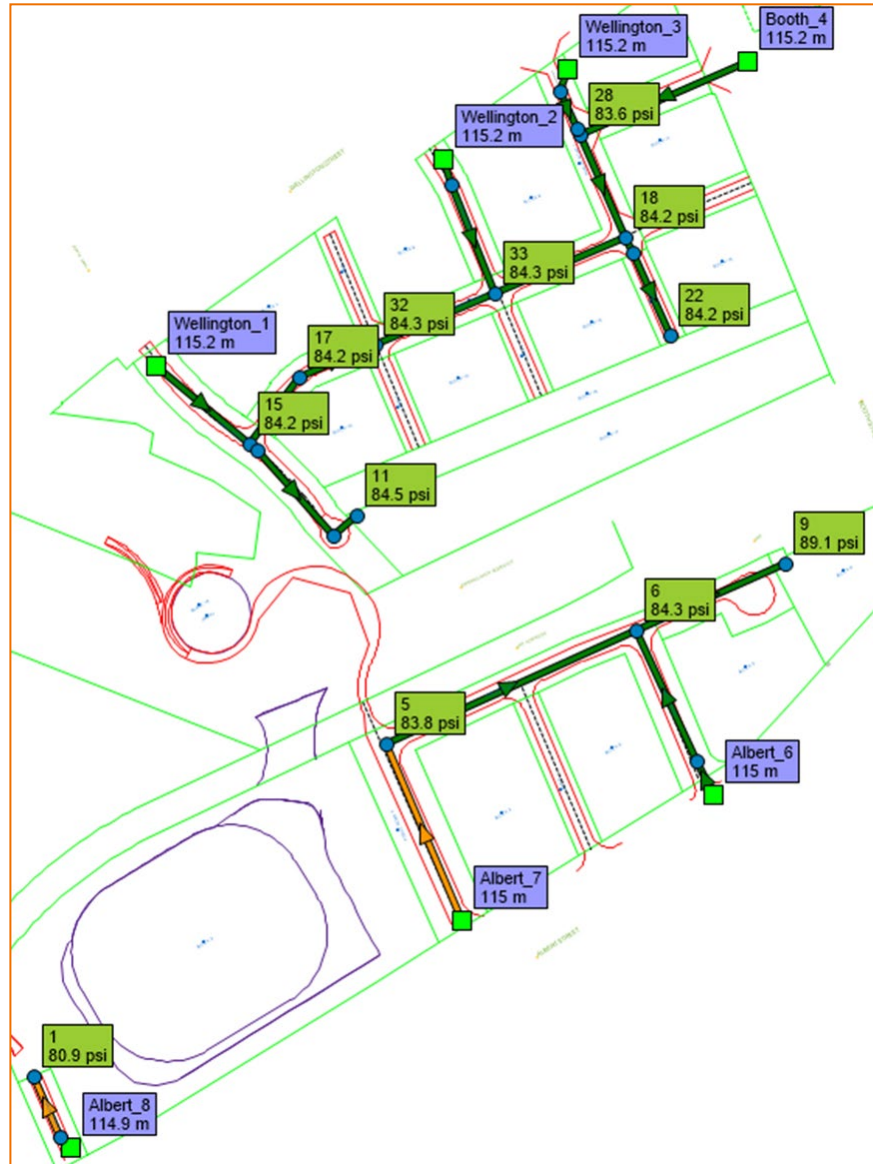


Figure 3.1: AVDY Pressure Results

### 3.3.1 PEAK HOUR DEMAND (PKHR)

The hydraulic modeling results indicate that under the peak hour demands, the pressure in the proposed watermain ranges from 477 kPa to 539 kPa (69.2 psi to 78.2 psi). These pressures are within the serviceable limit of 276 kPa to 552 kPa (40 psi to 80 psi) as specified in the City of Ottawa Design Guidelines – Water Distribution. Results are shown in **Figure 3.2** below.





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## 3 Water Servicing

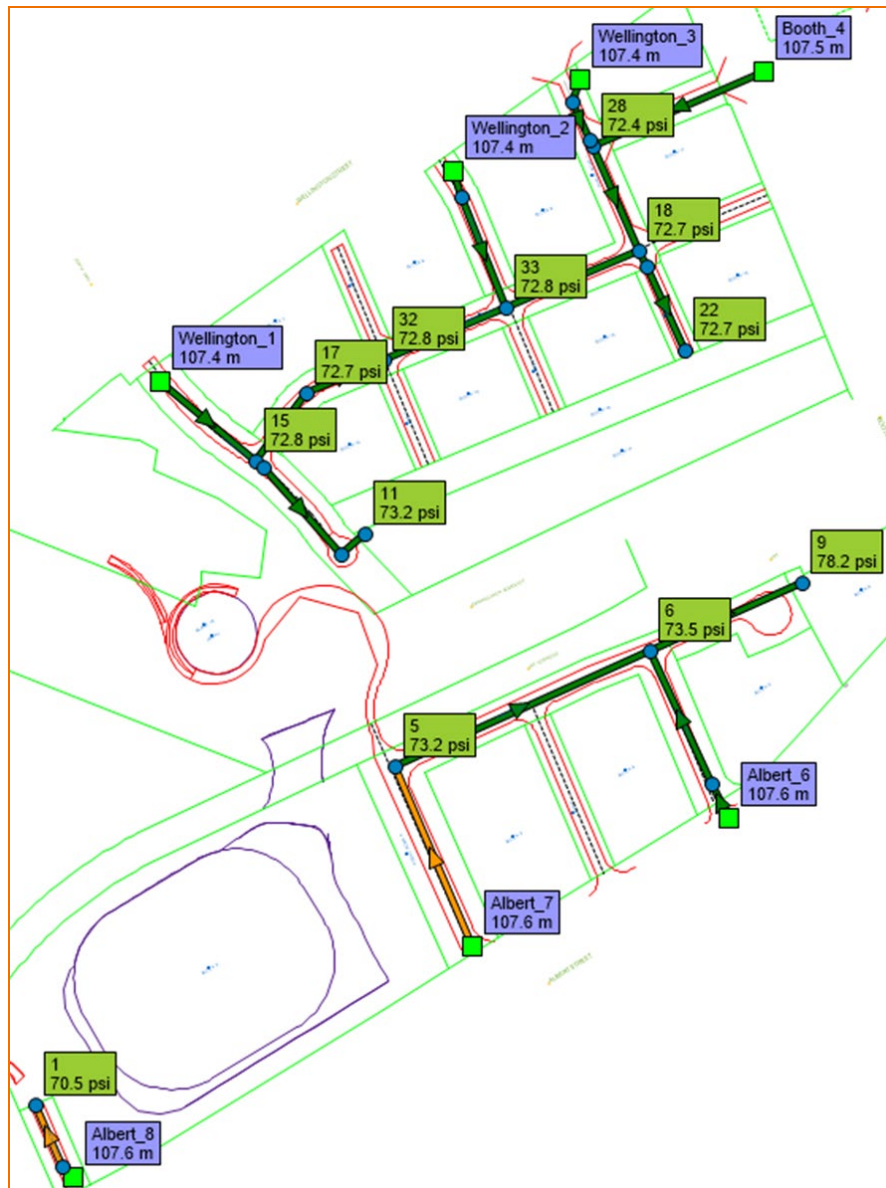


Figure 3.2: PKHR Pressure Results

### 3.3.2 MAXIMUM DAY DEMAND + FIRE FLOW (MXDY+FF)

The hydraulic modeling was also used to assess the maximum day and fire flow demands while maintaining a residual pressure of 138 kPa (20 psi), per the City of Ottawa Design Guidelines – Water Distribution. The modeling is conducted using a steady-state maximum day demand scenario along with the automated fire flow simulation feature of PCSWMM. The fire flow demand is set to 200 L/s as per the demands noted in **Section 3.2.3**.



## Functional Servicing Study LeBreton Flats Plan of Subdivision 3 Water Servicing

Figure 3.3 illustrates that the proposed networks can deliver flows exceeding 200 L/s while maintaining the required residual pressure of 138 kPa (20 psi).

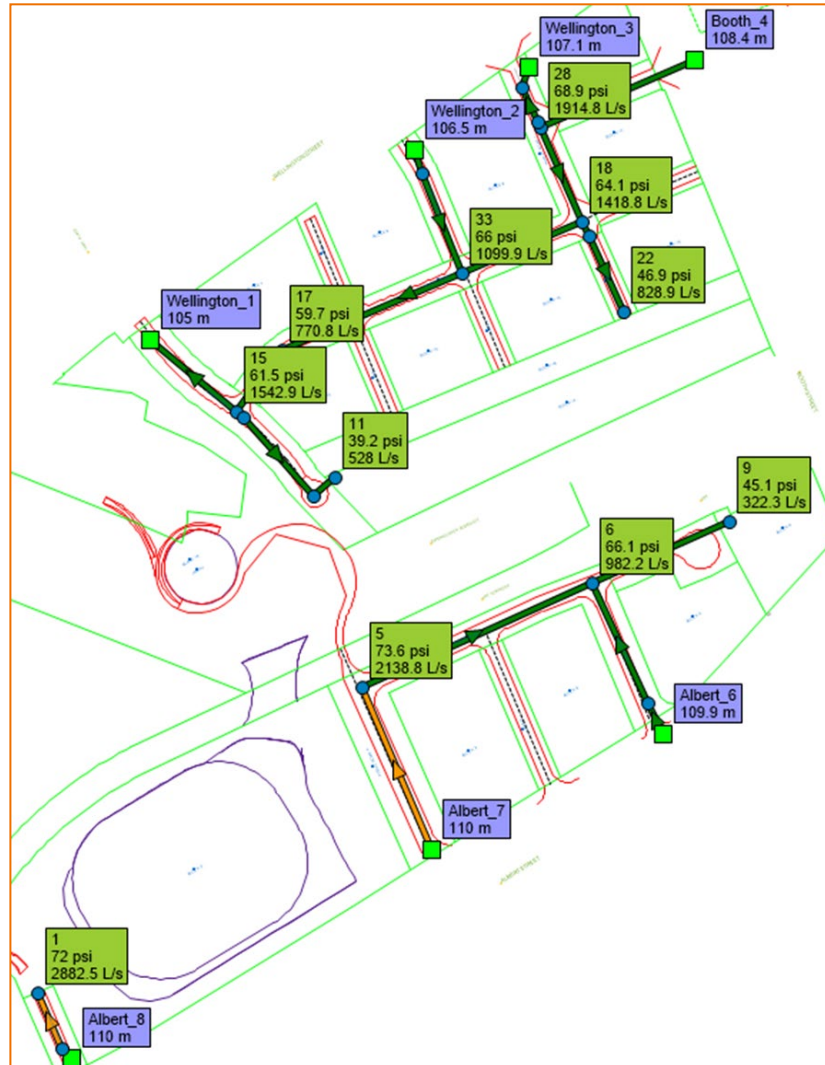


Figure 3.3: Fire Flow Results – Residual Pressure and Available Fire Flows

### 3.4 Conclusion

The proposed watermain alignment and sizing can achieve the required level of service within the LeBreton Flats subdivision. Based on the hydraulic analysis, the following conclusions were made:

- The proposed water distribution system is recommended to include a combination of 200 mm, and 300 mm diameter watermains.
- During peak hour conditions, the proposed system is capable of operating above the minimum required pressure of 275 kPa (40 psi).



## Functional Servicing Study LeBreton Flats Plan of Subdivision

### 3 Water Servicing

- Under fire flow conditions, the proposed networks can provide sufficient fire flows (200 L/s and above) while maintaining a residual pressure of 138 kPa (20 psi) in the LeBreton Flats development.

Watermain sizing and hydrant placement will be confirmed as part of the detailed design of subdivision.



## **4 Wastewater Servicing**

### **4.1 Background**

The LeBreton Flats subdivision lands are located within the central core of the City of Ottawa immediately adjacent to the Ottawa River. Public wastewater infrastructure is available to service the subdivision lands. The 1050 mm diameter Cave Creek Collector (CCC) sanitary sewer, crosses the southern portion of the development land (Block 2, Block 4 and Street 4). Design is underway for the realignment of the CCC. The CCC is intended to be relocated to the Albert Street ROW (by others) prior to the development of the impacted subdivision blocks. 250 mm diameter and 300 mm diameter sanitary sewers on Wellington Street, and a 375 mm diameter sanitary sewer on Booth Street also front the subdivision lands. These sewers direct wastewater to the LeBreton Flats Pumping Station (LFPS) via Fleet Street. The LFPS was designed to service the full buildout of LeBreton Flats subdivision north of the closed aqueduct, including the existing Claridge development and the Canadian War Museum. A flow allotment was also assigned for potential future development of Victoria Island. The design and construction of the LFPS was funded by the NCC.

### **4.2 Wastewater Generation and Servicing Design**

The following criteria have been used to calculate the estimated wastewater flow rates and to determine the size and location of the sanitary sewers. Design criteria are in accordance with the City of Ottawa Sewer Design Guidelines, and the Ministry of Environment Conservation and Parks (MECP) Design Guidelines for Sewage Works. Park design criteria are consistent with previous background studies.

- Minimum velocity = 0.6 m/s (0.8 m/s for upstream sections)
- Maximum velocity = 3.0 m/s
- Manning roughness coefficient for all smooth wall pipes = 0.013
- Minimum size of sanitary sewers inside the greenbelt = 250 mm
- Minimum grade of sanitary sewer service = 0.34% (0.65% where less than 10 contributing residential units)
- Residential average wastewater generation = 280 L/person/day
- Commercial average wastewater generation = 28,000 L/gross floor ha/day
- Hotel average wastewater generation = 225 L/bedspace/day
- Picnic space and flushing toilets average wastewater generation = 20 L/persons/day
- Residential Peaking Factor = based on Harmon Equation; maximum of 4.0, minimum of 2.0



## Functional Servicing Study LeBreton Flats Plan of Subdivision

### 4 Wastewater Servicing

- Commercial and Hotel Peaking Factor = 1.5
- Park Contingency Factor = 25 %
- Harmon correction factor = 0.8
- Infiltration allowance = 0.33 L/s/ha
- Minimum cover for sewers = 2.5 m
- Population density for apartment units = 1.8 persons/unit
- Population density for townhome units = 2.7 persons/unit
- Bedspace per hotel unit = 2 bedspaces/hotel unit
- Population density for park areas = 183.5 persons/ha

## 4.3 Functional Sanitary Servicing Design

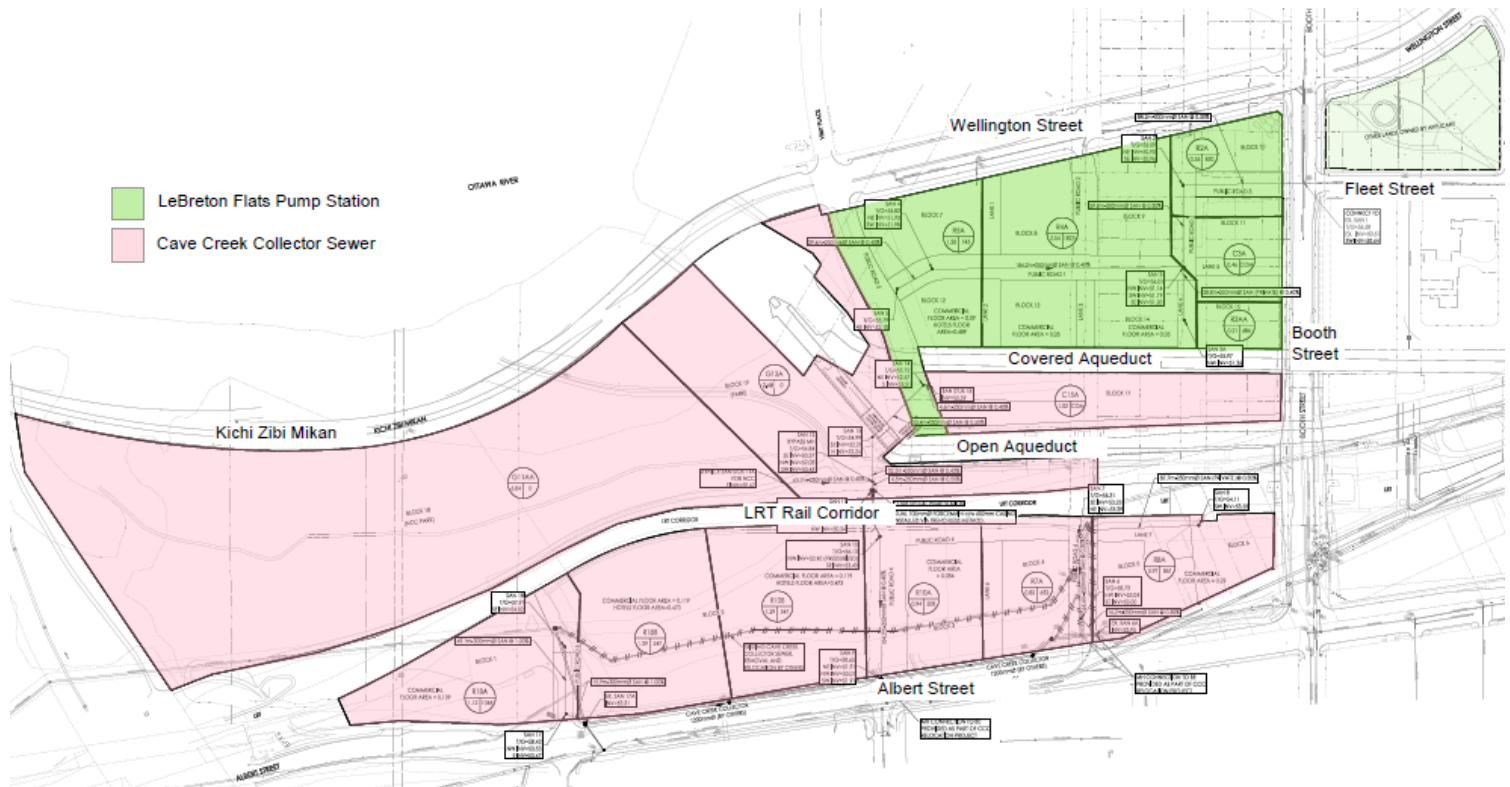
### 4.3.1 FUNCTIONAL LAYOUT

The functional layout of the municipal sanitary collection system ensures the servicing of all development blocks based on the NCC Master Concept Plan, planned densities and applicable design criteria.

The functional servicing layout and drainage area plan for the LeBreton Flats Plan of Subdivision is detailed on **Drawing SAN-1**. The LeBreton Flats development will be serviced by two separate networks of sanitary sewers. Wastewater from the subdivision lands north of the covered aqueduct will outlet to the 375 mm diameter sanitary sewer in Booth Street, which directs flow to the LFPS via Fleet Street. Wastewater from the subdivision lands south of the covered aqueduct will outlet to the Cave Creek Collector (CCC). In **Figure 4.1** below, lands serviced by the LFPS are green and those serviced by the CCC are shown in pink.



## Functional Servicing Study LeBreton Flats Plan of Subdivision 4 Wastewater Servicing



**Figure 4.1: Sanitary Drainage Outlets**

A network of sanitary sewers will service the subdivision lands with connections to the existing municipal sewers within Booth Street and Albert Street consistent with earlier master servicing studies. New municipal sewers will be located within the public roadways to provide a wastewater outlet for each of the development blocks and park blocks.

### 4.3.2 LEBRETON FLATS PUMP STATION CAPACITY ALLOCATION

Lands within the LeBreton Flats subdivision north of the covered aqueduct fall within the drainage area for the LFPS. As outlined in the Amended Certificate Approval issued by the Ministry of Environment, Number 8494-84GSRF (**Appendix C.3**), the station has a firm capacity of 100 L/s. In 2004, Dessau Soprin prepared the LeBreton Flats Infrastructure and Remediation Project Master Servicing Report and assigned conceptual flow rates to the LeBreton Flats area which includes the subdivision land. Total flows assigned to the subdivision area in the MSS were based on densities and gross floor area assumed in the 2002 Ainley Group LeBreton Flats Redevelopment Infrastructure Needs Study. Relevant excerpts from both reports are appended for reference (see **Appendix A.2**).

A sewer design sheet has been prepared distributing flows from the MSS to the subdivision and external lands to reflect the current development configuration. The design sheet is included in **Appendix C.4**. Total flows assumed for lands within the LFPS drainage area are summarized in the **Table 4.1** below. One small adjustment has been made to the MSS flow allocation to reflect the completed development of



**Functional Servicing Study LeBreton Flats Plan of Subdivision**  
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the Canadian War Museum site. Flow for the museum has been adjusted based on current design criteria to more accurately represent estimated actual flows from the site.

**Table 4.1: Flow Allocations per Dessau Soprin MSS**

<b>Subdivision/External Development Land*</b>	<b>MSS Flow Allocation</b>
BLOCK 5 (LMNO)	27.9
BLOCK 17 (JK)	5.8
BLOCK 7 (UT)	6.0
Victoria Island	20.0
Future Cultural/Institutional (V)	2.2
Canadian War Museum (XW)**	3.4
CLARIDGE PHASES 1-5 (PQRS)	20.6
N of Aqueduct & E of Booth (I)	0.3
<b>Allocation Total</b>	<b>86.2</b>
<b>Remaining LFPS Capacity (LFPS Firm Capacity = 100 L/s)</b>	<b>13.8</b>

\* Letter Drainage Area IDs per MSS Dwg C002 based on Ainley Infrastructure Needs Assessment

\*\* Actual Flow for Canadian War Museum Adjusted using Current Design Criteria

Given that the LFPS has a firm capacity of 100 L/s, there is an additional 13.8 L/s of capacity over and above that allocated as part of the MSS. This flow can be allocated based on density, percentage of overall flow allocation, by area, or another distribution. Based on our review of the options, it is recommended that the remaining capacity be allocated based on the percentage of undeveloped area within the LFPS drainage area. This appears to be the most equitable way to allocate the balance of the design flows. **Table 4.2** below presents the proportionate undeveloped area east and west of Booth Street to be serviced by the LFPS and assigns the balance of the remaining capacity accordingly.

**Table 4.2: Recommended Distribution for the Balance of Available LFPS Capacity**

<b>Undeveloped Areas to LFPS</b>	<b>Area (Ha)</b>	<b>Percentage Undeveloped Area</b>	<b>Flow Allocation</b>
LeBreton Flats Subdivision (lands west of Booth)	3.0	51%	7.0
Lands External to Subdivision (lands east of Booth)	2.9	49%	6.8

Combining the flow allocated to the subdivision lands (Block 5 and Block 17) in the MSS with the allocation in **Table 4.2**, the total flow allocation to the subdivision is 40.7 L/s.

It should be noted that actual wastewater flows are typically significantly lower than design flows. Should there be any question about available capacity as the area develops, monitored flows should be reviewed to assess actual capacity.



**Functional Servicing Study LeBreton Flats Plan of Subdivision**  
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**4.3.3 FUNCTIONAL DESIGN FLOW**

Functional design flows were estimated based on the assumed development densities and gross parcel areas established by the NCC in accordance with the West Downtown Core Secondary Plan. The density table is included in **Appendix A.1**. Although the density table assumes primarily residential and hotel use for Block 2, the proposed municipal sanitary sewers have the capacity to service the block should it become a major events centre.

A sanitary pumping station will be required to service the sanitary sewers receiving flows from the Block 17 (commercial/office) and park blocks 18 and 19 due to their relative elevation to the municipal gravity sewers and the need for the transmission infrastructure to cross the open aqueduct and the rail corridor. City of Ottawa Wastewater Operations have advised that the sanitary pump station will require back up power, dual forcemains and vehicular access. Wastewater Operations have also specified that the infrastructure crossing the rail line is required to be sleeved. The functional location and layout of the proposed pumping station (Option 1 per section 4.3.2 below) is included on **Drawing SAN-1**. Peak design flow to the station is calculated to be 2.6 L/s as detailed in the sanitary design sheet included in **Appendix C.1**.

The proposed design peak flows for the subdivision to each outlet are outlined in **Table 4.3** below and detailed in **Appendix C.1**. As shown in **Table 4.4** below, the peak design peak flows fall within the available capacity of both the CCC and the LFPS.

**Table 4.3: Estimated Total Wastewater Peak Flow for Draft Plan of Subdivision (lands west of Booth)**

Outlet	Residential			Hotel	Park	Commercial			Infiltration Flow (L/s)	Total Peak Flow (L/s)
	Population	Peak Factor	Peak Flow (L/s)	Peak Flow (L/s)	Peak Flow (L/s)	Area (ha)	Peak Factor	Peak Flow (L/s)		
LFPS	4104	2.86	38.0	0.8	-	0.66	1.5	0.2	1.5	40.5
CCC	4172	2.85	38.6	1.6	0.5	6.04	1.5	2.9	5.5	52.7
<b>Total Estimated Wastewater Peak Flow (L/s):</b>										<b>93.2</b>

**Table 4.4: Comparison of Design Flow with Capacity Allocation**

Outlet	Sanitary Peak Flows for Draft Plan of Subdivision (L/s)	Capacity Allocation
LFPS	40.5	40.7
CCC	52.7	No Limit Restriction Identified by the City





## Functional Servicing Study LeBreton Flats Plan of Subdivision

### 4 Wastewater Servicing

#### 4.3.4 SANITARY PUMP STATION

The existing infrastructure crossing the site and the relative elevations of the land and existing sewer outlets constrain the servicing of the lands between the covered aqueduct and the Confederation Line rail corridor. A small sanitary pumping station is required as part of the sanitary servicing infrastructure to service Block 17, the City park block, and the NCC park block.

Options for the pump station siting were evaluated based on the station requirements and constraints. A technical memo and schematics examining the options has been included in **Appendix C.2**. The memo includes the functional layout of both options. Option 1 is depicted on the Functional Sanitary Sewer System layout, **Drawing SAN-1** and is the recommended option based on the review of pros and cons identified.

The wet well will receive wastewater flow from the two parks and Block 17 by gravity where sewage will be pumped across the rail corridor. The forcemains will outlet to SAN 10 within Public Road 4 where sewage will flow by gravity to the CCC. The detailed design of the pump station will form part of the detailed design of the subdivision.

## 4.4 Conclusion

The proposed sanitary sewer alignment and sizing can achieve the required level of service for the LeBreton Flats subdivision development.

The capacity of the receiving wastewater systems can accommodate design flows based on proposed densities.

A small sanitary pump station will be required to service the blocks that do not have a gravity outlet to the municipal collection system, Blocks 17, 18 and 19.

The detailed design of the sanitary collection system and components will be established as part of the detailed design of subdivision.



## 5 Stormwater Management and Stormwater Servicing

### 5.1 Background

The objective of this stormwater management plan is to determine the measures necessary to control the quantity and quality of stormwater released from the proposed development to the design criteria established in earlier Master Servicing Studies and subsequent pre-consultation with City of Ottawa staff.

### 5.2 Stormwater Management (SWM) Design Criteria

The Stormwater Management (SWM) criteria are established by combining current design practices outlined by the City of Ottawa Sewer Design Guidelines (SDG) (October 2012), as amended, consultation with City of Ottawa staff, and review of the LeBreton Flats MSS (LFMSS) and other background studies. The following summarizes the criteria, with the source of each criterion indicated in brackets:

#### General

- Use of the dual drainage principle (City of Ottawa SDG)
- Wherever feasible and practical, site-level measures should be used to reduce and control the volume and rate of runoff (City of Ottawa SDG)
- Assess impact of 100-year event outlined in the City of Ottawa Sewer Design Guidelines on the major and minor drainage systems (City of Ottawa SDG)

#### Storm Sewer and Inlet Controls

- The minor system will be designed to convey the 5-year post event, and quantity control will be required for the individual blocks up to and including the 100-year event (LFMSS, CIMA+ 2021)
- Discharge from the blocks and ROWs should be controlled to the 5-year storm event with  $C=0.70$  (City of Ottawa pre-consultation).
- $T_c$  should be not less than 10 minutes (City of Ottawa SDG).

#### Surface Storage and Overland Flow

- Building openings to be a minimum of 0.30 m above the 100-year water level (City of Ottawa SDG)
- Maximum depth of flow under either static or dynamic conditions shall be less than 0.35 m for local streets (City of Ottawa SDG)



## Functional Servicing Study LeBreton Flats Plan of Subdivision

### 5 Stormwater Management and Stormwater Servicing

- Provide adequate emergency overflow conveyance off-site with a minimum vertical clearance of 0.15 m between the spill elevation and the ground elevation at the building envelope in the proximity of the flow route or ponding area (City of Ottawa SDG)

#### Quality Control

- An Enhanced level of quality control of 80% removal of Total Suspended Solids (TSS) has been requested for all stormwater outlets (City of Ottawa pre-consultation)

### 5.3 Functional Stormwater Management Design

The LeBreton Flats development is to be designed using the “dual drainage” principle, whereby the minor (pipe) system is designed to convey the peak rate of runoff from the 5-year design storm and runoff from larger events is conveyed by both minor (pipe) and major (overland) channels, such as roadways and walkways, safely off site without impacting proposed or existing downstream properties.

In keeping with the 5-year inlet restriction criterion, inlet control devices (ICDs) or orifice plates will be specified during the detailed design stage for the individual blocks and street catchbasins to limit the inflow to the minor system. Restricted inlet rates to the sewers are necessary to prevent the hydraulic grade line (HGL) from surcharging storm sewers into basements and other underground infrastructure during major storms.

The Modified Rational Method has been employed to assess the rate and volume of runoff anticipated during post-development rainfall events. Based on the draft plan and preliminary Grading Plan, drainage area boundaries have been defined. Runoff coefficient values were then assigned to each drainage area based on a conservative estimate of built-form imperviousness. Runoff coefficients for each area are assigned based on City of Ottawa SDG and accepted practices. Full details can be found in **Appendix D.1**, while **Drawing STM-1** illustrates the conceptual post-development drainage conditions.

The major system flows generated from larger events (beyond the 100-year storm) will be safely conveyed to the open aqueduct as per existing conditions by engineered (overland) channels such as roadways, ditches, and walkways. The overland channels immediately north of Albert Street have also been proposed to receive overland flow from approximately 21 ha of land south of Albert Street, which is tributary to the open aqueduct under historical conditions (see Major Overland Flow section below). It is of note that construction of the Confederation Line has effectively blocked existing overland flow path to the open aqueduct, with no option for overland conveyance identified in the stormwater management report for the Confederation Line guideway.

The minor system from the proposed subdivision will be conveyed and modelled up to the point of discharge to three storm sewer outlets, comprising of the open aqueduct, the 2100 mm diameter storm trunk sewer in Albert Street, and a 525 mm diameter section of storm sewer immediately upstream of the trunk sewer within Albert Street.



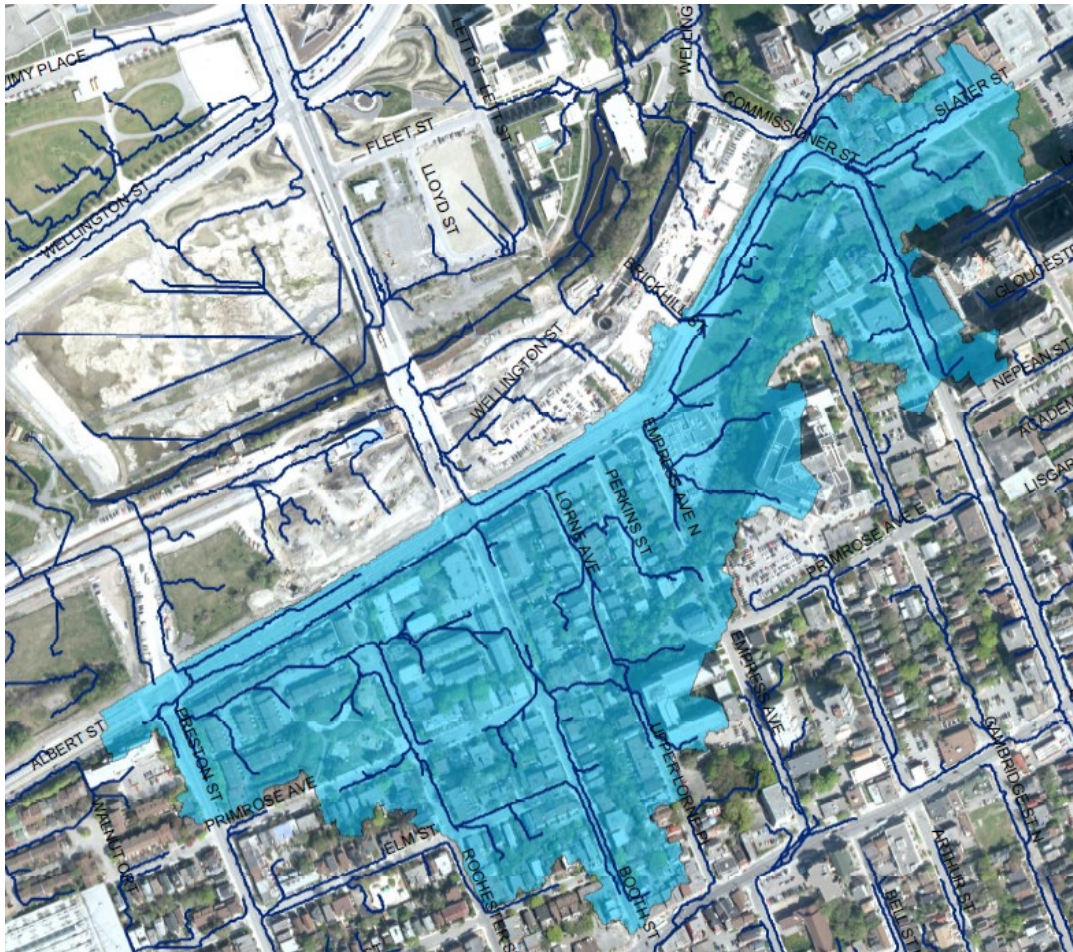
### **5.3.1 PRE-DEVELOPMENT DRAINAGE CONDITIONS**

The existing drainage conditions for the site have been determined by evaluating available topographic mapping to delineate the existing flow patterns and subdrainage areas, with the study area split into subcatchments based on existing surface inlets. The runoff coefficients for the existing subdrainage areas have been determined based on the relative imperviousness of the respective areas. A network of existing culverts and catch basins direct the drainage from most areas to either the open aqueduct, the Confederation Line ditch line, and the Ottawa River. Existing areas to be retained as NCC or City of Ottawa park land largely drain to existing catch basin and culvert infrastructure to the Ottawa River or open aqueduct. The pre-development subdrainage areas are shown on **Drawing EX STM-1**.

An external area to the south measuring approximately 21 ha as identified by City of Ottawa personnel contributes overland flow to the open aqueduct as identified in previous background studies. This emergency overland flow route enters LeBreton Flats Subdivision via a low point at the intersection of Albert and Preston Streets, with grading indicating a potential for major system flows to overtop the centerline of Albert Street allowing major system runoff to enter the proposed subdivision.



## Functional Servicing Study LeBreton Flats Plan of Subdivision 5 Stormwater Management and Stormwater Servicing



**Figure 5.1: External Stormwater Drainage Area Crossing Albert Street (LeBreton Flats Master Servicing Report Amendment, Parsons, June 2019)**

The target release rate for the site was calculated using the rational method, a time of concentration of 10 minutes, and the City of Ottawa IDF curves. The rational method equation is as follows:

- $Q = 2.78 CiA$
- Where:
  - $Q$  = peak flow rate, L/s
  - $A$  = drainage area, ha
  - $I$  = rainfall intensity, mm/hr (per Ottawa IDF curves)
  - $C$  = site runoff coefficient



**Functional Servicing Study LeBreton Flats Plan of Subdivision  
5 Stormwater Management and Stormwater Servicing**

The release rates are summarized in **Table 5.1**. The post-development peak flows for the study area for the 5-year and the 100-year event must be restricted to be less than or equal to the 5-year pre-development with a C of 0.7.

**Table 5.1: Target Release Rate**

Design Storm	Target Flow Rate (L/s)
5-Year	4360

**5.3.2 POST-DEVELOPMENT DRAINAGE CONDITIONS**

The post-development drainage patterns for the site were established based on the draft plan and shown on **Drawing STM-1**, where the subdrainage areas have been delineated based on their drainage outlet, storage treatment, and design criteria. The subdrainage areas have been grouped into the following categories as shown in **Table 5.2**.

**Table 5.2: Summary of Post-Development Subdrainage Areas**

Category	Applicable Blocks	Subdrainage Areas	Total Area (ha)	Outlet
Block Areas – Tributary to Fleet Street	Blocks 7 to 15	C6B, C6C, C5A, C5B, C5C, C4D, C4AA, C4C, C3AA	2.90	Fleet Street 2100 mm diameter storm sewer
ROWs – Tributary to Fleet Street	Public Roads 1 to 3, 5, and Lanes 1 to 5	C6A, C6D, C4B, C3B	1.55	Fleet Street 2100 mm diameter storm sewer
Block Areas – Tributary to Albert Street	Blocks 1 to 6	C19A, C16A, C16B, C12B, C12A, C13A	5.22	Albert Street 525 mm and 2100 mm diameter storm sewers
ROWs – Tributary to Albert Street	Public Roads 4 and 6, and Lanes 6 to 7	C19B, C15A, C14A, C14B, C13B	1.13	Albert Street 525 mm and 2100 mm diameter storm sewers



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Category	Applicable Blocks	Subdrainage Areas	Total Area (ha)	Outlet
Block Area – Tributary to the Open Aqueduct	Block 17	C17A	0.89	Open Aqueduct
City Park	Block 19	PARK-1, PARK-2	2.48	Open Aqueduct / Nepean Bay / Ottawa River
NCC Lands, Closed Aqueduct Block	Blocks 16 and 18	UNC-1, NCC-1	7.33	Ottawa River / Open Aqueduct

The post-development subdrainage areas and runoff coefficients are summarized in **Appendix D.1**.

### 5.3.2.1 Quantity Control

The LeBreton Flats development will lead to a significant increase in the site's overall runoff coefficient, as the site is presently vacant and predominantly pervious area. In addition, the C coefficient values have been increased by 25 % for the post-development 100-year storm event based on MTO Drainage Manual recommendations and City of Ottawa Sewer Design Guidelines. Quantity control measures are required on this site to meet the restrictive stormwater release criteria.

To assess the post-development runoff, a runoff coefficient of  $C=0.85$  was assigned to all the development blocks, save for the parks ( $C=0.40$ ) and the covered aqueduct (Block 16,  $C=0.20$ ), while  $C=0.70$  was assigned to the public roads and private lane ROWs.

Detailed design for each block is expected to progress through individual Site Plan Control (SPC) processes. To demonstrate the serviceability of the subdivision, the Block areas and ROWs have been treated as a single consolidated area with a combined runoff coefficient, overall storage requirements, and a single outflow rate that satisfies the 5-year pre-development release rate. To demonstrate the serviceability of each individual Block, the stormwater management design calculations also provide the required release rates at the Block level.

It is anticipated that surface storage with inlet control devices (ICDs) in catch basins be provided in the public roadway and private lane ROWs, while onsite storage methods (i.e. controlled rooftop storage, cisterns, underground tanks, oversized pipes, or a combination thereof with restricted release) will be provided onsite within the blocks to meet the target discharge. Further details of the stormwater storages for each block and the surface storages within the ROWs will be provided at the detailed plan of subdivision and individual block site plan control stages for the development.



## Functional Servicing Study LeBreton Flats Plan of Subdivision 5 Stormwater Management and Stormwater Servicing

The storage requirements for the site were determined using the Modified Rational Method (MRM). The detailed MRM analysis have been provided in **Appendix D.1**. The 100-year storage requirements per outlet are summarized in **Table 5.3**, where:

- Qactual is the 100-year rainfall runoff rate generated from the Block area as determined by the Rational Method Calculation at tc = 10 min
- Vstored is the volume of storage required.

**Table 5.3: 100-Year Storage Requirements for Block Areas and ROWs**

Outlet	Area Type	Area	C	C	Qactual	Qcontrol	Vstored
		(ha)	(5-yr)	(100-yr)	(L/s)	(L/s)	(m <sup>3</sup> )
Fleet Street	Blocks	2.90	0.85	1.00	1441	588	511
	ROWs	1.55	0.70	0.88	673	314	215
Albert Street	Blocks	5.22	0.85	1.00	2591	1533	920
	ROWs	1.13	0.70	0.88	490	229	157
Open Aqueduct	Block 17	0.89	0.85	1.00	442	180	157

### 5.3.2.2 Quality Control

On-site quality control measures are expected for the proposed development per pre-consultation with the City of Ottawa. An enhanced level of protection (80% removal of total suspended solids) was identified for the site before discharging to the storm sewer outlet. The use of LIDs may be limited for the development based on elevated bedrock as well as historic land use for a portion of the development as a landfill. As such quality control measures will largely be limited to oil/grit separators, surface filtration measures, and filtration manufactured treatment devices (MTDs). The MECP has recently advised that OGS units should be sized for quality control based on revised particle size distributions which largely limit OGS units to providing 50-55% removal of total suspended solids. Jellyfish membrane systems are proposed as an end-of-pipe filtration MTD solution to achieve quality control where treatment train processes are not possible given spatial requirements within municipal rights-of-way.

Jellyfish membrane systems are proposed in the most downstream storm manholes within the subdivision before the connections into the existing storm sewers within Albert and Fleet Streets. These end-of-pipe systems are to be designed to treat runoff from the 90<sup>th</sup> percentile annual storm event (approx. 25mm storm) to satisfy MECP criteria for design. The drainage area for the Fleet Street outlet is too large to permit a single end-of-pipe MTD to treat the entire development, and so individual blocks in this area as well as Block 2 (previously an area noted for an arena) will require quality control prior to discharge to the municipal system. The quality control unit for the outlet into the open aqueduct will be incorporated into the stormwater design by others at the detailed design phase.

The Hydrogeological Review (Stantec, 2024) recommended using low impact development (LID) systems designed to promote sediment filtration, evapotranspiration, and/or capture stormwater from the parks





## Functional Servicing Study LeBreton Flats Plan of Subdivision

### 5 Stormwater Management and Stormwater Servicing

and direct it toward a stormwater sewer that conveys the water away from any proposed buildings. Furthermore, the LeBreton Flats Master Servicing Report (CIMA+, 2021) also identified bio-swales and/or rain gardens as the preferred LID measures for park blocks.

See **Appendix D.3** for conceptual quality MTD sizing calculations.

#### 5.4 Functional Storm Servicing

A functional storm servicing design featuring conceptual sewer alignments, emergency overland flows, and storm drainage areas is provided in **Drawing STM-1**. Preliminary storage requirements and supporting calculations are provided in Appendix. The sewers are to be designed in conformance with all City of Ottawa and MECP Guidelines, policies, and design parameters.

The proposed roadways will have urban cross sections complete with curb, gutter, and catch basins to inlet to the minor storm system. Design of the storm sewer (including catch basin design and locations) are to be determined at the detailed design phase when a dynamic model will be developed to evaluate the post-development conditions and sewer hydraulic design. At present, the functional sewer design is free of conflicts with other services (SAN and WTR) and has adequate cover for frost protection.

The buildings in each development block are anticipated to be serviced by storm service laterals, which will accommodate the controlled release of rooftop runoff, building foundation drain flow, and release of stormwater runoff from building area drains or stormwater storage cistern(s). It is assumed that sump pits and pumps will be required to accommodate the foundation drains and the possible stormwater storage cistern(s) at the basement (underground) parking levels.

The mechanical consultant or plumbing contractor will ultimately be responsible to confirm the building service lateral sizing; sump pump requirements and designs; and ensure conformance to building code requirements. Building service sizing and sump pump requirements will be confirmed at the detailed design phase.

#### 5.5 Major System Flow

During preconsultation discussions, the City of Ottawa identified that the Confederation Rail Line is situated in the overland flow path of runoff from an area of approximately 21 hectares external to the subdivision, south of Albert Street. Infrastructure for conveyance of the external drainage has not been accommodated with works undertaken to date including the construction of the Confederation Line. The City of Ottawa advised that an emergency overland flow outlet would have to be designed to support the plan of subdivision to safely convey the external stormwater drainage across the rail line to the open aqueduct. It was agreed that responsibility for funding and construction as well as timing of the outlet would be negotiated between the City of Ottawa and the NCC.

Using available 2K mapping topography, the catchment area for the external drainage was delineated, and an overall runoff coefficient of 0.70 was applied based on prevailing imperviousness of existing areas.



## Functional Servicing Study LeBreton Flats Plan of Subdivision

### 5 Stormwater Management and Stormwater Servicing

A PCSWMM model for the major system within the catchment area was developed in consideration of the typical 18m ROW cross section for all streets with the exception of Preston and the south side of Albert Street which were developed based on existing photogrammetry. Subcatchments within the area are generally sloped from southeast to northwest to the intersection of Albert/Preston Street. Given the relatively high average longitudinal slope of the roadways, it was conservatively assumed that no additional storage would be available within ponded areas beyond that already determined for the given road cross sections. Subcatchment slopes were conservatively set at 3% on average, and subcatchment widths defined as subcatchment area x 225 per recommendations of the SDG for lumped drainage areas.

Each street intersection or major incoming driveway was modeled with a storage node in the PCSWMM model without surface storage to permit routing of the major system from street to street. At each storage node, runoff was removed from the model using catch basin capture curves for inlets on continuous grade as noted in the SDG, and for capacity of surface grates within sags from Design Charge 4.19 in the MTO Drainage Manual. Catch basin counts for each area were estimated based on direct take-offs from available City of Ottawa GIS mapping (GeoOttawa). It is assumed that the minor system in this area does not surcharge to surface during major storm events, and that the area is not equipped with inlet control devices given the overall existing sewer age.

The 100yr 3hr Chicago storm and 100yr 3hr +20% climate change storm was then run on the resulting model to verify at a high level whether considerable major system flows could be expected to discharge over the centerline of Albert Street at the Preston intersection. Results of the model are noted in **Table 5.4** below, and PCSWMM model input and output files are included in **Appendix D.4**.

**Table 5.4: Major System Spillage at Albert/Preston**

Design Storm	Major System Spillage (L/s)
100-Year	372
100-Year + 20%	983

It is proposed to permit major system spillage from Albert to progress northwards through the subdivision along public ROWs, with eventual capture via a bank of surface catch basins or high-flow trench drain to a proposed storm sewer. This sewer is anticipated to be directed northwards under the Confederation Line rail corridor to connect directly to the open aqueduct complete with a sluice gate on the outgoing manhole to permit maintenance of the system and isolate the sewer from aqueduct normal water elevations. Flows to the open aqueduct in this manner are only anticipated for extreme storm events (100yr and above). See **Drawing PP-STM** for conceptual major system capture sewer details. Responsibility for funding and construction of the works, as well as timing for the outlet, are to be negotiated between the City of Ottawa and the NCC.



## **5.6 Conclusion**

The proposed storm sewer alignment and sizing will provide the required level of service for the LeBreton Flats subdivision development and meet quantity and quality control requirements.

- On site storage within the blocks and ROWs are proposed to limit inflow from the subdivision into the existing storm sewers on Albert and Fleet Streets to the 5-year storm event based on City of Ottawa IDF curves and to a maximum runoff coefficient of 0.70.
- Major overland flow is directed to City managed rights-of-way.
- A major system overland capture point located south of the open aqueduct is proposed to manage spillage from Albert Street and approximately 21ha of external contributing area during the climate change (100yr +20%) storm event. Captured flows are to be directed to the open aqueduct. City of Ottawa and NCC to establish responsibilities for funding and construction.
- Quality control is proposed to be provided by end-of-pipe filtration MTDs for urban rights-of-way, with additional on-site quality control required for site plan blocks north of the aqueduct, and for the hotel/potential arena parcel.
- Quality control for the proposed park blocks is anticipated to be provided by on-site surface filtration through the use of bioswales, enhanced grass swales, or other infiltration measures.



## 6 Site Grading

The site measures approximately 21.5 ha in area and is mostly vacant, save for the two aqueducts and the existing multi-use pathways (MUPs). Per Appendix D of the LFMSS (CIMA+, March 2021) and topographic survey data, the existing terrain generally slopes from the edges of the site towards the open aqueduct and Broad Street, with portions of the NCC and City Park blocks draining to the Ottawa River.

A functional grading plan (see **Drawing GP-1**) is provided to support the stormwater management review presented in **Section 5**. The functional grading scheme verifies stormwater management calculations and allows for major system flow routes to progress along public ROWs as per City design criteria, and ultimately to the open aqueduct as per existing conditions. It provides preliminary high-point to high-point elevations in critical areas to demonstrate the proposed overall drainage patterns. The plan ties-in to existing elevations at the rail corridor and adjacent right of ways and no drainage is proposed to be directed to the adjacent private properties.



## **7 Utilities**

Overhead (OH) hydro-wires run east-west along Albert Street and north-south along Preston Street, and significant hydro underground plant exists along Albert and Booth Street. Limited hydro plant exists along the northern boulevard of the Kichi Zibi Mikan and Wellington Street.

Within the subdivision boundaries, Hydro Ottawa duct runs along the southern limit of Block 2. Overhead electrical lines extend across the subdivision lands from the underground duct at Albert Street at Preston Street and extend to underground duct north of the covered aqueduct. A 100mm hydro duct extends from the covered aqueduct at the Inlet from the Ottawa River to Booth Street.

The detailed design of utility services will be further investigated as part of the composite utility planning process as part of the detailed design of subdivision. Existing utilities within the site boundaries may require relocation where they are not being incorporated into the detailed design.

Enbridge gas plant exists within the rights-of-way in the vicinity of the proposed site. Gas servicing is anticipated to be via the existing 300 mm diameter medium pressure system that runs along Preston and Albert Streets and via the existing 150mm line within Booth Street north of Fleet Street. The site is expected to be serviced through connections to these existing services.

Bell utilities exist near the development along Albert, Booth, and the Parkway. It is anticipated that the future development will be serviced by Bell fibre optic cables which will be extended through the subdivision.

The exact size, location, and routing of utilities is to be finalized during detailed design. Detailed design of the required utility services will be completed by the respective utility companies. Any relocation and protection of existing utilities in conflict with the proposed development will be coordinated with the individual utility providers.



## 8 Municipal Rights-of-Way

The widths of the proposed municipal roadways for the plan of subdivision were established to ensure that all right-of-way (ROW) infrastructure including municipal servicing, utility servicing, sidewalks, trees, streetlights and vehicular travel lanes can be accommodated while maintaining minimum offsets to adjacent infrastructure. The City standard ROW sections developed for greenfield development are not suitable for use in the urban core and do not meet the intent of the MCP.

Functional sections have been included on the Details Sheet, **Drawing DS-1** to demonstrate that the proposed ROW widths are adequate to support the required infrastructure. Alternative ROW sections will be established for the subdivision development as part of the detailed design.



## **9 Approvals**

The City of Ottawa will review and approve the functional design report to support the Draft Plan of Subdivision application for the development and issue conditions to be satisfied prior to early servicing and/or registration of the subdivision.

At the detailed design stage, an MECP Environmental Compliance Approval (ECA) will be required for the proposed public storm and sanitary sewage and stormwater management works. Approval for the new sewage pump station is expected to require approval through direct submission to the MECP, however this will be confirmed based on the final detailed design, and potentially via the Consolidated Linear Infrastructure (CLI) ECA process.

At the subdivision construction phase, registration on the Environmental Activity Registry (EASR) or A Permit to Take Water (PTTW) may be required depending on the volume of water. Expected permitting requirements can be provided by the geotechnical engineer at the detailed design phase.



## **10 Erosion and Sediment Control During Construction**

To protect downstream water quality and prevent sediment build-up in catch basins and storm sewers, erosion and sediment control measures must be implemented during construction. The following recommendations will be included in the contract documents and communicated to the Contractor.

1. Implement best management practices to provide appropriate protection of the existing and proposed drainage system and the receiving water course(s).
2. Limit the extent of the exposed soils at any given time.
3. Re-vegetate exposed areas as soon as possible.
4. Minimize the area to be cleared and grubbed.
5. Protect exposed slopes with geotextiles, geogrid, or synthetic mulches.
6. Install silt barriers/fencing around the perimeter of the site to prevent the migration of sediment offsite.
7. Install track out control mats (mud mats) at the entrance/egress as shown in **Drawing EC-1** to prevent migration of sediment into the public ROW.
8. Provide sediment traps and basins during dewatering works.
9. Install sediment traps (such as SiltSack® by Terrafix) between catch basins and frames.
10. Schedule the construction works at times which avoid flooding due to seasonal rains.

The Contractor will also be required to complete inspections and guarantee the proper performance of their erosion and sediment control measures at least after every rainfall. The inspections are to include:

- Verification that water is not flowing under silt barriers.
- Cleaning and changing the sediment traps placed on catch basins.

Refer to **Drawing EC-1** in for the proposed location of silt fences, sediment traps, and other erosion control measures.





## **11 Geotechnical and Environmental Considerations**

A Geotechnical Desktop Review (Stantec, May 7, 2024), Phase One Environmental Site Assessment (Stantec, August 2, 2024 and Hydrogeological Memo (Stantec, August 14, 2024) were prepared for the proposed development to support the draft plan of subdivision application. These reports form part of the submission package for the Planning Act approval.

### **11.1 Geotechnical Investigation**

Subsurface soil conditions within the subject area were determined through field investigations from February 1992 through to June 2018. In total the site has been divided into 4 portions (North, South, West, and East) based on subsurface conditions. The soil stratigraphy for the North, South, and West portions of site are summarized as follows:

- **West Portion of Site:** The proposed parklands north of the Confederation Line rail corridor sits on the former Nepean Bay landfill and consists of a layer of silty sand and gravel fill, complete with various amounts of debris, including wood, brick, and plastic, with a thickness of up to 19 m. Bedrock was encountered at 3.7 m to 15.4 m depth. South of the rail corridor, the fill layer is generally 1.5 m to 4.9 m thick, and bedrock was encountered at 5.6 m to 11.0 m depth.
- **North Portion of Site:** Bedrock was encountered at ground surface at some borehole locations. Elsewhere, bedrock was encountered at 2.7 m to 4.8 m depth. At the multi-use pathway where Preston Street formerly extended to the Ottawa River Parkway, the bedrock is overlain by a silty sand fill and gravel. Silty sand with gravel and cobbles fill material is the cover material for the buried aqueduct.
- **South Portion of Site:** The fill material comprises of loose to compact silty sand and containing gravel, cobbles, boulders, and construction debris, such as brick, wood, slag, and ashes. A silty clay and clayey silt deposit was encountered under the fill layer between the former Preston Street extension and the former Broad Street right of way. Bedrock was encountered at 3.5 m to 9.2 m depth.

Groundwater levels were measured at depths between 1.1 m to 9.8 m, though seasonal variations in the water table should be expected and would need to be monitored continuously at key locations where underground infrastructures are proposed. It is expected that construction may occur below the existing groundwater table and therefore a permit to take water may be required. No grade raise restrictions were identified for the site.

### **11.2 Environmental Site Assessment**

A Phase One Environmental Site Assessment (ESA) was conducted to determine if Areas of Potential Environmental Concern (APECs) exists on the proposed site due to current and/or past Potential



**Functional Servicing Study LeBreton Flats Plan of Subdivision**  
**11 Geotechnical and Environmental Considerations**

Contaminating Areas (PCAs) on the proposed site or nearby properties within 250 m of the perimeter of the site boundary.

The Phase One ESA determined the presence of APECs on the proposed site potentially impacting soil and groundwater quality, on account of the past industrial, commercial, and mixed-use residential usage of the site before the site was cleared out in the 1960s. Specifically, the proposed parks at the western end of the site north of the Confederation Line rail corridor sits in areas identified as PCAs due to it being a former landfill, with the potential contaminants the result from importation of fill material of unknown quality and the use for waste disposal and management. As such, a Phase Two ESA will be required to assess the issues before a Record of Site Condition can be submitted for the site.

### **11.3 Hydrogeological Review**

A hydrogeological review was conducted to evaluate the hydrogeologic conditions on the site and potential for Low Impact Development (LID) infrastructure/techniques to be implemented at the site and the potential dewatering requirements.

The ability to infiltration stormwater within the development will be limited by space constraints and the shallow depth of bedrock. Capture and infiltration of groundwater is not recommended in the vicinity of building foundations due to the risk of short circuiting. Further, there is risk that infiltration systems may transport contaminants from the subsurface.

LID systems designed to promote sediment filtration, evapotranspiration, and/or capture stormwater and direct it toward a stormwater sewer that conveys the water away from buildings are recommended. Bio-swales, rain gardens, and green roofs were also identified as the preferred LID measures for the site.



## **12 Conclusions and Recommendations**

### **12.1 Potable Water Servicing**

The proposed watermain network and pipe sizing are capable of achieving the required level of service in the proposed development:

- During peak hour (PKHR) conditions, the proposed watermain network is expected to operate above the minimum pressure objective of 276 kPa (40 psi);
- The proposed system is capable of providing sufficient fire flow while maintaining a residual pressure of 138kPa (20 psi) in all areas.

### **12.2 Wastewater Servicing**

The LeBreton Flats subdivision will be serviced by a network of gravity sewers which will direct wastewater flows to two different outlets. The area north of the covered aqueduct contributing to the 375 mm diameter storm sewer in Fleet Street, and ultimately to the LeBreton Flats Pumping Station. The balance of the subdivision will be serviced by the 1200 mm diameter Cave Creek Collector which runs along Albert Street.

A small pump station will be required to service the two park blocks and Block 17.

The preferred cover requirement of 2.5 m for the sanitary sewer system has been satisfied in all locations, and requirements for slope and velocities have been met within the local internal sewers. The downstream sewers have been adequately sized to receive peak sanitary discharge from the proposed subdivision.

### **12.3 Stormwater Management**

The proposed stormwater management plan is in compliance with the goals specified in the background reports and the 2012 City of Ottawa Sewer Guidelines:

- On site storage within the blocks and ROWs are proposed to limit inflow from the subdivision into the existing storm sewers on Albert and Fleet Streets to the 5-year storm event based on City of Ottawa IDF curves and to a maximum runoff coefficient of 0.70;
- Major overland flow is directed to City managed rights-of-way;
- A major system overland capture point located south of the open aqueduct is proposed to manage spillage from Albert Street and approximately 21ha of external contributing area during the climate change (100yr +20%) storm event. Captured flows are to be directed to the open aqueduct. City of Ottawa and NCC to establish responsibilities for funding and construction.



## **Functional Servicing Study LeBreton Flats Plan of Subdivision**

### **12 Conclusions and Recommendations**

- Quality control is proposed to be provided by end-of-pipe filtration MTDs for urban rights-of-way, with additional on-site quality control required for site plan blocks north of the aqueduct, and for the hotel/potential arena parcel.
- Quality control for the proposed park blocks is anticipated to be provided by on-site surface filtration through the use of bioswales, enhanced grass swales, or other infiltration measures.

#### **12.4 Utilities**

Utility infrastructure is available on the surrounding municipal roadways and will be extended to service the subdivision. Designs will be prepared by each of the respective utilities at the detailed design stage.

#### **12.5 Municipal Right's of Way**

Alternative ROW cross sections will be used for this urban development to meet the intent of the MCP. Municipal ROW widths proposed are sufficient to accommodate all infrastructure needs. The alternative ROW sections will be established at detailed design.

#### **12.6 Grading**

The functional grading scheme has been developed to allow for an emergency overland flow outlet to downstream rights-of-way as per City standards, and ultimately to the open aqueduct as per existing conditions.

#### **12.7 Approvals/Permits**

At the detailed design stage, an MECP Environmental Compliance Approval (ECA) will be required for the proposed public storm sewage and stormwater management works. Approval for the new sewage pump station is expected to require approval through direct submission to the MECP, however this will be confirmed based on the final detailed design. The ECA for sanitary sewer works is anticipated to be required through the CLI ECA process.

At the subdivision construction phase, registration on the Environmental Activity Registry (EASR) or A Permit to Take Water (PTTW) may be required depending on the volume of water. Expected permitting requirements can be provided by the geotechnical engineer at the detailed design phase.



# APPENDICES



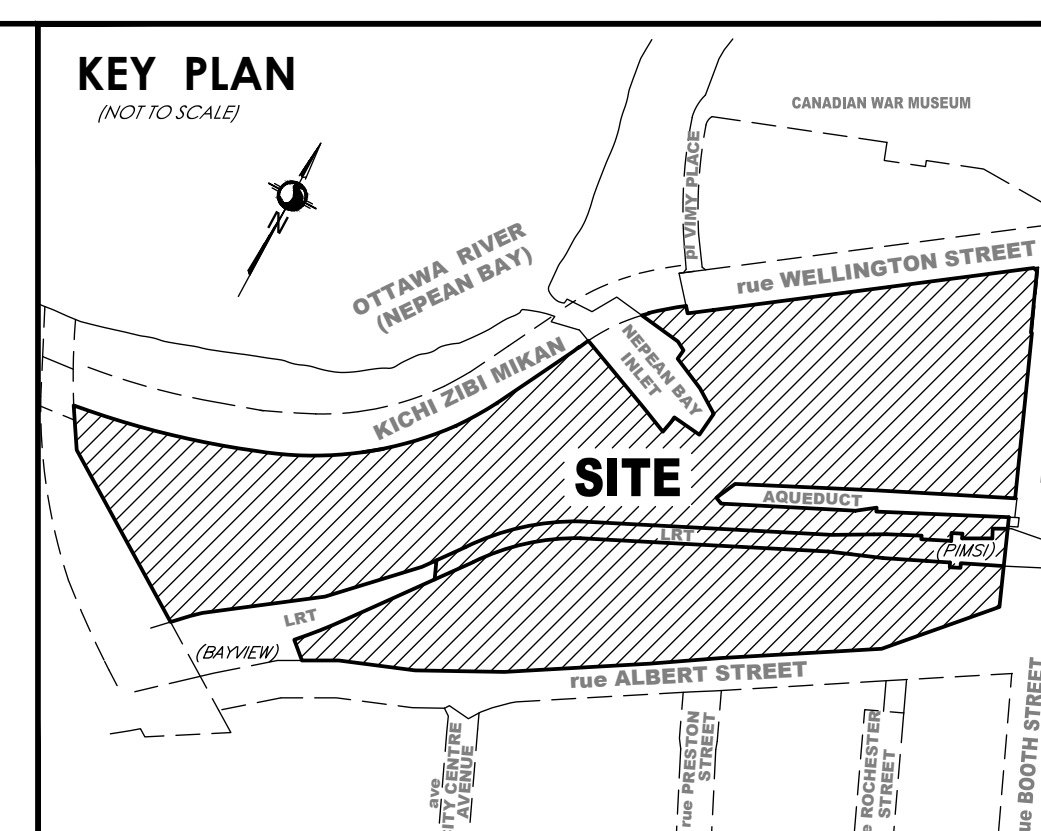
## **Appendix A Background**

### **A.1 Draft Plan and Densities**



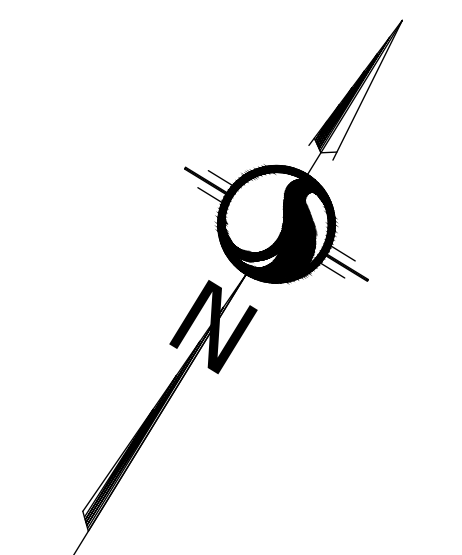
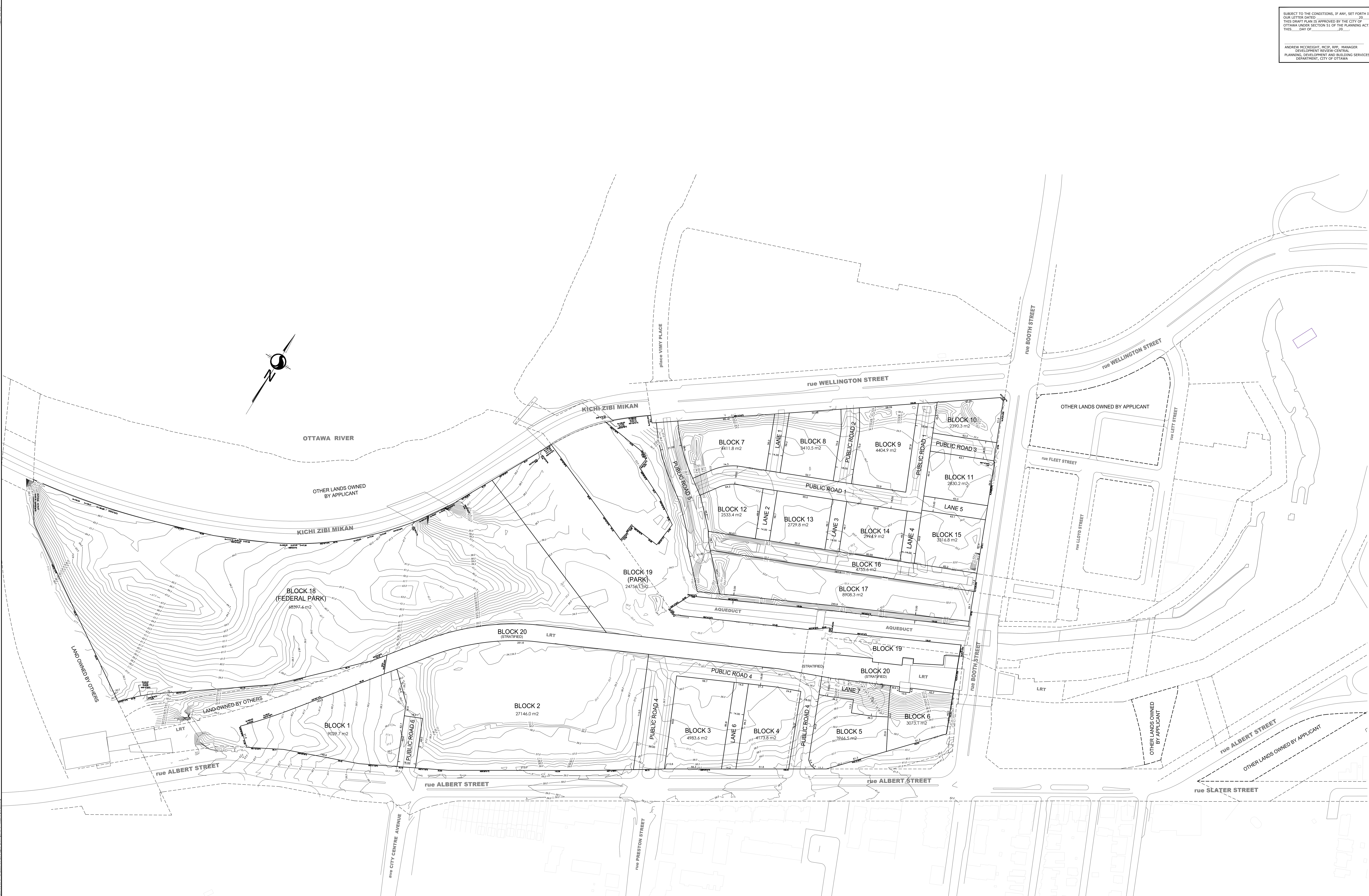
SUBJECT TO THE CONDITIONS, IF ANY, SET FORTH IN OUR LETTER DATED \_\_\_\_\_, 20\_\_\_\_.  
 THIS DRAFT PLAN IS APPROVED BY THE CITY OF OTTAWA UNDER SECTION 51 OF THE PLANNING ACT, THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 20\_\_\_\_.

ANDREW MCCREIGHT, M.C.P., R.P.P., MANAGER  
 DEVELOPMENT REVIEW-CENTRAL  
 PLANNING, DEVELOPMENT AND BUILDING SERVICES  
 DEPARTMENT, CITY OF OTTAWA



**DRAFT PLAN OF SUBDIVISION OF**

**PART OF LOTS 38, 39 AND 40  
 CONCESSION A (OTTAWA FRONT)  
 PART OF THE BED OF THE OTTAWA RIVER  
 IN FRONT OF LOT 38 & LOT 39,  
 CONCESSION A (OTTAWA FRONT)  
 PART OF DUCK ISLAND  
 IN FRONT OF LOT 38,  
 CONCESSION A (OTTAWA FRONT)  
 PART OF PRESTON STREET  
 (CLOSED BY BY-LAW OC1899021)  
 (GEOGRAPHIC TOWNSHIP OF NEPEAN)  
 PART OF BLOCKS A, B & C  
 PART OF MILL STREET  
 (CLOSED BY BY-LAW CR588482)  
 PART ENGINE HOUSE AREA  
 REGISTERED PLAN 60  
 LOTS 1 & 2 AND PART OF LOTS 3, 4 & 5  
 IN BLOCK E  
 PART OF LOTS 1, 2 & 3  
 IN BLOCK F  
 LOTS 2 TO 12 (BOTH INCLUSIVE)  
 IN BLOCK G  
 LOTS 2, 4, 6, 8, 10 & 11 AND PART OF LOTS  
 3, 5, 7, 9 & 12  
 IN BLOCK H  
 LOT 4 AND PART OF LOTS 1, 2 & 3  
 IN BLOCK S  
 LOTS 1 & 4 AND PART OF LOTS 2 & 3  
 IN BLOCK T  
 PART OF THE LANE AT REAR OF BLOCK S  
 THE LANE AT REAR OF BLOCK T  
 (CLOSED BY BY-LAW LT124312)  
 PART OF BROAD STREET  
 (CLOSED BY BY-LAW LT124312)  
 PART OF BROAD STREET  
 (CLOSED BY BY-LAW LT124312)  
 PART OF FLEET STREET  
 (FORMERLY QUEEN STREET)  
 (CLOSED BY BY-LAW LT124312)  
 PART OF OTTAWA STREET  
 (CLOSED BY BY-LAW LT124312)  
 PART OF SHERWOOD STREET  
 (CLOSED BY BY-LAWS CR280019)  
 REGISTERED PLAN 2  
 LOTS A, B, C & D  
 REGISTERED PLAN 31129  
 CITY OF OTTAWA**



Scale 1:1000  
 METRIC CONVERSION  
 DIMENSIONS AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

**STRAFTA NOTE:**  
 THIS PLAN IS STRATIFIED TO SHOW HCC AIR RIGHTS ON BLOCK 20

**ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51 OF THE PLANNING ACT:**  
 (A) AS SHOWN ON DRAFT PLAN  
 (B) AS SHOWN ON DRAFT PLAN  
 (C) AS SHOWN ON DRAFT PLAN  
 (D) AS SHOWN ON DRAFT PLAN  
 (E) AS SHOWN ON DRAFT PLAN  
 (F) AS SHOWN ON DRAFT PLAN  
 (G) AS SHOWN ON DRAFT PLAN  
 (H) AS SHOWN ON DRAFT PLAN  
 (I) AS SHOWN ON DRAFT PLAN  
 (J) AS SHOWN ON DRAFT PLAN

**LAND USE**

NUMBER OF RESIDENTIAL BLOCKS:	4
NUMBER OF COMMERCIAL OR MIXED USE BLOCKS:	11
NUMBER OF LANES:	7
NUMBER OF PUBLIC ROADS:	6
NUMBER OF PARKS:	2
AREA OF DEVELOPMENT BLOCKS (1-17):	9,504 m <sup>2</sup>
AREA OF PARKS (BLOCKS 18-19):	9,315 m <sup>2</sup>
AREA OF LANES:	5,669 m <sup>2</sup>
AREA OF PUBLIC ROADS:	1,995 m <sup>2</sup>
<b>TOTAL AREA OF SUBDIVISION:</b>	<b>21,484 m<sup>2</sup></b>

**OWNER'S CERTIFICATE**  
 I HEREBY AUTHORIZE STANTEC GEOMATICS LTD. TO SUBMIT THIS DRAFT PLAN OF SUBDIVISION ON MY BEHALF.

DATE: \_\_\_\_\_

I HAVE THE AUTHORITY TO SIGN THE CORPORATION

**SURVEYOR'S CERTIFICATE**  
 I HEREBY CERTIFY THAT THE BOUNDARIES OF THE SUBJECT LANDS AND THEIR RELATIONSHIP TO ADJOINING LANDS HAVE BEEN ACCURATELY AND CORRECTLY SHOWN.

DATE: \_\_\_\_\_

FRANCIS LAU  
 CHIEF MEASURING OFFICER

**Stantec**  
 CANADA LAND SERVICES  
 100 GILLES AVENUE, SUITE 300  
 OTTAWA, ONTARIO, K1G 3G4  
 TEL: 613-772-4452  
 WWW.STANTEC.COM

DRAWN: ME CHECKED: \_\_\_\_\_ DATE: August 28, 2024 PROJECT NO.: 15047100-11





## **A.2 Background Report Excerpts**



R-0813

11934.A



Commission

Commission  
de la Capitale nationale

Canada

**LEBRETON FLATS  
INFRASTRUCTURE  
AND REMEDIATION PROJECT**

**PROJECT N°: SC436**



**MASTER SERVICING REPORT**

**FINAL REPORT (5<sup>TH</sup> REVISION)**

O/File: 480000-100-Hy-07



**DESSAU  
SOPRIN**

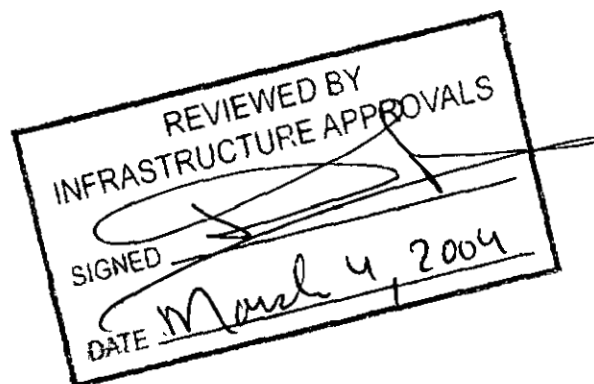
# LeBreton Flats Infrastructure and Remediation Project

## Master Servicing Report

FINAL REPORT (5<sup>th</sup> Revision)

February 2004

Y/Ref.: SC-436  
O/Ref.: 480000-100-Hy-07



SANITARY SEWER DESIGN SHEET - PRELIMINARY

Dessau-Soprin inc.

February 6, 2004

SC-436

CLIENT: National Capital Commission

PROJECT: Le Breton Flats Infrastructure and Remediation Project

DESIGNED: Nicolas Vekeman, Dominique Deveau

Location				Description										Flows					Proposed sewer data**				
Street	From mh	To mh	Sub-catchment	Detail	Individual		Accumulative		Peak factor (M)	Individual		Accumulative		Q <sub>res</sub> (l/s)	Q <sub>urban</sub> (l/s)	Q <sub>office</sub> (l/s)	Q <sub>retail</sub> (l/s)	Q <sub>total</sub> (l/s)	Diameter (mm)	Slope (%)	Length (m)	Q <sub>cap.</sub> (l/s)	Velocity (m/s)
					Pop. (persons)	Area (ha)	Pop. (persons)	Area (ha)		Office (m <sup>2</sup> )	Retail (m <sup>2</sup> )	Office (m <sup>2</sup> )	Retail (m <sup>2</sup> )										
Booth	5	8	13 & 14	X,W,V			5.32			64000		64000		0.0	1.5	5.6	0.0	7.0	250	0.45	90	39.9	0.81
Forgarty	26	11	30	K	202	0.49	202	0.49	4.15		400		400	3.4	0.1	0.0	0.0	3.6	250	0.45	60	39.9	0.81
Forgarty	11	11a	15	1/2L & 1/2M	480	0.63	682	1.12	3.90				400	10.8	0.3	0.0	0.0	11.1	250	0.45	60	39.9	0.81
Forgarty	11a	10					682	1.12	3.90				400	10.8	0.3	0.0	0.0	11.1	250	0.45	75	39.9	0.81
LeBreton	9	10	16	1/2L	252	0.28	252	0.28	4.11					4.2	0.1	0.0	0.0	4.3	250	0.45	90	39.9	0.81
LeBreton	10	12	17	1/4M	114	0.18	1048	1.58	3.79				400	16.1	0.4	0.0	0.0	16.6	250	0.45	80	39.9	0.81
Broad	27	13	31	1/2J	101	0.22	101	0.22	4.24		200		200	1.7	0.1	0.0	0.0	1.8	250	0.45	75	39.9	0.81
Broad	13	13a	18	1/4M & 1/2N	376	0.59	477	0.81	3.98				200	7.7	0.2	0.0	0.0	7.9	250	0.45	75	39.9	0.81
Broad	13a	12					477	0.81	3.98				200	7.7	0.2	0.0	0.0	7.9	250	0.45	80	39.9	0.81
LeBreton	12	14	19	1/4N	131	0.21	1656	2.6	3.65				600	24.5	0.7	0.0	0.1	25.3	300	0.4	75	61.2	0.87
Sherwood	28	15	32	1/2J	101	0.22	101	0.22	4.24		200		200	1.7	0.1	0.0	0.0	1.8	250	0.45	75	39.9	0.81
Sherwood	15	15a	20	O2 & 1/4N	332	0.56	433	0.78	4.01				200	7.0	0.2	0.0	0.0	7.3	250	0.45	80	39.9	0.81
Sherwood	15a	14					433	0.78	4.01				200	7.0	0.2	0.0	0.0	7.3	250	0.45	90	39.9	0.81
LeBreton	14	8	21	O		0.27	2089	3.65	3.57	19000	1000	19000	1800	30.2	1.0	1.6	0.2	33.0	300	0.4	85	61.2	0.87
Booth	8	16	22	U		0.4	2089	9.37	3.57	25200	1400	108200	3200	30.2	2.6	9.4	0.3	42.5	375	0.3	75	96.0	0.87
Booth	17	16	23	P3 & O3		0.7		0.7		34525	3305	34525	3305	0.0	0.2	3.0	0.3	3.5	250	0.45	115	39.9	0.81
Fleet	16	18	24	1/2P	104	0.09	2193	10.16	3.55		100	142725	6605	31.6	2.8	12.4	0.6	47.4	375	0.45	75	117.6	1.06
Lloyd	24	20	33	I	21	0.1	21	0.1	4.38		100		100	0.4	0.0	0.0	0.0	0.4	250	0.45	105	39.9	0.81
Lloyd	20	18	27	1/2P & 1/2Q	330	0.33	351	0.43	4.05		100		200	5.8	0.1	0.0	0.0	5.9	250	0.45	105	39.9	0.81

SANITARY SEWER DESIGN SHEET - PRELIMINARY

Dessau-Soprin inc.

February 6, 2004

SC-436

CLIENT: National Capital Commission

PROJECT: Le Breton Flats Infrastructure and Remediation Project

DESIGNED: Nicolas Vekeman, Dominique Deveau

Location				Description										Flows					Proposed sewer data**				
Street	From mh	To mh	Sub-catchment	Detail	Individual		Accumulative		Peak factor (M)	Individual		Accumulative		Q <sub>res</sub> (l/s)	Q <sub>extran</sub> (l/s)	Q <sub>office</sub> (l/s)	Q <sub>retail</sub> (l/s)	Q <sub>total</sub> (l/s)	Diameter (mm)	Slope (%)	Length (m)	Q <sub>cap.</sub> (l/s)	Velocity (m/s)
					Pop. (persons)	Area (ha)	Pop. (persons)	Area (ha)		Office (m <sup>2</sup> )	Retail (m <sup>2</sup> )	Office (m <sup>2</sup> )	Retail (m <sup>2</sup> )										
Fleet	18	22	26	1/4Q	114	0.12	2658	10.71	3.49			142725	6805	37.5	3.0	12.4	0.6	53.5	375	0.45	80	117.6	1.06
Lett	21	22	25	S & T	420	1.18	420	1.18	4.01	37800	2100	37800	2100	6.8	0.3	3.3	0.2	10.6	250	0.45	90	39.9	0.81
Lett	23	22	28	R & 1/4Q	415	0.43	415	0.43	4.01					6.7	0.1	0.0	0.0	6.9	250	0.45	110	39.9	0.81
Fleet	22	PS					3493	12.32	3.39			180525	8905	47.9	3.4	15.7	0.8	67.8*	375	0.45	80	117.6	1.06

Drawing Reference: 480000 (100) HY0001 and HYC002

Notes: Stacked and Townhouses 3.0 ppu  
 Low or Med-Rise 2.1 ppu  
 High-Rise 2.1 ppu

N-Value : 0,013

\* Add 20 l/s to include future development of Victoria Island.

\*\* Pipes were designed to meet future Victoria Island needs.

Design flow rates (Q) :

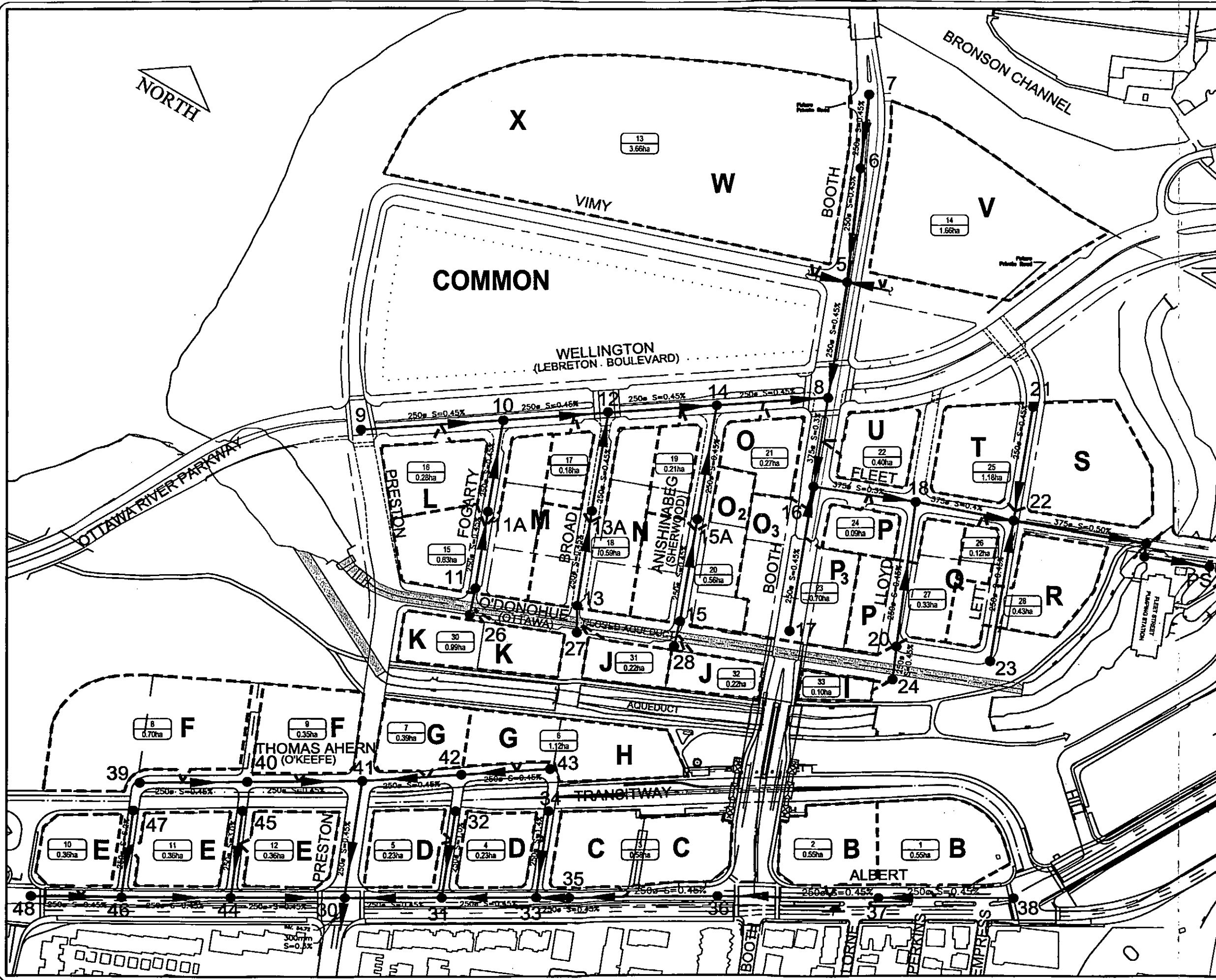
- Residential (res) : 350 l/pers/d
- Extraneous (extran) : 0,28 l/s/ha
- Office (office) : 5 l/d/m<sup>2</sup>
- Retail (retail) : 5 l/d/m<sup>2</sup>

Peaking Factor :

Res.:  $M = 1 + K \times \left( \frac{14}{4 + P^{1/2}} \right)$   
 P = population in 1000's  
 K = 1

Office : 1,5  
 Retail : 1,5

File: \\Data\sherrin\DATA\Proj\048\480000\W\0 DAO\Conceptual Design Plan\Dao 100\0480000100HYC002.dwg



Legend

- 250m Proposed sanitary sewer
- G** Block identification
- 15** Node number
- 5 Subcatchment number  
0.92ha Land area in hectares
- Subcatchment areas

**LEBRETON FLATS  
INFRASTRUCTURE AND REMEDIATION PROJECT  
MASTER SERVICING REPORT**

Titre  
**SANITARY SUBCATCHMENT  
AREA PLAN**

**DESSAU  
SOPRIN**

Dessau-Soprin inc.  
885, boul. de la Carrière, office 110  
Hull (Québec) J8Y 6S6  
Phone no.: (819) 771-2727  
Fax: (819) 771-3689

Prepared N. Vekaman	Department: Municipal	Project director: S. Duplessis
Drawn L. De Gregorio	Scale: Not to scale	
Verified D. Deveau	Date: May 02, 2003	

Project	Work lot	Dept.	Drawing no.	Rev.
<b>0480000100HYC0020B</b>				



CONSULTING  
ENGINEERS  
PLANNERS

Ainley Graham & Associates Limited  
2724 Fenton Road, Gloucester, Ontario K1T 3T7  
Tel: (613) 822-1052 • Fax: (613) 822-1573  
E-mail: ottawa@ainleygroup.com

January 8, 2001

File No. 21010.1

National Capital Commission  
40 Elgin Street  
Suite 202  
Ottawa, Ontario  
K1P 1C7

Attn: **Mr. Robert Walters, MCIP, RPP**  
**Senior Planner**  
**Property Development & Planning**

Ref: **LeBreton Flats Redevelopment**  
**Infrastructure Needs Study**

Dear Sir:

Ainley Group is please to submit three (3) copies of the final report, incorporating review agency comments, entitled "Lebreton Flats Redevelopment Infrastructure Needs Study (Updated 2001)" (January 2002). Should you have any further questions please do not hesitate to contact us.

Yours very truly,

AINLEY GRAHAM & ASSOCIATES LTD.,

Fairouz Wahab, P. Eng.  
Project Engineer

Encl.  
FW/fw

Cc. Ronald Jack, P. Eng. - Delcan Corporation  
John van Gaal, P. Eng. - Stantec Consulting

J:\21000\21010\report\RW080102.let.wpd

TABLE 1-1

**LEBRETON FLATS DEVELOPMENT DENSITIES  
OPTION 1 (EXCLUDING BLOCKS W3 AND X3 AS PART OF PHASE I)**



Block	Area (ha)	Residential			Residential Population				Office (m <sup>2</sup> )	Retail (m <sup>2</sup> )
		Stacked	Low or	High-Rise	S-TH 3.0 (ppu)	L/M-R 2.1 (ppu)	H-R 2.1 (ppu)	Total		
		Townhouse (units)	Mid-Rise (units)	(units)						
<b>PHASE I</b>										
O	0.27	-	-	-	-	-	-	0	19,000	1,000
U-T	0.94	-	-	-	-	-	-	0	63,000	3,500
<b>Sub-Total</b>	<b>1.21</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>82,000</b>	<b>4,500</b>
<b>PHASE II</b>										
P	0.19	34	50	-	102	105	-	207	-	200
Q-R	0.77	10	345	-	30	725	-	755	-	-
S	0.84	-	-	200	-	-	420	420	-	-
<b>Sub-Total</b>	<b>1.80</b>	<b>44</b>	<b>395</b>	<b>200</b>	<b>132</b>	<b>830</b>	<b>420</b>	<b>1382</b>	<b>0</b>	<b>200</b>
<b>PHASE III</b>										
J2	0.22	-	48	-	-	101	-	101	-	200
K2	0.24	-	48	-	-	101	-	101	-	200
L2	0.56	-	160	80	-	336	168	504	-	-
M2	0.70	40	80	80	120	168	168	456	-	-
N2	0.82	40	112	80	120	235	168	523	-	-
O2	0.35	32	50	-	96	105	-	201	-	-
<b>Sub-Total</b>	<b>2.89</b>	<b>112</b>	<b>498</b>	<b>240</b>	<b>336</b>	<b>1046</b>	<b>504</b>	<b>1886</b>	<b>0</b>	<b>400</b>
<b>PHASE IV</b>										
B3	1.09	-	-	-	-	-	-	0	25,000	418
C3	0.58	-	-	-	-	-	-	0	16,200	800
D3	0.45	-	90	80	-	189	168	357	-	800
E3	1.07	-	90	200	-	189	420	609	-	1,200
F3	1.05	-	280	-	-	588	-	588	-	-
G3	0.77	13	128	-	39	269	-	308	-	-
H3	0.73	8	64	-	24	134	-	158	-	-
I3	0.10	-	10	-	-	21	-	21	-	100
J3	0.22	-	48	-	-	101	-	101	-	200
K3	0.25	-	48	-	-	101	-	101	-	200
O3	0.32	-	-	-	-	-	-	0	24,000	1,200
P3	0.38	-	-	-	-	-	-	0	10,525	2,105
V3	1.66	-	-	-	-	-	-	0	11,798	-
W3	2.16	-	-	-	-	-	-	0	21,563	-
X3	1.49	-	-	-	-	-	-	0	22,813	-
<b>Sub-Total</b>	<b>12.32</b>	<b>21</b>	<b>758</b>	<b>280</b>	<b>63</b>	<b>1,592</b>	<b>588</b>	<b>2,243</b>	<b>131,899</b>	<b>7,023</b>
<b>TOTAL</b>	<b>18.02</b>	<b>177</b>	<b>1,651</b>	<b>720</b>	<b>531</b>	<b>3,467</b>	<b>1,512</b>	<b>5,510</b>	<b>213,899</b>	<b>12,123</b>

NOTES: Land areas, Residential units, Office & Retail areas provided by NCC (March 26, 2001)  
Residential Persons per Unit (ppu) from Update Report (1993)



**From:** [Montgomery, Paul](#)  
**To:** [O'Connell, Erin](#); [Smadella, Karin](#)  
**Cc:** [Mottalib, Abdul](#); [Thiffault, Dustin](#)  
**Subject:** Re: Lebreton Flats Draft Plan of Subdivision - Engineering Discussion  
**Date:** Tuesday, November 14, 2023 7:55:22 PM  
**Attachments:** [image001.gif](#)  
[image002.png](#)

---

Hello Karen; all is well and I hope the same for you and yours.

Below is what information I have regarding water elevations, in and around the two Fleet Street aqueducts:

The **open aqueduct** is largely connected, together with the **covered aqueduct**, with and at the forebay of the Fleet Street Pumping Station. With little usual flow through the **open aqueduct**, I would guess that its usual water elevation would be fairly level along its length and would follow the usual operating level of the forebay; currently between 51.82m and 52.03m (per Record Drawings: ISB05-3013, Sheet 1, Delcan). Peak and surge operating levels, in the forebay, can be higher and sometimes spill over the forebay's stoplog weir. I don't have a precise elevation of this weir but, from previous visual observations, I would roughly estimate its current crest elevation to be ~52.2m.

The hydraulic grade line along the length of the **covered aqueduct** is much steeper and will, of course, vary with flow rate. Usual and optimal flow rates through the **covered aqueduct** were estimated to be between 25 to 35m<sup>3</sup>/s (Fleet Street Pumping Station Hydraulic Capacity Study, October 1998, Delcan).

For the **open aqueduct**, Water Production has no records of upstream water elevations, estimated or observed, for or during storm events. It is worth noting that there is a small diameter (~200mm?) pipe connection, at the upper end of the **open aqueduct**, which flows water from the river and from just above the headworks facility, to maintain some flow through. This small pipe connection, along with any other seepage, piped or overland flows entering into the **open aqueduct**, would steepen its operating hydraulic grade line somewhat but, to what degree, I cannot precisely say.

For the **covered aqueduct**, data taken from personal survey notes on April 30, 2019, recorded the peak river water elevation, just upstream of the Headworks flow control gates, at 53.7m. I then estimated an additional river level increase of ~0.5m would begin to bypass at/around the Headworks facility and down into the lower Lebreton Flats area. From the same Delcan study noted above, the usual river water elevation, just above Headworks, was noted as 52.8m (as controlled by the Chaudiere Ring Dam). Much of the then observed headloss, through the **covered aqueduct**, was attributed to the Headworks trash racks and gatehouse structure.

Lastly, I do recall finished grades, adjacent to the **open aqueduct** and by the Pimisi Station, being quite close the usual operating level of the forebay. I did not keep copies of those early station drawings but Erin should know where they can be found.

I hope you find this information helpful!

Paul

**From:** [Montgomery, Paul](#)  
**To:** [Smadella, Karin](#)  
**Cc:** [Moroz, Peter](#); [Tousignant, Eric](#); [Duquette, Vincent](#); [Fawzi, Mohammed](#)  
**Subject:** RE: Open Aqueduct Configuration - Upstream end.  
**Date:** Monday, March 25, 2024 8:56:41 PM  
**Attachments:** [~WRD2863.jpg](#)  
[image001.png](#)  
[SN 015120 STRUCTURAL EVALUATION FINAL REPORT MARCH 2015.pdf](#)  
[B01512001-01 .pdf](#)

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Hi Karin,

Unfortunately, I am fairly certain that the City has very little detailed record information on this former rail bridge. I recall a concerted effort made by several staff to locate any such details, in advance of the construction of the temporary Preston Street Extension but, to my knowledge, very little was found. I have attached what I could find through the City's Geoinformation site, about this immediate area, for your reference. Much of the structure is on NCC property so I can only speculate who might now own this structure. From the attached 2014 report's photos, it would also appear that the LPTM has been routed under a portion of the southerly end of the former (and now heritage) 1870 railway bridge (SN015120). This 2014 report mentions an earlier 2006 condition report but I could not find a copy of it on the Geoinformation site. If the City's structures folks have more detail, perhaps try reaching out to Jack Zhao?

As you may already know, the original open aqueduct extended through to Nepean Bay and had its own headworks structure (i.e. separate from the current headworks structure). Historical photos and the attached report appear to confirm that this open aqueduct was, at one time, entirely routed underneath this former rail bridge. I have checked and no detailed records, about this abandoned section of open aqueduct or former headworks structure, are here at Lemieux or on the same geoinformation site. As such, precisely how and how much of this aqueduct section was filled in, I cannot say, but I would guess that any original rock cut, for this aqueduct section, was simply filled in, from the then shore and back towards this former rail bridge. The attached MH report suggests likewise and notes that only a southerly ~10m section of the arch structure still acts as a bridge, with the rest underlain by some manner of fill material.

The dashed line, as highlighted in red below, shows a rather *approximate* location of the pipe, as I understand it, but I would suggest that its terminus lies somewhere underneath the old rail bridge and not beyond. Again, like much of this area, details on this pipe are few. I can confirm that the pipe exists and it is valved off, from time to time, coincident with the draining of the aqueducts. I would guess that the pipe was installed along and with the filling in of the upstream section of the old aqueduct. Again, I have no details of the pipe's depth but there is a valve box inside our fenced headworks compound, like those used for watermains, which we can operate.

The attached drawing, by Stantec, details some circa 2001 rehabilitation work completed on the bridge. This was the only drawing I found, for this particular structure, so I hope this, and the above information will be helpful.

Take care,

Paul

**M. Paul Montgomery, P.Eng.**  
Plant Manager, Water Production East  
Infrastructure and Water Services Department, City of Ottawa  
1 Onigam Street, Ottawa, Ontario, K1Y 2C4  
tel / tél: (613) 580-2424, ext / poste: 23302  
cell: (613) 223-0907  
e-mail / courriel: [Paul.Montgomery@ottawa.ca](mailto:Paul.Montgomery@ottawa.ca)

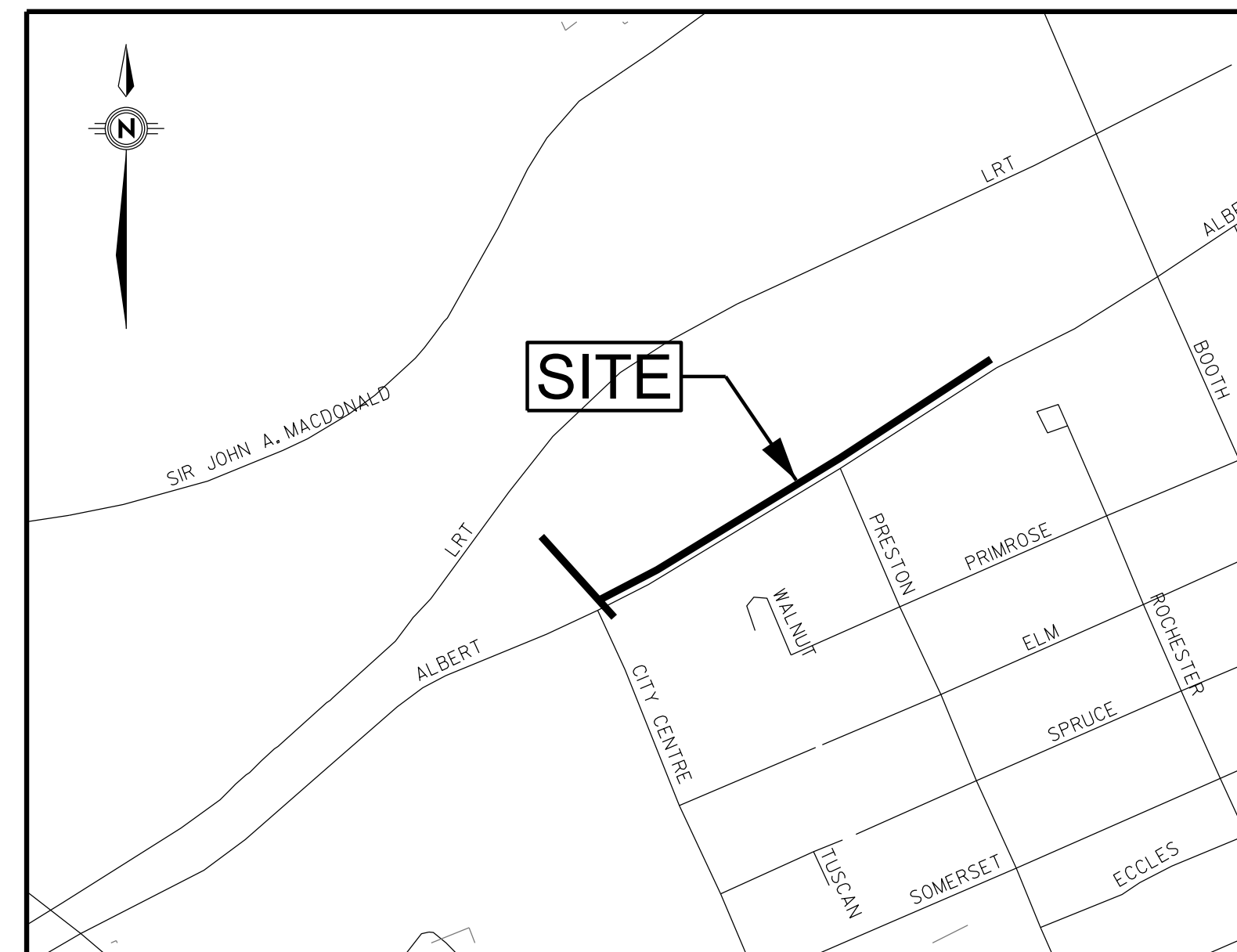
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**From:** Smadella, Karin <Karin.Smadella@stantec.com>



# INFRASTRUCTURE SERVICES

C. DUCLOS, P.ENG.  
DIRECTOR  
INFRASTRUCTURE SERVICES



**Robinson**  
Consultants

## CAVE CREEK COLLECTOR REALIGNMENT

### CONTRACT NO. CP000511

ISSUED FOR FINAL PRELIMINARY DESIGN  
JAN. 23, 2024

# SYMBOLS

EXISTING

PROPOSED

REMOVALS

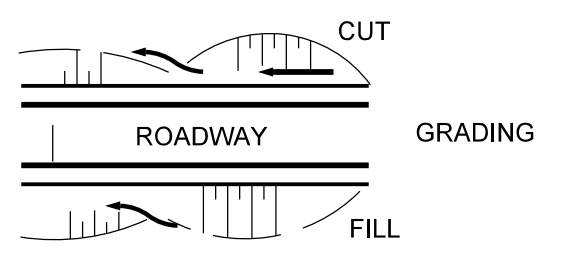
Structure Adjustment		(SL)	○ ADJ DENOTES ADJUSTMENT ONLY
Self Leveling Frame & Cover		CS	
Clay Seal			
San. Sewer & Manhole		PROP. 250mmØ SAN	
Comb. Sewer & Manhole		PROP. 250mmØ COMB	
Storm Sewer & Manhole		PROP. 450mmØ STM	
Single Curb Inlet Catch Basin		CICB#	
Single Catch Basin		CB#	
Ditch Inlet Catch Basin		DICB#	
Double Curb Inlet Catch Basin		DCICB#	
Double Catch Basin		DCB#	
Subdrain ( with direction of flow )			
Water Main		PROP. 406mmØ WM	
Hydrant & Valve Box		V&VB	
Valve & Valve Box		V&VB	
Valve & Valve Chamber		V&VC	
Valves ( Water services only )		SP	
Sanitary Service Lateral		SA	
Storm Service Lateral		ST	
Water Lateral & Stand Pipe		SP	
Gas Main & Valve			
Property Line			
Concrete Curb			
Depressed Curb		DC	
Ditch			
Fence & Gate			
Guide Rail			
Retaining Wall			
Trees ( Dripline & Trunk Dia. / Small Tree )			
Hedge / Brush Area			
Concrete Sidewalk / Median			
Asphalt Sidewalk / Pathway			
Asphalt Laneways & Entrances			
Asphalt ( Full Depth )			
Asphalt ( Partial Depth )			
Gravel Laneways & Entrances			
Paving Stones			
TWSI			
Bell Utility Pole & Anchor			
Bell Manhole			
Bell Box / Pedestal			
Hydro Utility Pole & Anchor			
Hydro Manhole			
Hydro Transformer / Pedestal			
Light Standard			
Traffic Manhole			
Traffic Handhole			
Traffic Control Box			
Traffic Mast Arm Foundation			
Metal Pole			
Wood Pole			

# REFERENCE POINTS

● BM ELEV.	BENCH MARK
□ CM	CONCRETE MONUMENT
■	ROCK BAR
● IP	IRON TUBE OR PIPE
■ IB	IRON BAR
● PK	PK NAIL
● ISCM 2-	2ND ORDER INTEGRATED SURVEY CONTROL MONUMENT
● ISCM 3-	3RD ORDER INTEGRATED SURVEY CONTROL MONUMENT
✂	CUT CROSS
V	CUT VEE
● RIB	ROUND IRON BAR
∅	REINFORCING BAR
■ SIB	STANDARD IRON BAR
■ SSIB	SHORT STANDARD IRON BAR

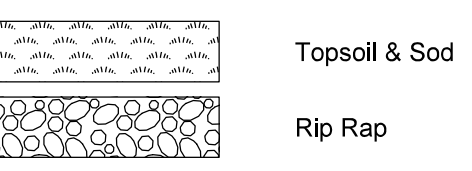
DWG.	DESCRIPTION
000	COVER SHEET
I1	LEGEND, INDEX, AND NOTES
P01	PLAN & PROFILE - STA. 1+000 TO 1+150
P02	PLAN & PROFILE - STA. 2+000 TO 2+150
P03	PLAN & PROFILE - STA. 2+150 TO 2+300
P04	PLAN & PROFILE - STA. 2+300 TO 2+450

# MISCELLANEOUS



- MW4 MONITORING WELL (PLAN VIEW)
- BH4 BOREHOLE (PLAN VIEW)
- AG4 AUGER HOLE (PLAN VIEW)
- HV4 HYDROVAC HOLE (PLAN VIEW)

# SUPPLEMENTAL



CAVE CREEK COLLECTOR REALIGNMENT



LEGEND, INDEX, AND NOTES

Contract No. CP-000511 Dwg. No. 11

Sheet - of -

C. Duclos, P.Eng. J. Trudel, P.Eng.



Asset No.

Asset Group

Des. I.M. Chkd. D.S.

Dwn. I.M. Chkd. D.S.

Utility Circ. No. Index No.

Const. Inspector

Scale: HORIZONTAL

0m - -

0m VERTICAL

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

No.	Description	By	Date (dd/mm/yy)
1	ISSUED FOR PRELIMINARY DESIGN CIRCULATION	D.S.	24/11/23
2	ISSUED FOR FINAL PRELIMINARY DESIGN	D.S.	23/01/24

NOT FOR CONSTRUCTION

Asset No. \_\_\_\_\_  
Asset Group \_\_\_\_\_

C. Duclos, P.Eng. Director Infrastructure Services  
J. Trudel, P.Eng. Senior Engineer Infrastructure Services

**Robinson Consultants**

Des. I.M. Chkd. D.S.  
Dwn. I.M. Chkd. D.S.  
Utility Circ. No. Index No. \_\_\_\_\_  
Const. Inspector \_\_\_\_\_

Scale: HORIZONTAL 10  
VERTICAL 2

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

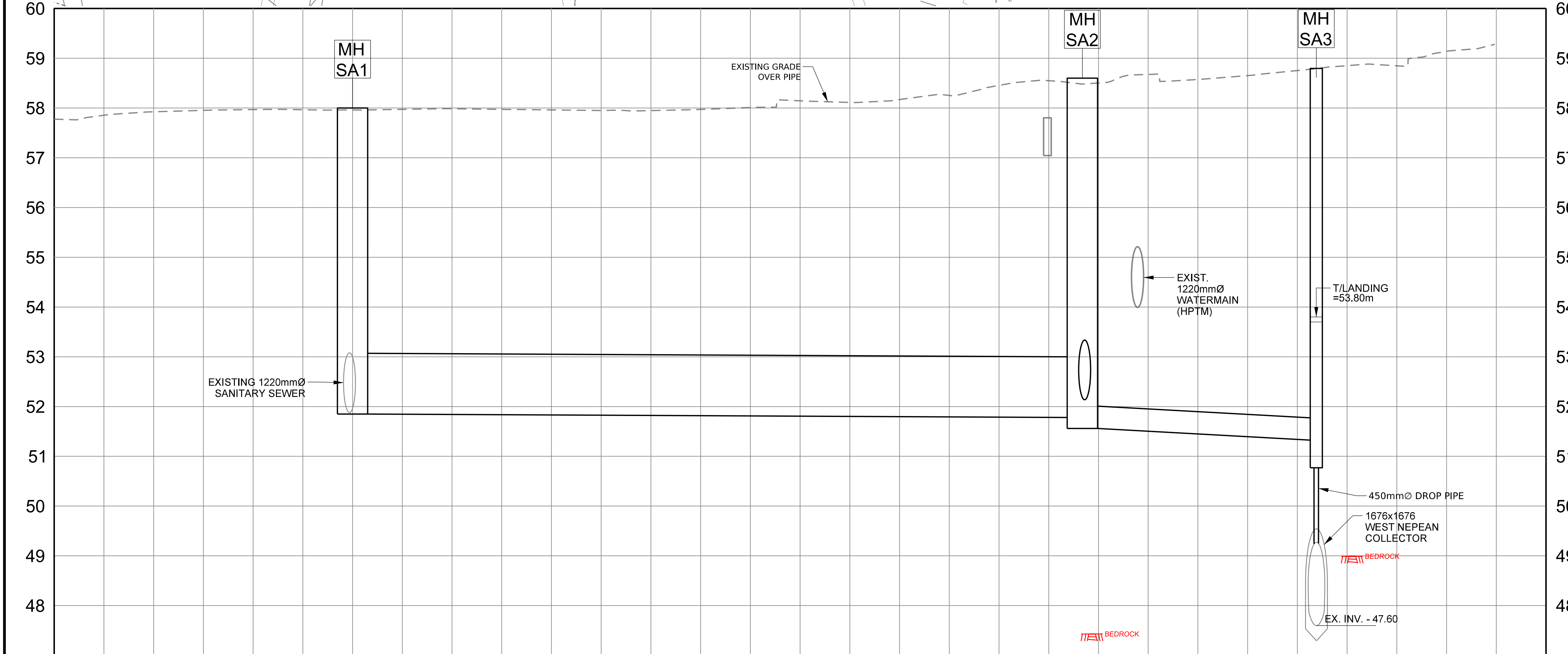
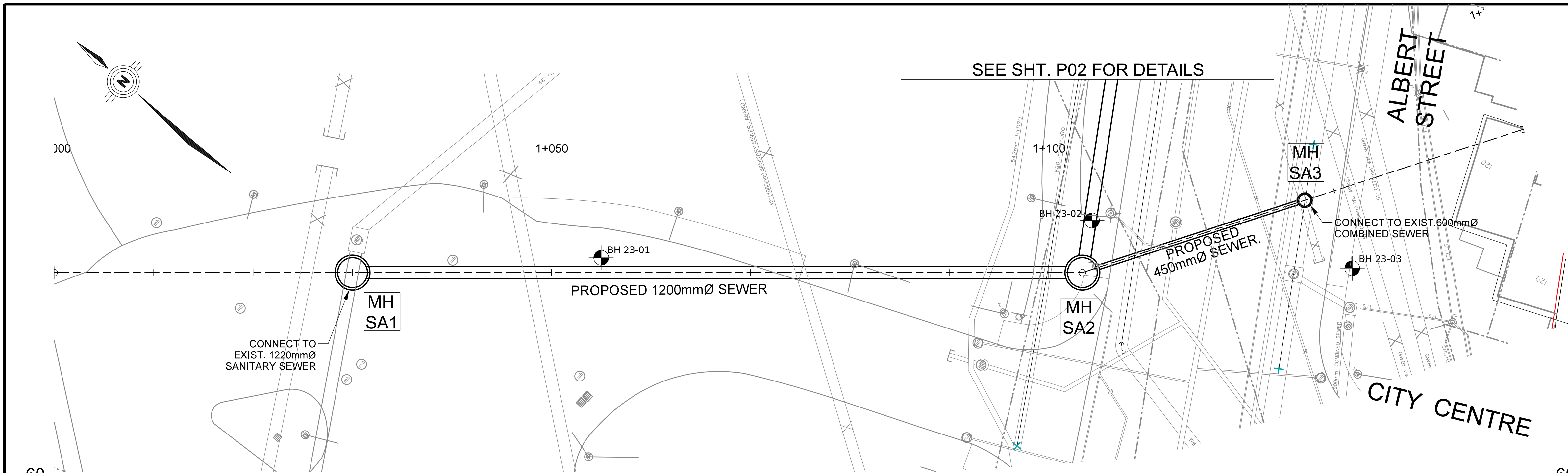
No.	Description	By	Date (dd/mm/yy)
1	ISSUED FOR PRELIMINARY DESIGN CIRCULATION	D.S.	24/11/23
2	ISSUED FOR FINAL PRELIMINARY DESIGN	D.S.	23/01/24

**NOT FOR CONSTRUCTION**

SANITARY SEWER MH DATA							
No.	Station	Offset (m)	Type		Elevations		Grate to Invert
			Structure	Cover	Grate	Low Inv.	
MHSA1	1+030.00	0.00	701.014	S24	58.00	51.85	6.15
MHSA2	1+103.38	0.00	701.014	S24	58.60	51.56	7.04
MHSA3	1+126.90	0.00	701.010	S24 / SL	58.80	50.73	8.08

SL DENOTES SELF LEVELLING COVER

NOTE:  
CITY OF OTTAWA IS IN CONSULTATION WITH HYDRO OTTAWA REGARDING THE IMPACTED HYDRO UNDERGROUND INFRASTRUCTURE



57.776	57.854	57.923	57.952	57.968	57.965	57.962	57.973	57.986	57.972	57.961	57.949	57.949	57.972	58.009	58.144	58.112	58.171	58.252	58.454	58.549	58.503	58.675	58.572	58.651	58.752	58.850	58.848	59.139	EXISTING GRADE OVER PIPE						
PROPOSED TOP OF WATERMAIN																																			
PROPOSED STORM SEWER INVERT																																			
					51.850	70.38m - PROPOSED 1200mm Concrete SANITARY SEWER @ 0.10%															51.780	51.560	21.39m - PROPOSED 450 mm PVC SANITARY SEWER @ 1.10%		51.325				PROPOSED SANITARY SEWER INVERT						
1+000					1+025											1+050						1+075						1+100			1+125				STATION

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

No.	Description	By	Date (dd/mm/yy)
1	ISSUED FOR PRELIMINARY DESIGN CIRCULATION	D.S.	24/11/23
2	ISSUED FOR FINAL PRELIMINARY DESIGN	D.S.	23/01/24

**NOT FOR CONSTRUCTION**

SANITARY SEWER MH DATA						
No.	Station	Offset (m)	Type	Structure	Cover	Elevations
						Grate   Low Inv.   Invert
MHSA2	2+050.00	0.00	SEE DWG. P01 FOR DETAILS			

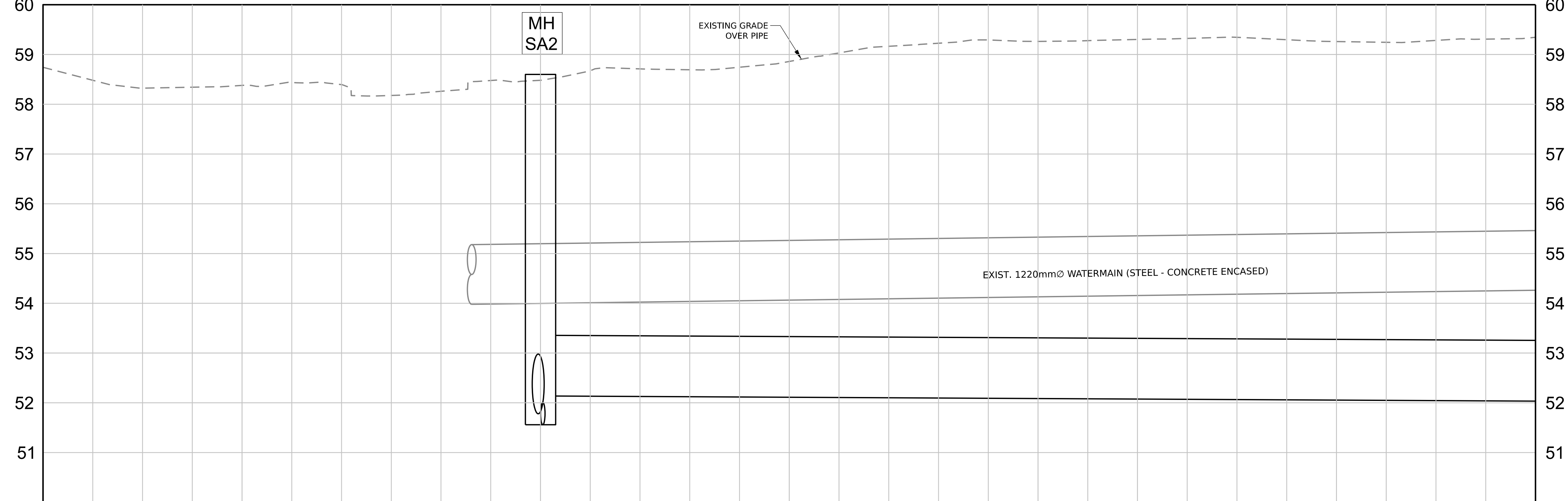
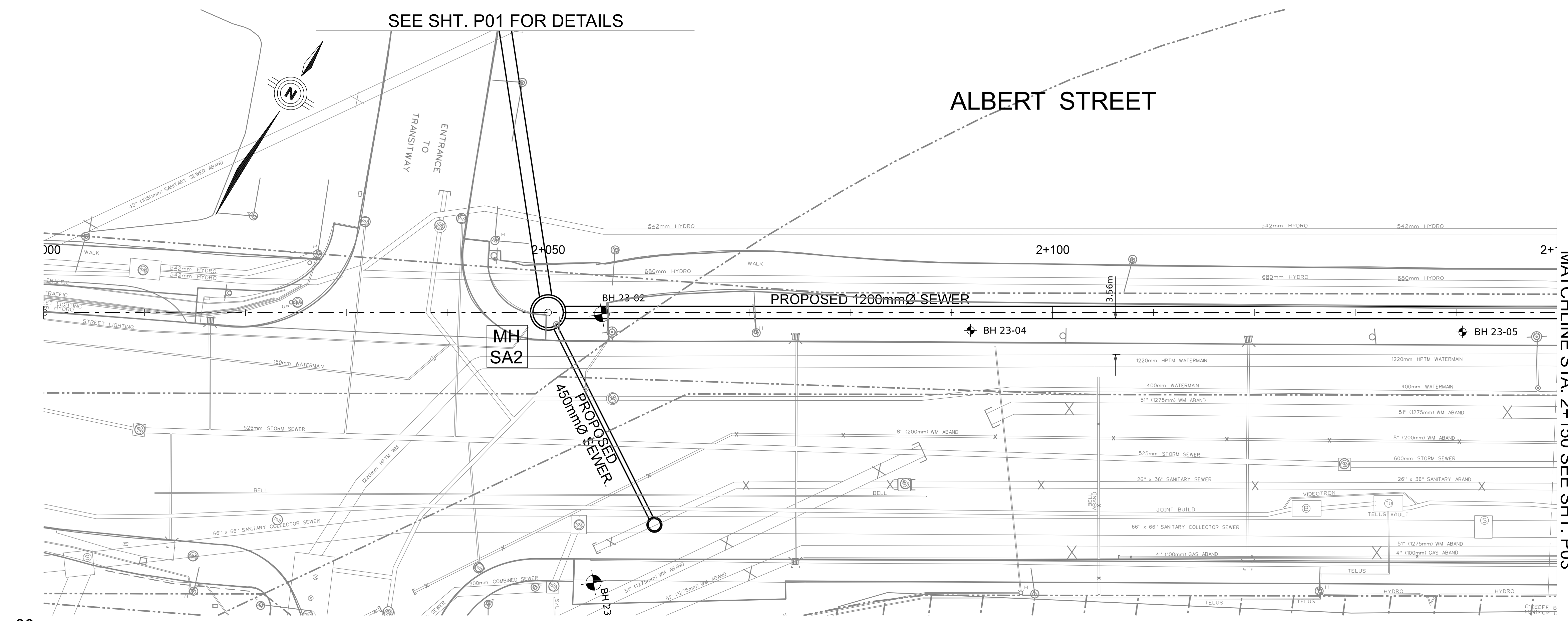
SL DENOTES SELF LEVELLING COVER

NOTE:  
CITY OF OTTAWA IS IN CONSULTATION WITH  
HYDRO OTTAWA REGARDING THE IMPACTED  
HYDRO UNDERGROUND INFRASTRUCTURE

SEE SHT. P01 FOR DETAILS

ALBERT STREET

MATCHLINE STA. 2+150 SEE SHT. P03



58.840	58.888	58.788	58.772	58.629	58.495	58.476	58.457	58.409	58.443	58.531	58.637	58.654	58.637	58.643	58.644	58.638	58.634	58.652	58.649	58.658	58.694	58.711	58.747	58.765	58.817	58.858	58.866	58.897	58.911	58.891	EXISTING GRADE OVER PIPE
																	PROPOSED TOP OF WATERMAIN														
																	PROPOSED STORM SEWER INVERT														
																	PROPOSED SANITARY SEWER INVERT														
2+000				2+025						2+050				2+075			2+100				2+125							2+150	STATION		

106.73m - PROPOSED 1200mm Concrete SANITARY SEWER @ 0.10%

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

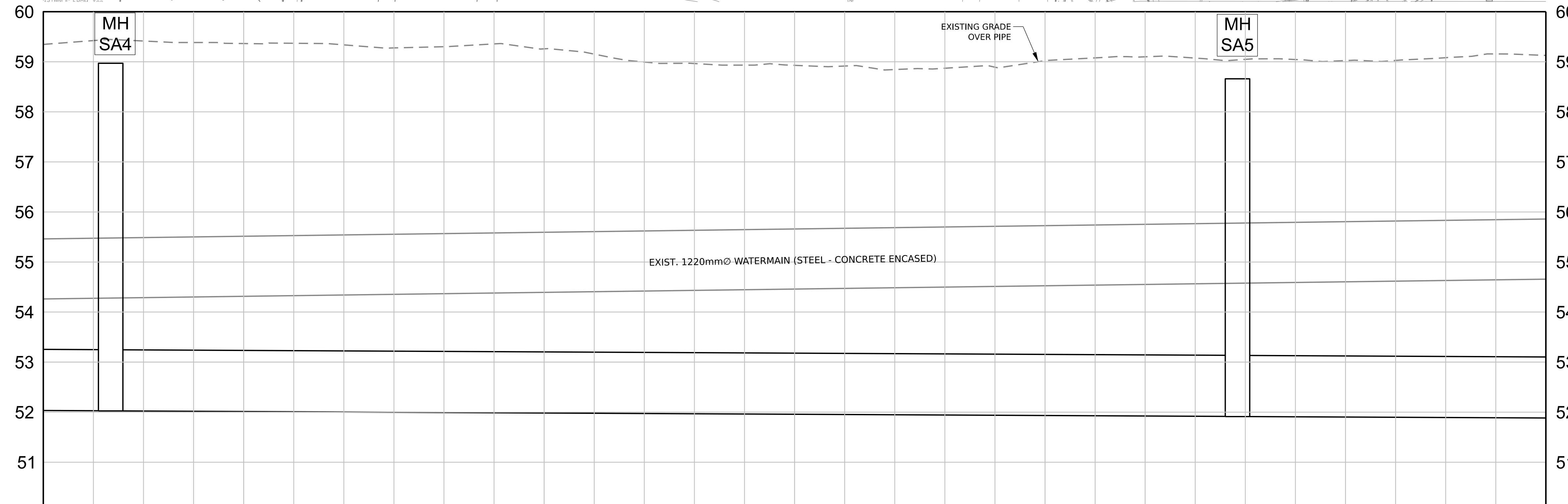
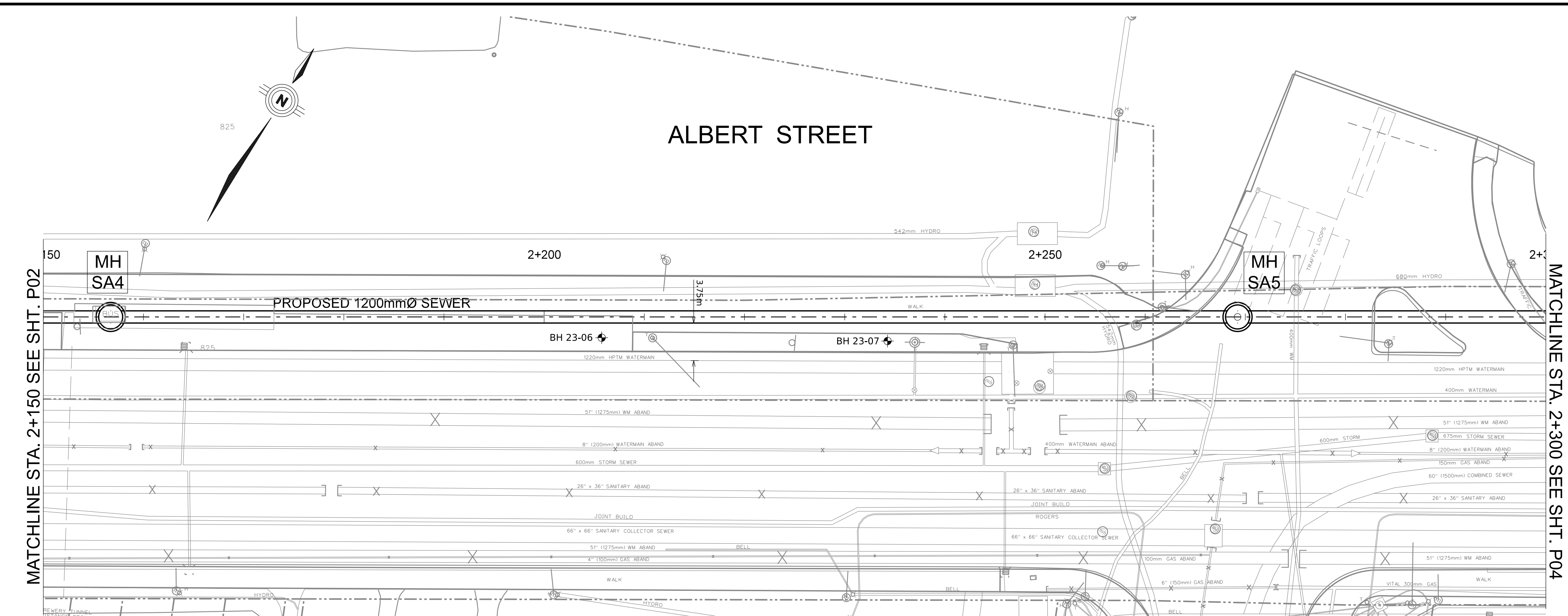
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2	ISSUED FOR FINAL PRELIMINARY DESIGN	D.S.	23/01/24

**NOT FOR CONSTRUCTION**

SANITARY SEWER MH DATA						
No.	Station	Offset (m)	Type	Cover	Elevations	Grate to
MHSA4	2+156.73	0.00	701.013	S24	58.97	52.03 6.94
MHSA5	2+269.22	0.00	701.013	S24 / SL	58.66	51.91 6.75

SL DENOTES SELF LEVELLING COVER

NOTE:  
CITY OF OTTAWA IS IN CONSULTATION WITH  
HYDRO OTTAWA REGARDING THE IMPACTED  
HYDRO UNDERGROUND INFRASTRUCTURE



Station	58.943	58.978	59.000	59.015	59.030	59.049	59.063	59.082	59.115	59.126	59.129	59.161	59.149	59.164	59.162	59.118	59.096	59.093	59.107	58.997	59.044	58.813	58.674	58.693	58.665	58.658	58.635	58.601	58.512	58.647		
EXISTING GRADE OVER PIPE																																
PROPOSED TOP OF WATERMAIN																																
PROPOSED STORM SEWER INVERT																																
PROPOSED SANITARY SEWER INVERT																																
STATION	2+175	2+200	2+225	2+250	2+275	2+300																										

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

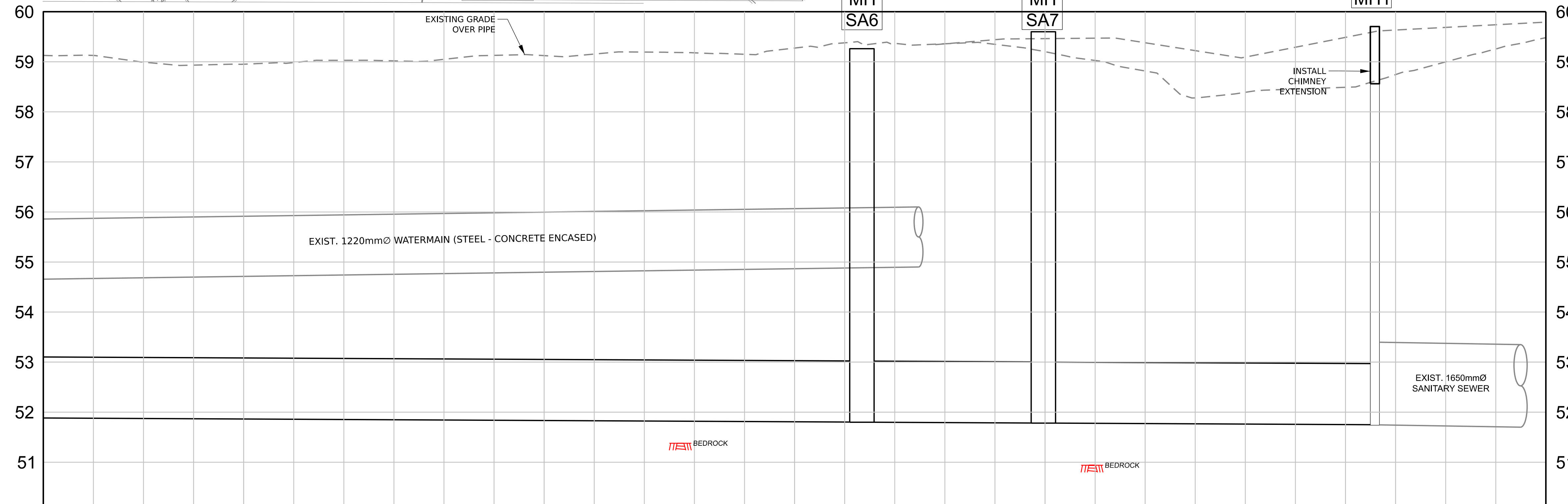
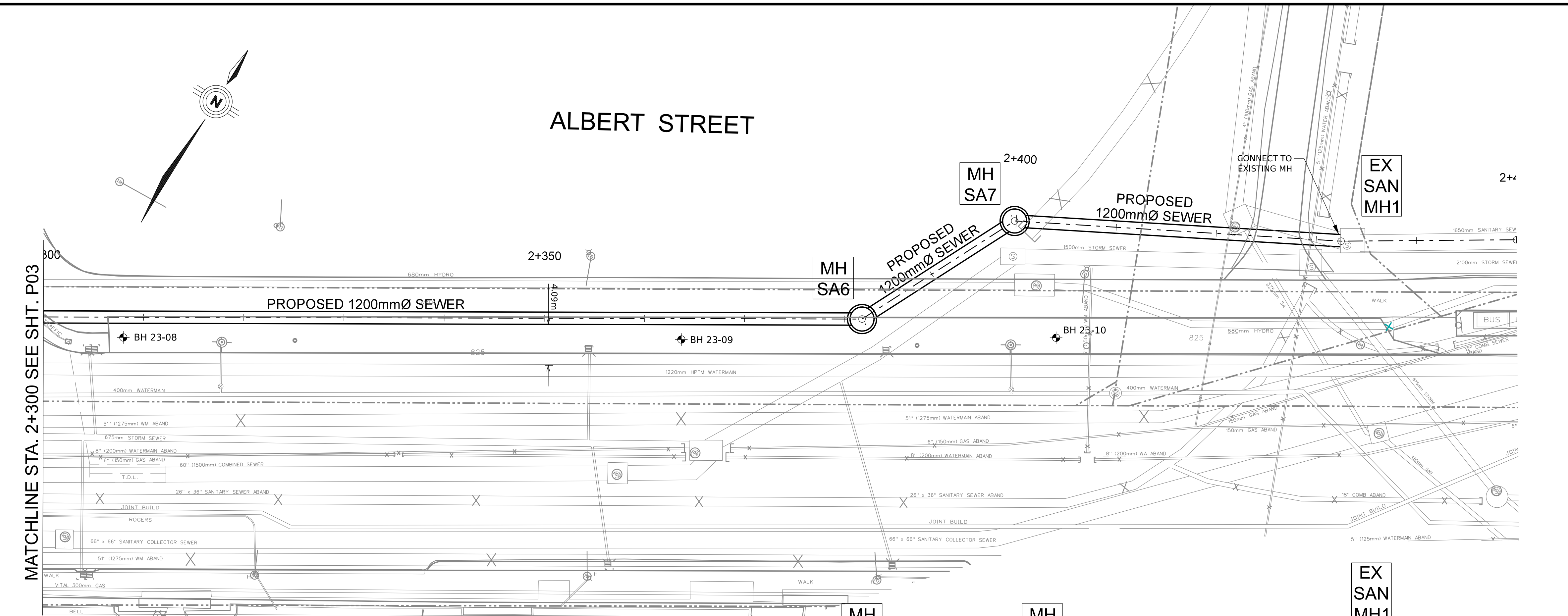
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1	ISSUED FOR PRELIMINARY DESIGN CIRCULATION	D.S.	24/11/23
2	ISSUED FOR FINAL PRELIMINARY DESIGN	D.S.	23/01/24

**NOT FOR CONSTRUCTION**

SANITARY SEWER MH DATA						
No.	Station	Offset (m)	Type	Cover	Elevations	Grate to Invert
MHSA6	2+381.02	0.00	701.013	S24	59.26	51.80 7.46
MHSA7	2+399.84	0.00	701.013	S24	59.80	51.78 7.82

SL DENOTES SELF LEVELLING COVER

NOTE:  
CITY OF OTTAWA IS IN CONSULTATION WITH  
HYDRO OTTAWA REGARDING THE IMPACTED  
HYDRO UNDERGROUND INFRASTRUCTURE



58.911	58.888	58.896	58.920	58.939	58.930	58.968	58.999	58.998	59.006	59.064	59.082	59.117	59.131	59.213	59.272	59.285	EXISTING GRADE OVER PIPE
PROPOSED TOP OF WATERMAIN																	
PROPOSED STORM SEWER INVERT																	
<p>← 112.50m - PROPOSED 1200mm Concrete SANITARY SEWER @ +0.10% →</p> <p>← 18.11m - PROPOSED 1200mm Conc. SANITARY SEWER @ +0.10% →</p> <p>← 33.86m - PROPOSED 1200mm Concrete SANITARY SEWER @ +0.12% →</p>																	
2+325	2+350	2+375	2+400	2+425													STATION



Record Drawing

These drawings have been prepared based on information provided by others. Stantec Consulting Ltd. has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result.



NO.	REVISIONS	BY	DATE
1.	ISSUED FOR TENDER	B.B.	2004-11-19
2.	ISSUED FOR CONSTRUCTION	B.B.	2005-03-11
3.	AS RECORDED	J.W.	2007-03

LOW PRESSURE TRANSMISSION MAIN REPLACEMENT PROGRAM  
 LEMIEUX ISLAND W.P.P. TO FLEET STREET PUMPING STATION  
 PROPOSED 1676MM WATERMAIN PLAN & PROFILE  
 STATIONS 5+043 TO 5+140



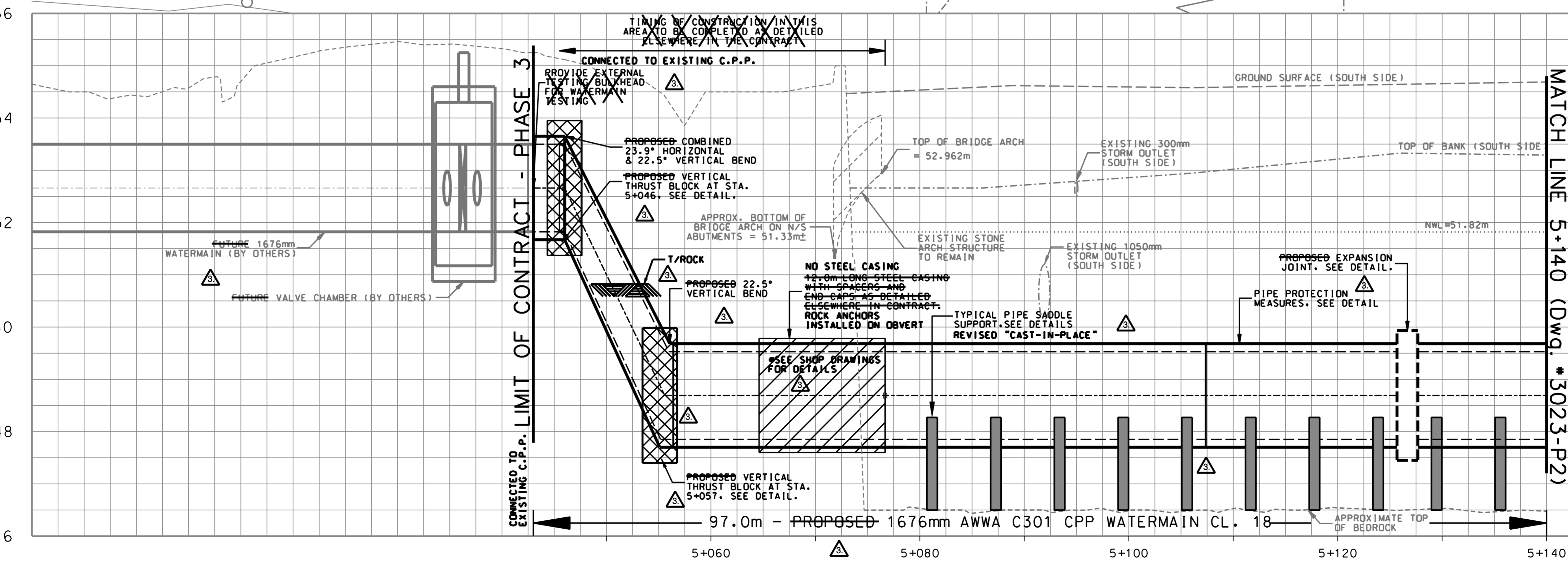
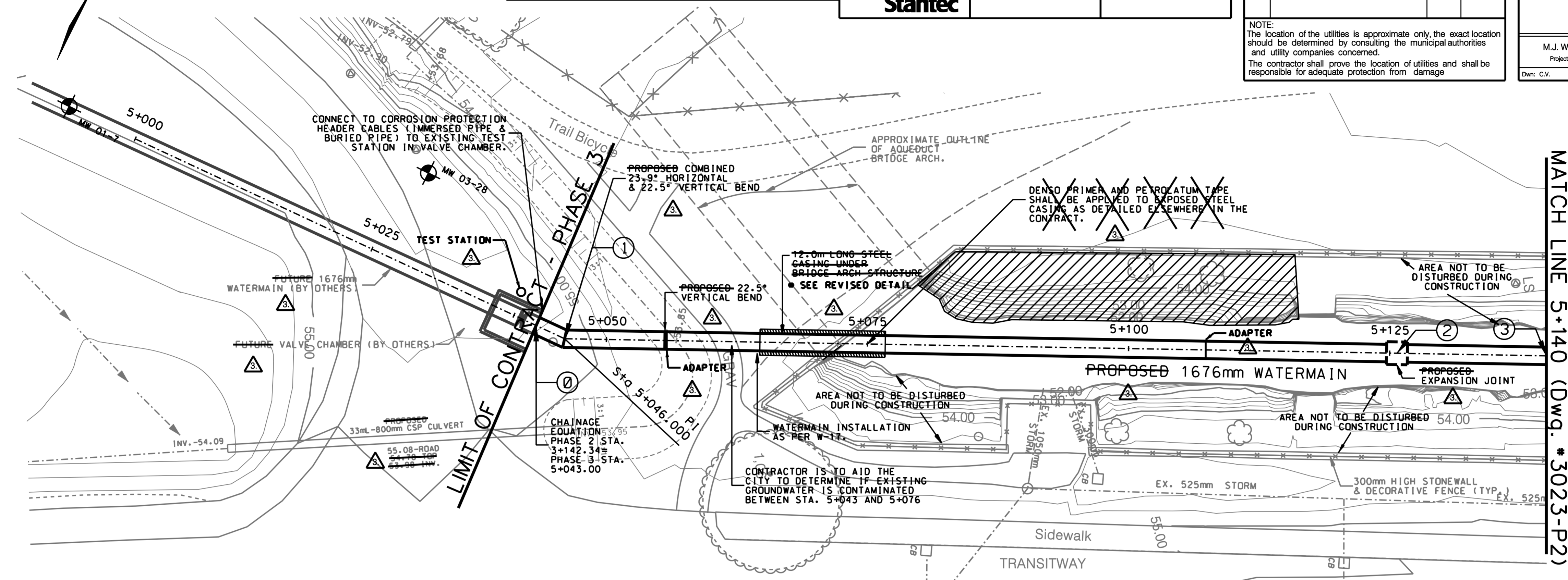
CONTRACT NO. ISB04-3023  
 DWG. NO. 3023-P1  
 SHEET 11 OF 25  
 Date: 2009-09-11  
 Scale: Horizontal 1:250, Vertical 1:50

M.J. WILLMETS Project Manager  
 R.G. HEWITT, P.ENG. Director Infrastructure Services  
 W.R. NEWELL, P.ENG. Manager Construction Services West  
 Dwn: C.V. Chkd: B.B. Des: B.B. Chkd: J.D.K.

NOTE:  
 The location of the utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned.  
 The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

- NOTES:
- RESTORE DISTURBED AREAS, CULVERTS, SIDEWALK, DECORATIVE LANDSCAPING (FLOWER GARDEN), PAVEMENT TO ORIGINAL CONDITION UNLESS INDICATED OTHERWISE ON THE DRAWING, IN ACCORDANCE WITH THE REQUIREMENTS OF THE CITY OF OTTAWA.
  - ENDS OF PIPE AT THE LIMIT OF CONTRACT TO BE MARKED BEFORE BACK FILLING. TIE-IN TO THE EXISTING FEATURES FOR FUTURE LOCATING.
  - SITE SECURITY FENCING SHALL BE INSTALLED ALONG THE LIMITS OF CONSTRUCTION BEFORE CONSTRUCTION WORK STARTS AND SHALL REMAIN IN PLACE UNTIL REINSTATEMENT IS COMPLETED, EXCEPT WHERE OTHERWISE NOTED.
  - PRESERVE AND PROTECT HYDRO POLES.
  - MAINTAIN EXISTING PEDESTRIAN MOVEMENTS AT ALL TIMES DURING CONSTRUCTION. PROVIDE INFORMATION SIGNAGE, DIRECTIONAL SIGNAGE AND BARRICADES TO DIRECT PEDESTRIANS AROUND THE CONSTRUCTION ACTIVITY AREA.
  - PIPE SADDLE SUPPORT LOCATIONS AND SPACING ARE FOR ILLUSTRATION PURPOSES ONLY. PIPE SADDLE SUPPORTS ARE TO BE SPACED SO THAT EACH PIPE SECTION IS SUPPORTED BY AT LEAST ONE (1) SADDLE (MAXIMUM SPACING TO BE NO GREATER THAN 6.1m FROM CENTER TO CENTER). A PIPE SADDLE SUPPORT TO BE LOCATED NO GREATER THAN 1.0m FROM EACH SIDE OF THE CENTERLINE OF THE EXPANSION JOINTS. THE SADDLE SUPPORT ADJACENT TO EXPANSION JOINTS TO BE EMBEDDED 1.0m INTO SOUND BEDROCK AS DETAILED. THE MIDDLE PIPE SUPPORT BETWEEN EXPANSION JOINTS AND TUNNEL SECTION OR PIPE BLOCK ANCHORS OR THRUST ANCHORS SHALL BE EMBEDDED 1.0m INTO SOUND BEDROCK, AS DETAILED.

AREA CAN BE USED AS AN OPTIONAL ACCESS INTO THE AOUEDUCT DURING CONSTRUCTION. AREA TO BE REINSTATED TO ORIGINAL CONDITION UPON COMPLETION OF PROJECT. EXISTING ROCK FACE NOT TO BE DISTURBED.



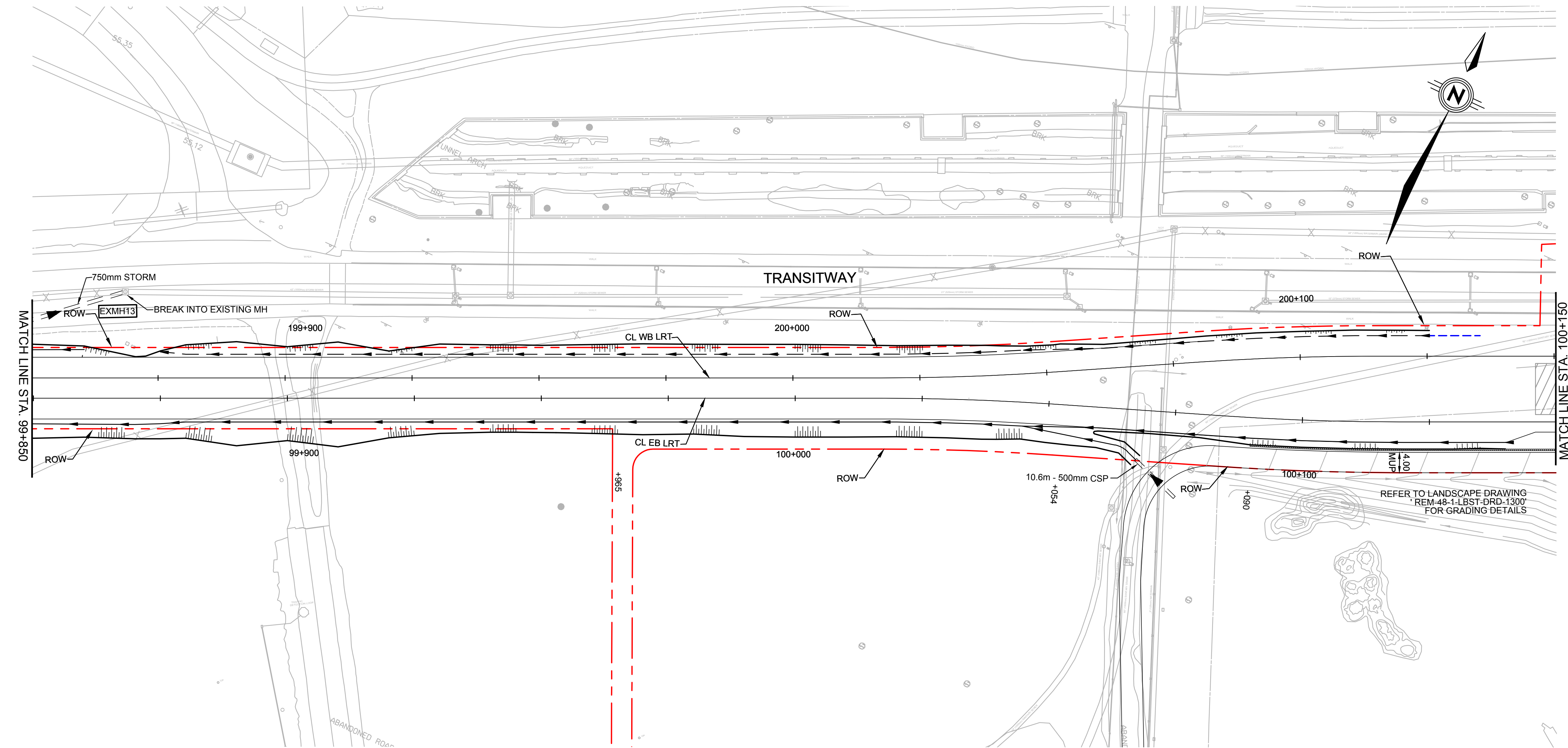
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		5+046.0			5+046.0
		5+055.5			5+055.5
		5+056.5			5+056.5
		5+060.0			5+060.0
		5+064.6			5+064.6
		5+076.7			5+076.7
		5+080.0			5+080.0
		5+100.0			5+100.0
		5+107.4			5+107.4
		5+120.0			5+120.0
		5+127.26			5+127.26
		5+140.0			5+140.0

AS-BUILT

MATCH LINE 5+140 (Dwg. # 3023-P2)

LIMIT OF CONTRACT - PHASE 3

DWG. FRAME: 700mm x 500mm, RND-C-0903-WG



CULVERT DATA

	STATION	OFFSET (m)	ELEVATIONS (m)
INVERT 1	100+067.77	9.79RT	54.701
INVERT 2	100+075.87	16.70RT	54.742

OFFSETS ARE FROM CENTER LINE OF EB LRT

**GUIDEWAY DESIGN - SEGMENT 1  
GRADING AND DRAINAGE**

CONTRACT No.  
**OILC-11-00-P006**

DESIGNED	CHECKED
DRAWN	SEALED
KUSUM	-

DRAWING NUMBER  
**REM-20-1-0000-DRD-2716**

DESIGN/BUILDER

ENGINEERING JV

DESIGN FIRM

SCALE  
HORIZONTAL 1:500 FULL SIZE  
1:1000 HALF SIZE

ASSET No. -  
ASSET GROUP -

REV	DESCRIPTION	BY	DATE
0	SIN-0518: ISSUED FOR CONSTRUCTION	RC	2016-01-15
1	SIN-0649: ISSUED FOR CONSTRUCTION	RC	2016-04-12
2	SIN-1396: ISSUED FOR CONSTRUCTION	RC	2017-08-31
3	SIN-1506: ISSUED FOR CONSTRUCTION	RC	2017-11-22
4	AS BUILT	KN	2019-07-22

KEY MAP  
N.T.S.

NO PART OF THIS DOCUMENT MAY BE REPRODUCED, PUBLISHED, CONVERTED, OR STORED IN ANY DATA RETRIEVAL SYSTEM, OR TRANSMITTED IN ANY FORM BY ANY MEANS ELECTRONIC, MECHANICAL, PHOTOCOPIING, RECORDING, OR OTHERWISE WITHOUT THE PRIOR WRITTEN PERMISSION OF THE RTGE JOINT VENTURE.

This As-Built Document has been prepared based upon information furnished by OLRT Constructors.

**LAYOUT INFORMATION BASED ON 3 DEGREE  
MTM ZONE 9 NAD 83 (OLRT) COORDINATE SYSTEM  
COMBINED SCALE FACTOR 0.999946**

**GENERAL NOTES:**

- A. THE LOCATION OF EXISTING UTILITIES ARE APPROXIMATE AND SHOULD BE VERIFIED BY THE CONTRACTOR IN THE FIELD. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE.
- B. REFER TO 'STRAY CURRENT REPORT' FOR ADDITIONAL CORROSION CONTROL SYSTEMS, INCLUDING THE LOCATION AND TYPICAL ARRANGEMENT, MEASURING POINTS, AND STRAY CURRENT MONITORING SYSTEMS. CORROSION CONTROL MEASURES SHALL BE PROVIDED FOR BURIED PIPES AND PIPES SUBJECT TO DIRECT CURRENT (DC) STRAY CURRENTS.
- C. MATERIAL SUBSTITUTIONS MAY BE CONSIDERED AT THE DISCRETION OF THE OLRTC REPRESENTATIVE. SUBSTITUTIONS SHALL NOT BE MADE WITHOUT THE PRIOR APPROVAL OF THE OLRTC REPRESENTATIVE. THE APPROVAL OR REJECTION OF A PROPOSED SUBSTITUTION WILL BE MADE AT THE DISCRETION OF THE OLRTC REPRESENTATIVE.
- D. CONNECTION POINTS TO EXISTING UTILITIES TO BE VERIFIED BY VISUAL EXPOSURE AND SURVEY AS REQUIRED.
- E. ROW BASED ON PROPERTY REQUEST PLANS (PRP) PROVIDED BY THE CITY.
- F. REFER TO OLRTC'S ENVIRONMENTAL MANAGEMENT PLAN (LATEST REVISION) FOR EROSION AND SEDIMENT CONTROL, TREE PROTECTION AND OTHER ENVIRONMENTAL REQUIREMENTS FOR CONFEDERATION LINE.

PRIMARY SEAL

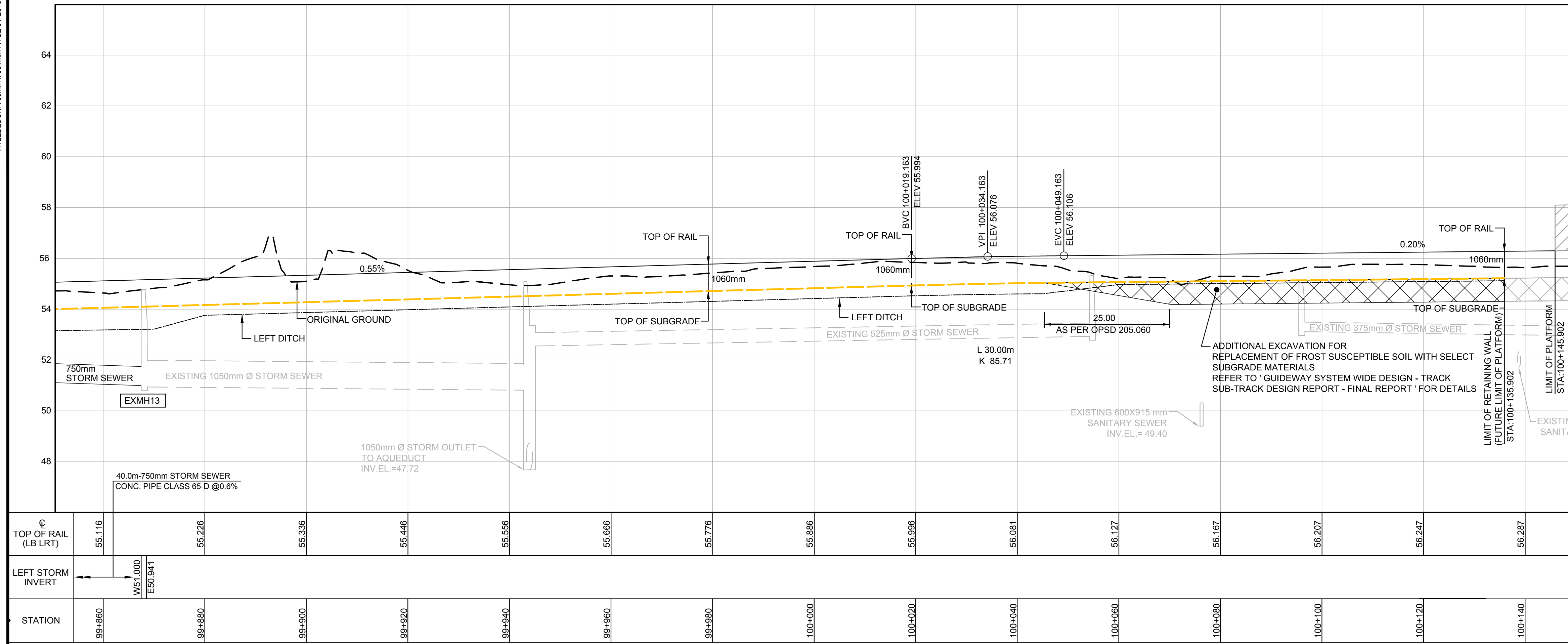
**Refer to Rev 3  
for the originally  
sealed version**

SECONDARY SEAL (IF REQUIRED)

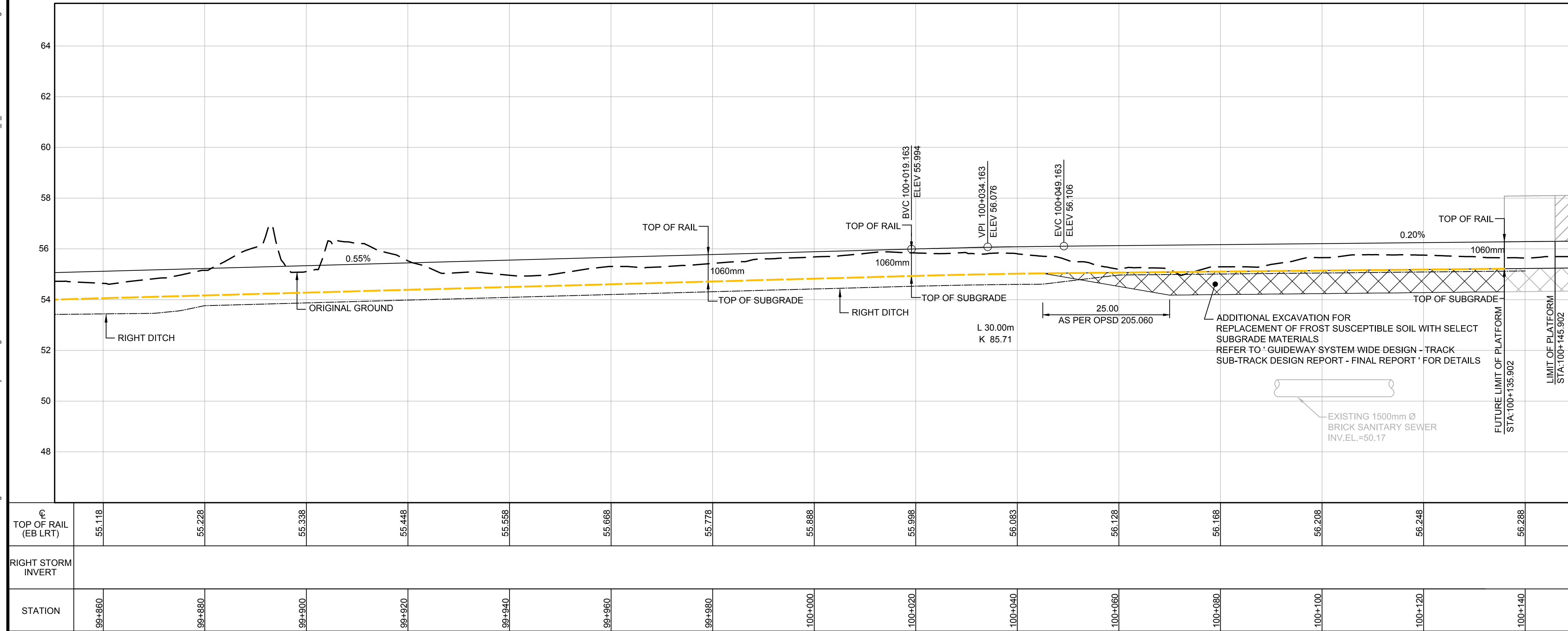
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### LEFT SIDE



### RIGHT SIDE



Confederation Line  
Ligne de la Confédération

Ottawa

**GUIDEWAY DESIGN - SEGMENT 1  
GRADING AND DRAINAGE**

CONTRACT No. OILC-11-00-P006

DESIGNED	CHECKED
DRAWN	SEALED
KUSUM	

DRAWING NUMBER: REM-20-1-0000-DRD-2717

DESIGN/BUILDER:

ENGINEERING JV:

DESIGN FIRM:

SCALE: HORIZONTAL 1:500 FULL SIZE, 1:1000 HALF SIZE; VERTICAL 1:100 FULL SIZE, 1:200 HALF SIZE

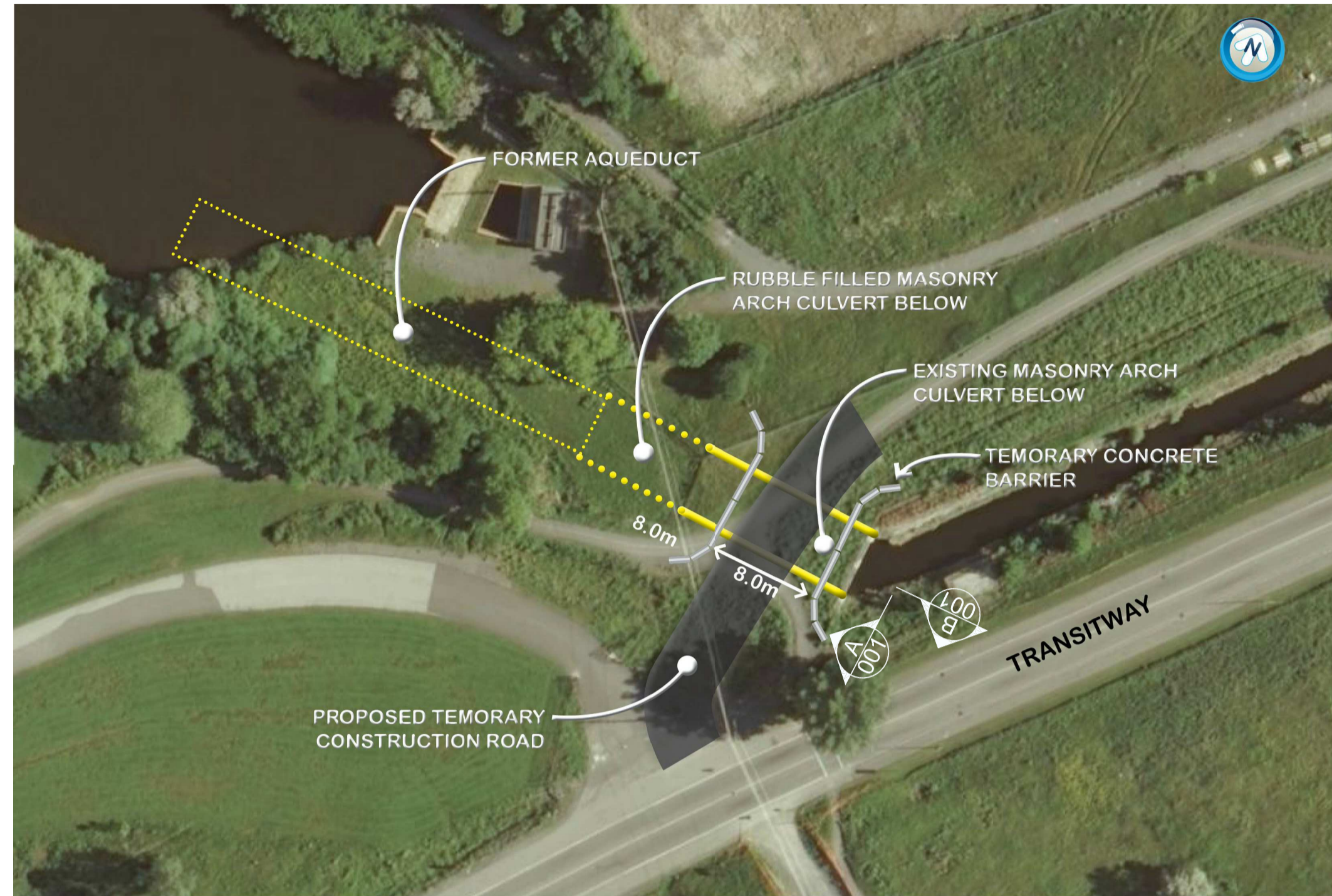
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2	SIN-0824: ISSUED FOR CONSTRUCTION	RC	2016-06-23
3	SIN-1396: ISSUED FOR CONSTRUCTION	RC	2017-08-31
4	SIN-1506: ISSUED FOR CONSTRUCTION	RC	2017-11-22
5	AS BUILT	KN	2019-07-22

KEY MAP N.T.S.

NO PART OF THIS DOCUMENT MAY BE REPRODUCED, PUBLISHED, CONVERTED, OR STORED IN ANY DATA RETRIEVAL SYSTEM, OR TRANSMITTED IN ANY FORM BY ANY MEANS ELECTRONIC, MECHANICAL, PHOTOCOPIING, RECORDING, OR OTHERWISE WITHOUT THE PRIOR WRITTEN PERMISSION OF THE RTGE JOINT VENTURE.

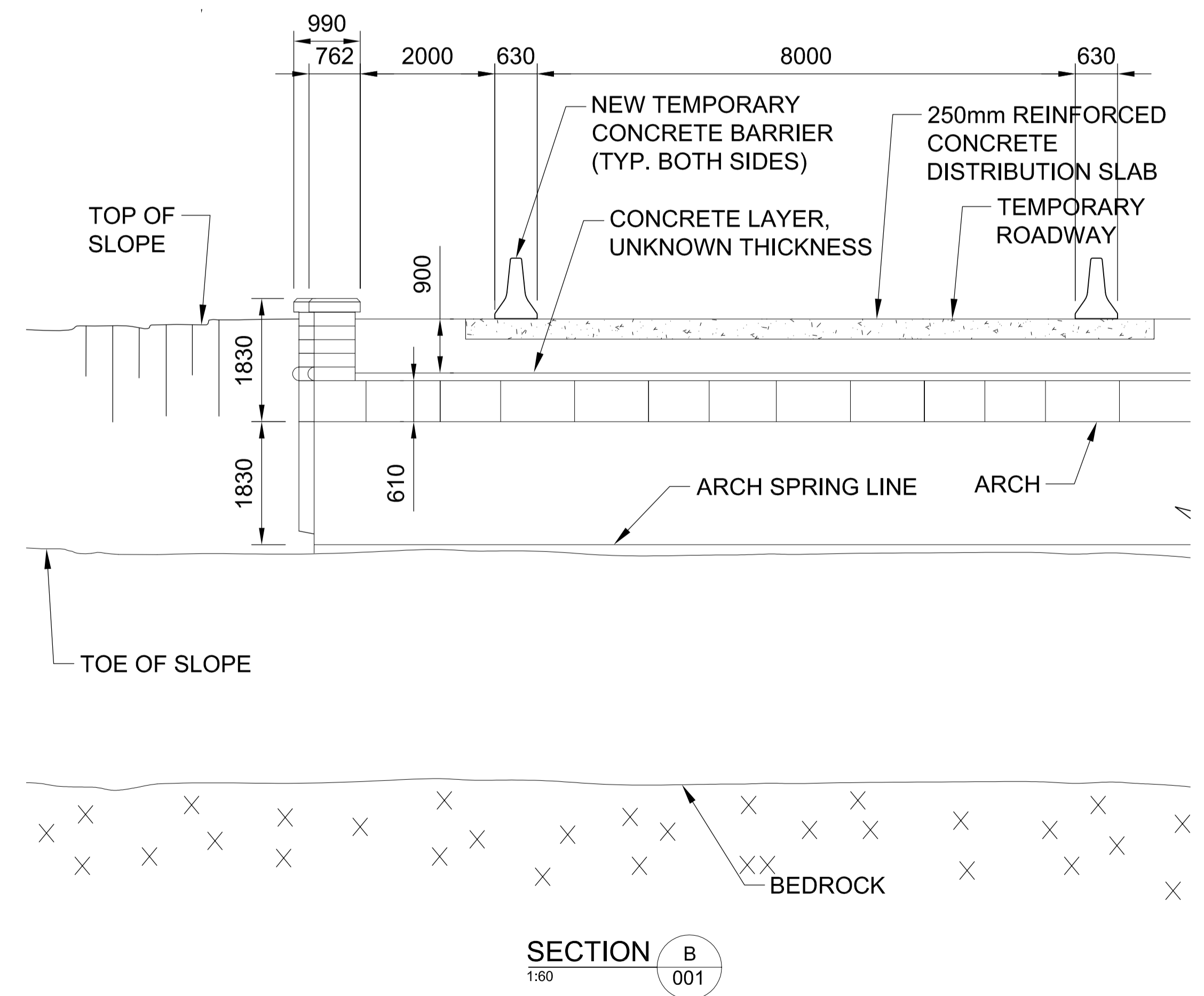
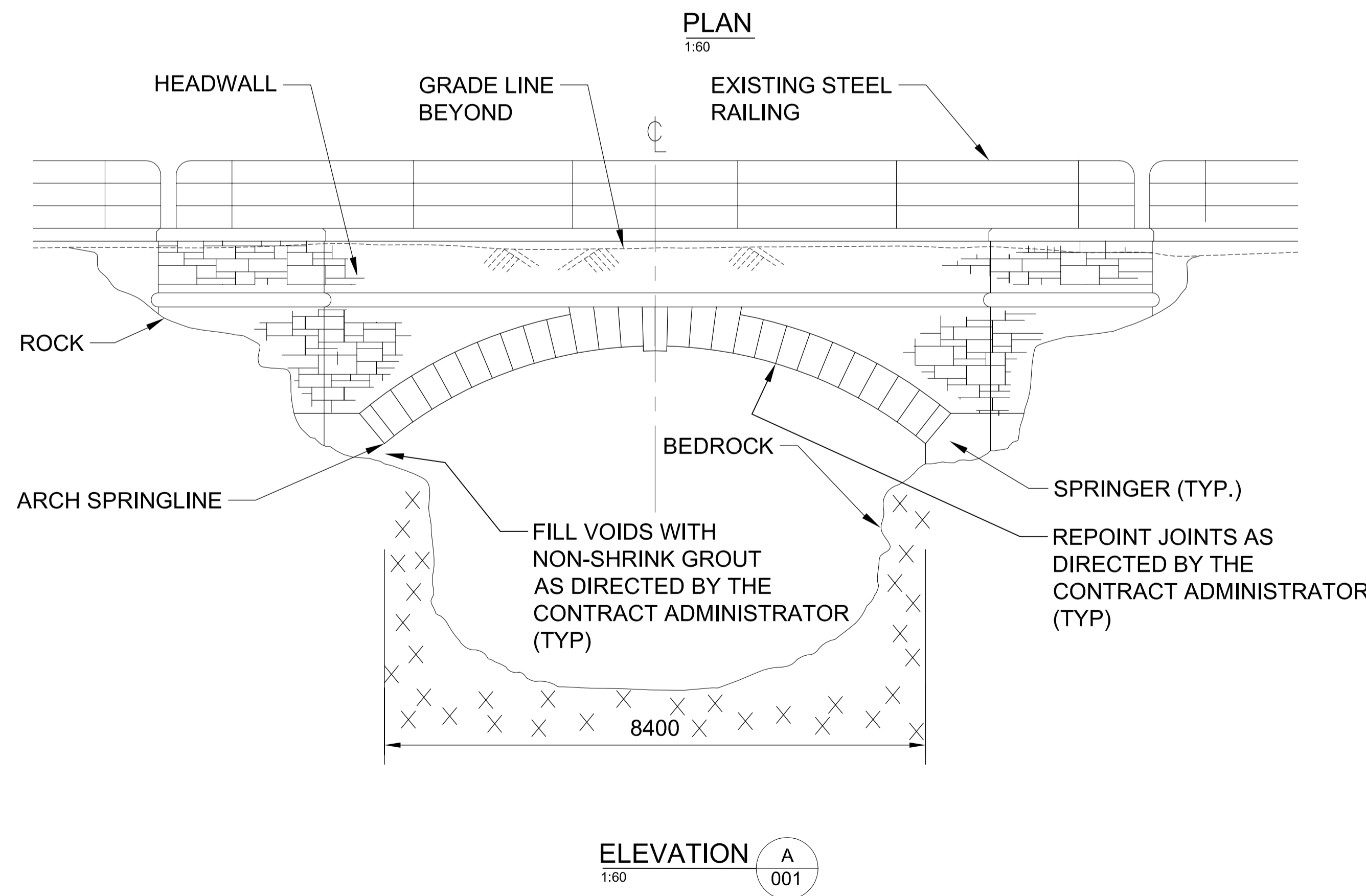
This As-Built Document has been prepared based upon information furnished by OLRT Constructors.

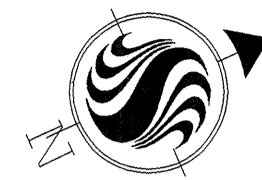
LAYOUT INFORMATION BASED ON 3 DEGREE  
MTM ZONE 9 NAD 83 (OLRT) COORDINATE SYSTEM  
COMBINED SCALE FACTOR 0.999946




CANADIAN CENTRAL RAILWAY BRIDGE (SN015120)				
GENERAL ARRANGEMENT		Contract No. ISD14-7114	Dwg. No.	
		Sheet	of	
		Asset No.		
		Asset Group		
		Des. HL	Chk'd. JBE	
		Dwn. GK	Chk'd. HL	
		Utility Circ. No.	Index No.	
		Const. Inspector		
		Scale: <b>AS NOTED</b>		
<p><b>NOTE:</b> The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.</p>				
REVISIONS	No.	Description	By	Date (dd/mm/yy)

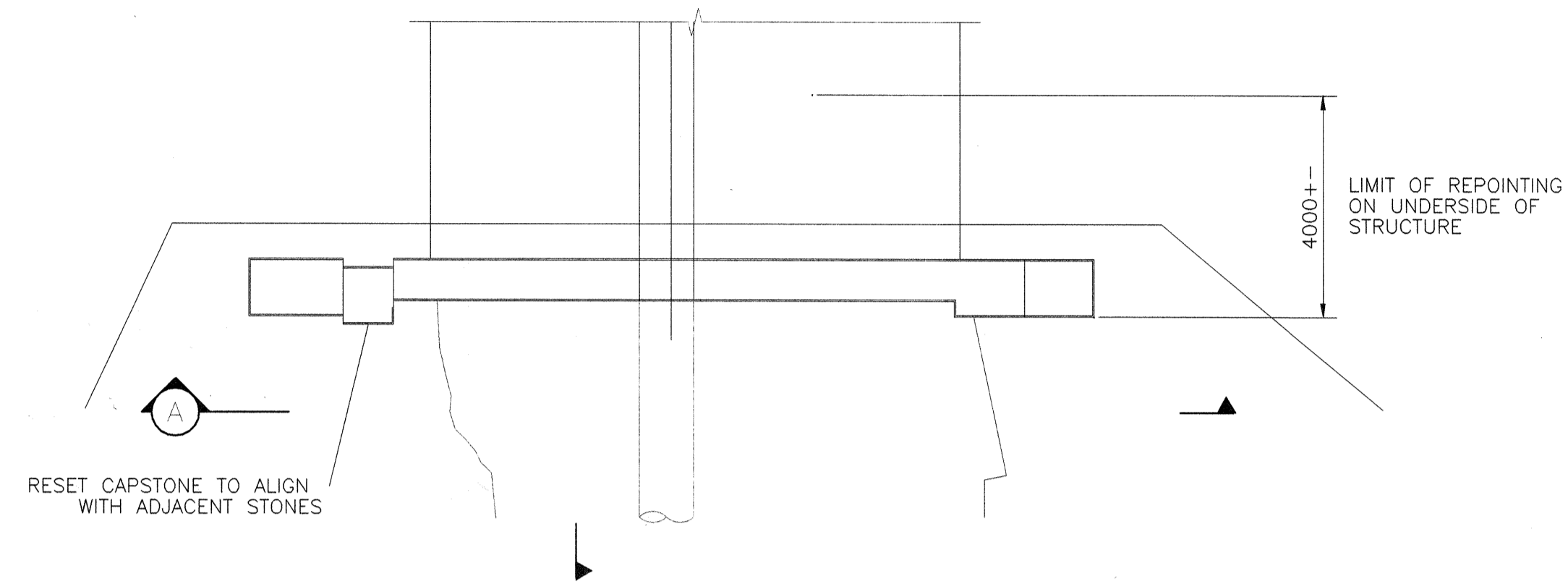
- NOTES:**
- THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL OTHER APPLICABLE CONTRACT DRAWINGS. INFORMATION SHOWN ON THIS DRAWING HAS BEEN EXTRACTED FROM xxxx AND SUPPLEMENTED BY FIELD INVESTIGATIONS.



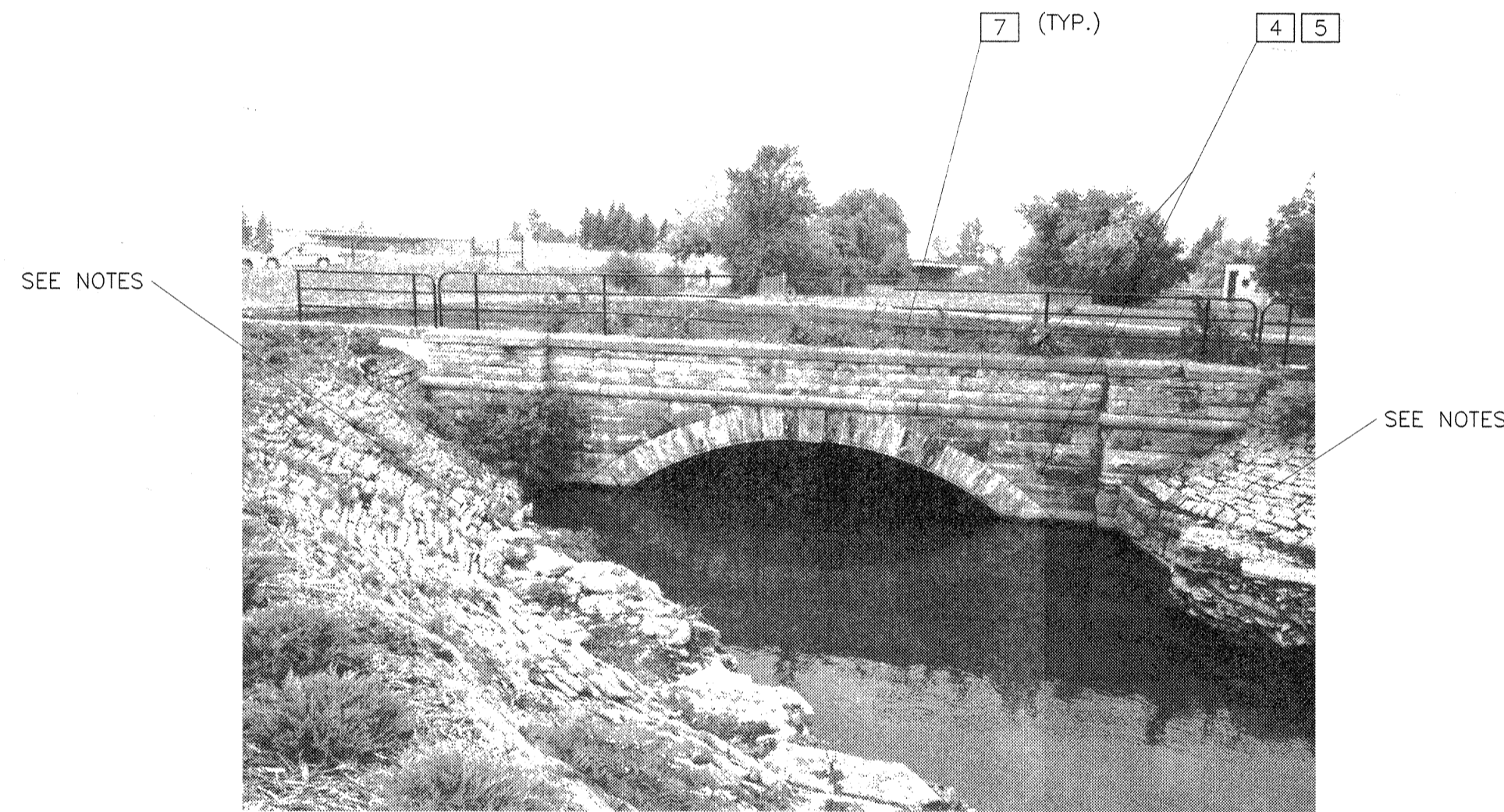


No.	REVISION	BY	DATE
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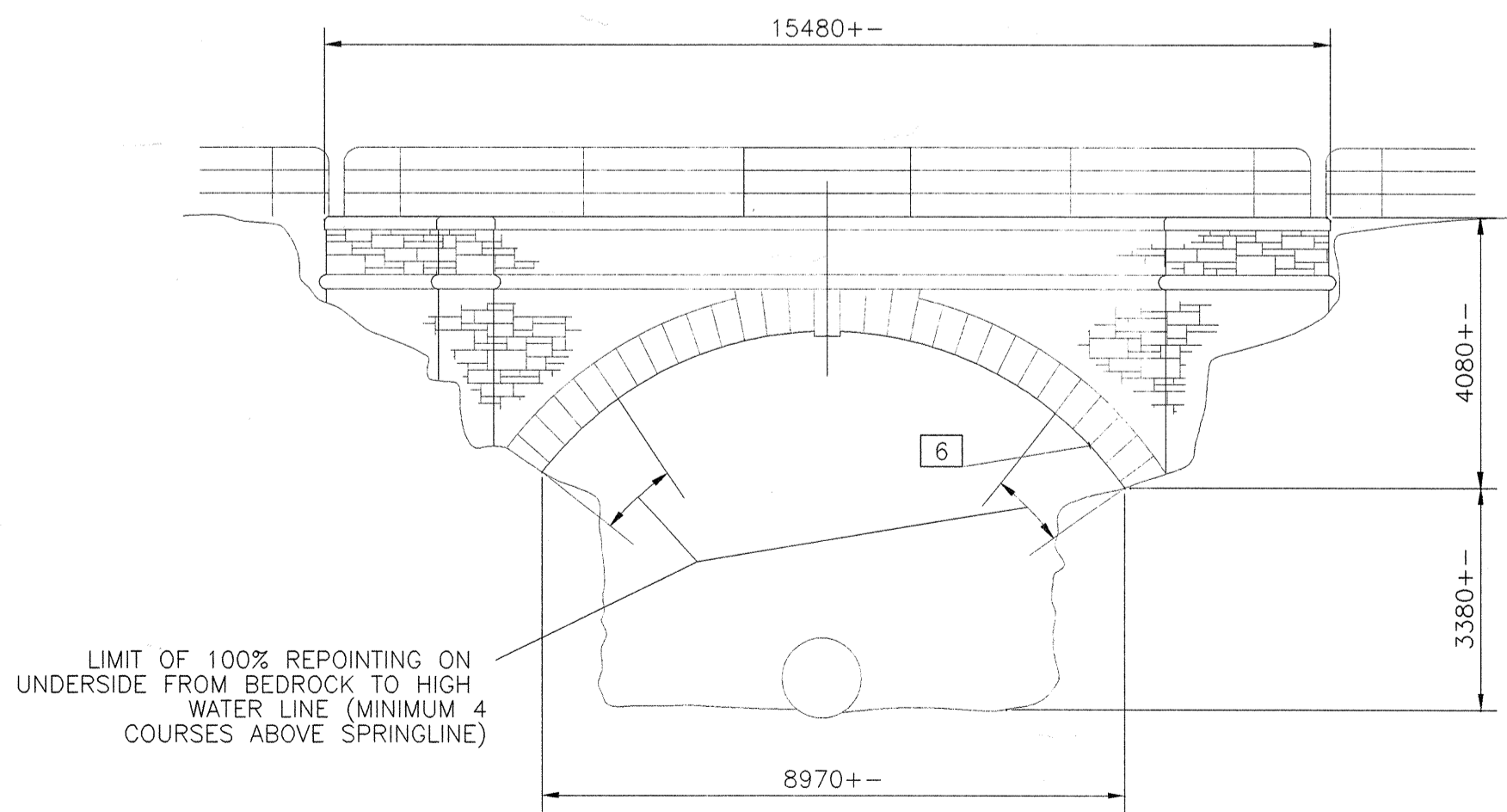
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		B-051201-001	
<b>THE CANADA CENTRAL RAILWAY BRIDGE</b>		Sheet of	
		CONTRACT No. ETL00-7000	
<b>GENERAL ARRANGEMENT</b>		Des.	S.T.R.
		Chk.	D.A.H.
J. MILLER, P.ENG. <i>Director of Engineering</i>		Dwn.	J.M.B.
		Chk.	J.M.
V.K. SAHNI, P.ENG. <i>Manager Structural Branch</i>		Date:	10 MAR 00
		Scale:	1:100



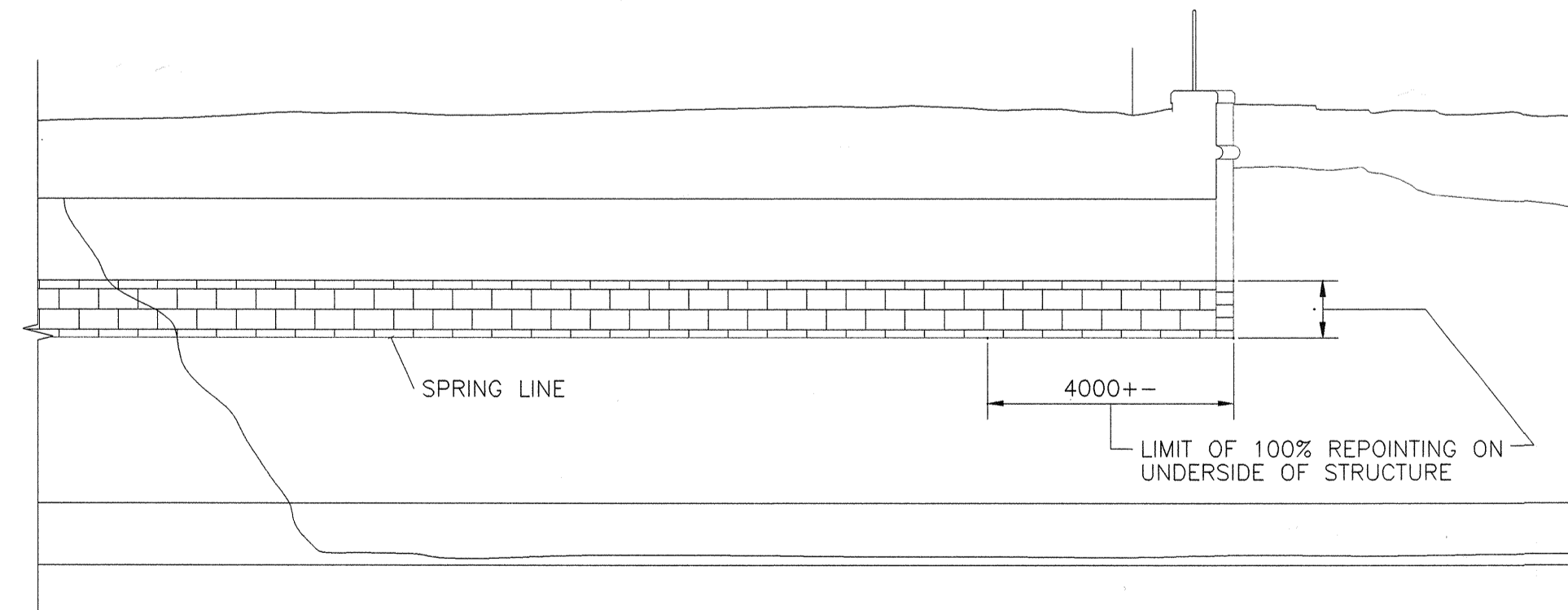
**PLAN**  
1:100



**WEST ELEVATION**  
EXISTING



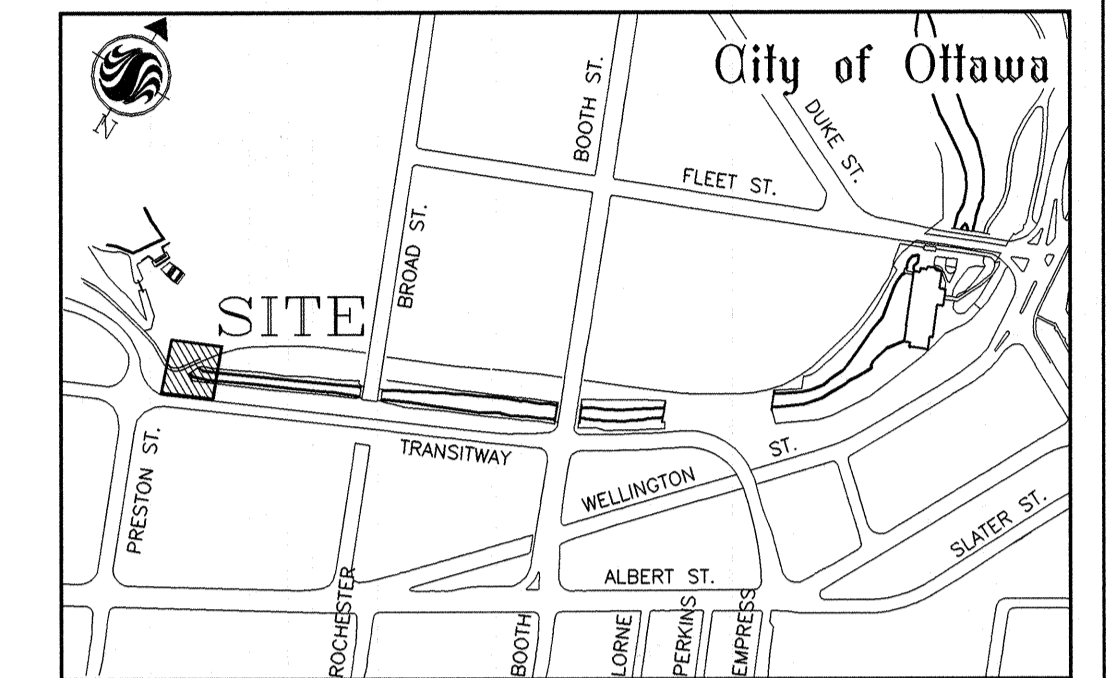
**A WEST ELEVATION**  
1:100



**B SECTION**  
1:100

**SCOPE of WORK:**

- 1 INSTALL FENCING, BARRICADES, ETC. AS REQUIRED TO PREVENT PUBLIC ACCESS TO THE WORK SITE.
- 2 DO NOT BLOCK EXISTING PATH. CONFINE ACCESS ACROSS PATH TO ONE LOCATION, APPROXIMATELY 4.0m WIDE.
- 3 PROVIDE ACCESS SCAFFOLDING, FALSE WORK AND DEMOLITION CATCHMENT SYSTEM.
- 4 REPLACE DETERIORATED STONE IN SPANDREL WALL AS DIRECTED BY THE ENGINEER.
- 5 CHIP AND REPOINT MASONRY JOINTS (100%) ON EXTERIOR.
- 6 CHIP AND REPOINT ARCH BARREL UNDERSIDE AT WATERLINE (100% OF AREA). CHIP AND REPOINT REMAINDER OF ARCH SOFFIT ONLY AS DIRECTED BY THE CONTRACT ADMINISTRATOR.
- 7 SEAL SKYWARD FACING JOINTS.
- 8 REINSTATE LANDSCAPING.



**GENERAL NOTES:**

- THE CANADA CENTRAL RAILWAY BRIDGE IS A DESIGNATED HISTORIC STRUCTURE. ALL MASONRY RESTORATION IS TO PRESERVE THE HERITAGE APPEARANCE.
- THE AREA IN AND AROUND THE BRIDGE MAY CONTAIN VALUABLE AND SENSITIVE ARCHAEOLOGICAL RESOURCES. RESTRICT WORK TO DESIGNATED AREAS AND NOTIFY CONTRACT ADMINISTRATOR UPON DISCOVERY OF RELICS, ETC.
- ACCESS, WORK AND STORAGE AREAS SHALL BE LIMITED TO THOSE AREAS SHOWN ON THE DRAWINGS.
- DO ALL MASONRY RESTORATION WORK TO CAN3-A371-M94, EXCEPT AS MODIFIED BY THESE DRAWINGS AND THE CONTRACT SPECIFICATIONS.
- WHERE STONEMASONRY IS REMOVED, STABILIZE AND PROVIDE PROTECTION TO EXPOSED MASONRY REMAINING. PROVIDE TEMPORARY SHORING AND BRACING AS REQUIRED.
- UNLESS OTHERWISE NOTED, NO STONES ARE TO BE REPAIRED OR REPLACED WITHOUT PRIOR INSPECTION AND APPROVAL OF THE CONTRACT ADMINISTRATOR.
- NO CLEANING OF THE STONEMASONRY IS TO BE CARRIED OUT (UNLESS NOTED OTHERWISE) EXCEPT FOR THAT REQUIRED TO RESTORE PRECONTRACT APPEARANCE AS A RESULT OF SPILLAGE OF MORTAR, CONCRETE, GROUT, ETC.
- DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE. ELEVATIONS AND STATIONS ARE IN METERS.
- THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS AND DETAILS OF EXISTING FEATURES BEFORE PROCEEDING WITH THE WORK. ANY DISCREPANCIES SHALL BE PROMPTLY REPORTED TO THE CONTRACT ADMINISTRATOR.
- FIELD MEASURE TO ENSURE PROPER FIT.
- THE AQUADUCT WILL BE DRAINED FOR A PERIOD OF 4 WEEKS BEGINNING SEPTEMBER 18th TO PERMIT WORK TO BE COMPLETED ON THE ARCH BARREL UNDERSIDES. CATCHMENT SYSTEMS MUST BE IN PLACE TO PREVENT ANY REMOVALS OR OTHER MATERIALS FROM BLOCKING OR FALLING INTO THE AQUADUCT. COMPLY WITH THE ENVIRONMENT OPERATIONAL CONSTRAINTS OUTLINED IN THE CONTRACT SPECIFICATIONS.
- MAINTAIN WORK SITE IN A NEAT AND ORDERLY MANNER AT ALL TIMES AND REINSTATE ALL DISRUPTED AREAS TO THE SATISFACTION OF THE CONTRACT ADMINISTRATOR.
- DESIGN CRITERIA AND LOADING TO OHBDC 1991 3RD EDITION FOR PEDESTRIAN BRIDGES.
- THE NCC HAS RECENTLY COMPLETED RESTORATION WORKS OF THE AQUADUCT AREA ADJACENT TO THIS STRUCTURE INCLUDING THE RAILING OVER THE STRUCTURE. THESE WORKS ARE NOT TO BE DISTURBED BY THE WORK OF THIS CONTRACT AND ANY DAMAGE SHALL BE REPAIRED AT THE CONTRACTORS EXPENSE TO THE SATISFACTION OF THE CONTRACT ADMINISTRATOR.

# Building LeBreton

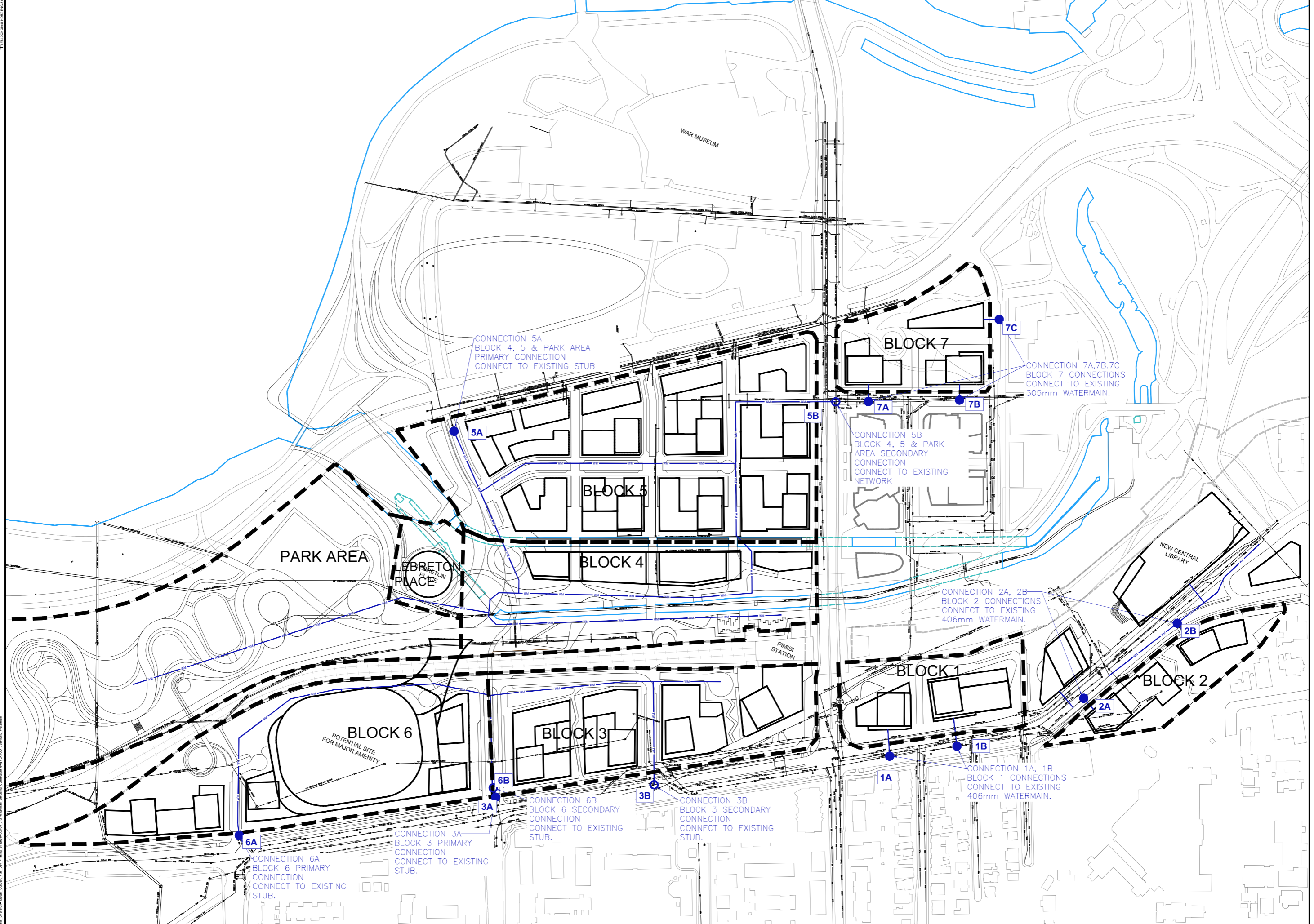
## Master Servicing Report

Renewed Master Concept Plan & Development Strategy



CIMA+ file number: A000958  
March 5<sup>th</sup>, 2021





CONNECTION 5A  
BLOCK 4, 5 & PARK AREA  
PRIMARY CONNECTION  
CONNECT TO EXISTING STUB

CONNECTION 7A,7B,7C  
BLOCK 7 CONNECTIONS  
CONNECT TO EXISTING  
305mm WATERMAIN.

CONNECTION 5B  
BLOCK 4, 5 & PARK  
AREA SECONDARY  
CONNECTION  
CONNECT TO EXISTING  
NETWORK

CONNECTION 2A, 2B  
BLOCK 2 CONNECTIONS  
CONNECT TO EXISTING  
406mm WATERMAIN.

CONNECTION 1A, 1B  
BLOCK 1 CONNECTIONS  
CONNECT TO EXISTING  
406mm WATERMAIN.

CONNECTION 6B  
BLOCK 6 SECONDARY  
CONNECTION  
CONNECT TO EXISTING  
STUB.

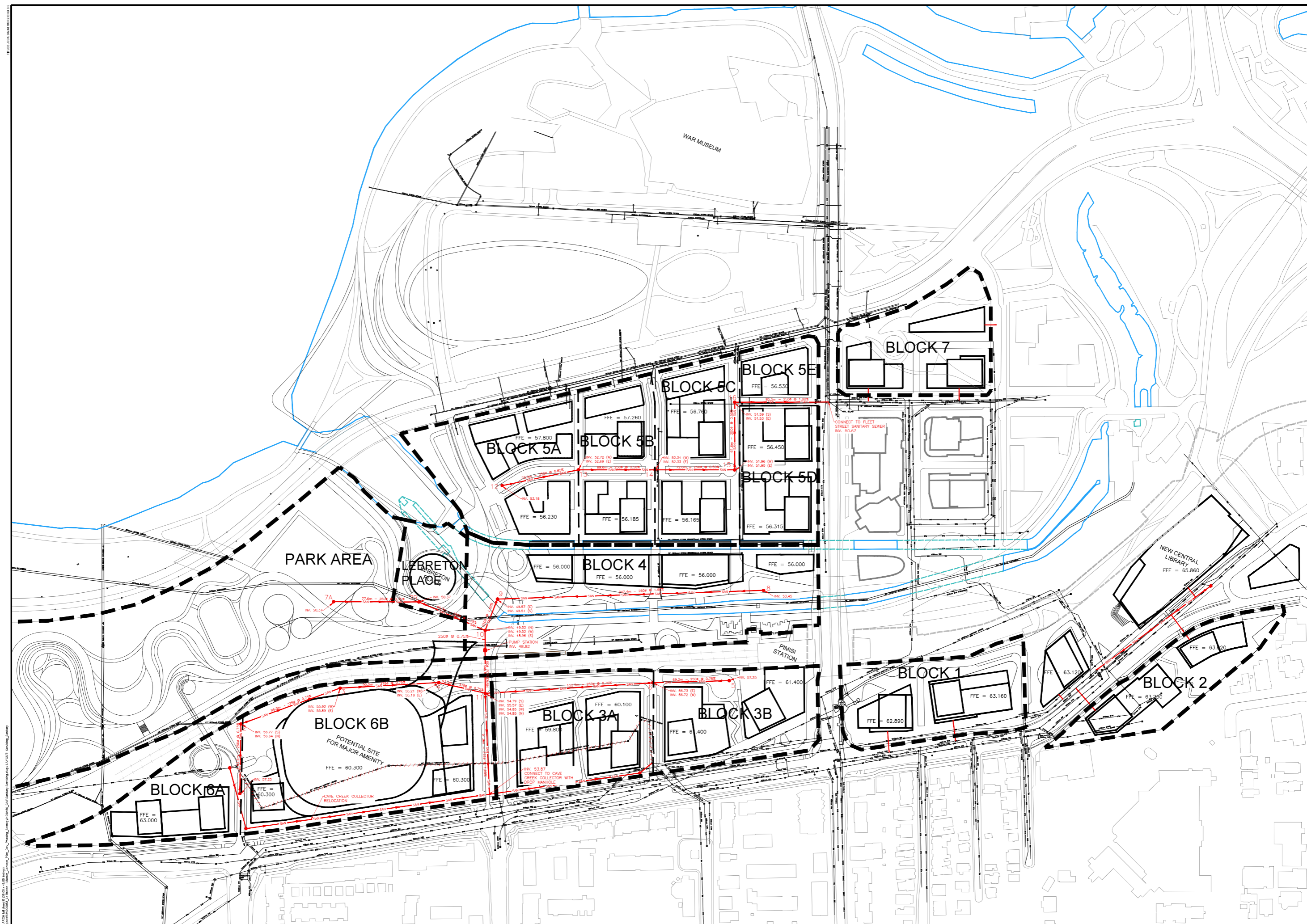
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BLOCK 3 SECONDARY  
CONNECTION  
CONNECT TO EXISTING  
STUB.

CONNECTION 3A  
BLOCK 3 PRIMARY  
CONNECTION  
CONNECT TO EXISTING  
STUB.

CONNECTION 6A  
BLOCK 6 PRIMARY  
CONNECTION  
CONNECT TO EXISTING  
STUB.

PRINT DATE: 2024/03/28 10:40:00 AM  
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 PLOT DEVICE: HP DesignJet T1100e

<b>CIMA+</b> CIVIL		CLIENT_NAME LE BRETON MASTER CONCEPT WATERMAIN SERVICING	DRAWN BY S.C. POISSON CHECKED BY J. LEBRETON DATE 2024/02/07 PROJECT NO. 20240058 SHEET NO. 1 of 1
-----------------------	--	--	---



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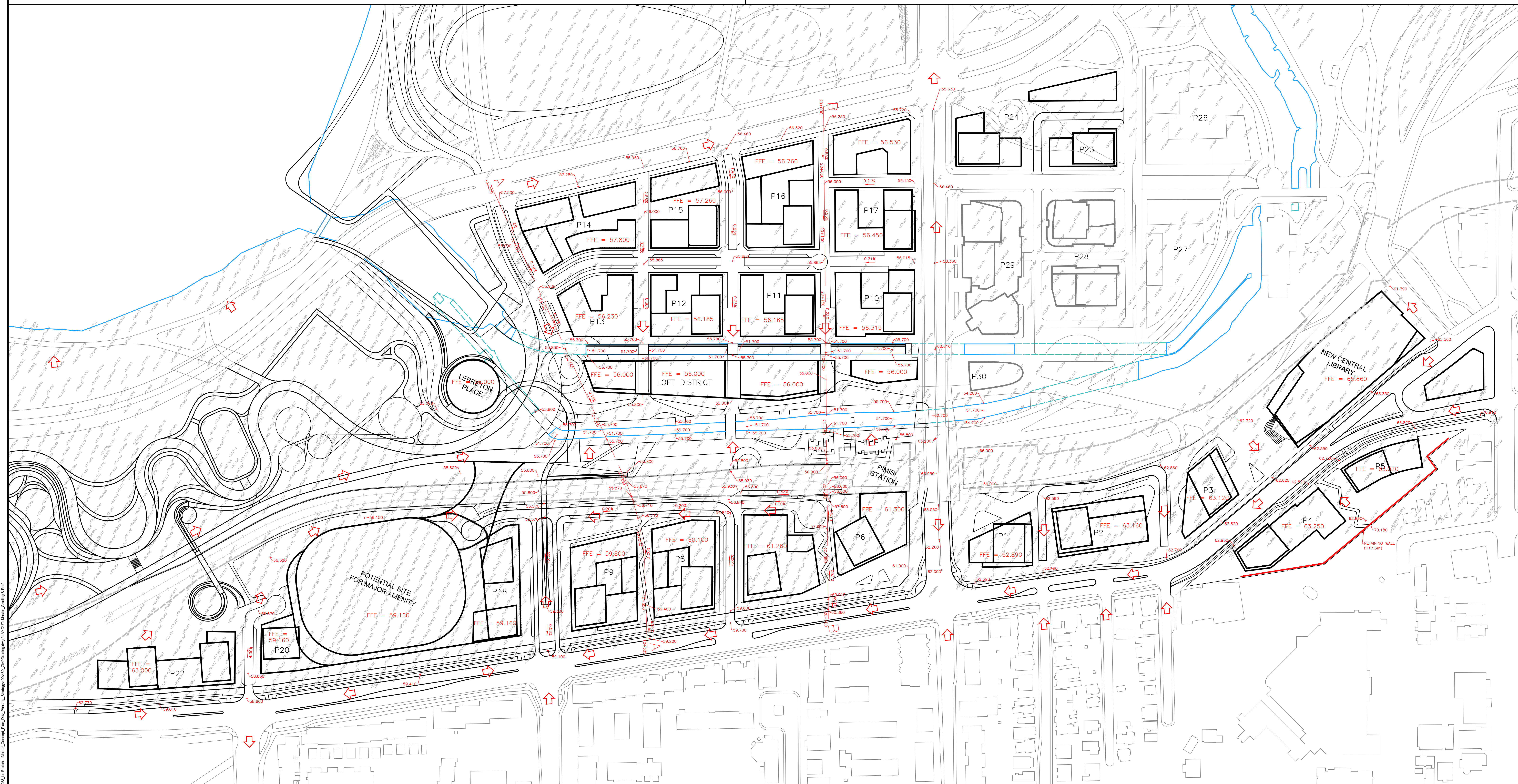
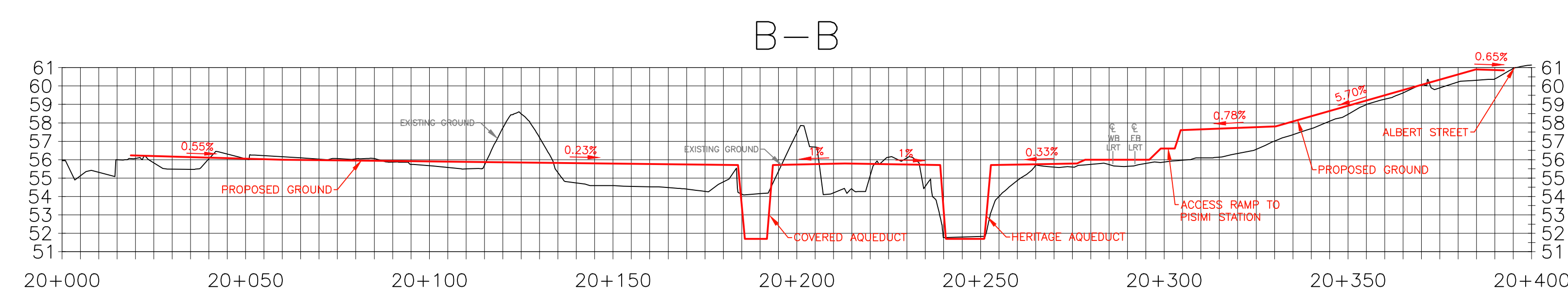
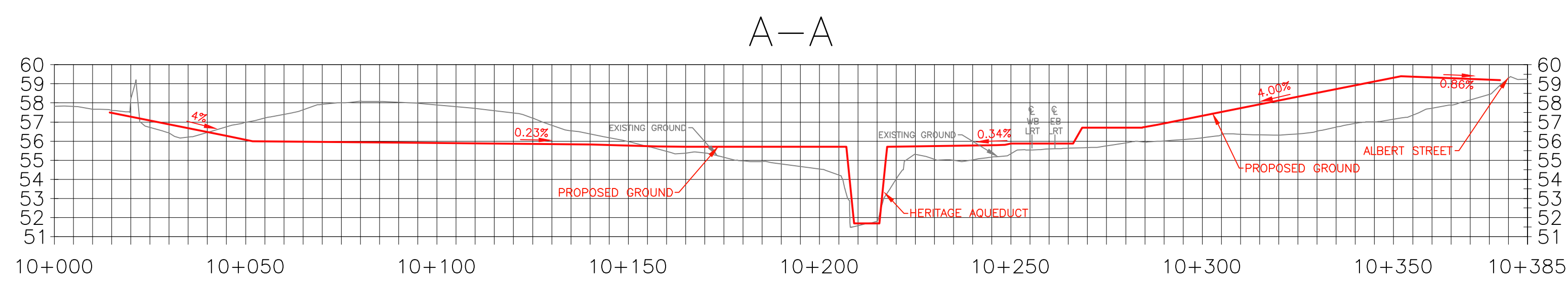
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2023/03 SAN	PRELIMINARY DRAFT REPORT CIVIL	1 SAN	1 SAN	1



PRINT DATE: 2020/03/03 10:45:00 AM; ARCHITECT: J. SAUVÉ; PROJECT: LE BRETON PLACE; DRAWING: STORM SERVICING; SCALE: 1:1000; SHEET: 1 OF 1



		<b>NCC / O2</b> <b>LE BRETON MASTER CONCEPT</b> <b>STORM SERVICING</b>		DATE: 2020/03/03 DRAWN BY: J. SAUVÉ CHECKED BY: C. LABEL	SCALE: 1:1000 DATE: 2020/03/07 PROJECT NO: 2000058 SHEET NO: 1 of 1
200403 PRELIMINARY DRAFT REPORT REV. 2	200013 PRELIMINARY DRAFT REPORT	DESIGNER: [Blank] APPROVED BY: [Blank]	REVIEWER: [Blank]	<b>CIVIL</b>	



PRINT DATE: 20240301 09:56:52 AM (GMT-7) PROJECT: 20240301 - 10/24/2024

No.	Date	Description	By
3	202403	PRELIMINARY GRADING REV. 2	
2	202403	PRELIMINARY GRADING	
1	202403	PRELIMINARY GRADING	



PROJECT NAME <b>LE BRETON MASTER CONCEPT</b>	CLIENT <b>NCC / O2</b>
PROJECT NO. <b>20240301</b>	DATE <b>20240307</b>
DRAWN BY <b>C. LABEL</b>	CHECKED BY <b>C. LABEL</b>
DISCIPLINE <b>CIVIL</b>	
PROJECT TITLE <b>GRADING - MASTER PLAN</b>	
SHEET NO. <b>1 of 3</b>	

## **Appendix B Water Servicing**

### **B.1 Domestic Water Demands**



**LeBreton Flats, Ottawa, ON - Domestic Water Demand Estimates**

Draft Plan of Subdivision, Stantec Geomatics, April 5, 2024 & associated densities  
 Project No. 160401780



Population densities per Table 4.1 City of Ottawa Water Design Guidelines:		
Apartment	1.8	ppu
Townhome	2.7	ppu

Demand conversion factors per Table 4.2 of the City of Ottawa Water Design Guidelines and Technical Bulletin ISTB-2021-03:		
Residential	280	L/cap/day
Hotel	225	L/bedspace/d
Commercial and Institutional	28000	L/gross ha/day

Block ID	Commercial / Institutional (m <sup>2</sup> )	No. of Units	Population	Avg Day Demand		Max Day Demand <sup>1 2</sup>		Peak Hour Demand <sup>1 2</sup>	
				(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
<b>Block 1</b>									
Apartment		592	1066	207.2	3.45	518.0	8.63	1139.6	18.99
Commercial	1389		0	2.7	0.05	4.1	0.07	7.3	0.12
<i>Block 1 Subtotal</i>	1389	592	1066	209.9	3.50	522.1	8.70	1146.9	19.11
<b>Block 2</b>									
Apartment		608	1094	212.8	3.55	532.0	8.87	1170.4	19.51
Hotel <sup>3</sup>		201		62.8	1.05	94.2	1.57	169.6	2.83
Commercial	2370		0	4.6	0.08	6.9	0.12	12.4	0.21
<i>Block 2 Subtotal</i>	2370	809	1094	280.2	4.67	633.1	10.55	1352.4	22.54
<b>Block 3</b>									
Apartment		267	481	93.5	1.56	233.6	3.89	514.0	8.57
Townhome		10	27	5.3	0.09	13.1	0.22	28.9	0.48
Commercial	838		0	1.6	0.03	2.4	0.04	4.4	0.07
<i>Block 3 Subtotal</i>	838	277	508	100.3	1.67	249.2	4.15	547.2	9.12
<b>Block 4</b>									
Apartment		348	626	121.8	2.03	304.5	5.08	669.9	11.17
Townhome		10	27	5.3	0.09	13.1	0.22	28.9	0.48
<i>Block 4 Subtotal</i>	0	358	653	127.1	2.12	317.6	5.29	698.8	11.65
<b>Block 5</b>									
Apartment		203	365	71.1	1.18	177.6	2.96	390.8	6.51
Commercial	2035		0	4.0	0.07	5.9	0.10	10.7	0.18
Office	13391		0	26.0	0.43	39.1	0.65	70.3	1.17
<i>Block 5 Subtotal</i>	15426	203	365	75.0	1.25	183.6	3.06	401.5	6.69
<b>Block 6</b>									
Apartment		270	486	94.5	1.58	236.3	3.94	519.8	8.66
Commercial	2811		0	5.5	0.09	8.2	0.14	14.8	0.25
Office	10922		0	21.2	0.35	31.9	0.53	57.3	0.96
<i>Block 6 Subtotal</i>	13733	270	486	100.0	1.67	244.4	4.07	534.5	8.91
<b>Block 7</b>									
Apartment		81	146	28.4	0.47	70.9	1.18	155.9	2.60
Townhome		74	200	38.9	0.65	97.1	1.62	213.7	3.56
<i>Block 7 Subtotal</i>	0	155	346	67.2	1.12	168.0	2.80	369.6	6.16
<b>Block 8</b>									
Apartment		135	243	47.3	0.79	118.1	1.97	259.9	4.33
Townhome		56	151	29.4	0.49	73.5	1.23	161.7	2.70
<i>Block 8 Subtotal</i>	0	191	394	76.7	1.28	191.6	3.19	421.6	7.03
<b>Block 9</b>									
Apartment		135	243	47.3	0.79	118.1	1.97	259.9	4.33
Townhome		76	205	39.9	0.67	99.8	1.66	219.5	3.66
<i>Block 9 Subtotal</i>	0	211	448	87.2	1.45	217.9	3.63	479.3	7.99
<b>Block 10</b>									
Apartment		135	243	47.3	0.79	118.1	1.97	259.9	4.33
Townhome		46	124	24.2	0.40	60.4	1.01	132.8	2.21
<i>Block 10 Subtotal</i>	0	181	367	71.4	1.19	178.5	2.98	392.7	6.55
<b>Block 11</b>									
Apartment		268	482	93.8	1.56	234.5	3.91	515.9	8.60
Commercial	1792		0	3.5	0.06	5.2	0.09	9.4	0.16
<i>Block 11 Subtotal</i>	1792	268	482	97.3	1.62	239.7	4.00	525.3	8.76

<b>Block 12</b>									
Apartment		221	398	77.4	1.29	193.4	3.22	425.4	7.09
Hotel <sup>3 4</sup>		104		32.5	0.54	48.8	0.81	87.9	1.46
Commercial	884		0	1.7	0.03	2.6	0.04	4.6	0.08
<b>Block 12 Subtotal</b>	884	325	398	111.6	1.86	244.8	4.08	517.9	8.63
<b>Block 13</b>									
Apartment		216	389	75.6	1.26	189.0	3.15	415.8	6.93
Townhome		14	38	7.4	0.12	18.4	0.31	40.4	0.67
Commercial	514		0	1.0	0.02	1.5	0.02	2.7	0.04
<b>Block 13 Subtotal</b>	514	230	427	83.9	1.40	208.9	3.48	458.9	7.65
<b>Block 14</b>									
Apartment		288	518	100.8	1.68	252.0	4.20	554.4	9.24
Townhome		14	38	7.4	0.12	18.4	0.31	40.4	0.67
Commercial	546		0	1.1	0.02	1.6	0.03	2.9	0.05
<b>Block 14 Subtotal</b>	546	302	556	109.2	1.82	272.0	4.53	597.7	9.96
<b>Block 15</b>									
Apartment		381	686	133.4	2.22	333.4	5.56	733.4	12.22
Commercial	2860		0	5.6	0.09	8.3	0.14	15.0	0.25
<b>Block 15 Subtotal</b>	2860	381	686	138.9	2.32	341.7	5.70	748.4	12.47
<b>Block 17</b>									
Commercial	3717		0	7.2	0.12	10.8	0.18	19.5	0.33
Office	22950		0	44.6	0.74	66.9	1.12	120.5	2.01
<b>Block 17 Subtotal</b>	26667	0	0	51.9	0.86	77.8	1.30	140.0	2.33
<b>Block 18</b>									
Park <sup>5</sup>	68398		1268	22.0	0.37	33.0	0.55	59.4	0.99
<b>Block 18 Subtotal</b>	68398	0	1268	22.0	0.37	33.0	0.55	59.4	0.99
<b>Block 19</b>									
Park <sup>5</sup>	24756		459	8.0	0.13	11.9	0.20	21.5	0.36
<b>Block 19 Subtotal</b>	24756	0	459	8.0	0.13	11.9	0.20	21.5	0.36
<b>Total Site :</b>	<b>160173</b>	<b>4753</b>	<b>10003</b>	<b>1817.7</b>	<b>30.29</b>	<b>4335.8</b>	<b>72.26</b>	<b>9413.7</b>	<b>156.90</b>

**Notes:**

- The City of Ottawa water demand criteria used to estimate peak demand rates for residential areas are as follows:  
maximum day demand rate = 2.5 x average day demand rate  
peak hour demand rate = 2.2 x maximum day demand rate (as per Technical Bulletin ISD-2010-02)
- Water demand criteria used to estimate peak demand rates for commercial areas, hotels, and parks are as follows:  
maximum daily demand rate = 1.5 x average day demand rate  
peak hour demand rate = 1.8 x maximum day demand rate (as per Technical Bulletin ISD-2010-02)
- Hotel bedspace assumed to be 2 bedspace/room per LeBreton Flats MSS (CIMA+ 2021)
- Block 12 hotel unit counts estimated based on density of hotel room/gross floor area (201 rooms/9450 m<sup>2</sup>) established in Block 2 in density table.
- Park population based on 185.3 persons/ha density; 20 L/p/d water demand based on park picnic and flush toilet demand from City Sewer Design Guidelines

## **B.2 Boundary Conditions**



**From:** [Fawzi, Mohammed](#)  
**To:** [Smadella, Karin](#)  
**Cc:** [Duguet, Vincent](#); [Moroz, Peter](#); [Mottalib, Abdul](#); [Thiffault, Dustin](#); [Wu, Michael](#); [binitha.chakrabarty@ncc-ccn.ca](#)  
**Subject:** RE: LeBreton Flats Boundary Conditions Request  
**Date:** Monday, June 24, 2024 12:33:05 PM  
**Attachments:** ~WRD2598.jpg  
 image004.png  
 image005.png  
 image006.png  
 image007.png  
 LeBreton Flats June 2024.pdf

Hi Karin,

The following are boundary conditions, HGL, for hydraulic analysis at LeBreton Flats (zone 1W) assumed to be connected to via 8 Connections to the 305mm watermain on Wellington Avenue, 406mm on Booth Street and 406mm on Albert Street (see attached PDF for location).

**Notes:**

- Analysis has been completed by classifying the demands into three groups:
  - North Block: Blocks 7 to 19
  - South Block: Blocks 1 to 5
  - South Individual Block: Block 6
- Private main looping has been assumed for North Blocks.
- For Connections 1,2,3,4 and 8: The maximum pressure is estimated to be more than 80 psi. A pressure check at completion of construction is recommended to determine if pressure control is required.*

	Connection 1	Connection 2	Connection 3	Connection 4	Connection 5	Connection 6	Connection 7	Connection 8
Minimum HGL (m)	107.4	107.4	107.4	107.5	107.6	107.6	107.6	107.6
Maximum HGL (m)	115.2	115.2	115.2	115.2	115.1	115.0	115.0	114.9
MaxDay + FireFlow (200 L/s)	105.0	106.5	107.1	108.4	110.1	109.9	110.0	110.0

These are for current conditions and are based on computer model simulation.

*Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.*

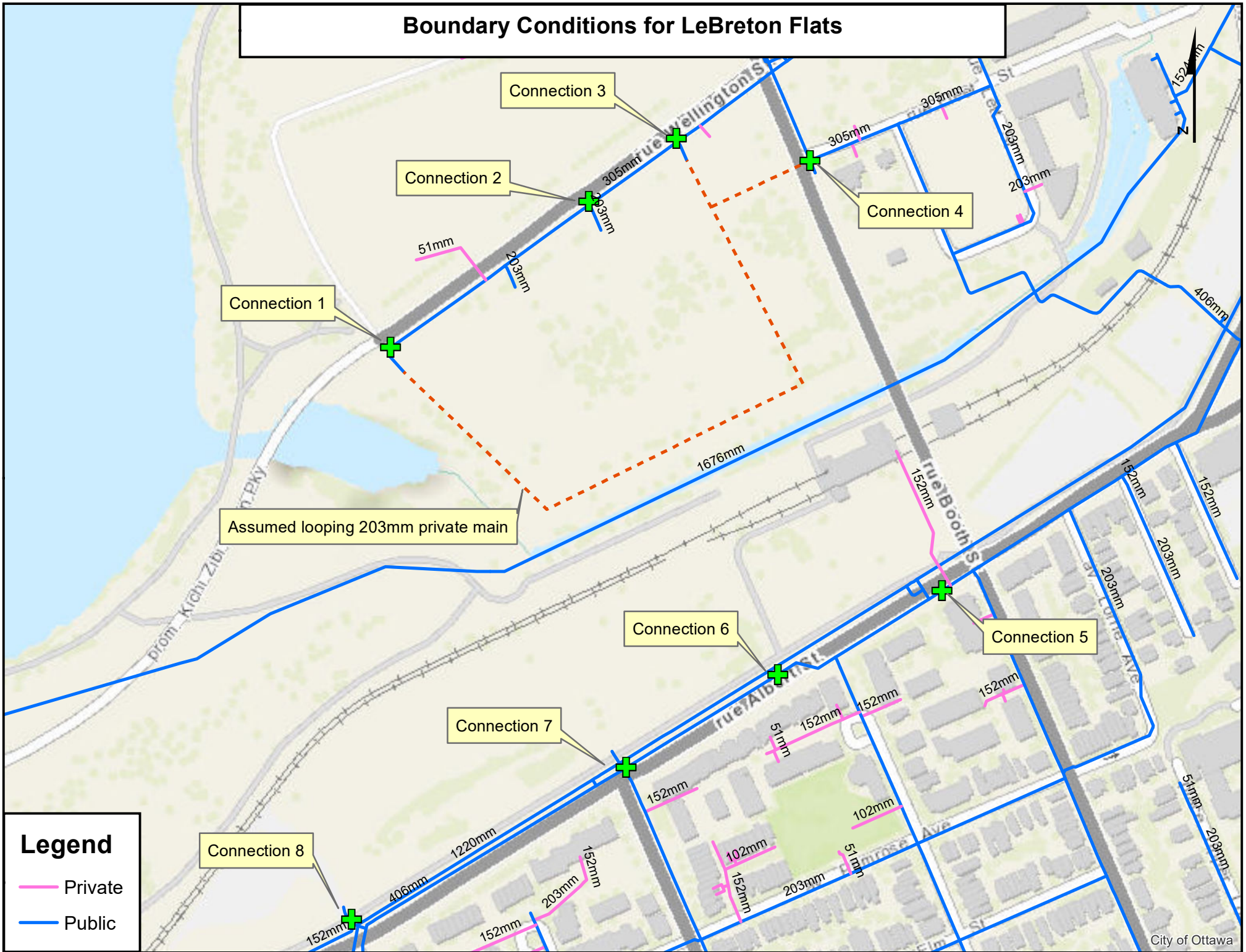
Best Regards,

**Mohammed Fawzi, P.Eng.**

Project Manager, Infrastructure - Gestionnaire de projet, Projets d'infrastructure

Development Review All Wards (DRAW) | Direction de l'examen des projets d'aménagement - Tous les quartiers (EPATQ)  
 Planning, Development and Building Services Department (PDBS) | Direction générale des services de la planification, de l'aménagement  
 110 Laurier Avenue West | 110 Avenue Laurier Ouest  
 Ottawa, ON K1P 1J1  
 613.580.2424 ext./poste 20120, [Mohammed.Fawzi@ottawa.ca](mailto:Mohammed.Fawzi@ottawa.ca)

# Boundary Conditions for LeBreton Flats



## Legend

- Private
- Public



### **B.3 Preliminary Hydraulic Analysis**



**Junction Results - Basic Day**

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (m)	Pressure (psi)2	Pressure (kPa)
8	0.00	58.89	115.00	56.11	79.79	550.14
2	0.00	58.55	114.90	56.35	80.13	552.45
1	8.17	57.98	114.90	56.92	80.93	558.02
28	0.00	56.43	115.20	58.77	83.56	576.15
29	0.00	56.42	115.20	58.78	83.58	576.25
5	1.67	56.08	115.00	58.92	83.79	577.68
25	1.45	56.17	115.20	59.03	83.93	578.70
30	1.19	56.11	115.20	59.09	84.03	579.35
18	1.62	56.01	115.19	59.18	84.16	580.23
15	0.00	56.00	115.19	59.19	84.16	580.28
23	0.00	56.00	115.19	59.19	84.17	580.31
16	0.00	55.98	115.19	59.21	84.19	580.50
17	2.98	55.96	115.18	59.23	84.22	580.65
22	2.32	55.95	115.19	59.24	84.23	580.75
6	3.37	55.74	114.99	59.25	84.25	580.89
33	1.82	55.93	115.19	59.26	84.26	580.97
32	2.68	55.87	115.18	59.31	84.34	581.52
11	0.86	55.73	115.19	59.45	84.54	582.89
12	0.50	55.72	115.19	59.47	84.57	583.06
9	1.67	52.36	114.99	62.63	89.06	614.06

**Link Results - Basic Day**

ID	FROM	TO	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)
1001	Albert_8	2	7.98	297.00	120.00	8.17	0.12
1002	5	Albert_7	99.73	297.00	120.00	-3.74	0.05
1003	5	6	143.55	204.00	110.00	2.07	0.06
1004	8	Albert_6	19.71	204.00	110.00	-2.97	0.09
1005	6	8	74.71	204.00	110.00	-2.97	0.09
1006	9	6	84.55	204.00	110.00	-1.67	0.05
1008	12	11	15.52	204.00	110.00	0.86	0.03
1009	16	12	59.34	204.00	110.00	1.36	0.04
1010	15	Wellington_1	63.13	204.00	110.00	-4.60	0.14
1011	16	15	5.45	297.00	120.00	-1.36	0.02
1012	17	15	42.92	204.00	110.00	-3.24	0.10
C3	32	33	68.12	204.00	110.00	-2.42	0.07
1017	23	22	46.88	204.00	110.00	2.32	0.07
1018	25	Wellington_2	13.71	204.00	110.00	-5.42	0.17
C2	17	32	42.82	204.00	110.00	0.26	0.01
1020	28	Booth_4	95.52	204.00	110.00	-1.71	0.05
1022	30	29	21.74	204.00	110.00	2.51	0.08
1023	Wellington_3	30	12.02	204.00	110.00	3.70	0.11
C1	2	1	34.20	297.00	120.00	8.17	0.12
C4	33	18	73.85	204.00	110.00	-0.27	0.01
C6	25	33	60.97	204.00	110.00	3.97	0.12
C11	23	18	8.86	204.00	110.00	-2.32	0.07
C12	29	28	3.77	297.00	120.00	2.51	0.04
C13	28	18	58.08	204.00	110.00	4.21	0.13

**Junction Results - Peak Hour**

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (m)	Pressure (psi)2	Pressure (kPa)
8	0.00	58.89	107.56	48.68	69.22	477.24
2	0.00	58.55	107.59	49.04	69.73	480.78
1	41.66	57.98	107.54	49.56	70.47	485.84
28	0.00	56.43	107.36	50.93	72.42	499.34
29	0.00	56.42	107.36	50.94	72.44	499.45
17	14.79	55.96	107.08	51.12	72.70	501.23
22	12.47	55.95	107.08	51.13	72.71	501.32
23	0.00	56.00	107.14	51.14	72.72	501.41
18	8.76	56.01	107.15	51.15	72.73	501.43
25	7.99	56.17	107.33	51.16	72.74	501.54
15	0.00	56.00	107.19	51.19	72.78	501.82
16	0.00	55.98	107.19	51.21	72.82	502.05
32	14.67	55.87	107.08	51.21	72.82	502.06
33	9.96	55.93	107.15	51.22	72.83	502.16
30	6.55	56.11	107.38	51.27	72.91	502.68
11	2.33	55.73	107.18	51.44	73.15	504.36
12	1.35	55.72	107.18	51.46	73.18	504.55
5	9.12	56.08	107.56	51.48	73.21	504.75
6	18.34	55.74	107.42	51.67	73.48	506.62
9	8.91	52.36	107.36	55.01	78.22	539.29

**Link Results - Peak Hour**

ID	FROM	TO	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)
1001	Albert_8	2	7.98	297.00	120.00	41.66	0.60
1002	5	Albert_7	99.73	297.00	120.00	-20.30	0.29
1003	5	6	143.55	204.00	110.00	11.18	0.34
1004	8	Albert_6	19.71	204.00	110.00	-16.07	0.49
1005	6	8	74.71	204.00	110.00	-16.07	0.49
1006	9	6	84.55	204.00	110.00	-8.91	0.27
1008	12	11	15.52	204.00	110.00	2.33	0.07
1009	16	12	59.34	204.00	110.00	3.68	0.11
1010	15	Wellington_1	63.13	204.00	110.00	-21.72	0.66
1011	16	15	5.45	297.00	120.00	-3.68	0.05
1012	17	15	42.92	204.00	110.00	-18.04	0.55
C3	32	33	68.12	204.00	110.00	-11.42	0.35
1017	23	22	46.88	204.00	110.00	12.47	0.38
1018	25	Wellington_2	13.71	204.00	110.00	-27.96	0.86
C2	17	32	42.82	204.00	110.00	3.25	0.10
1020	28	Booth_4	95.52	204.00	110.00	-13.64	0.42
1022	30	29	21.74	204.00	110.00	9.01	0.28
1023	Wellington_3	30	12.02	204.00	110.00	15.56	0.48
C1	2	1	34.20	297.00	120.00	41.66	0.60
C4	33	18	73.85	204.00	110.00	-1.42	0.04
C6	25	33	60.97	204.00	110.00	19.97	0.61
C11	23	18	8.86	204.00	110.00	-12.47	0.38
C12	29	28	3.77	297.00	120.00	9.01	0.13
C13	28	18	58.08	204.00	110.00	22.65	0.69

Fire Flow Results - Max Day + 200 L/s

ID	Static Demand (L/s)	Static Pressure (m)	Static Pressure (psi)	Static Pressure (kPa)	Static Head (m)	Fire Flow Demand (L/s)	Residual Pressure (m)	Residual Pressure (psi)	Available Flow (L/s)	Available Pressure (psi)
9	4.09	57.52	81.79	563.92	109.88	200.00	31.74	45.13	322.3	20
11	0.43	49.52	70.42	485.50	105.25	200.00	27.59	39.23	528.0	20
12	0.00	49.54	70.44	485.68	105.25	200.00	30.86	43.88	562.1	20
17	6.15	49.47	70.35	485.05	105.43	200.00	41.96	59.66	770.8	20
32	6.78	49.83	70.86	488.58	105.70	200.00	42.36	60.23	817.6	20
22	5.72	50.69	72.08	496.96	106.64	200.00	32.96	46.87	828.9	20
6	8.45	54.15	76.99	530.85	109.89	200.00	46.51	66.13	982.2	20
8	0.00	51.01	72.54	500.14	109.90	200.00	48.17	68.50	1000.7	20
33	4.65	50.40	71.67	494.13	106.33	200.00	46.38	65.96	1099.9	20
25	3.63	50.29	71.51	493.03	106.46	200.00	48.27	68.64	1229.8	20
23	0.00	50.66	72.03	496.64	106.65	200.00	43.13	61.33	1339.5	20
18	4.05	50.65	72.02	496.57	106.66	200.00	45.05	64.07	1418.8	20
16	0.00	49.28	70.07	483.11	105.25	200.00	43.11	61.29	1457.7	20
15	0.00	49.25	70.04	482.88	105.25	200.00	43.24	61.48	1542.9	20
30	2.98	51.00	72.52	500.01	107.11	200.00	49.51	70.40	1554.9	20
29	0.00	50.71	72.10	497.12	107.13	200.00	48.45	68.90	1860.3	20
28	0.00	50.70	72.09	497.02	107.13	200.00	48.44	68.88	1914.8	20
5	4.35	53.91	76.65	528.50	109.98	200.00	51.76	73.60	2138.8	20
1	19.26	52.00	73.95	509.85	109.98	200.00	50.61	71.96	2882.5	20
2	0.00	51.45	73.16	504.39	110.00	200.00	51.18	72.78	7042.4	20

## **Appendix C Sanitary Servicing**

### **C.1 Sanitary Sewer Design Sheet**





SUBDIVISION:  
**LeBreton Flats**  
**Draft Plan of Subdivision**  
 DATE: 2024-07-23  
 REVISION: 1  
 DESIGNED BY: AR  
 CHECKED BY: MV

**SANITARY SEWER  
 DESIGN SHEET**  
 (City of Ottawa)

FILE NUMBER: 160401780

**DESIGN PARAMETERS**

MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	280 l/p/day	MINIMUM VELOCITY	0.60 m/s
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	28,000 l/ha/day	MAXIMUM VELOCITY	3.00 m/s
PEAKING FACTOR (INDUSTRIAL):	2.4	INDUSTRIAL (HEAVY)	55,000 l/ha/day	MANNINGS n	0.013
PEAKING FACTOR (ICI >20%):	1.5	INDUSTRIAL (LIGHT)	35,000 l/ha/day	BEDDING CLASS	B
PERSONS / SINGLE	3.4	INSTITUTIONAL	28,000 l/ha/day	MINIMUM COVER	2.50 m
PERSONS / TOWNHOME	2.7	INFILTRATION	0.33 l/s/ha	HARMON CORRECTION FACTOR	0.8
PERSONS / APARTMENT	1.8	HOTEL	225 l/bedspace/day	BEDSPACE/HOTEL UNIT	2.00

LOCATION	RESIDENTIAL AREA AND POPULATION											HOTEL				PARKS				COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+H	INFILTRATION			TOTAL FLOW (l/s)	PIPE										
	AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (ha)	SINGLE	UNITS TOWN	APT	POP.	CUMULATIVE AREA (ha)	POP.	PEAK FACT.	PEAK FLOW (l/s)	UNITS	BEDSPACE	ACCU. BED	PEAK FLOW (l/s)	AREA (ha)	POP.	ACCU. POP.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)		ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)		ACCU. AREA (ha)	INFILT. FLOW (l/s)	LENGTH (m)	DIA (mm)	MATERIAL	CLASS	SLOPE (%)	CAP. (FULL) (l/s)	CAP. V PEAK FLOW (%)	VEL. (FULL) (m/s)	
R5A	SAN 5	SAN 4	1.20	0	74	302	743	1.20	743	3.30	8.0	104	208	208	0.8	0.00	0	0	0.00	0.09	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.20	1.20	0.4	9.2	29.6	250	PVC	SDR 35	0.40	38.3	23.98%	0.77
R4A	SAN 4	SAN 3	2.04	0	160	774	1825	3.24	2569	3.00	25.0	0	0	208	0.8	0.00	0	0	0.00	0.11	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.1	2.04	3.24	1.1	26.9	184.2	250	PVC	SDR 35	0.40	38.3	70.17%	0.77		
R3AA	SAN 3A	SAN 3	0.21	0	0	381	686	0.21	686	3.32	7.4	0	0	0	0.0	0.00	0	0	0.00	0.29	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.2	0.21	0.21	0.1	7.7	38.8	250	PVC	SDR 35	0.40	38.3	20.03%	0.77			
C3A	SAN 3	SAN 2	0.00	0	0	0	0	3.45	3254	2.93	30.9	0	0	208	0.8	0.00	0	0	0.00	0.18	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.2	0.46	3.91	1.3	33.2	59.8	300	PVC	SDR 35	0.30	52.6	63.16%	0.75				
R2A	SAN 2	SAN 1	0.56	0	46	403	850	4.01	4104	2.86	38.0	0	0	208	0.8	0.00	0	0	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.2	0.56	4.47	1.5	40.5	88.2	300	PVC	SDR 35	0.30	52.6	77.06%	0.75					
C15A	SAN 15	SAN 14	0.00	0	0	0	0	0.00	0	3.80	0.0	0	0	0	0.0	0.00	0	0	0.00	2.67	2.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	1.02	1.02	0.3	1.6	4.6	250	PVC	SDR 35	0.70	50.7	3.22%	1.02		
G13A	SAN 14	SAN 13	0.00	0	0	0	0	0.00	0	3.80	0.0	0	0	0	0.0	0.00	0	0	0.00	0.00	2.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	0.00	1.02	0.3	1.6	53.4	250	PVC	SDR 35	0.50	42.9	3.81%	0.86			
G11AA	SAN 13	SAN 11	0.00	0	0	0	0	0.00	0	3.80	0.0	0	0	0	0.0	2.48	459	459	0.13	0.00	2.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	2.48	3.50	1.2	2.6	38.9	250	PVC	SDR 35	0.38	37.4	6.91%	0.75			
G11AA	SAN 11A	SAN 11	0.00	0	0	0	0	0.00	0	3.80	0.0	0	0	0	0.0	6.84	1268	1268	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	6.84	6.84	2.3	2.6	63.9	300	PVC	SDR 35	0.41	61.5	4.27%	0.87				
See Note 2. below R10A, R10B	SAN 11	SAN 10	0.00	0	0	0	0	0.00	0	3.80	0.0	0	0	0	0.0	0.00	0	1727	0.50	0.00	2.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	0.00	10.34	3.4	5.2												
R18A, R18B	SAN 10	SAN 9	2.22	0	10	571	1055	2.22	1055	3.23	11.0	101	201	201	0.8	0.00	0	0	0.00	0.20	2.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	2.22	12.56	4.1	17.4	104.2	250	PVC	SDR 35	0.40	38.3	45.27%	0.77			
R18A, R18B	SAN 18	SAN 17	2.41	0	0	896	1613	2.41	1613	3.13	16.3	101	201	201	0.8	0.00	0	0	0.00	0.26	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.1	2.41	2.41	0.8	18.0	49.1	300	PVC	SDR 35	1.00	96.0	18.75%	1.36				
R18A, R18B	SAN 17	SAN 17A	0.00	0	0	0	0	2.41	1613	3.13	16.3	0	0	201	0.8	0.00	0	0	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.1	0.00	2.41	0.8	18.0	15.9	300	PVC	SDR 35	1.00	96.0	18.75%	1.36					
R8A	SAN 9	SAN 7	0.91	0	0	473	851	0.91	851	3.28	9.0	0	0	0	0.0	0.00	0	0	0.00	2.92	2.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.91	0.91	0.3	10.8	87.7	250	PVC	SDR 35	0.30	33.2	32.39%	0.67				
R7A	SAN 7	SAN 6	0.80	0	10	348	653	1.71	1505	3.14	15.3	0	0	0	0.0	0.00	0	0	0.00	0.00	2.92	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.80	1.71	0.6	17.3	64.4	250	PVC	SDR 35	0.30	33.2	52.12%	0.67					
R7A	SAN 6	SAN 6A	0.00	0	0	0	0	1.71	1505	3.14	15.3	0	0	0	0.0	0.00	0	0	0.00	0.00	2.92	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.00	1.71	0.6	17.3	16.2	250	PVC	SDR 35	0.30	33.2	52.12%	0.67					
								300	4148	8276	4172	2.85	38.6			6.04												2.9		16.69	5.5	52.7													
																															21.16		93.2												

1. Sanitary manhole numbers taken from functional sanitary servicing plan Drawing SAN-1 attached as part of submission package.  
 2. PPS for proposed pumping station to service Blocks 17-19 and located upstream of SAN 11 with forcemain connecting SAN 11 to SAN 10; outflow from PPS assumed to be the same as intake flow  
 3. Hotel bedspace assumed to be 2 bedspace/room per LeBreton Flats MSS (CIMA+ 2021)  
 4. Block 12 hotel unit counts estimated based on density of hotel room/gross floor area (201 rooms/9450 m<sup>2</sup>) established for Block 2 in density table.  
 5. Park area population estimated based on 185.3 persons/ha density in LeBreton Flats MSS (CIMA+ 2021); 20 L/p/d demand based on park picnic and flush toilet demands

## **C.2 Proposed Preliminary Pump Station Design Memo**



To: Peter Moroz, P.Eng. From: Gregory Chochlinski, P. Eng.  
Stantec, Ottawa

Project/File: 160401780 Date: July 23, 2024

---

**Reference: LeBreton Flats Subdivision Sewage PS – Functional Design****INTRODUCTION**

Further to your request we prepared a Functional Design and location options for the proposed Sewage PS at LeBreton Flats. We understand that this Memo will be reviewed by the stakeholders and one of the two options will be selected to advance to the preliminary design.

We understand that the proposed PS would receive a peak flow of about 3.6 L/s but we propose a pumping rate of about 7.0 L/s through 100 mm diameter forcemain to maintain self-cleaning velocity of 0.90 m/s. Twin forcemains are proposed for redundancy, as per the City guidelines. After construction and commissioning the PS will be taken over and operated by the City of Ottawa.

Two location options are presented and evaluated in this Memo:

**Option 1:** PS location close to LRT corridor (south of the arch bridge)

**Option 2:** PS location north of the arch bridge

In both cases the twin discharge forcemains would need to be installed under the existing LRT tracks using trenchless construction method.

Refer to the **Attachment** for the proposed plan and profile drawings for two options.

**PS DESIGN COMPONENTS**

The proposed PS will be a wet well type with two submersible pumps, one duty, one standby, with the following components:

- Prefabricated Fiberglass wet well, 2.4 m diameter (minimum size acceptable to the City)
- Inlet sewer 250 mm dia. with an isolation valve and trash basket
- Two submersible sewage pumps capable of pumping about 7.0 L/s
- Twin forcemains, 100 mm dia. each (HDPE/PVC, SS inside the swabbing chamber)
- Bypass MH (upstream of the wet well) to allow bypassing the wet well during inspections/repairs or emergency situations
- Swabbing/Bypass Chamber d/s of the wet well
- Precast concrete control building with HVAC, for process, electrical and SCADA equipment
- Permanent power supply
- Soft starters for well pumps
- Standby Power: Generator (diesel or natural gas)



**Reference: LeBreton Flats Subdivision PS – Functional Design**

- SCADA control and communication

The Swabbing/Bypass Chamber downstream of the wet well will have the following components:

- Swab launcher at each of the two 100 mm forcemains (FMs)
- 75 mm Bypass Connections with isolation valves at each of the two FMs
- Flowmeters at each of the two FMs
- Isolation valves at entry and exist within the chamber
- Drain valves and sump pit (gravity drain back to the well could be an option)

The PS facility will be equipped with the following:

- Security fence, 2.4 m tall with a sliding access gate 4.0 m wide.
- Asphalt access road and parking (2 spots) with a turning point
- Granular or asphalt walkways to the control building and generator
- Protective bollards
- Yard hydrant and flow metering chamber (if connection to the City water supply system is possible).  
Or water trucks will be used when occasional cleanup of the wet well is required.

### **TRENCHLESS CROSSING OF LRT CORRIDOR**

The proposed 100 mm dia. twin FMs will cross the existing LRT corridor using trenchless construction method. More detailed geotechnical evaluation is required to determine the most suitable trenchless method, installation depth, allowable vibration and settlement limits etc.

At this point it appears that a 600 mm dia. casing installed by pipe ramming might be a suitable option. The pipe material for two 100 mm FMs crossing the LRT inside the casing are anticipated to be HDPE. The casing would be grouted or filled with blown-in sand after the installation of FMs.

### **REVIEW OF PROPOSED LOCATION OPTIONS**

In both options part of the arch of the existing old bridge would need to be removed to allow installation of pipes. The first 10 m of the arch bridge will remain intact as it is considered a heritage structure. The remaining portion of the arch bridge (about 20 m) is already abandoned, buried and filled with stone under the arch. The proposed open cut will remove a section of the abandoned arch for installation of the FMs/sewer/access road.

In both options the proposed new pipes will cross above the existing 1,650 mm dia. watermain, this will greatly reduce the risk of any damage to the watermain.

The pros and cons of two options are presented below:

<b>Description</b>	<b>Option 1: PS near the LRT</b>	<b>Option 2: PS north of arch bridge</b>
<b>PS Layout</b>	Simpler	More complicated
<b>Lot size requirement</b>	Approx. 14.0 x 23.0 m	Approx. 20.0 x 20.0 m (irreg.)

Reference: LeBreton Flats Subdivision PS – Functional Design

<b>Pipe alignment</b>	Simple, straight, FM easier to swab. Only one pipe (gravity sewer) crossing the arch bridge. Swabbing connection might not be needed as the short FM could be cleaned with water jets from the MH side, if ever needed.	Longer, more bends for FM, more difficult to swab. Three pipes crossing the arch bridge.
<b>Access Road</b>	Longer access road needed, wider cut at arch bridge needed	Short road, no road over the arch bridge
<b>Water Supply and YH for cleaning</b>	Longer water line needed (water truck could be more economical for occasional cleaning of wet well)	Shorter line, from the new development
<b>Trenchless crossing of LRT</b>	Same	Same
<b>Power Supply</b>	Likely from Street 5, to be designed as part of the plan of subdivision.	Likely from Street 5, to be designed as part of the plan of subdivision
<b>Property/easement acquisition issues</b>	On the NCC property to be conveyed to the City of Ottawa for City park.	On the NCC property to be conveyed to the City of Ottawa for City park

Please let us know if you have any comments or questions. We look forward to discussing this Memo with all interested parties and stakeholders.

Regards,

**STANTEC CONSULTING LTD.**



Type text here

**Gregory Chochlinski** P.Eng., M.Eng.  
Senior Associate  
Mobile: 613-290-2322  
[gregory.chochlinski@stantec.com](mailto:gregory.chochlinski@stantec.com)  
[stantec.com](http://stantec.com)

Attachments:

1. Functional Design Drawings – Plan and Profile – Option 1 and 2

July 23, 2024  
Peter Moroz, P.Eng.

**Reference:** LeBreton Flats Subdivision PS – Functional Design

# **Attachment 1**

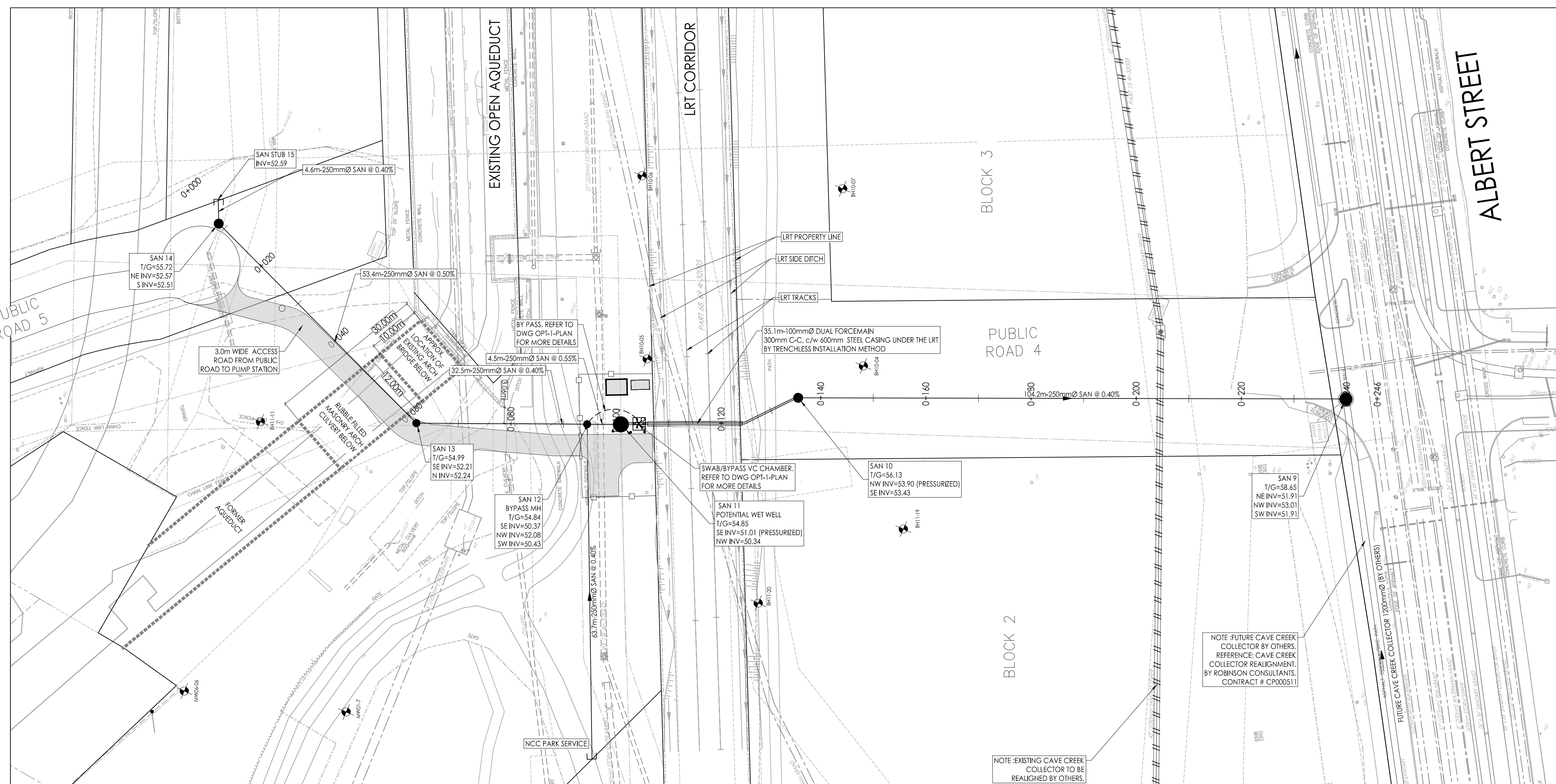
## **Functional Design Drawings**

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Legend

- PROPOSED PUMP STATION
- PROPOSED SANITARY SEWER
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING WATERMAIN

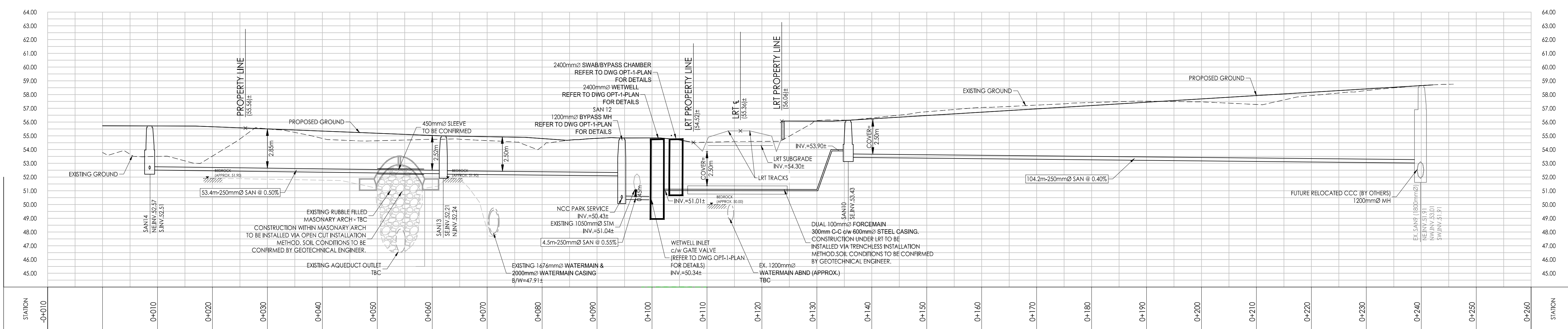


Notes

- APPROXIMATE DEPTH OF BEDROCK RETRIEVED FROM GEOTECHNICAL REPORT BY STANTEC CONSULTING, TITLED "GEOTECHNICAL DESKTOP REVIEW, LEBRETON FLATS PLAN OF SUBDIVISION, OTTAWA, ONTARIO, PREPARED FOR NATIONAL CAPITAL COMMISSION, DATED MAY 7, 2024
- LRT DESIGN LAYOUT RETRIEVED FROM: MMM GROUP, DRAWING # REM-20-1-0000-DRD-2714, DATED: 2019-07-22
- TOPOGRAPHIC SURVEY RETRIEVED FROM: STANTEC GEOMATICS LTD, PROJECT # 160401780-112, DATED AUGUST 31, 2023
- DRAFT PLAN RETRIEVED FROM: STANTEC GEOMATICS LTD, PROJECT # 160401780-112, DATED MARCH 12, 2024



PROFILE SCALE  
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Revision		By	Appd.	YY.MM.DD

File Name:	160401780-FSR.dwg	JP	DT	JP	24.06.10
		Dwn.	Chkd.	Dsgn.	YY.MM.DD

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NOT TO BE USED FOR CONSTRUCTION

Client/Project  
NCC (NATIONAL CAPITAL COMMISSION)  
40 Elgin Street, Suite 202  
OTTAWA, ON, K1P 1C7  
LEBRETON FLATS DRAFT PLAN OF SUBDIVISION

Title  
SANITARY PUMP STATION  
OPTION 1

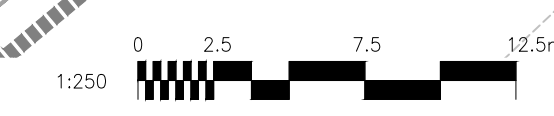
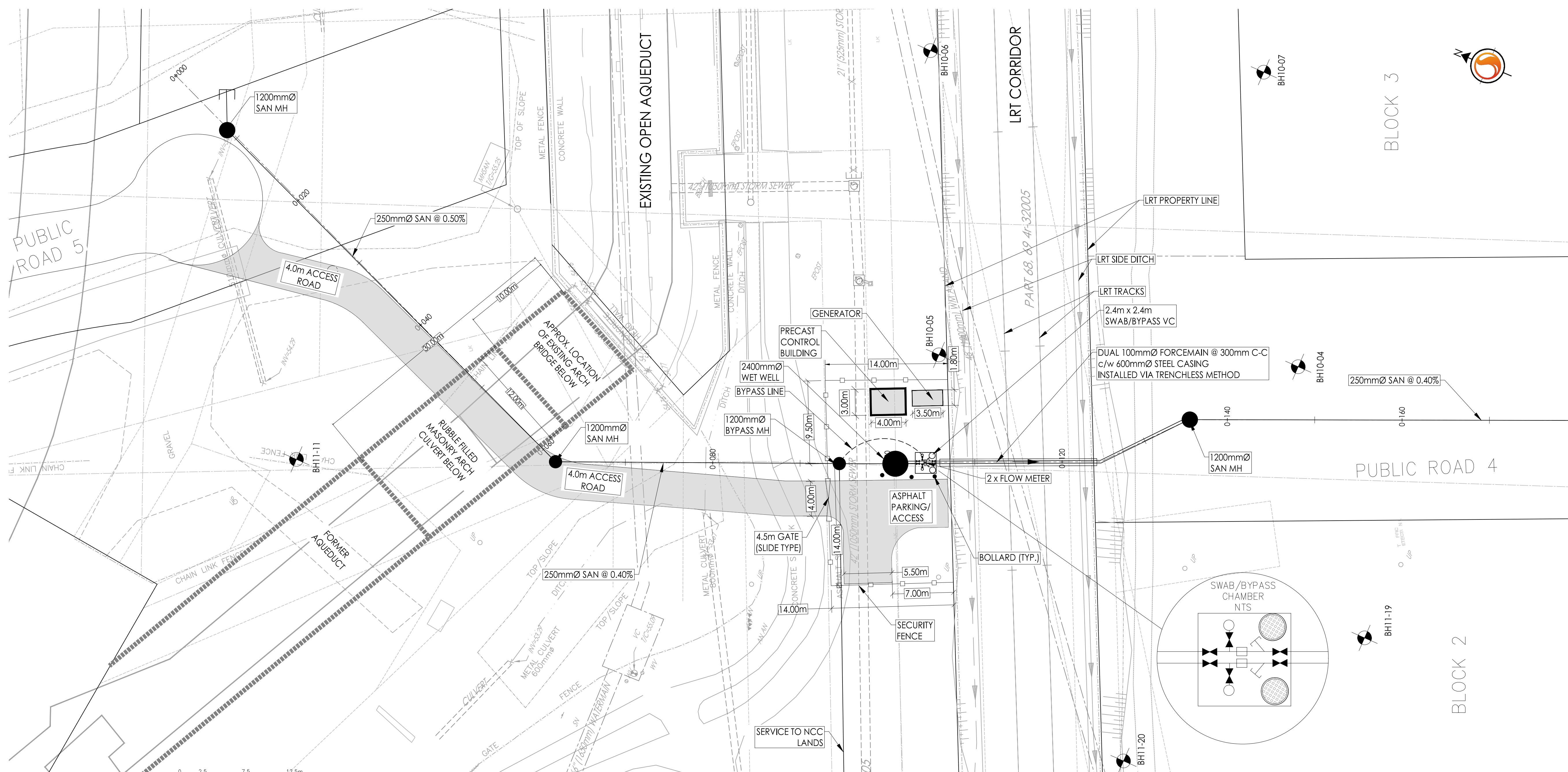
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	Revision

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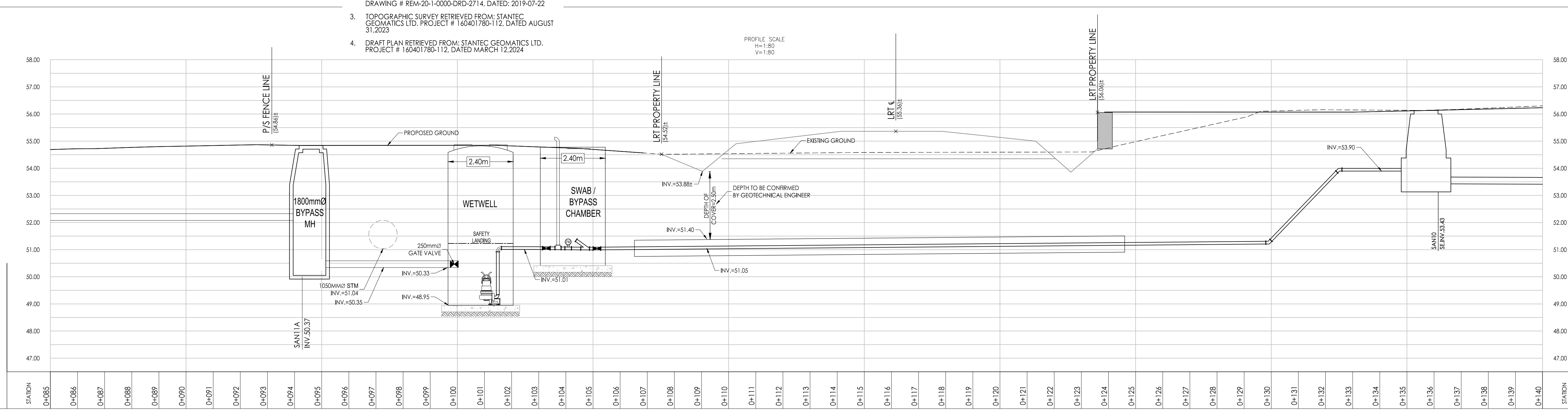
Legend

- CONCEPTUAL PUMP STATION
- PROPOSED SANITARY SEWER
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING WATERMAIN



- Notes
- APPROXIMATE DEPTH OF BEDROCK RETRIEVED FROM GEOTECHNICAL REPORT BY STANTEC CONSULTING, TITLED "GEOTECHNICAL DESKTOP REVIEW, LEBRETON FLATS PLAN OF SUBDIVISION, OTTAWA, ONTARIO, PREPARED FOR NATIONAL CAPITAL COMMISSION, DATED MAY 7, 2024
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Revision	By	Appd.	YY.MM.DD
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File Name:	JP	DT	JP	24.06.10
160401780-FSR.dwg	Dwn.	Chkd.	Dgn.	YY.MM.DD

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NCC (NATIONAL CAPITAL COMMISSION)  
40 Elgin Street, Suite 202  
OTTAWA, ON, K1P 1C7  
LEBRETON FLATS DRAFT PLAN OF SUBDIVISION

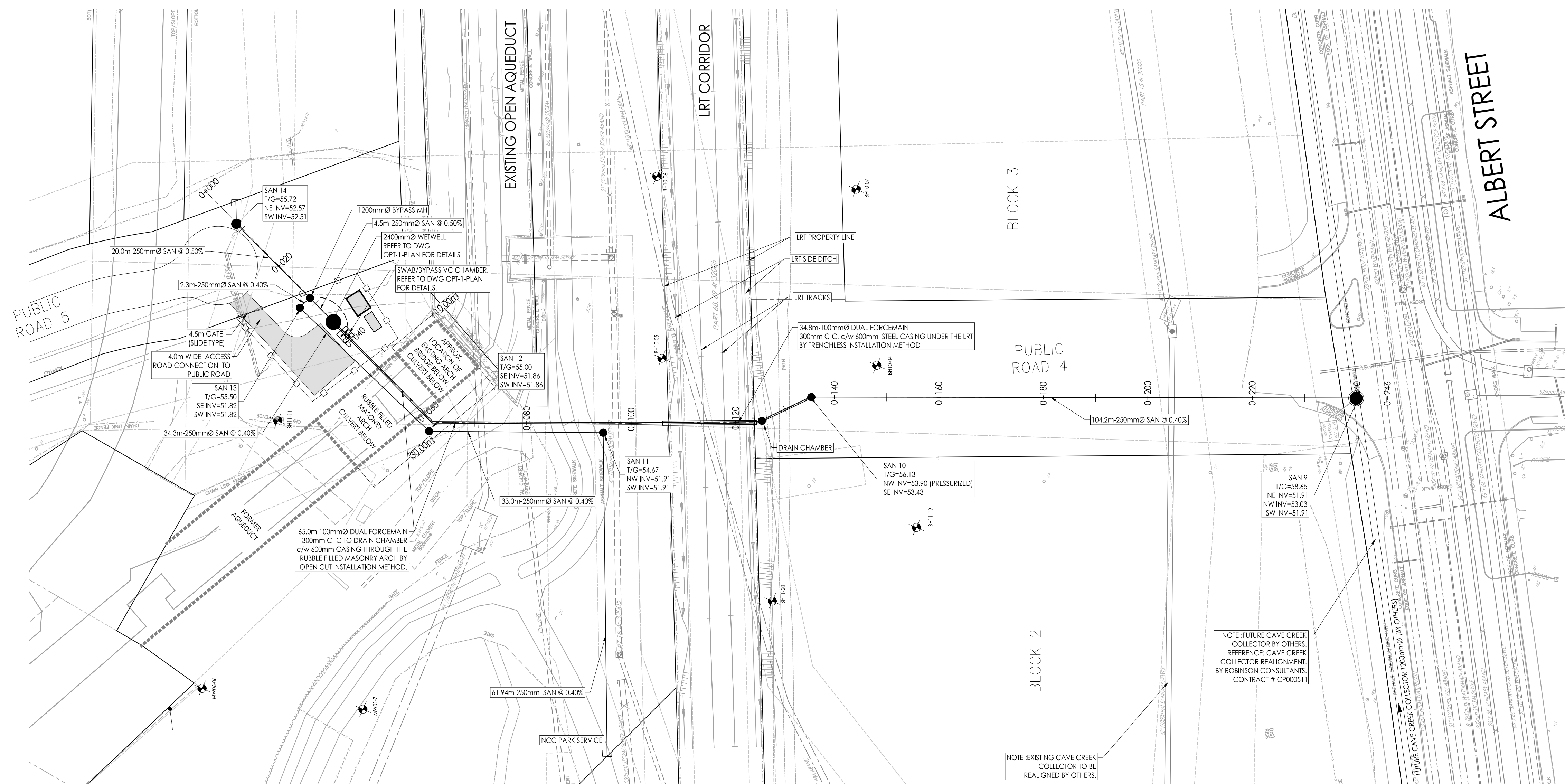
Title  
SANITARY PUMP STATION  
OPTION 1-PLAN

Project No.	Scale
160401780	

Drawing No.	Sheet	Revision
OPT-1P	2 of 3	1

**Legend**

	CONCEPTUAL PUMP STATION
	PROPOSED SANITARY SEWER
	EXISTING SANITARY SEWER
	EXISTING STORM SEWER
	EXISTING WATERMAIN

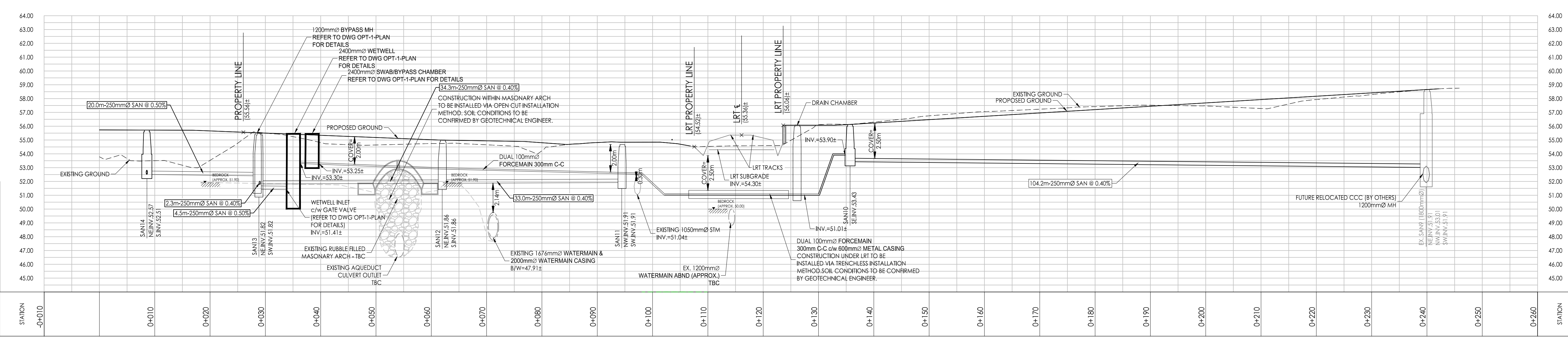


**Notes**

- APPROXIMATE DEPTH OF BEDROCK RETRIEVED FROM GEOTECHNICAL REPORT BY STANTEC CONSULTING, TITLED "GEOTECHNICAL DESKTOP REVIEW, LEBRETON FLATS PLAN OF SUBDIVISION, OTTAWA, ONTARIO, PREPARED FOR NATIONAL CAPITAL COMMISSION, DATED MAY 7, 2024"
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PROFILE SCALE  
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**Notes**

Revision	By	Appd.	YY.MM.DD
1	JP	KS	24.07.19

File Name: 160401780-FSR.dwg

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JP	DT	JP	24.06.10

**Permit-Seal**

**PRELIMINARY**  
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Client/Project  
NCC (NATIONAL CAPITAL COMMISSION)  
40 Elgin Street, Suite 202  
OTTAWA, ON, K1P 1C7  
LEBRETON FLATS DRAFT PLAN OF SUBDIVISION

Title  
SANITARY PUMP STATION  
OPTION 2

Project No. 160401780	Scale
Drawing No.	Sheet Revision

### **C.3 LeBreton Flats Pumping Station Certificate of Approval**





**AMENDED CERTIFICATE OF APPROVAL**  
**MUNICIPAL AND PRIVATE SEWAGE WORKS**  
NUMBER 8494-84GSRF  
Issue Date: April 15, 2010

City of Ottawa  
100 Constellation Crescent, 6th Floor  
Ottawa, Ontario  
K2G 6J8

Site Location: 10 Fleet Street  
10 Fleet Street North East of Fleet Street Pumping Station, East of Tailrace Canal  
Ottawa City

*You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:*

Inlet Gravity Sanitary Sewer

An existing 375mm diameter inlet gravity concrete sanitary sewer services the Lebreton Flats Development. Flow normally will pass through the Lebreton Flats Sanitary Pumping Station (LFPS) and the LFPS will only pump when levels in the receiving Interceptor Outfall Sewer (IOS) rise to a set level of 47.70m.

Sewage Pump Station

A sanitary sewage pump station with a rated firm capacity of 100 L/s to be constructed to serve the Lebreton Flats development, comprising of an in-ground cast-in-place flow through wet well located at the east end of Fleet Street just to the northeast of the Fleet Street Pumping Station (FSPS) at the corner of Fleet and the former Wellington Streets consisting of the following:

- A pre-cast maintenance hole (MH2) located immediately upstream of the flow through wetwell, equipped with 300mm diameter overflow to the FSPS tailrace. An emergency overflow float alarm at the wetwell will indicate if the overflow is in use.
- Sewage inflow to the wetwell is directed through a drop bowl.
- A cast-in-place flow through wetwell equipped with two (2) 11.2kW submersible pumps (one duty and one standby) of the non-clog type, each pump is capable of pumping up to 100 L/s at 6 m TDH, complete with soft starters, two (2) multitrodes for liquid level measurement and pump control (one duty / one backup). The wetwell is isolated by a 400x400mm stainless steel sluice gate and actuator which is controlled by a multitrode located in the downstream maintenance hole (MH1).



- The wetwell is equipped with one (1) stainless steel vent, complete with bird screen.
- The six (6) meter ductile iron forcemain pumps sewage into the adjacent maintenance hole (MH1) which is equipped with vent to release air during high flow events in order to pressurize MH1 pump into the receiving IOS.
- An 80kW diesel engine generator set for standby power during emergencies to be located within the existing adjacent FSPS, including a 1250L capacity fuel storage facility to be located within a spill containment area.
- The controls located in the FSPS building will have electrical and control equipment, including a new Supervisory Control and Data Acquisition (SCADA) system.

All in accordance with the following submitted documents:

1. Request for Amendment of Certificate of Approval #9608-7L6RZV submitted under covering letter dated February 8, 2010 by Ziad Ghadban, P. Eng., Manager, Design and Construction, Municipal East Branch, and all supporting documentation and information, including revised design drawings #13973-PS104, #13973-PS105 and #13973-PS301 prepared by Stantec Consulting Ltd.
2. Application for Approval of Municipal and Private Sewage Works submitted under covering letter dated September 9, 2008 by James Ricker, P.Eng., Project Engineer, Environmental Infrastructure, Stantec Consulting Ltd., Consulting Engineers;
3. Design brief outlining description of proposed works prepared by Stantec Consulting Ltd., Consulting Engineer;
4. Geotechnical report entitled "Geotechnical Investigation for a Proposed Wet Well Chamber, Fleet Street Pumping Station, Ottawa, Ontario" prepared by Jacques Whitford;
5. Final plans entitled "Fleet Street Pumping Station Electrical Upgrade and Construction of the Lebreton Flats Sanitary Pumping Station" prepared by Stantec Consulting Ltd., Consulting Engineers;
6. Final specifications entitled "Fleet Street Pumping Station Electrical Upgrade and Construction of the Lebreton Flats Sanitary Pumping Station" prepared by Stantec Consulting Ltd., Consulting Engineers;
7. MOE Appendix H (Modified) – Sewage Pump Station Design - Table 1 and 2;
8. MOE Appendix I – Information Required for Pump Station Applications; and
9. Notice of Study Completion.

*For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:*

1. "Act " means the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended;
2. "Certificate " means this entire certificate of approval document, issued in accordance with Section 53 of the Act , and includes any schedules;

3. "*Director* " means any *Ministry* employee appointed by the Minister pursuant to section 5 of the *Act* ;
4. "*District Manager* " means the District Manager of the MOE, Ottawa District Office of the Ministry;
5. "*Ministry* " means the Ontario Ministry of the Environment;
6. "*Owner* " means City of Ottawa and includes its successors and assignees;
7. "*Regional Director* " means the Regional Director of the MOE, Ottawa Region of the Ministry;
8. "*Substantial Completion* " has the same meaning as "*substantial performance* " in the Construction Lien Act; and
9. "*Works* " means the sewage works described in the *Owner* 's application, this *Certificate* and in the supporting documentation referred to herein, to the extent approved by this *Certificate* .

*You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:*

## TERMS AND CONDITIONS

### 1. GENERAL PROVISIONS

- 1.1 The *Owner* shall ensure that any person authorized to carry out work on or operate any aspect of the *Works* is notified of this *Certificate* and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.
- 1.2 Except as otherwise provided by these Conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Certificate* , the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this *Certificate* .
- 1.3 Where there is a conflict between a provision of any submitted document referred to in this *Certificate* and the Conditions of this *Certificate* , the Conditions in this *Certificate* shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.
- 1.4 Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.
- 1.5 The requirements of this *Certificate* are severable. If any requirement of this *Certificate* , or the application of any requirement of this *Certificate* to any circumstance, is held invalid or unenforceable, the application of such requirement to other circumstances and the remainder of this *Certificate* shall not be affected thereby.

2. **EXPIRY OF APPROVAL**

2.1 The approval issued by this *Certificate* will cease to apply to those parts of the *Works* which have not been constructed within five (5) years of the date of this *Certificate* .

3. **UPON THE SUBSTANTIAL COMPLETION OF THE WORKS**

3.1 Upon the *Substantial Completion* of the *Works* , the Owner shall prepare a statement, certified by a Professional Engineer, that the works are constructed in accordance with this *Certificate* , and upon request, shall make the written statement available for inspection by Ministry personnel.

3.2 Within one year of the *Substantial Completion* of the *Works* , a set of as-built drawings showing the works “as constructed” shall be prepared. These drawings shall be kept up to date through revisions undertaken from time to time and a copy shall be retained at the *Works* for the operational life of the *Works* .

4. **OPERATION AND MAINTENANCE**

4.1 The *Owner* shall exercise due diligence in ensuring that, at all times, the *Works* and the related equipment and appurtenances used to achieve compliance with this *Certificate* are properly operated and maintained. Proper operation and maintenance shall include effective performance, adequate funding, adequate operator staffing and training, including training in all procedures and other requirements of this *Certificate* and the *Act* and regulations, adequate laboratory facilities, process controls and alarms and the use of process chemicals and other substances used in the *Works* .

4.2 The *Owner* shall prepare an operations manual within six (6) months of *Substantial Completion* of the *Works* , that includes, but not necessarily limited to, the following information:

- (a) operating procedures for routine operation of the *Works* ;
- (b) inspection programs, including frequency of inspection, for the *Works* and the methods or tests employed to detect when maintenance is necessary;
- (c) repair and maintenance programs, including the frequency of repair and maintenance for the *Works* ;
- (d) procedures for the inspection and calibration of monitoring equipment;
- (e) a spill prevention control and countermeasures plan, consisting of contingency plans and procedures for dealing with equipment breakdowns, potential spills and any other abnormal situations, including notification of the *District Manager* ; and
- (f) procedures for receiving, responding and recording public complaints, including recording any follow-up actions taken.

4.3 The *Owner* shall maintain the operations manual current and retain a copy at the location of the *Works* for the operational life of the *Works* . Upon request, the *Owner* shall make the manual available to *Ministry* staff.

*The reasons for the imposition of these terms and conditions are as follows:*

1. Condition 1 is imposed to ensure that the *Works* are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the *Certificate* and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review. The condition also advises the *Owners* their responsibility to notify any person they authorized to carry out work pursuant to this *Certificate* the existence of this *Certificate* .
2. Condition 2 is included to ensure that, when the *Works* are constructed, the *Works* will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment.
3. Condition 3 is included to ensure that the *Works* are constructed in accordance with the approval and that record drawings of the *Works* “as constructed” are maintained for future references.
4. Condition 4 is included to require that the *Works* be properly operated, maintained, funded, staffed and equipped such that the environment is protected and deterioration, loss, injury or damage to any person or property is prevented. As well, the inclusion of a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the *Owner* and made available to the *Ministry* . Such a manual is an integral part of the operation of the *Works* . Its compilation and use should assist the *Owner* in staff training, in proper plant operation and in identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for *Ministry* staff when reviewing the *Owner*' s operation of the *Works* .

**This Certificate of Approval revokes and replaces Certificate(s) of Approval No. 9608-7L6RZV issued on November 10, 2008.**

*In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:*

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

*The Notice should also include:*

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

*And the Notice should be signed and dated by the appellant.*

*This Notice must be served upon:*

The Secretary\*  
Environmental Review Tribunal  
655 Bay Street, 15th Floor  
Toronto, Ontario  
M5G 1E5

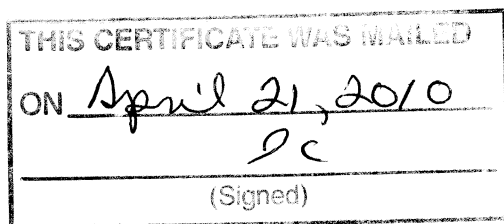
AND

The Director  
Section 53, *Ontario Water Resources Act*  
Ministry of the Environment  
2 St. Clair Avenue West, Floor 12A  
Toronto, Ontario  
M4V 1L5

\* Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or [www.ert.gov.on.ca](http://www.ert.gov.on.ca)

*The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.*

DATED AT TORONTO this 15th day of April, 2010



*Zafar Bhatti*

Zafar Bhatti, P.Eng.

Director

Section 53, *Ontario Water Resources Act*

OF/

c: District Manager, MOE Ottawa  
James Ricker, P. Eng., Stantec Consulting Ltd. ✓

## **C.4 Sanitary Flow Allocation – Dessau Soprin MSS**





SUBDIVISION:  
**LeBreton Flats**

DATE:  
 REVISION: 1  
 DESIGNED BY:  
 CHECKED BY: -

**SANITARY SEWER  
 DESIGN SHEET  
 (City of Ottawa)**

**Sanitary Flow Allocation - Data from Dessau Soprin MSS**

FILE NUMBER: 160401780

DESIGN PARAMETERS			
MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	350 l/p/day
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	50,000 l/ha/day
PEAKING FACTOR (INDUSTRIAL):	2.4	INDUSTRIAL (HEAVY)	55,000 l/ha/day
PEAKING FACTOR (ICI >20%):	1.5	INDUSTRIAL (LIGHT)	35,000 l/ha/day
PERSONS / SINGLE	3.0	INSTITUTIONAL	50,000 l/ha/day
PERSONS / TOWNHOME	3.0	INFILTRATION	0.28 l/s/ha
PERSONS / APARTMENT	2.1	HOTEL	225.00 l/bed-space/day
		MINIMUM VELOCITY	0.60 m/s
		MAXIMUM VELOCITY	3.00 m/s
		MANNINGS n	0.013
		BEDDING CLASS	B
		MINIMUM COVER	2.50 m
		HARMON CORRECTION FACT	1.0

LOCATION			RESIDENTIAL AREA AND POPULATION							COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		HOTEL		C+H	INFILTRATION			TOTAL	PIPE										
AREA ID NUMBER*	FROM M.H.	TO M.H.	AREA (ha)	SINGLE	UNITS TOWN	APT	POP.	CUMULATIVE AREA (ha)	POP.	PEAK*** FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	FLOW (l/s)	LENGTH (m)	DIA (mm)	MATERIAL	CLASS	SLOPE (%)	CAP. (FULL) (l/s)	CAP. V. PEAK FLOW (%)	VEL. (FULL) (m/s)		
BLOCK 5 (LMNO)	LFPS		3.020		112	642	1684	3.020	1684	23.1	0.22	0.22	0.00	0.00	0.00	0.00	4.30	4.30	0.00	0.00	3.9	3.02	3.02	0.8	27.9										
BLOCK 17 (JK)	LFPS (now to CCC)		0.930			192	403	0.930	403	5.5	0.08	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.93	0.93	0.3	5.8										
BLOCK 7 (UT)	LFPS		0.940					0.940			0.35	0.35	0.00	0.00	0.00	0.00	6.30	6.30	0.00	0.00	5.8	0.94	0.94	0.3	6.0										
Victoria Island	LFPS																									20.0									
Future Cultural/Institutional (V)**	LFPS		1.660					1.660			0.00	0.00	0.00	0.00	0.00	0.00	1.96	1.96	0.00	0.00	1.7	1.66	1.66	0.5	2.2										
Canadian War Museum (XW)**	LFPS		3.660					3.660			0.00	0.00	0.00	0.00	0.00	0.00	4.44	4.44	0.00	0.00	3.9	3.66	3.66	1.0	4.9										
CLARIDGE PHASES 1-5 (PQRS)	LFPS		1.980		44	595	1382	1.980	1382	19.0	0.23	0.23	0.00	0.00	0.00	0.00	1.05	1.05	0.00	0.00	1.1	1.98	1.98	0.6	20.6										
N of Aqueduct & E of Booth (I) CLAR	LFPS		0.100			10	21	0.100	21	0.3	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.10	0.10	0.0	0.3										
<b>LFPS TOTAL</b>							<b>3490</b>		<b>3490</b>	<b>47.9</b>	<b>0.89</b>	<b>0.89</b>		<b>0.00</b>		<b>0.00</b>	<b>18.05</b>	<b>18.05</b>		<b>0.00</b>	<b>16.4</b>	<b>12.29</b>	<b>12.29</b>	<b>3.4</b>	<b>87.8</b>										

\* Letter Drainage Area IDs per Ainley Infrastructure Needs Assessment Drawing 1-3 and Table 1-2 - Referenced in Dessau Soprin MSS

\*\* Dessau Soprin MSS assigned 64,000m2 to VXW. In site statistics (Ainley table 1-2), 44,376 assigned to XW. As such the difference has been assigned to V (Future Cultural/Institutional) to match total in DS report which is more conservative than Ainley values.

\*\*\* Peak residential flows from MSS assigned based on proportionate population

## **Appendix D Stormwater Management**

### **D.1 Modified Rational Method Calculations**





### Stormwater Management Calculations

File No: 160401780  
 Project: LeBreton Flats  
 Date: 23-May-24

SWM Approach:  
 Post-development to 5-yr Storm C=0.7, Tc=10min

**Post-Development Site Conditions:**

**Overall Runoff Coefficient for Site and Sub-Catchment Areas**

Runoff Coefficient Table								
Catchment Type	Sub-catchment Area ID / Description		Area (ha) "A"	Runoff Coefficient "C"		"A x C"	Overall Runoff Coefficient	
				Hard	Soft			
Controlled - Tributary	BLK-17	Hard	0.827	0.9	0.744	0.757	0.850	
		Soft	0.064	0.2	0.013			
	Subtotal			0.89				
Controlled - Tributary	BLK-15	Hard	0.308	0.9	0.277	0.282	0.850	
		Soft	0.024	0.2	0.005			
	Subtotal			0.33				
Controlled - Tributary	BLK-14	Hard	0.278	0.9	0.250	0.255	0.850	
		Soft	0.021	0.2	0.004			
	Subtotal			0.30				
Controlled - Tributary	BLK-13	Hard	0.253	0.9	0.228	0.232	0.850	
		Soft	0.019	0.2	0.004			
	Subtotal			0.27				
Controlled - Tributary	BLK-12	Hard	0.235	0.9	0.212	0.215	0.850	
		Soft	0.018	0.2	0.004			
	Subtotal			0.25				
Controlled - Tributary	BLK-11	Hard	0.263	0.9	0.237	0.241	0.850	
		Soft	0.020	0.2	0.004			
	Subtotal			0.28				
Controlled - Tributary	BLK-10	Hard	0.222	0.9	0.200	0.203	0.850	
		Soft	0.017	0.2	0.003			
	Subtotal			0.24				
Controlled - Tributary	BLK-9	Hard	0.409	0.9	0.368	0.374	0.850	
		Soft	0.031	0.2	0.006			
	Subtotal			0.44				
Controlled - Tributary	BLK-8	Hard	0.317	0.9	0.285	0.290	0.850	
		Soft	0.024	0.2	0.005			
	Subtotal			0.34				
Controlled - Tributary	BLK-7	Hard	0.410	0.9	0.369	0.375	0.850	
		Soft	0.032	0.2	0.006			
	Subtotal			0.44				
Controlled - Tributary	BLK-6	Hard	0.285	0.9	0.257	0.261	0.850	
		Soft	0.022	0.2	0.004			
	Subtotal			0.31				
Controlled - Tributary	BLK-5	Hard	0.368	0.9	0.331	0.337	0.850	
		Soft	0.028	0.2	0.006			
	Subtotal			0.40				
Controlled - Tributary	BLK-4	Hard	0.371	0.9	0.334	0.340	0.850	
		Soft	0.029	0.2	0.006			
	Subtotal			0.40				
Controlled - Tributary	BLK-3	Hard	0.463	0.9	0.416	0.424	0.850	
		Soft	0.036	0.2	0.007			
	Subtotal			0.50				
Controlled - Tributary	BLK-2	Hard	2.521	0.9	2.269	2.307	0.850	
		Soft	0.194	0.2	0.039			
	Subtotal			2.71				
Controlled - Tributary	BLK-1	Hard	0.838	0.9	0.755	0.768	0.850	
		Soft	0.064	0.2	0.013			
	Subtotal			0.90				
<b>Total</b>				<b>9.01</b>		<b>7.661</b>		
<b>Overall Runoff Coefficient= C:</b>							<b>0.85</b>	

<b>Total Roof Areas</b>	<b>0.000 ha</b>
<b>Total Tributary Surface Areas (Controlled and Uncontrolled)</b>	<b>9.013 ha</b>
<b>Total Tributary Area to Outlet</b>	<b>9.013 ha</b>
<b>Total Uncontrolled Areas (Non-Tributary)</b>	<b>0.000 ha</b>
<b>Total Site</b>	<b>9.013 ha</b>







# Stormwater Management Calculations

## Project #160401780, LeBreton Flats Modified Rational Method Calculations for Storage

Area (ha)	C	tc (min)	I (5-yr) (mm/hr)	Release (L/s)
0.40	0.70	10.00	104.19	81.01

Onsite Storage			
5-year Vreq (m³)	Vminimum (m³)	Volume Check	Vexcess (m³)
10.42	71.00	OK	60.58

Subdrainage Area: BLK-3  
Area (ha): 0.50  
C: 0.85  
Controlled - Tributary

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	104.19	122.70	101.05	21.65	12.99
20	70.25	82.73	82.73	0.00	0.00
30	53.93	63.51	63.51	0.00	0.00
40	44.18	52.03	52.03	0.00	0.00
50	37.65	44.34	44.34	0.00	0.00
60	32.94	38.80	38.80	0.00	0.00
70	29.37	34.59	34.59	0.00	0.00
80	26.56	31.28	31.28	0.00	0.00
90	24.29	28.60	28.60	0.00	0.00
100	22.41	26.39	26.39	0.00	0.00
110	20.82	24.52	24.52	0.00	0.00
120	19.47	22.93	22.93	0.00	0.00

Storage: Block 3 Onsite

Design Discharge				
Area (ha)	C	tc (min)	I (5-yr) (mm/hr)	Release (L/s)
0.50	0.70	10.00	104.19	101.05

Onsite Storage			
5-year Vreq (m³)	Vminimum (m³)	Volume Check	Vexcess (m³)
12.99	88.00	OK	75.01

Subdrainage Area: BLK-2  
Area (ha): 2.71  
C: 0.85  
Controlled - Tributary

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	104.19	668.36	550.41	117.95	70.77
20	70.25	450.63	450.63	0.00	0.00
30	53.93	345.92	345.92	0.00	0.00
40	44.18	283.43	283.43	0.00	0.00
50	37.65	241.53	241.53	0.00	0.00
60	32.94	211.32	211.32	0.00	0.00
70	29.37	188.41	188.41	0.00	0.00
80	26.56	170.39	170.39	0.00	0.00
90	24.29	155.80	155.80	0.00	0.00
100	22.41	143.73	143.73	0.00	0.00
110	20.82	133.57	133.57	0.00	0.00
120	19.47	124.88	124.88	0.00	0.00

Storage: Block 2 Onsite

Design Discharge				
Area (ha)	C	tc (min)	I (5-yr) (mm/hr)	Release (L/s)
2.71	0.70	10.00	104.19	550.41

Onsite Storage			
5-year Vreq (m³)	Vminimum (m³)	Volume Check	Vexcess (m³)
70.77	479.00	OK	408.23

Subdrainage Area: BLK-1  
Area (ha): 0.90  
C: 0.85  
Controlled - Tributary

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	104.19	222.32	183.09	39.23	23.54
20	70.25	149.90	149.90	0.00	0.00
30	53.93	115.07	115.07	0.00	0.00
40	44.18	94.28	94.28	0.00	0.00
50	37.65	80.34	80.34	0.00	0.00
60	32.94	70.29	70.29	0.00	0.00
70	29.37	62.67	62.67	0.00	0.00
80	26.56	56.68	56.68	0.00	0.00
90	24.29	51.82	51.82	0.00	0.00
100	22.41	47.81	47.81	0.00	0.00
110	20.82	44.43	44.43	0.00	0.00
120	19.47	41.54	41.54	0.00	0.00

Storage: Block 1 Onsite

Design Discharge				
Area (ha)	C	tc (min)	I (5-yr) (mm/hr)	Release (L/s)
0.90	0.70	10.00	104.19	183.09

Onsite Storage			
5-year Vreq (m³)	Vminimum (m³)	Volume Check	Vexcess (m³)
23.54	160.00	OK	136.46

**SUMMARY TO OUTLET**

	Vrequired	Vavailable*
<b>Tributary Area</b>	9.013 ha	
<b>Total 5yr Flow to Sewer</b>	1,827 L/s	235 1,596 m³
<b>Non-Tributary Area</b>	0.000 ha	
<b>Total 5yr Flow Uncontrolled</b>	0 L/s	
<b>Total Area</b>	9.013 ha	
<b>Total 5yr Flow</b>	1,827 L/s	

## Project #160401780, LeBreton Flats Modified Rational Method Calculations for Storage

Area (ha)	C	tc (min)	I (5-yr) (mm/hr)	Release (L/s)
0.40	0.70	10.00	104.19	81.01

Onsite Storage			
100-year Vreq (m³)	Vminimum (m³)	Volume Check	Vexcess (m³)
70.39	71.00	OK	0.61

Subdrainage Area: BLK-3  
Area (ha): 0.50  
C: 1.00  
Controlled - Tributary

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	178.56	247.38	101.05	146.34	87.80
20	119.95	166.18	101.05	65.14	78.16
30	91.87	127.28	101.05	26.23	47.22
40	75.15	104.11	101.05	3.06	7.35
50	63.95	88.60	88.60	0.00	0.00
60	55.89	77.44	77.44	0.00	0.00
70	49.79	68.98	68.98	0.00	0.00
80	44.99	62.33	62.33	0.00	0.00
90	41.11	56.96	56.96	0.00	0.00
100	37.90	52.51	52.51	0.00	0.00
110	35.20	48.77	48.77	0.00	0.00
120	32.89	45.57	45.57	0.00	0.00

Storage: Block 3 Onsite

Design Discharge				
Area (ha)	C	tc (min)	I (5-yr) (mm/hr)	Release (L/s)
0.50	0.70	10.00	104.19	101.05

Onsite Storage			
100-year Vreq (m³)	Vminimum (m³)	Volume Check	Vexcess (m³)
87.80	88.00	OK	0.20

Subdrainage Area: BLK-2  
Area (ha): 2.71  
C: 1.00  
Controlled - Tributary

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	178.56	1347.51	550.41	797.10	478.26
20	119.95	905.22	550.41	354.81	425.77
30	91.87	693.29	550.41	142.88	257.18
40	75.15	567.09	550.41	16.68	40.03
50	63.95	482.64	482.64	0.00	0.00
60	55.89	421.81	421.81	0.00	0.00
70	49.79	375.74	375.74	0.00	0.00
80	44.99	339.53	339.53	0.00	0.00
90	41.11	310.25	310.25	0.00	0.00
100	37.90	286.04	286.04	0.00	0.00
110	35.20	265.66	265.66	0.00	0.00
120	32.89	248.24	248.24	0.00	0.00

Storage: Block 2 Onsite

Design Discharge				
Area (ha)	C	tc (min)	I (5-yr) (mm/hr)	Release (L/s)
2.71	0.70	10.00	104.19	550.41

Onsite Storage			
100-year Vreq (m³)	Vminimum (m³)	Volume Check	Vexcess (m³)
478.26	479.00	OK	0.74

Subdrainage Area: BLK-1  
Area (ha): 0.90  
C: 1.00  
Controlled - Tributary

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	178.56	448.23	183.09	265.14	159.09
20	119.95	301.11	183.09	118.02	141.62
30	91.87	230.61	183.09	47.53	85.55
40	75.15	188.63	183.09	5.55	13.32
50	63.95	160.54	160.54	0.00	0.00
60	55.89	140.31	140.31	0.00	0.00
70	49.79	124.98	124.98	0.00	0.00
80	44.99	112.94	112.94	0.00	0.00
90	41.11	103.20	103.20	0.00	0.00
100	37.90	95.15	95.15	0.00	0.00
110	35.20	88.37	88.37	0.00	0.00
120	32.89	82.57	82.57	0.00	0.00

Storage: Block 1 Onsite

Design Discharge				
Area (ha)	C	tc (min)	I (5-yr) (mm/hr)	Release (L/s)
0.90	0.70	10.00	104.19	183.09

Onsite Storage			
100-year Vreq (m³)	Vminimum (m³)	Volume Check	Vexcess (m³)
159.09	160.00	OK	0.91

**SUMMARY TO OUTLET**

	Vrequired	Vavailable*
<b>Tributary Area</b>	9.013 ha	
<b>Total 100yr Flow to Sewer</b>	1,827 L/s	1,588 1,596 m³
<b>Non-Tributary Area</b>	0.000 ha	
<b>Total 100yr Flow Uncontrolled</b>	0 L/s	
<b>Total Area</b>	9.013 ha	
<b>Total 100yr Flow</b>	1,827 L/s	

File No: **160401780**  
 Project: **LeBreton Flats - Block Sites**  
 Date: **15-May-2024**

Created By: MW  
 Checked By: DT  
 Revision: 1

**100-YEAR SUMMARY OF BLOCK (SITE) STORAGE**

SWM Approach: **Post-development to 5-year with C=0.70 and tc = 10 min**

<b>100-year IDF</b> <b>City of Ottawa</b>	$I = a/(t + b)^c$	a =	<b>1735.688</b>	<b>t (min)</b>	<b>I (mm/hr)</b>
		b =	<b>6.014</b>	10	178.56
		c =	<b>0.820</b>	20	119.95
				30	91.87
			40	75.15	
			50	63.95	
			60	55.89	
			70	49.79	
			80	44.99	
			90	41.11	
			100	37.90	
			110	35.20	
			120	32.89	

**All Mixed-Use Blocks (Site) Post-Development Conditions:**

Tributary	(ha)
Fleet	2.90
Albert	5.22
Aqueduct	0.89
Total Area:	<b>9.01</b>
Overall C:	1.00

Target	(L/s)
To Fleet	588
To Albert	1059
To Aqueduct	181
Total Target	<b>1828</b>

t <sub>c</sub>	Runoff Rate	Maximum Allowable Discharge	Required Storage Volume	Required Storage Rate
(min)	(L/s)	(L/s)	(m <sup>3</sup> )	(m <sup>3</sup> /ha)
10	4474	1828	1588	176
20	3006	1828	1414	157
30	2302	1828	854	95
40	1883	1828	133	15
50	1602	1828	0	0
60	1401	1828	0	0

BLOCK ID	Area	C	C	Runoff Rate	Maximum Allowable Discharge	Required Storage Volume
	(ha)	(5-yr)	(100-yr)	(L/s)	(L/s)	(m <sup>3</sup> )
BLOCK 1	0.90	0.85	1.00	448	183	159
BLOCK 2	2.71	0.85	1.00	1348	550	478
BLOCK 3	0.50	0.85	1.00	247	101	88
BLOCK 4	0.40	0.85	1.00	198	81	70
BLOCK 5	0.40	0.85	1.00	197	80	70
BLOCK 6	0.31	0.85	1.00	153	62	54
BLOCK 7	0.44	0.85	1.00	219	89	78
BLOCK 8	0.34	0.85	1.00	169	69	60
BLOCK 9	0.44	0.85	1.00	219	89	78
BLOCK 10	0.24	0.85	1.00	119	48	42
BLOCK 11	0.28	0.85	1.00	140	57	50
BLOCK 12	0.25	0.85	1.00	126	51	45
BLOCK 13	0.27	0.85	1.00	136	55	48
BLOCK 14	0.30	0.85	1.00	149	61	53
BLOCK 15	0.33	0.85	1.00	165	67	58
BLOCK 17	0.89	0.85	1.00	442	181	157

## Stormwater Management Calculations

File No: **160401780**  
 Project: **LeBreton Flats**  
 Date: **18-Jul-24**

SWM Approach:  
 Post-development to Pre-development flows

**Post-Development Site Conditions:**

**Overall Runoff Coefficient for Site and Sub-Catchment Areas**

Runoff Coefficient Table									
Catchment Type	Sub-catchment Area	ID / Description		Area (ha) "A"	Runoff Coefficient "C"		"A x C"		Overall Runoff Coefficient
Uncontrolled - Non-Tributary	NCC-1		Hard	1.957	0.9	1.761			
			Soft	4.893	0.2	0.979			
		Subtotal			6.85		2.74		0.400
Uncontrolled - Tributary	UNC-1		Hard	0.000	0.9	0.000			
			Soft	0.480	0.2	0.096			
		Subtotal			0.48		0.096		0.200
Controlled - Tributary Open A	PARK-1, PARK-2		Hard	0.709	0.9	0.638			
			Soft	1.771	0.2	0.354			
		Subtotal			2.48		0.992		0.400
Controlled - Tributary Open A	C7A		Hard	0.827	0.9	0.744			
			Soft	0.064	0.2	0.013			
		Subtotal			0.89		0.757		0.850
Controlled - Tributary Albert	C19B, C15A, C14A, C14B, C13B		Hard	0.803	0.9	0.723			
			Soft	0.321	0.2	0.064			
		Subtotal			1.12		0.787		0.700
Controlled - Tributary Albert	9A, C16A, C16B, C12B, C12A, C		Hard	4.848	0.9	4.363			
			Soft	0.373	0.2	0.075			
		Subtotal			5.22		4.44		0.85
Controlled - Tributary Fleet	C6A, C6D, C4B, C3B		Hard	1.111	0.9	1.000			
			Soft	0.444	0.2	0.089			
		Subtotal			1.55		1.09		0.70
Controlled - Tributary Fleet	, C5A, C5B, C5C, C4D, C4AA, C		Hard	2.695	0.9	2.425			
			Soft	0.207	0.2	0.041			
		Subtotal			2.90		2.47		0.85
<b>Total</b>						<b>21.503</b>		<b>13.365</b>	
<b>Overall Runoff Coefficient= C:</b>									<b>0.62</b>

<b>Total Roof Areas</b>	0.000 ha
<b>Total Tributary Surface Areas (Controlled and Uncontrolled)</b>	<u>14.653 ha</u>
<b>Total Tributary Area to Outlet</b>	<u>14.653 ha</u>
<b>Total Uncontrolled Areas (Non-Tributary)</b>	6.850 ha
<b>Total Site</b>	<u><u>21.503 ha</u></u>





# Stormwater Management Calculations

**Project #160401780, LeBreton Flats**  
**Modified Rational Method Calculations for Storage**

100	22.41	276.4	276.4	0.0	0.0
110	20.82	256.9	256.9	0.0	0.0
120	19.47	240.2	240.2	0.0	0.0

Summary of 5-Year Block Storage

Block	Area (ha)	C (5-yr)	Qactual (L/s)	Qcontrol (L/s)	Qstored (L/s)	Vstored (m³)
1	0.90	0.85	222.3	183.1	39.2	23.5
2	2.71	0.85	668.4	550.4	117.9	70.8
3	0.50	0.85	122.7	101.0	21.7	13.0
4	0.40	0.85	98.4	81.0	17.4	10.4
5	0.40	0.85	97.7	80.4	17.2	10.3
6	0.31	0.85	75.7	62.3	13.4	8.0

Subdrainage Area: C6A, C6D, C4B, C3B Controlled - Tributary Fleet  
 Area (ha): 1.55  
 C: 0.70

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	104.19	315.3	315.3		
20	70.25	212.6	212.6		
30	53.93	163.2	163.2		
40	44.18	133.7	133.7		
50	37.65	113.9	113.9		
60	32.94	99.7	99.7		
70	29.37	88.9	88.9		
80	26.56	80.4	80.4		
90	24.29	73.5	73.5		
100	22.41	67.8	67.8		
110	20.82	63.0	63.0		
120	19.47	58.9	58.9		

Subdrainage Area: 3, C5C, C4D, C4AA, C4C, C3AA Controlled - Tributary Fleet  
 Area (ha): 2.90  
 C: 0.85

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	104.19	714.5	588.4	126.1	75.6
20	70.25	481.7	481.7	0.0	0.0
30	53.93	369.8	369.8	0.0	0.0
40	44.18	303.0	303.0	0.0	0.0
50	37.65	258.2	258.2	0.0	0.0
60	32.94	225.9	225.9	0.0	0.0
70	29.37	201.4	201.4	0.0	0.0
80	26.56	182.1	182.1	0.0	0.0
90	24.29	166.5	166.5	0.0	0.0
100	22.41	153.6	153.6	0.0	0.0
110	20.82	142.8	142.8	0.0	0.0
120	19.47	133.5	133.5	0.0	0.0

Summary of 5-Year Block Storage

Block	Area (ha)	C (5-yr)	Qactual (L/s)	Qcontrol (L/s)	Qstored (L/s)	Vstored (m³)
7	0.44	0.85	108.6	89.5	19.2	11.5
8	0.34	0.85	84.0	69.2	14.8	8.9
9	0.44	0.85	108.5	89.3	19.1	11.5
10	0.24	0.85	58.9	48.5	10.4	6.2
11	0.28	0.85	69.7	57.4	12.3	7.4
12	0.25	0.85	62.4	51.4	11.0	6.6
13	0.27	0.85	67.2	55.3	11.9	7.1
14	0.30	0.85	73.7	60.7	13.0	7.8
15	0.33	0.85	81.7	67.3	14.4	8.6

SUMMARY TO OUTLET

	Vrequired	Vavailable*
Fleet Street Tributary Area	4.457 ha	
Total 5yr Flow to Fleet Street Sewer	904 L/s	0 m³
Albert Street Tributary Area	6.345 ha	
Total 5yr Flow to Albert Street Sewer	1,287 L/s	
Open Aqueduct Tributary Area	3.371 ha	
Total 5yr Flow to Open Aqueduct	468 L/s	
Non-Tributary Area	7.330 ha	
Total 5yr Flow Uncontrolled	821 L/s	
Total Area	21.503 ha	
Total 5yr Flow	3,480 L/s	
Target	4,360 L/s	

**Project #160401780, LeBreton Flats**  
**Modified Rational Method Calculations for Storage**

100	37.90	550.1	550.1	0.0	0.0
110	35.20	510.9	510.9	0.0	0.0
120	32.89	477.4	477.4	0.0	0.0

Summary of 100-Year Block Storage

Block	Area (ha)	C (100-yr)	Qactual (L/s)	Qcontrol (L/s)	Qstored (L/s)	Vstored (m³)
1	0.90	1.00	448.2	183.1	265.1	159.1
2	2.71	1.00	1347.5	550.4	797.1	478.3
3	0.50	1.00	247.4	101.0	146.3	87.8
4	0.40	1.00	196.3	81.0	117.3	70.4
5	0.40	1.00	196.9	80.4	116.5	69.9
6	0.31	1.00	152.5	62.3	90.2	54.1

Subdrainage Area: C6A, C6D, C4B, C3B Controlled - Tributary Fleet  
 Area (ha): 1.55  
 C: 0.88

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	178.56	675.4	315.3	360.1	216.1
20	119.95	453.7	315.3	138.4	166.1
30	91.87	347.5	315.3	32.2	58.0
40	75.15	284.2	284.2	0.0	0.0
50	63.95	241.9	241.9	0.0	0.0
60	55.89	211.4	211.4	0.0	0.0
70	49.79	188.3	188.3	0.0	0.0
80	44.99	170.2	170.2	0.0	0.0
90	41.11	155.5	155.5	0.0	0.0
100	37.90	143.4	143.4	0.0	0.0
110	35.20	133.1	133.1	0.0	0.0
120	32.89	124.4	124.4	0.0	0.0

Subdrainage Area: 3, C5C, C4D, C4AA, C4C, C3AA Controlled - Tributary Fleet  
 Area (ha): 2.90  
 C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m³)
10	178.56	1440.5	588.4	852.1	511.2
20	119.95	967.7	588.4	379.3	455.1
30	91.87	741.1	588.4	152.7	274.9
40	75.15	606.2	588.4	17.8	42.8
50	63.95	515.9	515.9	0.0	0.0
60	55.89	450.9	450.9	0.0	0.0
70	49.79	401.7	401.7	0.0	0.0
80	44.99	362.9	362.9	0.0	0.0
90	41.11	331.6	331.6	0.0	0.0
100	37.90	305.8	305.8	0.0	0.0
110	35.20	284.0	284.0	0.0	0.0
120	32.89	265.4	265.4	0.0	0.0

Summary of 100-Year Block Storage

Block	Area (ha)	C (100-yr)	Qactual (L/s)	Qcontrol (L/s)	Qstored (L/s)	Vstored (m³)
7	0.44	1.00	219.0	89.5	129.5	77.7
8	0.34	1.00	169.3	69.2	100.1	60.1
9	0.44	1.00	218.7	89.3	129.3	77.6
10	0.24	1.00	118.7	48.5	70.2	42.1
11	0.28	1.00	140.5	57.4	83.1	49.9
12	0.25	1.00	125.8	51.4	74.4	44.6
13	0.27	1.00	135.5	55.3	80.2	48.1
14	0.30	1.00	148.7	60.7	87.9	52.8
15	0.33	1.00	164.6	67.3	97.4	58.4

SUMMARY TO OUTLET

	Vrequired	Vavailable*
Fleet Street Tributary Area	4.457 ha	
Total 100yr Flow to Fleet Street Sewer	904 L/s	0 m³
Albert Street Tributary Area	6.345 ha	
Total 100yr Flow to Albert Street Sewer	1,287 L/s	
Open Aqueduct Tributary Area	3.371 ha	
Total 100yr Flow to Open Aqueduct	796 L/s	
Non-Tributary Area	7.330 ha	
Total 100yr Flow Uncontrolled	1,760 L/s	
Total Area	21.503 ha	
Total 100yr Flow	4,746 L/s	
Target	4,360 L/s	

## **D.2 Storm Sewer Design Sheet**





LeBreton Flats Draft Plan

STORM SEWER DESIGN SHEET (City of Ottawa)

DESIGN PARAMETERS

I = a / (t+b)^n (As per City of Ottawa Guidelines, 2012)

Table with design parameters: a, b, c, MANNING'S n, BEDDING CLASS, MINIMUM COVER, TIME OF ENTRY.

FILE NUMBER: 160401780

DATE: 2024-07-23
REVISION: 1
DESIGNED BY: JP
CHECKED BY: DT

Main data table with columns: LOCATION, DRAINAGE AREA, PIPE SELECTION. Includes sub-headers for AREA ID NUMBER, FROM M.H., TO M.H., AREA (2-YEAR to 100-YEAR), ACCUM. AUC, T of C, I 2-YEAR to I 100-YEAR, Q CONTROL, ACCUM. Q CONTROL, Q ACT, LENGTH, PIPE WIDTH, PIPE HEIGHT, PIPE SHAPE, MATERIAL, CLASS, SLOPE, Q SUP (FULL), % FULL, VEL. (FULL), VEL. (ACT), TIME OF FLOW.

### **D.3 Quality Control MTD Sizing Calculations**



# Quality Manufactured Treatment Device (MTD) Sizing

Lebreton Flats

19-Jul-24

	Area	C	I (25mm) (Per MECP SWMPDM Equation 4.9)	Q (25mm) (Rational Method)	Q (5yr) (Per Sewer Design Sheet)	
C3B	0.11		0.70			
C4B	0.35		0.70			
C6A	0.36		0.70			
C6D	0.73		0.70			
<b>Total</b>	<b>1.55</b>	<b>0.70</b>	<b>36.0</b>	<b>109</b>	<b>781</b>	1x JF12 (Offline)
C12A	0.40		0.85			
C13B	0.17		0.70			
C13A	0.31		0.85			
<b>Total</b>	<b>0.88</b>	<b>0.82</b>	<b>41.2</b>	<b>83</b>	<b>209</b>	1x JF10 (Online)
C12B	0.40		0.85			
C14A	0.12		0.70			
C14B	0.31		0.70			
C15A	0.44		0.70			
C16B	0.50		0.85			
<b>Total</b>	<b>1.77</b>	<b>0.78</b>	<b>39.3</b>	<b>150</b>	<b>885</b>	1x JF12 (Offline)
C19A	0.90		0.85			
C19B	0.09		0.70			
<b>Total</b>	<b>0.99</b>	<b>0.84</b>	<b>41.9</b>	<b>96</b>	<b>240</b>	1 X JF10 (Online)

	Max Jellyfish Model #	Treatment Flow Rate	Max Online Flow Rate
	JF6	32.8	146.1
	JF8	55.5	197.1
	JF10	106.2	332.7
	JF12	148.9	375.4

## **D.4 Conceptual Major System PCSWMM Model Input/Output Files**



POST-DEVELOPMENT MODEL

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option          Value
FLOW_UNITS        LPS
INFILTRATION      HORTON
FLOW_ROUTING      DYNWAVE
LINK_OFFSETS      ELEVATION
MIN_SLOPE          0
ALLOW_PONDING     YES
SKIP_STEADY_STATE NO

START_DATE         07/17/2024
START_TIME         00:00:00
REPORT_START_DATE 07/17/2024
REPORT_START_TIME 00:00:00
END_DATE           07/17/2024
END_TIME           06:00:00
SWEEP_START        01/01
SWEEP_END          12/31
DRY_DAYS           0
REPORT_STEP        00:01:00
WET_STEP           00:01:00
DRY_STEP           00:01:00
ROUTING_STEP       1
RULE_STEP          00:00:00

INERTIAL_DAMPING   PARTIAL
NORMAL_FLOW_LIMITED BOTH
FORCE_MAIN_EQUATION H-W
VARIABLE_STEP      0
LENGTHENING_STEP  0
MIN_SURFAREA       0
MAX_TRIALS         8
HEAD_TOLERANCE     0.0015
SYS_FLOW_TOL       5
LAT_FLOW_TOL       5
```

POST-DEVELOPMENT MODEL

```
MINIMUM_STEP      0.5
THREADS           8

[EVAPORATION]
;;Data Source     Parameters
;;-----
CONSTANT          0.0
DRY_ONLY          NO

[RAINGAGES]
;;Name           Format   Interval SCF   Source
;;-----
RG1              INTENSITY 0:10   1.0     TIMESERIES 03H120C

[SUBCATCHMENTS]
;;Name           Rain Gage      Outlet          Area    %Imperv  Width  %Slope  CurbLen  SnowPack
;;-----
;0.7
33              RG1           SPR-B00         0.769436 71.43   173.123 3       0
;0.7
34              RG1           ELM-B00         0.784973 71.43   176.619 3       0
;0.7
37              RG1           B00-LP1         0.699023 71.43   157.28  3       0
;0.7
38              RG1           ELM-ROC         0.788085 71.43   177.319 3       0
;0.7
39              RG1           PRI-LOR         1.208135 71.43   271.83  3       0
;0.7
40              RG1           ALB-PRI         0.227745 71.43   51.243  3       0
;0.7
```

POST-DEVELOPMENT MODEL							
41	RG1	ALB-LOR	0.196647	71.43	44.246	3	0
;0.7							
42	RG1	PRI	0.677902	71.43	152.528	3	0
;0.7							
43	RG1	PRI-EMP	0.379017	71.43	85.279	3	0
;0.7							
44	RG1	LOR	0.781348	71.43	175.803	3	0
;0.7							
45	RG1	ALB-ROC	0.684771	71.43	154.073	3	0
;0.7							
46	RG1	ALB-BOO	0.436649	71.43	98.246	3	0
;0.7							
47	RG1	ALB-PRE	0.76698	71.43	172.57	3	0
;0.7							
48	RG1	ROC-LP1	1.407692	71.43	316.731	3	0
;0.7							
49	RG1	BOO-LP2	0.62678	71.43	141.026	3	0
;0.7							
50	RG1	PRI-BOO	0.735359	71.43	165.456	3	0
;0.7							
51	RG1	PRE	0.556116	71.43	125.126	3	0
;0.7							
52	RG1	ELM-PRI	1.137188	71.43	255.867	3	0

[SUBAREAS]

```
;;Subcatchment N-Imperv N-Perv S-Imperv S-Perv PctZero RouteTo PctRouted
```

POST-DEVELOPMENT MODEL						
;-----						
33	0.013	0.25	1.57	4.67	0	OUTLET
34	0.013	0.25	1.57	4.67	0	OUTLET
37	0.013	0.25	1.57	4.67	0	OUTLET
38	0.013	0.25	1.57	4.67	0	OUTLET
39	0.013	0.25	1.57	4.67	0	OUTLET
40	0.013	0.25	1.57	4.67	0	OUTLET
41	0.013	0.25	1.57	4.67	0	OUTLET
42	0.013	0.25	1.57	4.67	0	OUTLET
43	0.013	0.25	1.57	4.67	0	OUTLET
44	0.013	0.25	1.57	4.67	0	OUTLET
45	0.013	0.25	1.57	4.67	0	OUTLET
46	0.013	0.25	1.57	4.67	0	OUTLET
47	0.013	0.25	1.57	4.67	0	OUTLET
48	0.013	0.25	1.57	4.67	0	OUTLET
49	0.013	0.25	1.57	4.67	0	OUTLET
50	0.013	0.25	1.57	4.67	0	OUTLET
51	0.013	0.25	1.57	4.67	0	OUTLET
52	0.013	0.25	1.57	4.67	0	OUTLET

[INFILTRATION]

;;Subcatchment	Param1	Param2	Param3	Param4	Param5
;-----					
33	76.2	13.2	4.14	7	0
34	76.2	13.2	4.14	7	0
37	76.2	13.2	4.14	7	0
38	76.2	13.2	4.14	7	0
39	76.2	13.2	4.14	7	0
40	76.2	13.2	4.14	7	0
41	76.2	13.2	4.14	7	0
42	76.2	13.2	4.14	7	0
43	76.2	13.2	4.14	7	0
44	76.2	13.2	4.14	7	0
45	76.2	13.2	4.14	7	0
46	76.2	13.2	4.14	7	0
47	76.2	13.2	4.14	7	0
48	76.2	13.2	4.14	7	0
49	76.2	13.2	4.14	7	0



POST-DEVELOPMENT MODEL

50	76.2	13.2	4.14	7	0
51	76.2	13.2	4.14	7	0
52	76.2	13.2	4.14	7	0

[OUTFALLS]

;;Name	Elevation	Type	Stage Data	Gated	Route To
;;-----					
ALB-OF	0	FREE		NO	
OF1	0	FREE		NO	
OF2	0	FREE		NO	
OF3	0	FREE		NO	
OF4	0	FREE		NO	
OF5	0	FREE		NO	
OF6	0	FREE		NO	
OF7	0	FREE		NO	
SU1	0	FREE		NO	
SU10	0	FREE		NO	
SU11	0	FREE		NO	
SU12	0	FREE		NO	
SU13	0	FREE		NO	
SU14	0	FREE		NO	
SU15	0	FREE		NO	
SU16	0	FREE		NO	
SU17	0	FREE		NO	
SU2	0	FREE		NO	
SU3	0	FREE		NO	
SU4	0	FREE		NO	
SU5	0	FREE		NO	
SU6	0	FREE		NO	
SU7	0	FREE		NO	
SU8	0	FREE		NO	
SU9	0	FREE		NO	

[STORAGE]

;;Name	Elev.	MaxDepth	InitDepth	Shape	Curve Name/Params	SurDepth	Fevap
Psi	Ksat	IMD					
;;-----							
-----							

POST-DEVELOPMENT MODEL

ALB-B00	61.78	0.4	0	FUNCTIONAL	0	0	0	0
ALB-LOR	62.33	0.4	0	FUNCTIONAL	0	0	0	0
ALB-PRE	58.95	0.4	0	FUNCTIONAL	0	0	0	0
ALB-PRI	62.47	0.4	0	FUNCTIONAL	0	0	0	0
ALB-ROC	60.67	0.4	0	FUNCTIONAL	0	0	0	0
B00-LP1	62.23	0.4	0	FUNCTIONAL	0	0	0	0
B00-LP2	62.25	0.4	0	FUNCTIONAL	0	0	0	0
ELM-B00	64.98	0.4	0	FUNCTIONAL	0	0	0	0
ELM-PRI	62.36	0.4	0	FUNCTIONAL	0	0	0	0
ELM-ROC	63.04	0.4	0	FUNCTIONAL	0	0	0	0
LOR	76.87	0.4	0	FUNCTIONAL	0	0	0	0
PRI	61.31	0.4	0	FUNCTIONAL	0	0	0	0
PRI-B00	62.87	0.4	0	FUNCTIONAL	0	0	0	0
PRI-EMP	62.37	0.4	0	FUNCTIONAL	0	0	0	0
PRI-LOR	80.19	0.4	0	FUNCTIONAL	0	0	0	0
ROC-LP1	72	0.4	0	FUNCTIONAL	0	0	0	0
SPR-B00	61.36	0.4	0	FUNCTIONAL	0	0	0	0
	71.56	0.4	0	FUNCTIONAL	0	0	0	0

[CONDUITS]

;;Name	From Node	To Node	Length	Roughness	InOffset	OutOffset	InitFlow
MaxFlow							
;;-----							
-----							
C1	SPR-B00	ELM-B00	81.637	0.013	71.56	64.98	0
C10	PRE	ALB-PRE	120.656	0.013	61.31	59.03	0
C11	PRI-B00	B00-LP1	71.962	0.013	62.37	62.23	0
C12	B00-LP1	B00-LP2	41.708	0.013	62.23	62.25	0
C13	B00-LP2	ALB-B00	59.074	0.013	62.25	61.88	0
C14	ELM-PRI	ROC-LP1	91.928	0.013	62.36	61.36	0
C15	ROC-LP1	ALB-ROC	65.3	0.013	61.36	60.77	0

POST-DEVELOPMENT MODEL									
C16	ALB-BOO	ALB-ROC	123.296	0.013	61.78	60.67	0	0	
C17	ALB-ROC	ALB-PRE	192.513	0.013	60.67	58.95	0	0	
C2	ELM-BOO	PRI-BOO	79.055	0.013	64.98	62.37	0	0	
C3	LOR	PRI-LOR	68.101	0.013	76.87	72	0	0	
C4	PRI-LOR	ALB-LOR	185.838	0.013	72	62.43	0	0	
C5	PRI-EMP	PRI-LOR	96.195	0.013	80.19	72	0	0	
C6	PRI	ALB-PRI	91.889	0.013	62.87	62.57	0	0	
C7	ALB-PRI	ALB-LOR	48.944	0.013	62.47	62.33	0	0	
C8	ALB-LOR	ALB-BOO	77.391	0.013	62.33	61.78	0	0	
C9	ELM-ROC	ELM-PRI	80.486	0.013	63.04	62.36	0	0	

```
[WEIRS]
;;Name      From Node      To Node      Type      CrestHt      Qcoeff      Gated      EndCon
EndCoeff  SurchARGE  RoadWidth  RoadSurf  Coeff.  Curve
-----
W1         YES         ALB-PRE      ALB-OF      TRANSVERSE  59.18      1.67      NO         0         0
```

```
[OUTLETS]
;;Name      From Node      To Node      Offset      Type      QTable/Qcoeff      Qexpon
Gated
-----
OL1         ALB-PRE      SU17         58.95      TABULAR/HEAD  10CB_S0.03
NO
OL10        PRI-LOR      OF2          72         TABULAR/HEAD  10CB_S0.03
NO
```

POST-DEVELOPMENT MODEL					
OL11	PRI-EMP	SU15	80.19	TABULAR/HEAD	1CB_S0.03
NO					
OL12	PRI	SU14	62.87	TABULAR/HEAD	8CB_S0.03
NO					
OL13	ALB-PRI	SU13	62.47	TABULAR/HEAD	4CB_S0.03
NO					
OL14	ALB-LOR	SU12	62.33	TABULAR/HEAD	4CB_S0.03
NO					
OL15	ALB-BOO	SU10	61.78	TABULAR/HEAD	4CB_S0.03
NO					
OL16	BOO-LP2	SU9	62.25	TABULAR/HEAD	3CB_SAG
NO					
OL17	BOO-LP1	SU8	62.23	TABULAR/HEAD	3CB_SAG
NO					
OL18	PRI-BOO	OF3	62.37	TABULAR/HEAD	3CB_S0.03
NO					
OL19	PRI-LOR	OF1	72	TABULAR/HEAD	6CB_S0.03
NO					
OL2	PRE	SU1	61.31	TABULAR/HEAD	1CB_S0.03
NO					
OL20	PRI-BOO	SU7	62.37	TABULAR/HEAD	10CB_S0.03
NO					
OL21	ELM-BOO	SU5	64.98	TABULAR/HEAD	10CB_S0.03
NO					
OL22	ELM-PRI	SU3	62.36	TABULAR/HEAD	10CB_S0.03
NO					
OL23	PRE	OF7	61.31	TABULAR/HEAD	10CB_S0.03
NO					
OL24	ROC-LP1	SU2	61.36	TABULAR/HEAD	2CB_SAG
NO					
OL3	ALB-ROC	SU11	60.67	TABULAR/HEAD	10CB_S0.03
NO					
OL4	ROC-LP1	OF6	61.36	TABULAR/HEAD	10CB_S0.03
NO					
OL5	ELM-PRI	OF5	62.36	TABULAR/HEAD	4CB_S0.03
NO					
OL6	ELM-ROC	SU4	63.04	TABULAR/HEAD	6CB_S0.03
NO					

```

                                POST-DEVELOPMENT MODEL
OL7          ELM-B00          OF4          64.98          TABULAR/HEAD          3CB_S0.03
NO
OL8          SPR-B00          SU6          71.56          TABULAR/HEAD          9CB_S0.03
NO
OL9          LOR             SU16         76.87          TABULAR/HEAD          2CB_S0.03
NO

```

[XSECTIONS]

```

;;Link          Shape          Geom1          Geom2          Geom3          Geom4          Barrels          Culvert
;;-----
C1             IRREGULAR          18m
C10            IRREGULAR          20m_Preston
C11            IRREGULAR          18m
C12            IRREGULAR          18m
C13            IRREGULAR          18m
C14            IRREGULAR          18m
C15            IRREGULAR          18m
C16            IRREGULAR          15.5m_Albert_OS
C17            IRREGULAR          15.5m_Albert_OS
C2             IRREGULAR          18m
C3             IRREGULAR          18m
C4             IRREGULAR          18m
C5             IRREGULAR          18m
C6             IRREGULAR          18m
C7             IRREGULAR          15.5m_Albert_OS
C8             IRREGULAR          15.5m_Albert_OS
C9             IRREGULAR          18m
W1            RECT_OPEN          0.2           10            0            0

```

[TRANSECTS]

```

;;Transect Data in HEC-2 format
;
NC 0.013      0.013      0.013
X1 15.5m_Albert_OS  4          0.0        11.5       0.0        0.0        0.0        0.0        0.0
GR 0.23       0          0          11.5       0.15       11.5       0.23       15
;
NC 0.2        0.2        0.013
X1 18m        7          4.25       13.75      0.0        0.0        0.0        0.0        0.0

```

```

                                POST-DEVELOPMENT MODEL
GR 0.35       0          0.15       4.25       0          4.25       0.13       9          0          13.75
GR 0.15       13.75     0.35       18
;
NC 0.013      0.013      0.013
X1 20m_Preston  7          2.5        17.5       0.0        0.0        0.0        0.0        0.0
GR 0.2        0          0.15       2.5        0          2.5        0.15       10         0          17.5
GR 0.15       17.5     0.2        20

```

[LOSSES]

```

;;Link          Kentry          Kexit          Kavg          Flap Gate          Seepage
;;-----

```

[CURVES]

```

;;Name          Type          X-Value          Y-Value
;;-----
10CB_S0.03     Rating        0                0
10CB_S0.03     Rating        0.01            5
10CB_S0.03     Rating        0.02            17
10CB_S0.03     Rating        0.03            57
10CB_S0.03     Rating        0.04            110
10CB_S0.03     Rating        0.05            146
10CB_S0.03     Rating        0.06            179
10CB_S0.03     Rating        0.07            216
10CB_S0.03     Rating        0.08            256
10CB_S0.03     Rating        0.09            298
10CB_S0.03     Rating        0.1             335
10CB_S0.03     Rating        0.11            380
10CB_S0.03     Rating        0.12            390
10CB_S0.03     Rating        0.4             390

1CB_S0.03      Rating        0                0
1CB_S0.03      Rating        0.01            0.5
1CB_S0.03      Rating        0.02            1.7
1CB_S0.03      Rating        0.03            5.7
1CB_S0.03      Rating        0.04            11
1CB_S0.03      Rating        0.05            14.6
1CB_S0.03      Rating        0.06            17.9
1CB_S0.03      Rating        0.07            21.6

```

POST-DEVELOPMENT MODEL

1CB_S0.03	0.08	25.6
1CB_S0.03	0.09	29.8
1CB_S0.03	0.1	33.5
1CB_S0.03	0.11	38
1CB_S0.03	0.12	39
1CB_S0.03	0.4	39

1CB_SAG	Rating	0	0
1CB_SAG		0.01	1
1CB_SAG		0.02	2
1CB_SAG		0.03	4
1CB_SAG		0.04	7
1CB_SAG		0.05	11
1CB_SAG		0.06	16
1CB_SAG		0.07	20
1CB_SAG		0.08	36
1CB_SAG		0.09	48
1CB_SAG		0.1	61
1CB_SAG		0.11	73
1CB_SAG		0.12	86
1CB_SAG		0.13	99
1CB_SAG		0.14	109
1CB_SAG		0.15	120
1CB_SAG		0.16	129
1CB_SAG		0.17	136
1CB_SAG		0.18	145
1CB_SAG		0.19	150
1CB_SAG		0.2	156
1CB_SAG		0.21	161
1CB_SAG		0.22	167
1CB_SAG		0.23	172
1CB_SAG		0.24	176
1CB_SAG		0.25	181
1CB_SAG		0.26	186
1CB_SAG		0.27	189
1CB_SAG		0.28	194
1CB_SAG		0.29	199
1CB_SAG		0.3	202

POST-DEVELOPMENT MODEL

2CB_S0.03	Rating	0	0
2CB_S0.03		0.01	1
2CB_S0.03		0.02	3.4
2CB_S0.03		0.03	11.4
2CB_S0.03		0.04	22
2CB_S0.03		0.05	29.2
2CB_S0.03		0.06	35.8
2CB_S0.03		0.07	43.2
2CB_S0.03		0.08	51.2
2CB_S0.03		0.09	59.6
2CB_S0.03		0.1	67
2CB_S0.03		0.11	76
2CB_S0.03		0.12	78
2CB_S0.03		0.4	78

2CB_SAG	Rating	0	0
2CB_SAG		0.01	2
2CB_SAG		0.02	4
2CB_SAG		0.03	8
2CB_SAG		0.04	14
2CB_SAG		0.05	22
2CB_SAG		0.06	32
2CB_SAG		0.07	40
2CB_SAG		0.08	72
2CB_SAG		0.09	96
2CB_SAG		0.1	122
2CB_SAG		0.11	146
2CB_SAG		0.12	172
2CB_SAG		0.13	198
2CB_SAG		0.14	218
2CB_SAG		0.15	240
2CB_SAG		0.16	258
2CB_SAG		0.17	272
2CB_SAG		0.18	290
2CB_SAG		0.19	300
2CB_SAG		0.2	312
2CB_SAG		0.21	322

POST-DEVELOPMENT MODEL

2CB_SAG	0.22	334
2CB_SAG	0.23	344
2CB_SAG	0.24	352
2CB_SAG	0.25	362
2CB_SAG	0.26	372
2CB_SAG	0.27	378
2CB_SAG	0.28	388
2CB_SAG	0.29	398
2CB_SAG	0.3	404

3CB_S0.03	Rating	0	0
3CB_S0.03		0.01	1.5
3CB_S0.03		0.02	5.1
3CB_S0.03		0.03	17.1
3CB_S0.03		0.04	33
3CB_S0.03		0.05	43.8
3CB_S0.03		0.06	53.7
3CB_S0.03		0.07	64.8
3CB_S0.03		0.08	76.8
3CB_S0.03		0.09	89.4
3CB_S0.03		0.1	100.5
3CB_S0.03		0.11	114
3CB_S0.03		0.12	117
3CB_S0.03		0.4	117

3CB_SAG	Rating	0	0
3CB_SAG		0.01	3
3CB_SAG		0.02	6
3CB_SAG		0.03	12
3CB_SAG		0.04	21
3CB_SAG		0.05	33
3CB_SAG		0.06	48
3CB_SAG		0.07	60
3CB_SAG		0.08	108
3CB_SAG		0.09	144
3CB_SAG		0.1	183
3CB_SAG		0.11	219
3CB_SAG		0.12	258

POST-DEVELOPMENT MODEL

3CB_SAG	0.13	297
3CB_SAG	0.14	327
3CB_SAG	0.15	360
3CB_SAG	0.16	387
3CB_SAG	0.17	408
3CB_SAG	0.18	435
3CB_SAG	0.19	450
3CB_SAG	0.2	468
3CB_SAG	0.21	483
3CB_SAG	0.22	501
3CB_SAG	0.23	516
3CB_SAG	0.24	528
3CB_SAG	0.25	543
3CB_SAG	0.26	558
3CB_SAG	0.27	567
3CB_SAG	0.28	582
3CB_SAG	0.29	597
3CB_SAG	0.3	606

4CB_S0.03	Rating	0	0
4CB_S0.03		0.01	2
4CB_S0.03		0.02	6.8
4CB_S0.03		0.03	22.8
4CB_S0.03		0.04	44
4CB_S0.03		0.05	58.4
4CB_S0.03		0.06	71.6
4CB_S0.03		0.07	86.4
4CB_S0.03		0.08	102.4
4CB_S0.03		0.09	119.2
4CB_S0.03		0.1	134
4CB_S0.03		0.11	152
4CB_S0.03		0.12	156
4CB_S0.03		0.4	156

5CB_S0.03	Rating	0	0
5CB_S0.03		0.01	2.5
5CB_S0.03		0.02	8.5
5CB_S0.03		0.03	28.5

POST-DEVELOPMENT MODEL

5CB_S0.03	0.04	55
5CB_S0.03	0.05	73
5CB_S0.03	0.06	89.5
5CB_S0.03	0.07	108
5CB_S0.03	0.08	128
5CB_S0.03	0.09	149
5CB_S0.03	0.1	167.5
5CB_S0.03	0.11	190
5CB_S0.03	0.12	195
5CB_S0.03	0.4	195

6CB_S0.03	Rating	0	0
6CB_S0.03		0.01	3
6CB_S0.03		0.02	10.2
6CB_S0.03		0.03	34.2
6CB_S0.03		0.04	66
6CB_S0.03		0.05	87.6
6CB_S0.03		0.06	107.4
6CB_S0.03		0.07	129.6
6CB_S0.03		0.08	153.6
6CB_S0.03		0.09	178.8
6CB_S0.03		0.1	201
6CB_S0.03		0.11	228
6CB_S0.03		0.12	234
6CB_S0.03		0.4	234

7CB_S0.03	Rating	0	0
7CB_S0.03		0.01	3.5
7CB_S0.03		0.02	11.9
7CB_S0.03		0.03	39.9
7CB_S0.03		0.04	77
7CB_S0.03		0.05	102.2
7CB_S0.03		0.06	125.3
7CB_S0.03		0.07	151.2
7CB_S0.03		0.08	179.2
7CB_S0.03		0.09	208.6
7CB_S0.03		0.1	234.5
7CB_S0.03		0.11	266

POST-DEVELOPMENT MODEL

7CB_S0.03	0.12	273
7CB_S0.03	0.4	273

8CB_S0.03	Rating	0	0
8CB_S0.03		0.01	4
8CB_S0.03		0.02	13.6
8CB_S0.03		0.03	45.6
8CB_S0.03		0.04	88
8CB_S0.03		0.05	116.8
8CB_S0.03		0.06	143.2
8CB_S0.03		0.07	172.8
8CB_S0.03		0.08	204.8
8CB_S0.03		0.09	238.4
8CB_S0.03		0.1	268
8CB_S0.03		0.11	304
8CB_S0.03		0.12	312
8CB_S0.03		0.4	312

9CB_S0.03	Rating	0	0
9CB_S0.03		0.01	4.5
9CB_S0.03		0.02	15.3
9CB_S0.03		0.03	51.3
9CB_S0.03		0.04	99
9CB_S0.03		0.05	131.4
9CB_S0.03		0.06	161.1
9CB_S0.03		0.07	194.4
9CB_S0.03		0.08	230.4
9CB_S0.03		0.09	268.2
9CB_S0.03		0.1	301.5
9CB_S0.03		0.11	342
9CB_S0.03		0.12	351
9CB_S0.03		0.4	351

```
[TIMESERIES]
;;Name      Date      Time      Value
;;-----
03H100C    0:00      0
03H100C    0:10      6.05
```

POST-DEVELOPMENT MODEL

03H100C	0:20	7.54
03H100C	0:30	10.16
03H100C	0:40	15.97
03H100C	0:50	40.65
03H100C	1:00	178.56
03H100C	1:10	54.05
03H100C	1:20	27.32
03H100C	1:30	18.24
03H100C	1:40	13.74
03H100C	1:50	11.06
03H100C	2:00	9.29
03H100C	2:10	8.02
03H100C	2:20	7.08
03H100C	2:30	6.35
03H100C	2:40	5.76
03H100C	2:50	5.28
03H100C	3:00	4.88

03H120C	0:00	0
03H120C	0:10	7.26
03H120C	0:20	9.048
03H120C	0:30	12.192
03H120C	0:40	19.164
03H120C	0:50	48.78
03H120C	1:00	214.272
03H120C	1:10	64.86
03H120C	1:20	32.784
03H120C	1:30	21.888
03H120C	1:40	16.488
03H120C	1:50	13.272
03H120C	2:00	11.148
03H120C	2:10	9.624
03H120C	2:20	8.496
03H120C	2:30	7.62
03H120C	2:40	6.912
03H120C	2:50	6.336
03H120C	3:00	5.856

POST-DEVELOPMENT MODEL

[REPORT]  
 ;;Reporting Options  
 INPUT YES  
 CONTROLS NO  
 SUBCATCHMENTS ALL  
 NODES ALL  
 LINKS ALL

[TAGS]

[MAP]  
 DIMENSIONS 366080.2087 5030220.22155 366695.2693 5030739.82745  
 UNITS Meters

[COORDINATES]

```

;;Node X-Coord Y-Coord
;;-----
ALB-OF 366143.745 5030491.113
OF1 366561.224 5030486.487
OF2 366561.962 5030485.749
OF3 366487.932 5030457.828
OF4 366521.881 5030385.55
OF5 366379.435 5030410.818
OF6 366346.034 5030492.952
OF7 366197.772 5030338.959
SU1 366196.986 5030339.745
SU10 366423.129 5030613.526
SU11 366317.45 5030549.462
SU12 366489.932 5030653.498
SU13 366534.832 5030681.424
SU14 366570.424 5030600.933
SU15 366652.01 5030522.084
SU16 366589.041 5030422.427
SU17 366152.634 5030447.615
SU2 366345.376 5030493.61
SU3 366378.777 5030411.476
SU4 366408.893 5030335.912
SU5 366521.143 5030386.288
  
```

POST-DEVELOPMENT MODEL

SU6	366554.544	5030311.272
SU7	366487.194	5030458.566
SU8	366459.816	5030525.917
SU9	366443.389	5030564.793
ALB-BOO	366429.516	5030630.229
ALB-LOR	366495.464	5030670.72
ALB-PRE	366161.116	5030463.904
ALB-PRI	366537.409	5030695.935
ALB-ROC	366323.562	5030567.191
BOO-LP1	366468.067	5030537.126
BOO-LP2	366451.58	5030575.434
ELM-BOO	366528.923	5030398.925
ELM-PRI	366386.601	5030423.171
ELM-ROC	366418.363	5030349.222
LOR	366595.842	5030437.476
PRE	366210.835	5030353.976
PRI	366575.96	5030612.53
PRI-BOO	366497.404	5030471.42
PRI-EMP	366657.702	5030537.068
PRI-LOR	366568.929	5030500.03
ROC-LP1	366349.02	5030507.061
SPR-BOO	366561.898	5030324.249

[VERTICES]

;;Link	X-Coord	Y-Coord
;;-----	-----	-----
OL19	366561.087	5030495.555
OL20	366486.731	5030467.56
OL21	366519.9	5030396.484
OL22	366377.233	5030420.154
OL23	366209.658	5030342.429
OL24	366340.592	5030502.152

[POLYGONS]

;;Subcatchment	X-Coord	Y-Coord
;;-----	-----	-----
33	366619.39	5030289.71
33	366592.332	5030253.03

POST-DEVELOPMENT MODEL

33	366592.332	5030253.03
33	366552.97	5030243.84
33	366552.97	5030243.84
33	366527.372	5030297.603
33	366527.372	5030297.603
33	366544.282	5030311.094
33	366544.282	5030311.094
33	366537.925	5030336.48
33	366537.925	5030336.48
33	366541.376	5030359.772
33	366541.376	5030359.772
33	366581.91	5030377.77
33	366581.91	5030377.77
33	366619.39	5030289.71
34	366467.569	5030415.215
34	366548.303	5030449.668
34	366548.303	5030449.668
34	366548.485	5030449.745
34	366548.485	5030449.745
34	366581.91	5030377.77
34	366581.91	5030377.77
34	366541.376	5030359.772
34	366541.376	5030359.772
34	366537.925	5030336.48
34	366537.925	5030336.48
34	366516.325	5030327.358
34	366516.325	5030327.358
34	366512.08	5030329.18
34	366512.08	5030329.18
34	366508.26	5030333.8
34	366508.26	5030333.8
34	366503.303	5030331.783
34	366503.303	5030331.783
34	366467.569	5030415.215
37	366473.55	5030550.784
37	366503.256	5030564.221
37	366503.256	5030564.221
37	366523.663	5030511.484



POST-DEVELOPMENT MODEL

37	366523.663	5030511.484
37	366475.109	5030502.782
37	366475.109	5030502.782
37	366418.8	5030478.49
37	366418.8	5030478.49
37	366409.03	5030482.37
37	366409.03	5030482.37
37	366408.26	5030482.17
37	366408.26	5030482.17
37	366401.53	5030479.211
37	366401.53	5030479.211
37	366395.54	5030498.39
37	366395.54	5030498.39
37	366385.68	5030511.057
37	366385.68	5030511.057
37	366378.272	5030523.863
37	366378.272	5030523.863
37	366392.307	5030530.098
37	366392.307	5030530.098
37	366452.237	5030556.15
37	366452.237	5030556.15
37	366473.55	5030550.784
38	366397.9	5030385.485
38	366467.569	5030415.215
38	366467.569	5030415.215
38	366503.303	5030331.783
38	366503.303	5030331.783
38	366494.117	5030328.046
38	366494.117	5030328.046
38	366500.756	5030313.631
38	366500.756	5030313.631
38	366490.04	5030303.83
38	366490.04	5030303.83
38	366454.418	5030288.218
38	366454.418	5030288.218
38	366450.874	5030289.664
38	366450.874	5030289.664
38	366415.316	5030342.551

POST-DEVELOPMENT MODEL

38	366415.316	5030342.551
38	366397.9	5030385.485
39	366548.485	5030449.745
39	366548.303	5030449.668
39	366548.303	5030449.668
39	366531.64	5030490.871
39	366531.64	5030490.871
39	366523.663	5030511.484
39	366523.663	5030511.484
39	366503.256	5030564.221
39	366503.256	5030564.221
39	366481.219	5030621.173
39	366481.219	5030621.173
39	366502.985	5030642.015
39	366502.985	5030642.015
39	366531.021	5030654.341
39	366531.021	5030654.341
39	366539.111	5030632.511
39	366539.111	5030632.511
39	366563.37	5030585.01
39	366563.37	5030585.01
39	366573.07	5030551.98
39	366573.07	5030551.98
39	366589.47	5030530.98
39	366589.47	5030530.98
39	366617.51	5030534.77
39	366617.51	5030534.77
39	366626.497	5030514.457
39	366626.497	5030514.457
39	366583.83	5030495.579
39	366583.83	5030495.579
39	366574.4	5030463.87
39	366574.4	5030463.87
39	366548.485	5030449.745
40	366515.191	5030686.248
40	366562.582	5030716.209
40	366562.582	5030716.209
40	366566.792	5030706.813

POST-DEVELOPMENT MODEL

40	366566.792	5030706.813
40	366576.585	5030690.905
40	366576.585	5030690.905
40	366582.947	5030674.588
40	366582.947	5030674.588
40	366531.021	5030654.341
40	366531.021	5030654.341
40	366522.11	5030675.305
40	366522.11	5030675.305
40	366515.191	5030686.248
41	366466.27	5030655.32
41	366515.191	5030686.248
41	366515.191	5030686.248
41	366522.11	5030675.305
41	366522.11	5030675.305
41	366531.021	5030654.341
41	366531.021	5030654.341
41	366502.985	5030642.015
41	366502.985	5030642.015
41	366481.219	5030621.173
41	366481.219	5030621.173
41	366471.07	5030647.4
41	366471.07	5030647.4
41	366466.27	5030655.32
42	366531.021	5030654.341
42	366582.947	5030674.588
42	366582.947	5030674.588
42	366596.751	5030639.188
42	366596.751	5030639.188
42	366617.63	5030596.572
42	366617.63	5030596.572
42	366619.259	5030561.197
42	366619.259	5030561.197
42	366589.47	5030530.98
42	366589.47	5030530.98
42	366573.07	5030551.98
42	366573.07	5030551.98
42	366563.37	5030585.01

POST-DEVELOPMENT MODEL

42	366563.37	5030585.01
42	366539.111	5030632.511
42	366539.111	5030632.511
42	366531.021	5030654.341
43	366629.51	5030483.795
43	366627.384	5030512.453
43	366627.384	5030512.453
43	366626.497	5030514.457
43	366626.497	5030514.457
43	366617.51	5030534.77
43	366617.51	5030534.77
43	366589.47	5030530.98
43	366589.47	5030530.98
43	366619.259	5030561.197
43	366619.259	5030561.197
43	366617.63	5030596.572
43	366617.63	5030596.572
43	366620.419	5030596.721
43	366620.419	5030596.721
43	366639.85	5030595.64
43	366639.85	5030595.64
43	366652.84	5030596.3
43	366652.84	5030596.3
43	366656.016	5030582.215
43	366656.016	5030582.215
43	366667.312	5030555.751
43	366667.312	5030555.751
43	366661.449	5030546.897
43	366661.449	5030546.897
43	366653.74	5030529.165
43	366653.74	5030529.165
43	366629.51	5030483.795
44	366581.91	5030377.77
44	366548.485	5030449.745
44	366548.485	5030449.745
44	366574.4	5030463.87
44	366574.4	5030463.87
44	366583.83	5030495.579

POST-DEVELOPMENT MODEL

44	366583.83	5030495.579
44	366626.497	5030514.457
44	366626.497	5030514.457
44	366627.384	5030512.453
44	366627.384	5030512.453
44	366629.51	5030483.795
44	366629.51	5030483.795
44	366653.97	5030470.53
44	366653.97	5030470.53
44	366663.764	5030454.432
44	366663.764	5030454.432
44	366615.153	5030433.885
44	366615.153	5030433.885
44	366632.08	5030396.264
44	366632.08	5030396.264
44	366581.91	5030377.77
45	366301.091	5030575.904
45	366350.63	5030599.04
45	366350.63	5030599.04
45	366357.918	5030587.259
45	366357.918	5030587.259
45	366357.58	5030568.31
45	366357.58	5030568.31
45	366360.287	5030562.069
45	366360.287	5030562.069
45	366361.77	5030544.67
45	366361.77	5030544.67
45	366333.939	5030522.615
45	366333.939	5030522.615
45	366268.163	5030488.683
45	366268.163	5030488.683
45	366259.789	5030504.914
45	366259.789	5030504.914
45	366260.266	5030513.543
45	366260.266	5030513.543
45	366244.367	5030541.042
45	366244.367	5030541.042
45	366267.964	5030555.544

POST-DEVELOPMENT MODEL

45	366267.964	5030555.544
45	366291.967	5030570.296
45	366291.967	5030570.296
45	366301.091	5030575.904
46	366357.918	5030587.259
46	366440.91	5030639.287
46	366440.91	5030639.287
46	366466.27	5030655.32
46	366466.27	5030655.32
46	366471.07	5030647.4
46	366471.07	5030647.4
46	366481.219	5030621.173
46	366481.219	5030621.173
46	366472.49	5030616.02
46	366472.49	5030616.02
46	366447.398	5030604.888
46	366447.398	5030604.888
46	366431.26	5030587.84
46	366431.26	5030587.84
46	366413.62	5030580.29
46	366413.62	5030580.29
46	366387.985	5030574.085
46	366387.985	5030574.085
46	366360.287	5030562.069
46	366360.287	5030562.069
46	366357.58	5030568.31
46	366357.58	5030568.31
46	366357.918	5030587.259
47	366150.516	5030439.185
47	366144.31	5030436.46
47	366144.31	5030436.46
47	366125.161	5030426.264
47	366125.161	5030426.264
47	366108.166	5030455.608
47	366108.166	5030455.608
47	366140.746	5030476.592
47	366140.746	5030476.592
47	366166.263	5030493.026

POST-DEVELOPMENT MODEL

47	366166.263	5030493.026
47	366166.791	5030493.366
47	366166.791	5030493.366
47	366213.887	5030522.31
47	366213.887	5030522.31
47	366225.944	5030529.72
47	366225.944	5030529.72
47	366244.367	5030541.042
47	366244.367	5030541.042
47	366260.266	5030513.543
47	366260.266	5030513.543
47	366259.789	5030504.914
47	366259.789	5030504.914
47	366268.163	5030488.683
47	366268.163	5030488.683
47	366212.111	5030459.768
47	366212.111	5030459.768
47	366212.097	5030459.803
47	366212.097	5030459.803
47	366212.111	5030459.768
47	366212.111	5030459.768
47	366182.194	5030444.334
47	366182.194	5030444.334
47	366150.516	5030439.185
48	366285.83	5030399.63
48	366247.248	5030383.591
48	366247.248	5030383.591
48	366234.603	5030403.004
48	366234.603	5030403.004
48	366212.111	5030459.768
48	366212.111	5030459.768
48	366268.163	5030488.683
48	366268.163	5030488.683
48	366333.939	5030522.615
48	366333.939	5030522.615
48	366361.77	5030544.67
48	366361.77	5030544.67
48	366370.863	5030536.669

POST-DEVELOPMENT MODEL

48	366370.863	5030536.669
48	366378.272	5030523.863
48	366378.272	5030523.863
48	366385.68	5030511.057
48	366385.68	5030511.057
48	366395.54	5030498.39
48	366395.54	5030498.39
48	366401.53	5030479.211
48	366401.53	5030479.211
48	366389.087	5030472.996
48	366389.087	5030472.996
48	366351.34	5030449.657
48	366351.34	5030449.657
48	366307.543	5030424.064
48	366307.543	5030424.064
48	366285.83	5030399.63
49	366503.256	5030564.221
49	366473.55	5030550.784
49	366473.55	5030550.784
49	366452.237	5030556.15
49	366452.237	5030556.15
49	366392.307	5030530.098
49	366392.307	5030530.098
49	366378.272	5030523.863
49	366378.272	5030523.863
49	366370.863	5030536.669
49	366370.863	5030536.669
49	366361.77	5030544.67
49	366361.77	5030544.67
49	366360.287	5030562.069
49	366360.287	5030562.069
49	366387.985	5030574.085
49	366387.985	5030574.085
49	366413.62	5030580.29
49	366413.62	5030580.29
49	366431.26	5030587.84
49	366431.26	5030587.84
49	366447.398	5030604.888

POST-DEVELOPMENT MODEL

49	366447.398	5030604.888
49	366472.49	5030616.02
49	366472.49	5030616.02
49	366481.219	5030621.173
49	366481.219	5030621.173
49	366503.256	5030564.221
50	366548.303	5030449.668
50	366467.569	5030415.215
50	366467.569	5030415.215
50	366454.19	5030445.56
50	366454.19	5030445.56
50	366432.29	5030449.492
50	366432.29	5030449.492
50	366418.8	5030478.49
50	366418.8	5030478.49
50	366475.109	5030502.782
50	366475.109	5030502.782
50	366523.663	5030511.484
50	366523.663	5030511.484
50	366531.64	5030490.871
50	366531.64	5030490.871
50	366548.303	5030449.668
51	366247.248	5030383.591
51	366246.32	5030366.3
51	366246.32	5030366.3
51	366223.36	5030355.55
51	366223.36	5030355.55
51	366200.48	5030354.42
51	366200.48	5030354.42
51	366182.086	5030395.395
51	366182.086	5030395.395
51	366174.41	5030392.2
51	366174.41	5030392.2
51	366166.84	5030409.15
51	366166.84	5030409.15
51	366150.516	5030439.185
51	366150.516	5030439.185
51	366182.194	5030444.334

POST-DEVELOPMENT MODEL

51	366182.194	5030444.334
51	366212.111	5030459.768
51	366212.111	5030459.768
51	366234.603	5030403.004
51	366234.603	5030403.004
51	366247.248	5030383.591
52	366467.569	5030415.215
52	366397.9	5030385.485
52	366380.24	5030393.48
52	366339.15	5030374.4
52	366304.45	5030352.87
52	366296.88	5030370.78
52	366285.83	5030399.63
52	366307.543	5030424.064
52	366351.34	5030449.657
52	366389.087	5030472.996
52	366401.53	5030479.211
52	366408.26	5030482.17
52	366409.03	5030482.37
52	366418.8	5030478.49
52	366432.29	5030449.492
52	366454.19	5030445.56
52	366467.569	5030415.215

```
;;Storage Node X-Coord Y-Coord
;;-----
```

```
[SYMBOLS]
;;Gage X-Coord Y-Coord
;;-----
```

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

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\*\*\*\*\*

Element Count

\*\*\*\*\*

Number of rain gages ..... 1  
 Number of subcatchments ... 18  
 Number of nodes ..... 43  
 Number of links ..... 42  
 Number of pollutants ..... 0  
 Number of land uses ..... 0

\*\*\*\*\*

Raingage Summary

\*\*\*\*\*

Name	Data Source	Data Type	Recording Interval
RG1	03H120C	INTENSITY	10 min.

\*\*\*\*\*

Subcatchment Summary

\*\*\*\*\*

Name	Area	Width	%Imperv	%Slope	Rain Gage
Outlet					

---

33	0.77	173.12	71.43	3.0000	RG1
SPR-B00					
34	0.78	176.62	71.43	3.0000	RG1
ELM-B00					
37	0.70	157.28	71.43	3.0000	RG1
B00-LP1					
38	0.79	177.32	71.43	3.0000	RG1
ELM-ROC					
39	1.21	271.83	71.43	3.0000	RG1
PRI-LOR					
40	0.23	51.24	71.43	3.0000	RG1
ALB-PRI					
41	0.20	44.25	71.43	3.0000	RG1
ALB-LOR					
42	0.68	152.53	71.43	3.0000	RG1
PRI					
43	0.38	85.28	71.43	3.0000	RG1

PRI-EMP					
44	0.78	175.80	71.43	3.0000	RG1
LOR					
45	0.68	154.07	71.43	3.0000	RG1
ALB-ROC					
46	0.44	98.25	71.43	3.0000	RG1
ALB-BOO					
47	0.77	172.57	71.43	3.0000	RG1
ALB-PRE					
48	1.41	316.73	71.43	3.0000	RG1
ROC-LP1					
49	0.63	141.03	71.43	3.0000	RG1
BOO-LP2					
50	0.74	165.46	71.43	3.0000	RG1
PRI-BOO					
51	0.56	125.13	71.43	3.0000	RG1
PRE					
52	1.14	255.87	71.43	3.0000	RG1
ELM-PRI					

\*\*\*\*\*  
Node Summary  
\*\*\*\*\*

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
ALB-OF	OUTFALL	0.00	0.00	0.0	
OF1	OUTFALL	0.00	0.00	0.0	
OF2	OUTFALL	0.00	0.00	0.0	
OF3	OUTFALL	0.00	0.00	0.0	
OF4	OUTFALL	0.00	0.00	0.0	
OF5	OUTFALL	0.00	0.00	0.0	
OF6	OUTFALL	0.00	0.00	0.0	
OF7	OUTFALL	0.00	0.00	0.0	
SU1	OUTFALL	0.00	0.00	0.0	
SU10	OUTFALL	0.00	0.00	0.0	
SU11	OUTFALL	0.00	0.00	0.0	
SU12	OUTFALL	0.00	0.00	0.0	
SU13	OUTFALL	0.00	0.00	0.0	
SU14	OUTFALL	0.00	0.00	0.0	
SU15	OUTFALL	0.00	0.00	0.0	
SU16	OUTFALL	0.00	0.00	0.0	
SU17	OUTFALL	0.00	0.00	0.0	
SU2	OUTFALL	0.00	0.00	0.0	
SU3	OUTFALL	0.00	0.00	0.0	
SU4	OUTFALL	0.00	0.00	0.0	
SU5	OUTFALL	0.00	0.00	0.0	
SU6	OUTFALL	0.00	0.00	0.0	
SU7	OUTFALL	0.00	0.00	0.0	

SU8	OUTFALL	0.00	0.00	0.0
SU9	OUTFALL	0.00	0.00	0.0
ALB-BOO	STORAGE	61.78	0.40	0.0
ALB-LOR	STORAGE	62.33	0.40	0.0
ALB-PRE	STORAGE	58.95	0.40	0.0
ALB-PRI	STORAGE	62.47	0.40	0.0
ALB-ROC	STORAGE	60.67	0.40	0.0
BOO-LP1	STORAGE	62.23	0.40	0.0
BOO-LP2	STORAGE	62.25	0.40	0.0
ELM-BOO	STORAGE	64.98	0.40	0.0
ELM-PRI	STORAGE	62.36	0.40	0.0
ELM-ROC	STORAGE	63.04	0.40	0.0
LOR	STORAGE	76.87	0.40	0.0
PRE	STORAGE	61.31	0.40	0.0
PRI	STORAGE	62.87	0.40	0.0
PRI-BOO	STORAGE	62.37	0.40	0.0
PRI-EMP	STORAGE	80.19	0.40	0.0
PRI-LOR	STORAGE	72.00	0.40	0.0
ROC-LP1	STORAGE	61.36	0.40	0.0
SPR-BOO	STORAGE	71.56	0.40	0.0

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Link Summary

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Name	From Node	To Node	Type	Length
%Slope Roughness				
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C1	SPR-BOO	ELM-BOO	CONDUIT	81.6
8.0864	0.0130			
C10	PRE	ALB-PRE	CONDUIT	120.7
1.8900	0.0130			
C11	PRI-BOO	BOO-LP1	CONDUIT	72.0
0.1945	0.0130			
C12	BOO-LP1	BOO-LP2	CONDUIT	41.7
-0.0480	0.0130			
C13	BOO-LP2	ALB-BOO	CONDUIT	59.1
0.6263	0.0130			
C14	ELM-PRI	ROC-LP1	CONDUIT	91.9
1.0879	0.0130			
C15	ROC-LP1	ALB-ROC	CONDUIT	65.3
0.9036	0.0130			
C16	ALB-BOO	ALB-ROC	CONDUIT	123.3
0.9003	0.0130			
C17	ALB-ROC	ALB-PRE	CONDUIT	192.5
0.8935	0.0130			
C2	ELM-BOO	PRI-BOO	CONDUIT	79.1
3.3033	0.0130			



C3		LOR	PRI-LOR	CONDUIT	68.1
7.1695	0.0130				
C4		PRI-LOR	ALB-LOR	CONDUIT	185.8
5.1565	0.0130				
C5		PRI-EMP	PRI-LOR	CONDUIT	96.2
8.5450	0.0130				
C6		PRI	ALB-PRI	CONDUIT	91.9
0.3265	0.0130				
C7		ALB-PRI	ALB-LOR	CONDUIT	48.9
0.2860	0.0130				
C8		ALB-LOR	ALB-BOO	CONDUIT	77.4
0.7107	0.0130				
C9		ELM-ROC	ELM-PRI	CONDUIT	80.5
0.8449	0.0130				
W1		ALB-PRE	ALB-OF	WEIR	
OL1		ALB-PRE	SU17	OUTLET	
OL10		PRI-LOR	OF2	OUTLET	
OL11		PRI-EMP	SU15	OUTLET	
OL12		PRI	SU14	OUTLET	
OL13		ALB-PRI	SU13	OUTLET	
OL14		ALB-LOR	SU12	OUTLET	
OL15		ALB-BOO	SU10	OUTLET	
OL16		BOO-LP2	SU9	OUTLET	
OL17		BOO-LP1	SU8	OUTLET	
OL18		PRI-BOO	OF3	OUTLET	
OL19		PRI-LOR	OF1	OUTLET	
OL2		PRE	SU1	OUTLET	
OL20		PRI-BOO	SU7	OUTLET	
OL21		ELM-BOO	SU5	OUTLET	
OL22		ELM-PRI	SU3	OUTLET	
OL23		PRE	OF7	OUTLET	
OL24		ROC-LP1	SU2	OUTLET	
OL3		ALB-ROC	SU11	OUTLET	
OL4		ROC-LP1	OF6	OUTLET	
OL5		ELM-PRI	OF5	OUTLET	
OL6		ELM-ROC	SU4	OUTLET	
OL7		ELM-BOO	OF4	OUTLET	
OL8		SPR-BOO	SU6	OUTLET	
OL9		LOR	SU16	OUTLET	

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Cross Section Summary

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Full Conduit Flow	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels
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C1	18m	0.35	3.56	0.19	18.00	1
25310.06						
C10	20m_Preston	0.20	2.00	0.10	20.00	1
4499.28						
C11	18m	0.35	3.56	0.19	18.00	1
3925.81						
C12	18m	0.35	3.56	0.19	18.00	1
1949.04						
C13	18m	0.35	3.56	0.19	18.00	1
7044.06						
C14	18m	0.35	3.56	0.19	18.00	1
9283.36						
C15	18m	0.35	3.56	0.19	18.00	1
8460.47						
C16	15.5m_Albert_OS	0.23	1.46	0.10	15.00	1
2240.10						
C17	15.5m_Albert_OS	0.23	1.46	0.10	15.00	1
2231.59						
C2	18m	0.35	3.56	0.19	18.00	1
16176.70						
C3	18m	0.35	3.56	0.19	18.00	1
23832.00						
C4	18m	0.35	3.56	0.19	18.00	1
20211.25						
C5	18m	0.35	3.56	0.19	18.00	1
26017.86						
C6	18m	0.35	3.56	0.19	18.00	1
5085.65						
C7	15.5m_Albert_OS	0.23	1.46	0.10	15.00	1
1262.66						
C8	15.5m_Albert_OS	0.23	1.46	0.10	15.00	1
1990.28						
C9	18m	0.35	3.56	0.19	18.00	1
8181.22						

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Transect Summary  
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Transect 15.5m\_Albert\_OS  
Area:

0.0004	0.0014	0.0033	0.0058	0.0090
0.0130	0.0177	0.0231	0.0293	0.0362
0.0438	0.0521	0.0611	0.0709	0.0814
0.0926	0.1045	0.1172	0.1306	0.1447
0.1595	0.1751	0.1913	0.2083	0.2261
0.2445	0.2637	0.2836	0.3042	0.3255
0.3476	0.3704	0.3939	0.4187	0.4449

	0.4724	0.5013	0.5315	0.5631	0.5960
	0.6303	0.6660	0.7030	0.7413	0.7811
	0.8221	0.8646	0.9084	0.9535	1.0000

Hrad:

	0.0234	0.0467	0.0701	0.0934	0.1168
	0.1402	0.1635	0.1869	0.2102	0.2336
	0.2569	0.2803	0.3037	0.3270	0.3504
	0.3737	0.3971	0.4205	0.4438	0.4672
	0.4905	0.5139	0.5373	0.5606	0.5840
	0.6073	0.6307	0.6540	0.6774	0.7008
	0.7241	0.7475	0.7633	0.7690	0.7764
	0.7854	0.7958	0.8073	0.8198	0.8332
	0.8474	0.8623	0.8779	0.8940	0.9107
	0.9278	0.9453	0.9632	0.9814	1.0000

Width:

	0.0153	0.0307	0.0460	0.0613	0.0767
	0.0920	0.1073	0.1227	0.1380	0.1533
	0.1687	0.1840	0.1993	0.2147	0.2300
	0.2453	0.2607	0.2760	0.2913	0.3067
	0.3220	0.3373	0.3527	0.3680	0.3833
	0.3987	0.4140	0.4293	0.4447	0.4600
	0.4753	0.4907	0.5113	0.5400	0.5688
	0.5975	0.6263	0.6550	0.6838	0.7125
	0.7413	0.7700	0.7988	0.8275	0.8563
	0.8850	0.9138	0.9425	0.9713	1.0000

Transect 18m

Area:

	0.0005	0.0020	0.0045	0.0081	0.0126
	0.0181	0.0247	0.0322	0.0408	0.0503
	0.0609	0.0725	0.0851	0.0986	0.1132
	0.1288	0.1454	0.1631	0.1816	0.2003
	0.2190	0.2378	0.2571	0.2770	0.2975
	0.3186	0.3402	0.3625	0.3853	0.4087
	0.4327	0.4573	0.4825	0.5082	0.5346
	0.5615	0.5890	0.6171	0.6458	0.6751
	0.7049	0.7354	0.7664	0.7980	0.8302
	0.8630	0.8964	0.9303	0.9649	1.0000

Hrad:

	0.0183	0.0366	0.0549	0.0731	0.0914
	0.1097	0.1280	0.1463	0.1646	0.1829
	0.2012	0.2194	0.2377	0.2560	0.2743
	0.2926	0.3109	0.3292	0.3551	0.3911
	0.4270	0.4628	0.4975	0.5304	0.5618
	0.5917	0.6201	0.6471	0.6727	0.6971
	0.7203	0.7424	0.7633	0.7833	0.8023
	0.8203	0.8375	0.8539	0.8695	0.8844
	0.8986	0.9121	0.9249	0.9372	0.9489
	0.9601	0.9708	0.9810	0.9907	1.0000

Width:

0.0284	0.0568	0.0853	0.1137	0.1421
0.1705	0.1989	0.2274	0.2558	0.2842
0.3126	0.3410	0.3694	0.3979	0.4263
0.4547	0.4831	0.5115	0.5278	0.5278
0.5278	0.5372	0.5537	0.5703	0.5868
0.6033	0.6199	0.6364	0.6529	0.6694
0.6860	0.7025	0.7190	0.7356	0.7521
0.7686	0.7851	0.8017	0.8182	0.8347
0.8512	0.8678	0.8843	0.9008	0.9174
0.9339	0.9504	0.9669	0.9835	1.0000

Transect 20m\_Preston

Area:

0.0004	0.0016	0.0036	0.0064	0.0100
0.0144	0.0196	0.0256	0.0324	0.0400
0.0484	0.0576	0.0676	0.0784	0.0900
0.1024	0.1156	0.1296	0.1444	0.1600
0.1764	0.1936	0.2116	0.2304	0.2500
0.2704	0.2916	0.3136	0.3364	0.3600
0.3844	0.4096	0.4356	0.4624	0.4900
0.5184	0.5476	0.5776	0.6084	0.6400
0.6724	0.7056	0.7396	0.7744	0.8100
0.8464	0.8836	0.9216	0.9604	1.0000

Hrad:

0.0199	0.0398	0.0597	0.0796	0.0995
0.1194	0.1393	0.1592	0.1791	0.1990
0.2189	0.2388	0.2587	0.2786	0.2985
0.3184	0.3383	0.3582	0.3781	0.3980
0.4179	0.4378	0.4577	0.4776	0.4975
0.5175	0.5374	0.5573	0.5772	0.5971
0.6170	0.6369	0.6568	0.6767	0.6966
0.7165	0.7364	0.7565	0.7768	0.7971
0.8173	0.8376	0.8579	0.8782	0.8985
0.9188	0.9391	0.9594	0.9797	1.0000

Width:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

\*\*\*\*\*  
 Analysis Options  
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```

Flow Units ..... LPS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date ..... 07/17/2024 00:00:00
Ending Date ..... 07/17/2024 06:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:01:00
Wet Time Step ..... 00:01:00
Dry Time Step ..... 00:01:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... NO
Maximum Trials ..... 8
Number of Threads ..... 8
Head Tolerance ..... 0.001500 m

```

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*****
Runoff Quantity Continuity      Volume      Depth
                                hectare-m    mm
*****
Total Precipitation .....      1.106      86.000
Evaporation Loss .....          0.000       0.000
Infiltration Loss .....         0.173      13.470
Surface Runoff .....            0.920      71.504
Final Storage .....             0.014       1.126
Continuity Error (%) .....      -0.116

```

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*****
Flow Routing Continuity      Volume      Volume
                                hectare-m    10^6 ltr
*****
Dry Weather Inflow .....       0.000       0.000
Wet Weather Inflow .....       0.920       9.198
Groundwater Inflow .....       0.000       0.000
RDII Inflow .....              0.000       0.000
External Inflow .....          0.000       0.000
External Outflow .....         0.916       9.162
Flooding Loss .....            0.000       0.000
Evaporation Loss .....         0.000       0.000
Exfiltration Loss .....        0.000       0.000
Initial Stored Volume .....     0.000       0.000
Final Stored Volume .....       0.000       0.000

```

Continuity Error (%) ..... 0.399

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Highest Continuity Errors

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Node ALB-PRE (3.51%)  
Node ALB-ROC (-1.21%)

\*\*\*\*\*

Highest Flow Instability Indexes

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All links are stable.

\*\*\*\*\*

Most Frequent Nonconverging Nodes

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Convergence obtained at all time steps.

\*\*\*\*\*

Routing Time Step Summary

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Minimum Time Step : 1.00 sec  
Average Time Step : 1.00 sec  
Maximum Time Step : 1.00 sec  
% of Time in Steady State : 0.00  
Average Iterations per Step : 2.00  
% of Steps Not Converging : 0.00

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Subcatchment Runoff Summary

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Perv	Total	Total	Total	Total	Total	Total	Imperv
Runoff	Runoff	Total	Peak	Total	Evap	Infil	Runoff
Subcatchment	Runoff	Runoff	Precip	Runoff	mm	mm	mm
mm	mm	10 <sup>6</sup> ltr	mm	Runoff	mm	mm	mm
			LPS	Coeff			
33		86.00		0.00	0.00	13.47	60.38

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11.12	71.50	0.55	429.09	0.831			
34			86.00	0.00	0.00	13.47	60.38
11.12	71.50	0.56	437.76	0.831			
37			86.00	0.00	0.00	13.47	60.38
11.12	71.50	0.50	389.83	0.831			
38			86.00	0.00	0.00	13.47	60.38
11.12	71.50	0.56	439.49	0.831			
39			86.00	0.00	0.00	13.47	60.38
11.12	71.50	0.86	673.74	0.831			
40			86.00	0.00	0.00	13.47	60.38
11.12	71.50	0.16	127.01	0.831			
41			86.00	0.00	0.00	13.47	60.38
11.12	71.50	0.14	109.66	0.831			
42			86.00	0.00	0.00	13.47	60.38
11.12	71.50	0.48	378.05	0.831			
43			86.00	0.00	0.00	13.47	60.38
11.12	71.50	0.27	211.37	0.831			
44			86.00	0.00	0.00	13.47	60.38
11.12	71.50	0.56	435.74	0.831			
45			86.00	0.00	0.00	13.47	60.38
11.12	71.50	0.49	381.88	0.831			
46			86.00	0.00	0.00	13.47	60.38
11.12	71.50	0.31	243.51	0.831			
47			86.00	0.00	0.00	13.47	60.38
11.12	71.50	0.55	427.72	0.831			
48			86.00	0.00	0.00	13.47	60.38
11.12	71.50	1.01	785.03	0.831			
49			86.00	0.00	0.00	13.47	60.38
11.12	71.50	0.45	349.54	0.831			
50			86.00	0.00	0.00	13.47	60.38
11.12	71.50	0.53	410.09	0.831			
51			86.00	0.00	0.00	13.47	60.38
11.12	71.50	0.40	310.13	0.831			
52			86.00	0.00	0.00	13.47	60.38
11.12	71.50	0.81	634.18	0.831			

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Node Depth Summary  
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Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
ALB-OF	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OF1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OF2	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OF3	OUTFALL	0.00	0.00	0.00	0 00:00	0.00

OF4	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OF5	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OF6	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OF7	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
SU1	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
SU10	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
SU11	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
SU12	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
SU13	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
SU14	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
SU15	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
SU16	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
SU17	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
SU2	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
SU3	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
SU4	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
SU5	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
SU6	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
SU7	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
SU8	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
SU9	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
ALB-BOO	STORAGE	0.02	0.18	61.96	0	01:10	0.18
ALB-LOR	STORAGE	0.02	0.17	62.50	0	01:10	0.17
ALB-PRE	STORAGE	0.03	0.38	59.33	0	01:13	0.38
ALB-PRI	STORAGE	0.01	0.10	62.57	0	01:10	0.10
ALB-ROC	STORAGE	0.02	0.21	60.88	0	01:10	0.21
BOO-LP1	STORAGE	0.02	0.16	62.39	0	01:10	0.16
BOO-LP2	STORAGE	0.02	0.11	62.36	0	01:10	0.11
ELM-BOO	STORAGE	0.01	0.08	65.06	0	01:10	0.08
ELM-PRI	STORAGE	0.01	0.10	62.46	0	01:10	0.10
ELM-ROC	STORAGE	0.01	0.09	63.13	0	01:10	0.09
LOR	STORAGE	0.01	0.07	76.94	0	01:10	0.07
PRE	STORAGE	0.01	0.05	61.36	0	01:10	0.05
PRI	STORAGE	0.01	0.09	62.96	0	01:10	0.09
PRI-BOO	STORAGE	0.01	0.12	62.49	0	01:10	0.12
PRI-EMP	STORAGE	0.01	0.05	80.24	0	01:10	0.05
PRI-LOR	STORAGE	0.01	0.09	72.09	0	01:10	0.09
ROC-LP1	STORAGE	0.02	0.12	61.48	0	01:10	0.12
SPR-BOO	STORAGE	0.01	0.06	71.62	0	01:10	0.06

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Node Inflow Summary  
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Total	Flow	Maximum	Maximum	Lateral
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Inflow Volume Node ltr	Balance Error Percent	Type	Lateral Inflow LPS	Total Inflow LPS	Time of Max Occurrence days hr:min	Inflow Volume 10^6 ltr	10^6
ALB-OF		OUTFALL	0.00	983.37	0 01:13	0	
0.542	0.000						
OF1		OUTFALL	0.00	189.10	0 01:10	0	
0.343	0.000						
OF2		OUTFALL	0.00	315.17	0 01:10	0	
0.571	0.000						
OF3		OUTFALL	0.00	116.23	0 01:10	0	
0.158	0.000						
OF4		OUTFALL	0.00	76.34	0 01:10	0	
0.121	0.000						
OF5		OUTFALL	0.00	136.64	0 01:10	0	
0.212	0.000						
OF6		OUTFALL	0.00	390.00	0 01:08	0	
0.692	0.000						
OF7		OUTFALL	0.00	157.38	0 01:10	0	
0.241	0.000						
SU1		OUTFALL	0.00	15.74	0 01:10	0	
0.0241	0.000						
SU10		OUTFALL	0.00	156.00	0 01:03	0	
0.378	0.000						
SU11		OUTFALL	0.00	390.00	0 01:04	0	
0.793	0.000						
SU12		OUTFALL	0.00	156.00	0 01:03	0	
0.343	0.000						
SU13		OUTFALL	0.00	132.04	0 01:10	0	
0.182	0.000						
SU14		OUTFALL	0.00	230.16	0 01:10	0	
0.373	0.000						
SU15		OUTFALL	0.00	15.37	0 01:10	0	
0.0284	0.000						
SU16		OUTFALL	0.00	43.45	0 01:10	0	
0.0932	0.000						
SU17		OUTFALL	0.00	390.00	0 01:03	0	
1.06	0.000						
SU2		OUTFALL	0.00	176.99	0 01:10	0	
0.171	0.000						
SU3		OUTFALL	0.00	341.61	0 01:10	0	
0.529	0.000						
SU4		OUTFALL	0.00	178.45	0 01:10	0	
0.326	0.000						
SU5		OUTFALL	0.00	254.46	0 01:10	0	

0.405	0.000							
SU6		OUTFALL	0.00	159.88	0	01:10		0
0.271	0.000							
SU7		OUTFALL	0.00	387.42	0	01:10		0
0.526	0.000							
SU8		OUTFALL	0.00	395.00	0	01:10		0
0.542	0.000							
SU9		OUTFALL	0.00	205.36	0	01:10		0
0.238	0.000							
ALB-BOO		STORAGE	243.51	1383.15	0	01:10		0.312
1.19	-0.147							
ALB-LOR		STORAGE	109.66	973.51	0	01:10		0.141
0.892	-0.069							
ALB-PRE		STORAGE	427.72	2117.22	0	01:10		0.548
1.66	3.643							
ALB-PRI		STORAGE	127.01	267.16	0	01:10		0.163
0.275	-0.187							
ALB-ROC		STORAGE	381.88	2146.20	0	01:10		0.49
1.75	-1.198							
BOO-LP1		STORAGE	389.83	641.79	0	01:10		0.5
0.664	0.105							
BOO-LP2		STORAGE	349.54	567.92	0	01:10		0.448
0.57	-0.026							
ELM-BOO		STORAGE	437.76	705.78	0	01:10		0.561
0.841	-0.047							
ELM-PRI		STORAGE	634.18	892.55	0	01:10		0.813
1.05	-0.005							
ELM-ROC		STORAGE	439.49	439.49	0	01:10		0.564
0.564	-0.053							
LOR		STORAGE	435.74	435.74	0	01:10		0.559
0.559	-0.076							
PRE		STORAGE	310.13	310.13	0	01:10		0.398
0.398	-0.511							
PRI		STORAGE	378.05	378.05	0	01:10		0.485
0.485	-0.038							
PRI-BOO		STORAGE	410.09	780.30	0	01:10		0.526
0.841	-0.016							
PRI-EMP		STORAGE	211.37	211.37	0	01:10		0.271
0.271	-0.128							
PRI-LOR		STORAGE	673.74	1259.92	0	01:10		0.864
1.57	0.040							
ROC-LP1		STORAGE	785.03	1190.39	0	01:10		1.01
1.32	0.407							
SPR-BOO		STORAGE	429.09	429.09	0	01:10		0.55
0.55	-0.029							

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Node Surcharge Summary  
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No nodes were surcharged.

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Node Flooding Summary  
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No nodes were flooded.

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Storage Volume Summary  
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-----		Average	Avg	Evap	Exfil	Maximum	Max	Time of
Max	Maximum	Volume	Pcnt	Pcnt	Pcnt	Volume	Pcnt	
Occurrence	Outflow	1000 m <sup>3</sup>	Full	Loss	Loss	1000 m <sup>3</sup>	Full	days
hr:min	Unit LPS							
-----								
ALB-BOO		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	1336.68							
ALB-LOR		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	956.33							
ALB-PRE		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	1373.37							
ALB-PRI		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	264.71							
ALB-ROC		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	2002.33							
BOO-LP1		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	615.49							
BOO-LP2		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	551.81							
ELM-BOO		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	701.17							
ELM-PRI		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	883.83							
ELM-ROC		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	436.88							
LOR		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	434.66							
PRE		0.000	0.0	0.0	0.0	0.000	0.0	0

00:00	306.18							
	PRI	0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	370.55							
	PRI-BOO	0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	756.65							
	PRI-EMP	0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	210.39							
	PRI-LOR	0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	1236.88							
	ROC-LP1	0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	1168.57							
	SPR-BOO	0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	427.93							

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 Outfall Loading Summary  
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Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10 <sup>6</sup> ltr
ALB-OF	5.69	440.90	983.37	0.542
OF1	64.43	24.62	189.10	0.343
OF2	68.90	38.37	315.17	0.571
OF3	57.48	12.71	116.23	0.158
OF4	57.85	9.71	76.34	0.121
OF5	61.48	15.93	136.64	0.212
OF6	71.42	44.86	390.00	0.692
OF7	64.95	17.15	157.38	0.241
SU1	52.32	2.13	15.74	0.024
SU10	63.86	27.43	156.00	0.378
SU11	67.53	54.34	390.00	0.793
SU12	58.35	27.21	156.00	0.343
SU13	59.06	14.30	132.04	0.182
SU14	67.63	25.54	230.16	0.373
SU15	64.55	2.03	15.37	0.028
SU16	69.19	6.23	43.45	0.093
SU17	68.49	71.50	390.00	1.058
SU2	63.09	12.54	176.99	0.171
SU3	69.12	35.43	341.61	0.529
SU4	68.83	21.95	178.45	0.326
SU5	66.36	28.24	254.46	0.405
SU6	68.52	18.29	159.88	0.271
SU7	65.77	37.03	387.42	0.526
SU8	67.81	37.03	395.00	0.542
SU9	66.99	16.45	205.36	0.238

System                    62.39    1041.90    5610.57            9.162

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Link Flow Summary

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Link	Type	Maximum  Flow  LPS	Time of Max Occurrence days hr:min	Maximum  Veloc  m/sec	Max/ Full Flow	Max/ Full Depth
C1	CHANNEL	268.05	0 01:10	1.51	0.01	0.20
C10	CHANNEL	133.06	0 01:10	0.82	0.03	0.63
C11	CHANNEL	253.01	0 01:10	0.35	0.06	0.40
C12	CHANNEL	220.55	0 01:10	0.33	0.11	0.39
C13	CHANNEL	346.64	0 01:10	0.84	0.05	0.30
C14	CHANNEL	405.58	0 01:10	0.89	0.04	0.32
C15	CHANNEL	601.73	0 01:10	1.11	0.07	0.35
C16	CHANNEL	1180.68	0 01:10	1.26	0.53	0.85
C17	CHANNEL	1612.33	0 01:10	1.25	0.72	0.95
C2	CHANNEL	370.37	0 01:10	1.15	0.02	0.28
C3	CHANNEL	391.21	0 01:10	1.89	0.02	0.24
C4	CHANNEL	732.63	0 01:10	2.24	0.04	0.27
C5	CHANNEL	195.02	0 01:10	1.19	0.01	0.21
C6	CHANNEL	140.46	0 01:10	0.56	0.03	0.24
C7	CHANNEL	132.66	0 01:10	0.30	0.11	0.57
C8	CHANNEL	800.33	0 01:10	1.05	0.40	0.76
C9	CHANNEL	258.43	0 01:10	0.77	0.03	0.27
W1	WEIR	983.37	0 01:13			0.76
OL1	DUMMY	390.00	0 01:03			
OL10	DUMMY	315.17	0 01:10			
OL11	DUMMY	15.37	0 01:10			
OL12	DUMMY	230.16	0 01:10			
OL13	DUMMY	132.04	0 01:10			
OL14	DUMMY	156.00	0 01:03			
OL15	DUMMY	156.00	0 01:03			
OL16	DUMMY	205.36	0 01:10			
OL17	DUMMY	395.00	0 01:10			
OL18	DUMMY	116.23	0 01:10			
OL19	DUMMY	189.10	0 01:10			
OL2	DUMMY	15.74	0 01:10			
OL20	DUMMY	387.42	0 01:10			
OL21	DUMMY	254.46	0 01:10			
OL22	DUMMY	341.61	0 01:10			
OL23	DUMMY	157.38	0 01:10			
OL24	DUMMY	176.99	0 01:10			
OL3	DUMMY	390.00	0 01:04			
OL4	DUMMY	390.00	0 01:08			
OL5	DUMMY	136.64	0 01:10			

OL6	DUMMY	178.45	0	01:10
OL7	DUMMY	76.34	0	01:10
OL8	DUMMY	159.88	0	01:10
OL9	DUMMY	43.45	0	01:10

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Flow Classification Summary  
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Inlet Conduit Ctrl	Adjusted	----- Fraction of Time in Flow Class							
	/Actual	Up	Down	Sub	Sup	Up	Down	Norm	
	Length	Dry	Dry	Dry	Crit	Crit	Crit	Crit	Ltd
-----									
--									
C1 0.00	1.00	0.09	0.03	0.00	0.34	0.54	0.00	0.00	0.47
C10 0.00	1.00	0.12	0.00	0.00	0.09	0.00	0.00	0.79	0.09
C11 0.00	1.00	0.08	0.09	0.00	0.83	0.00	0.00	0.00	0.94
C12 0.00	1.00	0.07	0.02	0.00	0.91	0.00	0.00	0.00	0.68
C13 0.00	1.00	0.09	0.00	0.00	0.00	0.00	0.00	0.91	0.00
C14 0.00	1.00	0.07	0.07	0.00	0.59	0.27	0.00	0.00	0.93
C15 0.00	1.00	0.08	0.00	0.00	0.00	0.01	0.00	0.91	0.01
C16 0.00	1.00	0.08	0.02	0.00	0.36	0.54	0.00	0.00	0.04
C17 0.00	1.00	0.09	0.07	0.00	0.40	0.44	0.00	0.00	0.88
C2 0.00	1.00	0.12	0.04	0.00	0.31	0.53	0.00	0.00	0.46
C3 0.00	1.00	0.06	0.00	0.00	0.33	0.60	0.00	0.00	0.78
C4 0.00	1.00	0.13	0.00	0.00	0.00	0.00	0.00	0.87	0.00
C5 0.00	1.00	0.06	0.00	0.00	0.33	0.61	0.00	0.00	0.48
C6 0.00	1.00	0.09	0.00	0.00	0.00	0.00	0.00	0.91	0.00

C7	1.00	0.12	0.05	0.00	0.83	0.00	0.00	0.00	0.92
0.00									
C8	1.00	0.08	0.10	0.00	0.78	0.04	0.00	0.00	0.87
0.00									
C9	1.00	0.07	0.01	0.00	0.36	0.56	0.00	0.00	0.04
0.00									

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 Conduit Surcharge Summary  
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Conduit	Hours Full			Hours	Hours
	Both Ends	Upstream	Dnstream	Above Full Normal Flow	Capacity Limited
C10	0.01	0.01	0.23	0.01	0.01
C17	0.01	0.01	0.34	0.01	0.01

Analysis begun on: Fri Jul 19 10:00:24 2024  
 Analysis ended on: Fri Jul 19 10:00:25 2024  
 Total elapsed time: 00:00:01