East LeBreton Flats
201, 301 and 324 Lett Street
450 Lloyd Avenue
133 Booth Street

Claridge Development
Serviceability and Stormwater Management Report

Prepared for:

Claridge Homes

Prepared By:

NOVATECH
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario
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October 2017
Amended May 23, 2018
Revised June 23, 2020

Novatech File: 116042
Ref No. R-2017-113

NOVATECH
Engineers, Planners & Landscape Architects

June 23, 2020

City of Ottawa
Planning, Infrastructure and Economic Development Department
Planning and Infrastructure Approvals Branch
110 Laurier Avenue West, 4th Floor
Ottawa ON, K1P 1J1

Attention: **Mr. Abdul Mottalib, M. Eng., P. Eng.**

Dear Sir:

Reference: **LeBreton Flats East - Claridge Development**
Serviceability Report

Enclosed is the Serviceability and Stormwater Management Report for the proposed LeBreton Flats East development located on Lett Street and Lloyd Street in the City of Ottawa. This report addresses your comments of April 16, 2018 and is submitted in support of the site plan application and outlines how the site will be serviced with public infrastructure.

Trusting this report is adequate for your purposes. Should you have any questions, or require additional information, please contact me.

Yours truly,

NOVATECH

Greg MacDonald, P. Eng.
Director, Land Development and Public Sector Infrastructure

cc: Neil Malhotra (Claridge Homes)

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1.0 INTRODUCTION

This Serviceability Study has been prepared in support of a Site Plan application for the Claridge lands east of Booth Street as shown in **Figure 1 – Key Plan of LeBreton Flats East Lands**. The subject lands will henceforth be referred to as the "LeBreton Flats East lands". The site is 1.26 ha in area and is currently vacant, except for the Claridge sales center located at the Booth/Fleet intersection.

The lands are currently zoned GM17[120] H (40) S94 or R5O H (20) and are bounded by the following:

- To the north, Pimisi Park and Sir John A. MacDonald Parkway;
- To the south, the historic aqueduct and the Confederation Line LRT Route;
- To the east, existing residential development (Claridge Phase I, II and III);
- To the west, Booth Street and vacant land planned for future mixed-use development.

Figure 1: Key Plan of LeBreton Flats East Lands

1.1 Proposed Development

The LeBreton Flats East lands will consist of five buildings as shown in **Figure 2 – Proposed Claridge Concept Plan.** It is intended that Buildings C and E will be a maximum of 25 storeys, Buildings B and D will be a maximum of 30 storeys and Building A will be a maximum of 45 storeys. The proposed developments will include underground parking garages with accesses on Lett Street and Lloyd Street. The estimated build-out date of the entire development is 2026.

The overall development will consist of the following:

Number of Residential Units: 1,600 (Phases 4/5)
Non-Residential GFA (Commercial/Retail/Institutional): 65,875 ft^2 (6,120 m^2) (Phases 4/5)

Figure 2: Proposed Claridge Overall Concept Plan

LeBreton Flats Phase 4 (current development)
The proposed development is located in LeBreton Flats, east of Lloyd Street, south of Fleet Street, west of Lett Street (long Lett) and north of Lett Street (short Lett) within the City of Ottawa. The existing property is currently occupied by existing street parking and a vacant land. The proposed re-development of this portion of the site will consist of a 25-storey building that will contain 276 units and a 30-storey building that will contain 319 units. A total of approximately 340 underground parking spaces will be provided on 3 levels of underground parking.

The Lebreton Ph4 area subject site is approximately 0.5216 ha in area. The development will have frontage on all streets surrounding it, will have a two-way vehicular access to the site located on Lloyd Street, as well as a ramp access to the underground parking garage and a loading area.

2.0 SANITARY SEWER

The development will be serviced by the existing 375mm diameter sanitary sewer on Fleet Street, the existing 250mm diameter sanitary sewer on Lloyd Street, and the existing 250mm diameter sanitary sewer on Lett Street as shown in **Figure 3 - Existing Infrastructure**. These sewers have been sized for the development and have received Certificates of Approval (now Environmental Compliance Approvals) from the Ministry of Environment and Climate Change. Copies of these, along with the sanitary sewer design sheets and drainage area plans, are included in **Appendix A.**

LeBreton Flats Phase 4 (current development)
The proposed 25-storey building between Lloyd Street/Fleet Street/Lett Street (long Lett) will be serviced by an existing sanitary service that connects to the existing 375mm dia. sanitary sewer on Fleet Street.

The proposed 30-storey building between Lett Street (long Lett)/Lett Street (short Lett)/Lloyd Street will be serviced by a 250mm dia. sanitary service that connects to the existing 250mm dia. sanitary sewer on Lett Street (long Lett).

The proposed development flows are based on the City of Ottawa Sewer Design Guidelines and are provided below.

2.1 Proposed Sanitary Flows from Development Site

Table 1 Summarizes the building statistics for Phase IV.

Table 1 Statistics	**Current Plan January 2020**	**Previous Plan May 2018**
Residential Units	595	350
Residential Floor Area	373,120 ft2 (34,664 m2)	247,570 ft2 (23,000 m2)
Retail Area	7,965 ft2 (740 m2)	21,500 ft2 (2,000 m2)
Institutional Area	4,100 ft2 (380 m2)	43,000 ft2 (4,000 m2)

Table 2 summarizes the different phases of LeBreton Flats East. Phase 1, 2 and 3 are currently built. Phase 4 is the subject of this application. Phase 5 is the next phase to be developed. The development phases are illustrated in Figure 4 below.

Table 2 Development Statistics

Phase	**Area (ha)**	**Studio**	**1 Bdr**	**2 Bdr**	**3 Bdr**	**Total**	**Comm (m2)**
Phases 1-3 Currently Constructed							
1	0.30	3	45	77	2	127	75
2	0.29	1	91	81	0	173	
3	0.57	1	69	72	0	142	
Total	**1.16**	**5**	**205**	**230**	**2**	**442**	**75**
Phase 4 This Application							
4	0.51	90	337	148	20	595	1,120
Total	**0.51**	**90**	**337**	**148**	**20**	**595**	**1,120**

FLEET STREET

LETT STREET

BOOTH STREET

LLOYD STREET

LETT STREET

375mmØ SAN

300mmØ WM

300mmØ SAN

300mmØ STM

525mmØ STM

250mmØ SAN

300mmØ WM

375mmØ SAN

300mmØ STM

750mmØ STM

300mmØ STM

2134x2134 STM OVERFLOW

450mmØ STM

375mmØ SAN

400mmØ WM

525mmØ STM

250mmØ SAN

200mmØ WM

525mmØ STM

750mmØ STM

250mmØ SAN

200mmØ WM

200mmØ WM

675mmØ STM

EX. 27' x 18' CLOSED AQUEDUCT

EX. 2134x2134 STM OVERFLOW

EXISTING STORM SEWER TO BE MAINTAINED

FUTURE CONCRETE SIDEWALK & BARRIER CURB

Edge of Asphalt

Bottom of Slope

DC

102

104

106

108

110

112

114

LEGEND:

STORM SEWER

SANITARY SEWER

WATERMAIN

NOVATECH

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EAST LEBRETON FLATS/CLARIDGE LANDS

EXISTING INFASTRUCTURE

SCALE 1:750 (0 10 20 30)

DATE MAY 2016

JOB 116042

FIGURE FG-3

SHT11X17.DWG - 279mmX432mm

M:\2016\116042\CAD\Design\Figures\DSK\DSK03_ExistingInfastructure\DSK03_INFASTRUCTURE.dwg, DSK03, Jul 05, 2017 - 1:29pm, mfang

Phase 5 Future Development							
5	0.75	229	362	401	13	1005	5,000
Total	**0.75**	**229**	**362**	**401**	**13**	**1005**	**5,000**
Phases 1 - 5	**2.42**	**324**	**904**	**779**	**35**	**2042**	**6,195**

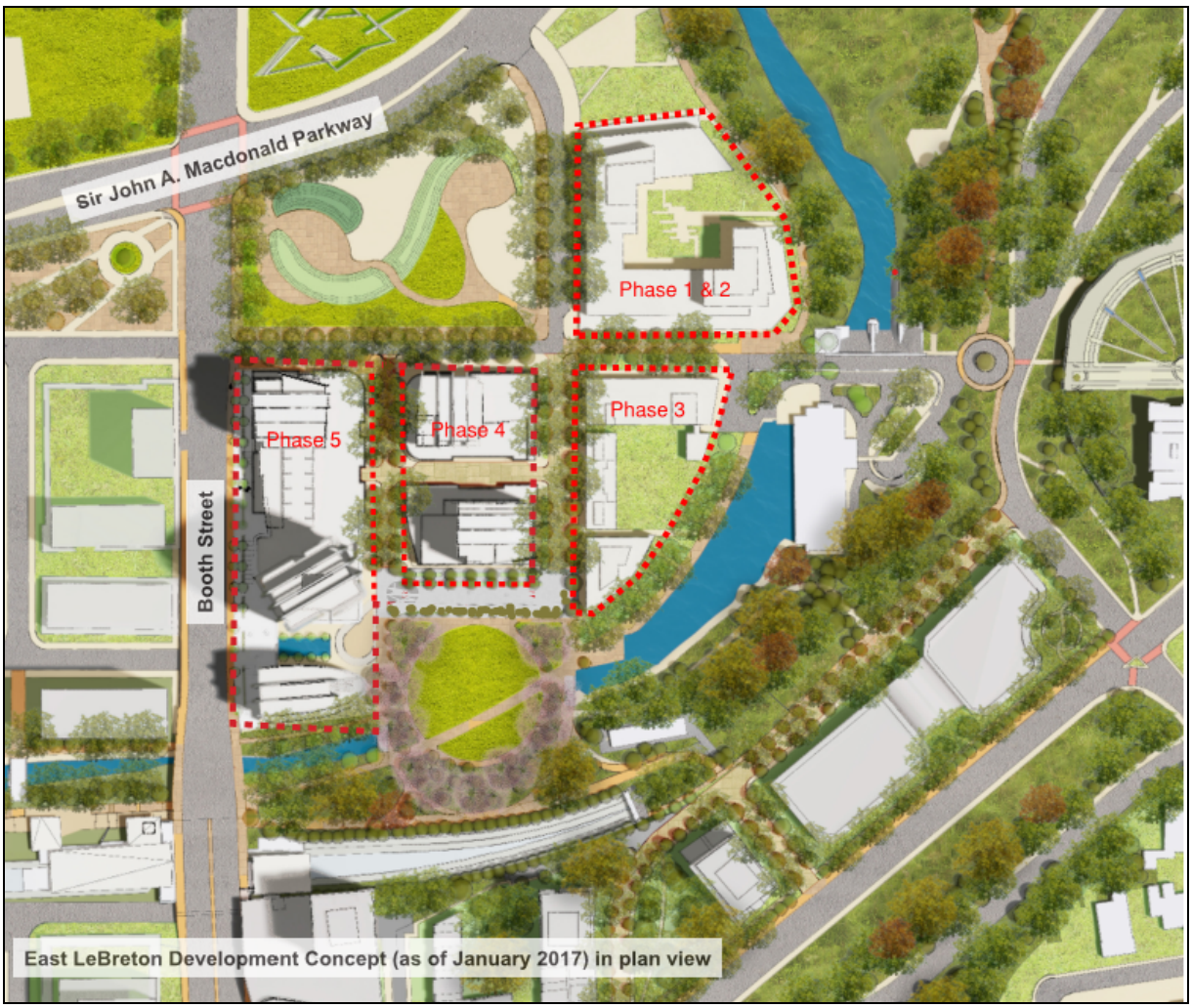


Figure 4 Development Phasing

Sanitary Flows Phases 1 - 5

Sanitary capacity to the area both east and west of Booth Street, e.g. tributary to the Fleet Street Sanitary Sewer and Fleet Street Pump Station was allocated per the Master Servicing Study completed by Dessau Soprin in February 2004. It is understood that this study is being updated but pending this the recommendation of the Dessau Soprin Report are to be followed.

Sanitary capacity allocated to Phases 1-5 in Figure 4 as taken from the Sanitary Sewer Design Sheet in the Dessau Soprin report is as follows:

Block ½ S (Node 25)
210 people
0.59 ha

Block R & ¼ Block Q (Node 28)
415 people
0.43 ha

Block ¼ Q (Node 26)
114 people
0.12 ha

Block ½ P and ½ Q (Node 27)
330 people
0.33 ha

Block ½ P (Node 24)
104 people
0.09 ha

Block I (Node 33)
21 people
0.10 ha

Block P3 (Node 23)
18,915 m2 Commercial/Retail (37,830 m2/2)0.35 ha

Total: 1194 people, 2.01 ha, 18,915 m2 Comm/Retail

Using the design criteria in the Dessau Soprin Report, Sanitary Flow Allocation to Phase 1-5 is calculated as follows:

$$Q_T = \frac{(1194)(350)}{86{,}400}(3.75) + \frac{(18{,}915)(5.0)}{86{,}400}(1.5) + (2.01)(0.28) = 20.34 \text{ L/sec}$$

Sanitary flows from the built Phases 1-3 and proposed Phase 4 is calculated below using the City's new Sewer Design Criteria.

Population = (95)(1.4) + (542)(1.4) + (378)(2.1) + (22)(3.1) = 1754 people
Peak Factor = $1 + 14/(4 + P^{1/2}) \times 0.80 = 3.10$
Area = 1.67 ha
Commercial/Institutional = 1,120m2
Peak Factor = 1.0

$$Q_{\text{Phases 1-4}} = \frac{(1754)(280)}{86{,}400}(3.10) + \frac{(1120)(2.8)}{86{,}400}(1.0) + (1.67)(0.33) = 18.21 \text{ L/sec}$$

Therefore, the total peak sanitary flow of 18.21 L/sec is within the allowance allocated by the Dessau Soprin Master Study of 2004, e.g. 20.34 L/sec.

The capacity of the receiving sanitary collection system can be described as follows:

- Capacity of 375 mm diameter gravity sewer on Fleet Street = 122.7 L/sec
- Firm Capacity of the Fleet Street Lift Station (per ECA) = 100 L/sec
- Actual Operating Capacity of the Fleet Street Lift Station = 106 L/sec

- Capacity of Fleet Street 250 mm discharge sewer when under surcharge = 130 L/sec

Sanitary Flows Including Future Phase 5

Sanitary flows including development of the future Phase 5 lands are estimated below:

Population = (324)(1.4) + (904)(1.4) + (779)(2.1) + (35)(3.1) = 3464 people
Peak Factor = $1 + 14/(4 + P^{1/2}) \times 0.80 = 2.91$
Area = 2.42 ha
Commercial/Institutional = 5,685 m2
Peak Factor = 1.0

$$Q_{\text{Phases 1-4}} = \frac{(3464)(280)}{86{,}400}(2.91) + \frac{(6195)(2.8)}{86{,}400}(1.0) + (2.42)(0.33) = 33.66 \text{ L/sec}$$

Estimated sanitary flows for full build-out of the Claridge LeBreton Flats East Lands Phase 1 – 5 exceed the allowable flows assigned in the Dessau Soprin Report by 13.32 L/sec, e.g. 33.66 L/sec – 20.34 L/sec).

The Master Servicing Study by Dessau Soprin calculated total sanitary flows to the Fleet Street Sanitary Sewer and Pump Station of 87.8 L/sec, which includes an allowance of 20 L/sec from Victoria Island. Under existing conditions, a surplus capacity of 12.20 l/sec is available assuming the limited capacity in the system to be the firm capacity of the Fleet Street Pump Station of 100 L/sec, e.g. 100L/sec – 87.8 L/sec. Further, by doing some minor upgrades to the Fleet Street Pump Station, such as changing the pump impellers, the limiting capacity could be increased to 122.7 L/sec which is the capacity of the 375 mm diameter @ 0.45 % Fleet Street gravity sanitary sewer. This surplus capacity of 34.90 L/sec could be distributed to the benefitting tributary area on an area-basis, as follows:

Total Benefitting Tributary Area = 12.32 ha (ref.: Dessau Soprin Sanitary Spread Sheet)

Surplus Capacity = 34.90 L/sec

$$\text{Distribution} = \frac{34.90 \text{ L/sec}}{12.32 \text{ ha}} = 2.83 \text{ L/sec/ha}$$

Assigning Claridge's portion of the surplus capacity would result in a total allowable allocation of 20.34 L/sec + (2.42 ha)(2.83 L/sec/ha) = 20.34 + 6.85 = 27.19 L/sec, which is about 6.47 L/sec less than the calculated full build out flow of 33.66 L/sec for Phase 1 – 5. Prior to full buildout of Phase 5, a more detailed analysis of sanitary flows and capacities for the full tributary area will need to be undertaken as part of a new Master Servicing Study.

2.2 Overall Sanitary Servicing Implementation Strategy

The Claridge Phase IV lands will form part of an overall development concept envisaged for the LeBreton Flats area. Various other development plans are proposed including the Rendezvous Proposal west of Booth Street, the City's Bayview Lands, City Centre, the new Ottawa Public Library and the Zibi Development on the Chaudière Islands. The current development concepts are shown in **Figure 5 - LeBreton Bayview Development Concept.** This section will discuss the servicing and implementation approach to servicing these development areas with sanitary sewer

and will form part of an overall Servicing Assessment and Implementation Strategy for the LeBreton Bayview Development Area, which study is currently in the planning stages.

Figure 5 LeBreton Bayview Concept Plan

The lands east of Booth Street (referred to as LeBreton East) are partially developed and consist of Claridge's Phase I, II and III (450 residential units and 75 m^2 commercial/retail). Phase IV, current subject lands, will consist of approximately 1600 residential units and 12,000 m^2 of commercial/retail. The remaining lands are owned by the National Capital Commission which are north of Fleet Street between Booth Street and Lett Street. Although the NCC lands are currently used as a park the NCC has indicated that this is a temporary use and, as such, it is expected that these could develop similar to the surrounding lands and could support another 300 residential units. These areas will discharge to the existing Fleet Street Sewer.

The lands west of Booth Street (referred to as LeBreton West) are proposed to consist of 4400 residential units, an 18,500-seat sports arena, an outdoor gathering area suitable for 28,000 people and 2,800,000 square feet (260,000 m^2) of retail/commercial area.[1] The LeBreton West A area north of the LRTwill discharge to the Fleet Street Sewer. The area denoted as LeBreton West B and the LeBreton West A lands south of the LRT will discharge to the West Nepean Sanitary Collector.

The City's Bayview lands and the lands immediately south, including City Centre, were the subject of the Bayview Station District Community Design Plan (CDP) completed in 2013. The CDP envisions a high density mixed-use development with an estimated build-out of 5,900,000 square feet (548,000 m^2) of development area which will include office, retail, community facilities and

[1] Rendezvous LeBreton Proposal

approximately 4000 residential units. These areas will be serviced to the West Nepean Sanitary Collector.

The lands which occupy Chaudière Island are planned to be developed as a mixed-use community which will include approximately 1411 residential units and 205,000 square feet of commercial/retail/office area. The Chaudière Island lands currently discharge by forcemain to the Ottawa Interceptor Sewer at a chamber located at the interception of Sparks Street and Bronson Avenue.

The new Ottawa Public Library will be located on the north side of Albert Street, east of Booth Street and the NCC parcel of land, overlooking the Fleet Street Pump Station and Open Aqueduct tail waters. These lands will discharge to the sewer on Albert Street which in turn discharges to the West Nepean Sanitary Collector.

According to the Master Servicing Study completed by Dessau Soprin[2], the 375 mm diameter sanitary sewer on Fleet Street is to service a drainage area of 12.32 hectares and a population of 3493 people along with 189,430 m^2 (2,039,000 ft^2) of office/retail area. This drainage area includes the LeBreton Flats East lands, the lands north of Sir John A. MacDonald Parkway (War Museum and National Holocaust Monument), and the lands west of Booth Street depicted as LeBreton West A north of the LRT. The sewer design sheets and sanitary drainage area plan from the Dessau Soprin report are included in **Appendix B.**

An analysis was carried out to determine the sanitary flows from the total tributary area based on projected development yields proposed by the Rendezvous LeBreton Group as well as the lands east of Booth Street, and the War Museum. The analysis was carried out using current/new City of Ottawa criteria. Results are summarized in **Table 3** and complete spreadsheet including overall sanitary drainage area plan is included in **Appendix C.**

Table 3 Peak Sanitary Flows To Fleet Street Sewer and West Nepean Collector

Area ID	Area (ha)	Comm. Floor Area (m2)	Arena (Seats)	Residential Units	Peak Flow L/sec
To Fleet Street	17.6	124,000		3,850	65.7
To West Nepean Collector	23.0	220,000	18,500	2,900	101.2

The Chaudière Island lands currently discharge by forcemain to the Ottawa Interceptor Sewer at a chamber located at the interception of Sparks Street and Bronson Avenue as shown on the overall Sanitary Drainage Area Plan contained in Appendix C. Future servicing of this site will either continue to discharge to the Ottawa Interceptor or, alternatively, directly to the City of Gatineau. It is understood that the developer is having discussions with the City of Gatineau on this latter option.

The Fleet Street Sanitary Sewer (375 mm diameter at 0.45%) discharges to the Fleet Street Sanitary Sewer Station just east of the Pooley Mews Bridge. Under normal operating conditions, flows enter this station and discharge to the Ottawa Interceptor Sewer by gravity through a 250 mm diameter pipe. If the Ottawa Interceptor Sewer surcharges, a sluice gate closes at the

[2] LeBreton Flats Infrastructure and Remediation Project, Master Servicing Report, Final Report (5th Edition), February 2004

Fleet Street Sewer Station and the flows are then pumped past the closed gate to the 250 mm outlet sewer then to the Interceptor Sewer.

The hydraulic capacities of this system are described below. Relevant drawings of the Fleet Street Sanitary Pump Station are also included in **Appendix D** along with the Certificate of Approval for the station.

- Capacity of 375 mm diameter sanitary sewer on Fleet Street: **117.6 L/sec**
- Capacity of 250 mm diameter gravity sewer from Fleet Street Sanitary Station to Ottawa Interceptor Sewer: **140 L/sec**
    - ✶ *Allowed to surcharge to elevation 47.0 m before sluice gate closes and pumps kick in. Obvert of 375 mm incoming Fleet Street Sanitary Sewer is 47.91 m.*
- Capacity of Pumps when sluice gate is closed: **106-111 L/sec**
- Capacity of 250 mm diameter sewer to Interceptor under pumped conditions (based on maximum velocity of 3 m/sec): **152 L/sec**

As can be seen there is surplus capacity in the Fleet Street Sewer and Fleet Street Pump Station to accommodate the above-noted preliminary design flows, with a surplus capacity available. Once more accurate development plans are received, these numbers will be amended and confirmed.

There are no known capacity restrictions on the West Nepean Collector. However, an assessment of the surcharge levels in the West Nepean would need to be undertaken which should not be a concern given the depth of the collector.

3.0 STORM SEWER AND STORMWATER MANAGEMENT

As part of this development, stormwater will be controlled on-site and discharged via 200mm to 375mm dia. services that will connect to the 525mm dia. storm sewer on Lloyd Street, the 525mm dia. storm sewer on Lett Street (long Lett) or the 675mm dia. storm sewer on Lett Street (short Lett). These sewers discharge to an MOE approved (Ref. No. 3575-95WJYL) STC 4000 Stormcepter on Lett Street, which has been sized to include the proposed lands and outlets via a 675mm dia. storm sewer to the tailrace as shown on **Figure 3 - Existing Infrastructure**. A copy of the MOE approval is included in **Appendix A**. All proposed storm services will be equipped with backwater valves.

The City will require that on-site stormwater management be implemented to control post-development stormwater discharge from the 5 and 100-year storm events based on an allowable runoff coefficient (C) of 0.70, the Old City of Ottawa IDF curves, a time of concentration (t_c) of 10 minutes, and 5-year storm control, which is consistent with the Dessau-Soprin LeBreton Flats Infrastructure and Remediation Project - Master Servicing Report (2004). Stormwater management will be achieved using rooftop controls.

LeBreton Flats Phase 4 (current development)
The site has an overall slope towards the tailrace to the South. Storm runoff from the majority of the site is conveyed overland towards the surrounding street.

The proposed 25-storey building between Lloyd Street/Fleet Street/Lett Street (long Lett) will be serviced by a 375mm dia. storm service that connects to the existing 525mm dia. storm sewer on Lett Street (long Lett).

The proposed 30-storey building between Lett Street (long Lett)/Lett Street (short Lett)/Lloyd Street will be serviced by a 375mm dia. storm service that connects to the existing 675mm dia. storm sewer on Lett Street (short Lett).

The ultimate outlet is the 675mm dia. storm sewer to the tailrace on the southern portion of the overall site.

Water quality control will be provided within the “subdivision’s” storm sewer system with an MOE approved (Ref. No. 3575-95WJYL) STC 4000 Stormcepter on Lett Street, which has been sized to include the proposed lands and outlets via a 675mm dia. storm sewer to the tailrace and water quantity control is required on-site. On-site stormwater management will be implemented to control post-development stormwater discharge and will be achieved using rooftop controls and stormwater tanks.

The roof of both buildings will have controlled/uncontrolled roof drains directed to the stormwater tanks and be controlled before it outlets to the services. The flows will be pump controlled at 54.33L/s and 14.61L/s respectively to Lett Street (long Lett) and Lett Street (short Lett) (c/w back-up pump and emergency battery backup). The emergency overflow from the tanks will be at the surface.

The site will be graded such that flows in excess of the 100-year storm event will be conveyed overland to Lloyd Street, Fleet Street, Lett Street (long Lett), as well as Lett Street (short Lett).

Erosion and sediment control measures will be implemented during all phases of construction and inspected regularly.

4.0 WATERMAIN

4.1 Domestic Water Demand

The proposed development will be serviced by the 400mm dia. watermain on Lloyd Street, the 300mm dia. watermain on Flett Street and the 200mm dia. watermain on Lett Street as shown in **Figure 3 - Existing Infrastructure**. Service connection locations will be determined at the time of site plan submission. Shutoff valves will be provided at property lines as per City of Ottawa Specifications. The water meters will be in the basement level mechanical rooms of the buildings. Similarly, remote receptacles will be located at the surface near the entrances to the buildings on the exterior.

LeBreton Flats Phase 4 (current development)
The proposed 25-storey building between Lloyd Street/Fleet Street/Lett Street (long Lett) will be serviced by an existing water service that connects to the existing 300mm dia. watermain on Fleet Street.

The proposed 30-storey building between Lett Street (long Lett)/Lett Street (short Lett)/Lloyd Street will be serviced by a 200mm dia. water service that connects to the existing 200mm dia. watermain on Lett Street (short Lett).

Shutoff valves will be provided at property lines as per City of Ottawa Specifications. The water meters will be in the basement level mechanical rooms of the buildings. Similarly, remote receptacles will be located at the surface near the entrances to the buildings on the exterior.

Estimated domestic water demands for Phase 1 of the development are provided below with a detailed breakdown included in **Appendix E**:

Average Day Demand = 2.80 L/sec

Maximum Day Demand = 6.75 L/sec

Peak Hour Demand = 14.70 L/sec

4.2 Fire Demand

An estimate of the water required to meet firefighting demands is described below.

Section 4.2.11 of the City of Ottawa Water Design Guidelines reads:

“When calculating the fire flow requirements and affected pipe sizing, designers shall use the method developed by the Fire Underwriters Survey”, and

“The requirements for levels of fire protection on private property are covered in Section 7.2.11 of the Ontario Building Code.”

The Fire Underwriters Survey is used to assess the performance of the water distribution system on a “City Block” basis rather than an individual building basis. The Ontario Building Code governs the assessment of fire demand for individual buildings.

Section 7.2.11.1 of the Ontario Building Code states that the design, construction, installation and testing of fire service mains and water service pipe combined with fire service mains shall be in conformance with NFPA 24.
NFPA 24 is the standard for the "Installation of Private Fire Service Mains and their Appurtenances". Chapter 13 of NFPA 24 discusses sizing the private service fire mains for fire protection systems which shall be approved by the authority having jurisdiction, considering the following factors:

- Construction and Occupancy of the Building
- Fire Flow and Pressure of the Water Required
- Adequacy of the Water Supply

It is expected that any future building on the site will be sprinklered per Section 3.2.2.45 of the OBC. Section 3.2.5.7 of the OBC requires that an adequate water supply for fire fighting be provided to each building, and references Appendix A of the OBC. Sentence 3 of Section A 3.2.5.7 of the OBC (Appendix A) states that NFPA 13 be used for determining both sprinkler and hose stream demands for a sprinklered building.

The design of the sprinkler system is completed by a Fire Protection Engineer, or typically computed by the sprinkler contractor and approved by the Fire Protection Engineer. This process involves detailed hydraulic calculations based on building layout, pipe runs, head losses, fire pump requirements, etc. At this stage in the planning and site design process, these details are not available. Therefore, this report will confirm the maximum anticipated sprinkler and hose stream demands as per NFPA 13.

Section 11.2.3 of the NFPA 13, "Water Demand Requirements – Hydraulic Calculations Methods" was used to estimate the sprinkler and hose stream demands. Figure 11.2.3.1.1 – Area/Density Curves confirms the sprinkler demand, assuming Ordinary 1 construction. Table 11.2.3.1.2 confirms the hose stream allowance and water supply demand requirements, assuming ordinary hazard construction.

For Ordinary 1 type construction, design is based on a density of 0.15 gpm (US), and a maximum area of sprinkler operation limited to 1500 ft^2 (139 m^2). As per NFPA 13 Figure 11.2.3.1.1, the maximum anticipated sprinkler demand is 225 gpm (US). As per NFPA 13 Table 11.2.3.1.2, the maximum total combined inside and outside hose demand is 250 gpm (US) with a duration of 60-90 minutes.

Based on the calculations above, the total estimated sprinkler and hose demand for the development is 475 gpm (US). However, because the development has not been finalized to-date, it is recommended to add a 50% contingency. Therefore, a sprinkler demand of 713 gpm (US), 2700L/min, should be anticipated at this stage. Refer to **Appendix E** for excerpts from NFPA 13.

Boundary conditions were requested from the City of Ottawa using a fire demand calculated using the Fire Underwriters Insurance procedure. This method is used by municipalities to assess their systems on a more global basis and results in a more conservative fire demand for individual sites, as compared to Building Code calculations. The estimated fire demand using FUS was determined to be 7,000 L/min, which calculation is included in **Appendix E.** Boundary conditions based on this demand are also included in **Appendix E.** The watermain pressure at this demand is in the range of 78 psi (HGL = 108.5 m; TWM = 53.5 m) which is greater than the minimum residual of 20 psi. An EPANET analysis will be included with the site plan application.

5.0 CONCLUSIONS

Based on the foregoing, adequate sanitary, storm and water services are available to support the current Phase 1 application. Additional design analysis and details will be provided at the site plan application stage.

NOVATECH

Prepared by:

Jazmine Gauthier, B.A.Sc.
Project Manager | Land Development Engineering

Reviewed/Approved by:

Greg MacDonald, P.Eng
Director, Land Development and Public Sector Infrastructure

APPENDIX A

Existing Certificates of Approval, Design Sheets and Drainage Area Plans for Lloyd Street and Lett Street Sewers

FILE 105006

Ministry of the Environment / Ministère de l'Environnement

Ontario

CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 3759-6JKN99
Issue Date: November 30, 2005

Claridge Homes (Lebreton Flats) Inc.
210 Gladstone Avenue
Ottawa, Ontario
K2P 0Y6

Site Location: Lebreton Flats Development
Lett Street, Block 1, Ward 14 (from Fleet Street to Lebreton Boulevard)
Ottawa City

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

sanitary and storm sewers to be constructed in the City of Ottawa, on Lett Street, all in accordance with the application from Claridge Homes (Lebreton Flats) Inc., dated August 29, 2005, including final plans and specifications prepared by Novatech Engineering Consultants Ltd.

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 eachportion 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
2300 Yonge St., 12th Floor
P.O. Box 2382
Toronto, Ontario

AND

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

RECEIVED DEC - 8 2005

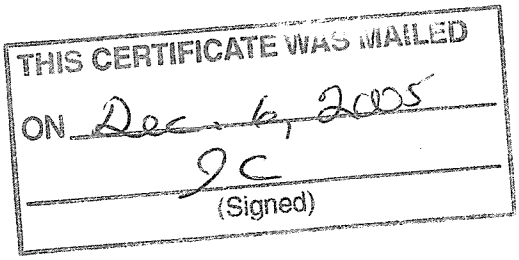
M4P 1E4

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**

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

DATED AT TORONTO this 30th day of November, 2005



A. Ahmed

Aziz Ahmed, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

VT/

c: District Manager, MOE Ottawa
Greg MacDonald, P. Eng., Novatech Engineering Consultants Ltd. ✓
Pierre Pagé, City Clerk, City of Ottawa
Jean Lachance, MCIP, RPP, P. Eng., Program Manager, Infrastructure Approvals, City of Ottawa

105006 - 2.

Ontario

Ministry of the Environment
Ministère de l'Environnement

ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 4962-8X9NYF
Issue Date: August 23, 2012

Claridge Homes (Lebreton Flats Phase 3) Inc.
210 Gladstone Avenue, Unit 2001
Ottawa, Ontario
K2P 0Y6

Site Location: Lett Street and Lloyd Street
City of Ottawa

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

storm sewers and ***sanitary sewers*** to be constructed in the City of Ottawa, as follows:

storm sewers on Lloyd Street (from Station 1+018.5 to Station 1+132), Lett Street (from Station 2+010 to Station 2+179.5) and on outlet/ aqueduct ROW from (Station 3+005 to Station 3+054); and

sanitary sewers on Lloyd Street (from Station 1+030 to 1+132) and Lett Street (from Station 2+084 to 2+169);

all in accordance with the application from Claridge Homes (Lebreton Flats Phase 3) Inc., dated **July 30, 2012,** including final plans prepared by Novatech Engineering Consultants Ltd.

In accordance with Section 139 of the Environmental Protection Act, 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 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance 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 environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in

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, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of
Part II.1 of the Environmental Protection 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) 212-6349, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 23rd day of August, 2012

THIS APPROVAL WAS MAILED
ON Aug 27, 2012
AA
(Signed)

Sherif Hegazy, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

AA/
c: District Manager, MOE Ottawa
Greg MacDonald, Novatech Engineering Consultants Ltd. ✓
Richard Buchanan, Infrastructure Approvals
Linda Carkner, Program Manager, Infrastructure Services
M. Rick O'Connor, City Clerk & Solicitor, City Manager's Office, City of Ottawa (File No. D07-16-02-0019)

105006-2.

RECEIVED

Ontario

Ministry of the Environment
Ministère de l'Environnement

ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 3575-95WJYL
Issue Date: March 25, 2013

Claridge Homes (Lebreton Flats Phase 3) Inc.
210 Gladstone Ave, No. 2001
Ottawa, Ontario
K2P 0Y6

Site Location: Lett Street and Lloyd Street
City of Ottawa

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

Stormwater management works , designed to service Claridge Homes (LeBreton Flats), a mix-use residential nd commercial development, located at Lett Street and Lloyd Street, in the City of Ottawa, comprising;

- ***one (1) oil/grit interceptor*** , model Stormceptor STC 4000, servicing a drainage area of 2.1 hectares, providing Enhanced level of protection (long term average total suspended solids removal of 80%), having a sediment capacity of 16,490 Litres, an oil capacity of 3,360 Litres, a total holding capacity of 24,710 Litres and a maximum treatment flow rate of 260 Litres per second, discharging to existing sewers;

all in accordance with the application dated July 30, 2012 and received on August 16, 2012, and all supporting documentation and information including a Stormwater Design Brief, final plans and specifications prepared by Novatech Engineering Consultants Ltd.

For the purpose of this environmental compliance approval, the following definitions apply:

1. "*Approval* " means this Environmental Compliance *Approval* and any Schedules to it, including the application and supporting documentation;

2. *"Director"* means any Ministry employee appointed by the Minister pursuant to section 5 of the Part 11.1 of the Environmental Protection Act;

3. *"District Manager"* means the District Manager of the Ottawa District Office of the Ministry;

4. *"Ministry"* means the Ontario Ministry of the Environment;

5. *"Owner"* means Claridge Homes (Lebreton Flats Phase 3) Inc., and includes its successors and assignees;

6. *"Works"* means the sewage works described in the *Owner's* application, this *Approval* and in the supporting documentation referred to herein, to the extent approved by this *Approval.*

You are hereby notified that this environmental compliance 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 *Approval* 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 *Approval* , the application for approval of the *Works* and the submitted supporting documents and plans and specifications as listed in this *Approval* .

1.3 Where there is a conflict between a provision of any submitted document referred to in this *Approval* and the Conditions of this *Approval* , the Conditions in this *Approval* 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 *Approval* are severable. If any requirement of this *Approval* , or the application of any requirement of this *Approval* to any circumstance, is held invalid or unenforceable, the application of such requirement to other circumstances and the remainder of this *Approval* shall not be affected thereby.

2. EXPIRY OF APPROVAL

This *Approval* will cease to apply to those parts of the *Works* which have not been constructed within five (5) years of the date of this *Approval.*

3. CHANGE OF OWNER

The *Owner* shall notify the *District Manager* and the *Director,* in writing, of any of the following

changes within thirty (30) days of the change occurring:

(a) change of *Owner;*

(b) change of address of the *Owner;*

(c) change of partners where the *Owner* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c.B17 shall be included in the notification to the *District Manager;* and,

(d) change of name of the corporation where the *Owner* is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C39 shall be included in the notification to the *District Manager.*

4. OPERATION AND MAINTENANCE

4.1 The *Owner* shall make all necessary investigations, take all necessary steps and obtain all necessary approvals so as to ensure that the physical structure, siting and operations of the stormwater management *Works* do not constitute a safety or health hazard to the general public.

4.2 The *Owner* shall design, construct and operate the oil-grit separator with the objective that the effluent from the *Works* is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film, sheen, foam or discolouration on the receiving waters.

4.3 The *Owner* shall carry out and maintain an annual inspection and maintenance program on the operation of the oil-grit separator in accordance with the manufacturer's recommendation.

4.4 After a two (2) year period, the *District manager* may alter the frequency of inspection of the stormwater management *Works* if he/she is requested to do so by the *Owner* and considers it acceptable upon review of information submitted in support of the request.

4.5 The *Owner* shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall make the logbook available for inspection by the *Ministry* upon request. The logbook shall include, but not necessarily be limited to, the following information:

(a) the name of the *Works* ; and

(b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed.

5. RECORD KEEPING

The *Owner* shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the operation and maintenance activities required by this *Approval.*

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 *Approval* 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 *Approval* the existence of this *Approval.*

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 Ministry records are kept accurate and current with respect to approved *Works* and to ensure that subsequent *owners* of the *Works* are made aware of the *Approval* and continue to operate the *Works* in compliance with it.

4. Condition 4 is included as regular inspection and necessary removal of sediment and excessive decaying vegetation from this approved stormwater management *Works* are required to mitigate the impact of sediment, debris and/or decaying vegetation on the treatment capacity of the *Works.* It is also required to ensure that adequate storage is maintained in the stormwater management Works at all times as required by the design, and to prevent stormwater impounded in the *Works* from becoming stagnant. Furthermore, Conditions 4 is included to ensure that the stormwater management *Works* are operated and maintained to function as designed.

5. Condition 5 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the *Works.*

In accordance with Section 139 of the Environmental Protection Act, 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 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance 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

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6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in

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, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of
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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) 212-6349, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 25th day of March, 2013

THIS APPROVAL WAS MAILED
ON April 8, 2013
9C
(Signed)

Sherif Hegazy, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

KH/
c: District Manager, MOE Ottawa
Greg MacDonald, P.Eng., Novatech Engineering Consultants Ltd. √

Stormceptor®

Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)

Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s
20	20	1.3	0.0004					
60	20	1.8	0.0016					
150	20	2.2	0.0108					
400	20	2.65	0.0647					
2000	20	2.65	0.2870					

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor version 1.0
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 300 is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 750 to STC 6000 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 300	STC 750 to STC 6000	STC 9000 to STC 14000
Single inlet pipe	75 mm	25 mm	75 mm
Multiple inlet pipes	75 mm	75 mm	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Imbrium Systems Inc., 1-800-565-4801.

Stormceptor®

Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	5/11/2012
Project Name	Lebreton Flats
Project Number	105006
Location	Ottawa, ON

Designer Information

Company	Novatech Engineering
Contact	David Smith

Rainfall

Name	OTTAWA MACDONALD-CARTIER INT'L A
State	ON
ID	6000
Years of Records	1967 to 2003
Latitude	45°19'N
Longitude	75°40'W

Notes

N/A

Water Quality Objective

TSS Removal (%)	80

Drainage Area

Total Area (ha)	2.1
Imperviousness (%)	69

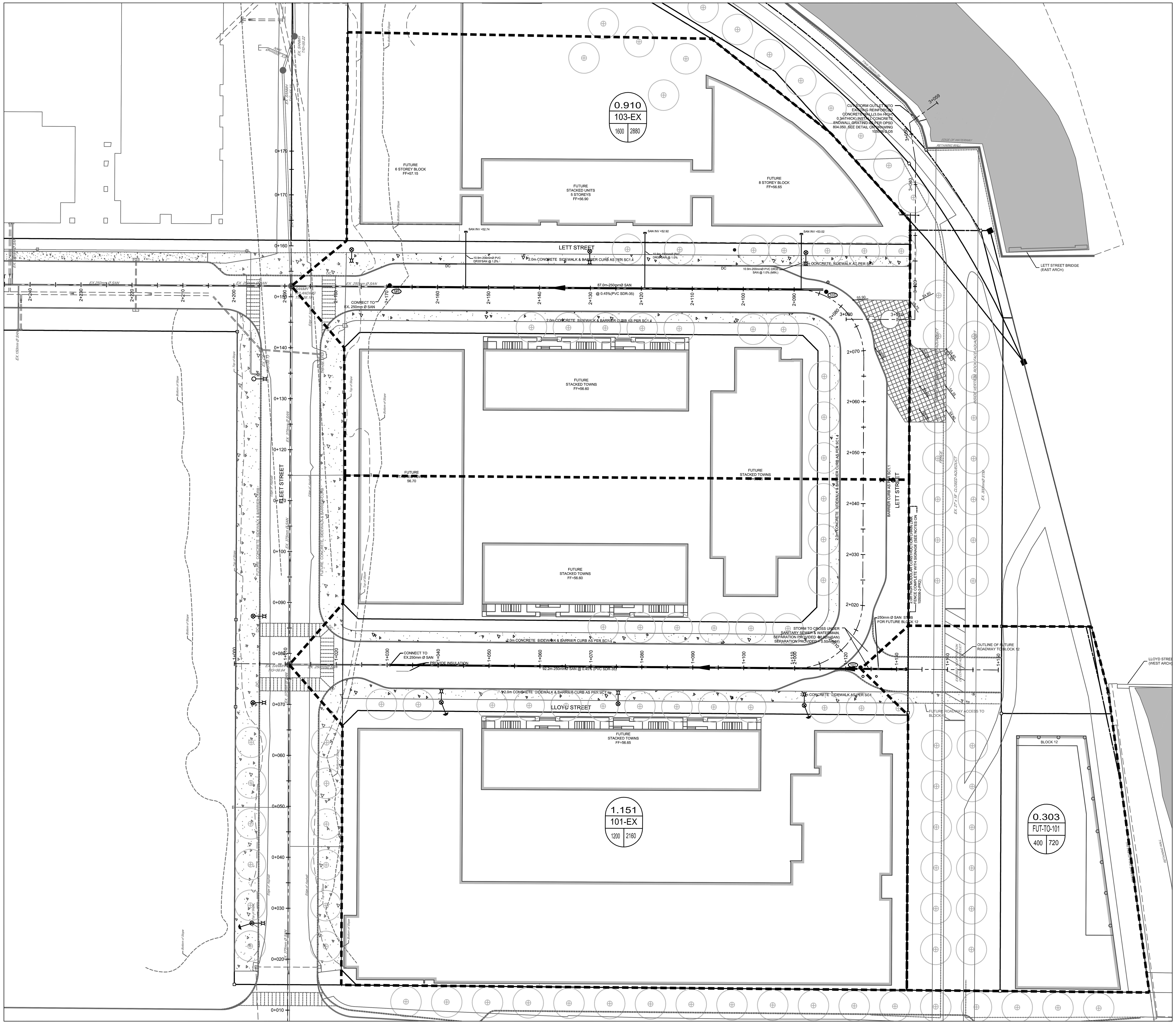
The Stormceptor System model STC 4000 achieves the water quality objective removing 80% TSS for a Fine (organics, silts and sand) particle size distribution.

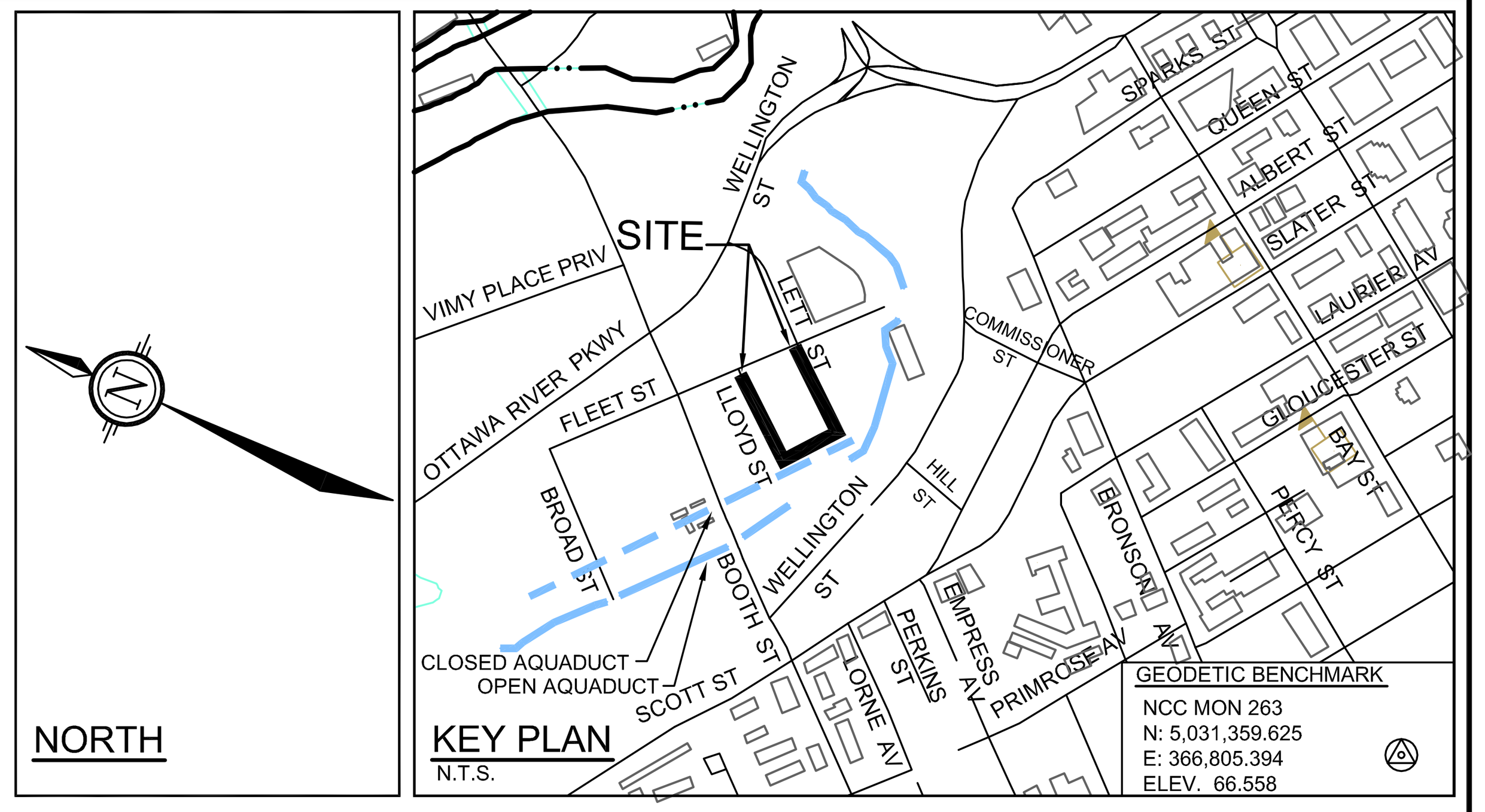
Upstream Storage

Storage (ha-m)	Discharge (L/s)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 300	56
STC 750	68
STC 1000	68
STC 1500	69
STC 2000	75
STC 3000	76
STC 4000	80
STC 5000	80
STC 6000	83
STC 9000	87
STC 10000	86
STC 14000	89





LEGEND

- 1.200 — AREA IN HECTARES
- 101-103 — MANHOLE TO MANHOLE
- 250 — POPULATION EQUIVALENT
- 525 — NUMBER OF UNITS
- SANITARY DRAINAGE AREA
- SAN MH — PROPOSED SANITARY MANHOLE & SEWER

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

CLARIDGE HOMES

CLARIDGE HOMES
SUITE 2001,
210 GLADSTONE AVENUE,
OTTAWA , ONTARIO
K2P 0Y6.

No.	REVISION	DATE	BY
6	ISSUED FOR MOE APPROVAL	AUG 03/12	GJM
5	REVISED PER CITY COMMENTS	JUL 26/12	GJM
4	REVISE & REISSUED FOR CITY REVIEW	MAR 12/12	GJM
3	REISSUED TO CITY	FEB 01/11	GJM
2	REISSUED TO CITY	OCT 27/10	BHB
1	ISSUED FOR CITY REVIEW	JUN 9/10	BHB

SCALE 1:400

DESIGN BHB
CHECKED GJM
DRAWN SAM
CHECKED BHB
APPROVED GJM

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER B.H. BAHIA 100164647 PROVINCE OF ONTARIO — Aug. 3, 2012

LICENSED PROFESSIONAL ENGINEER G.J. MacDONALD PROVINCE OF ONTARIO

NOVATECH ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

LOCATION
CITY OF OTTAWA
LEBRETON FLATS - PHASE 2

DRAWING NAME
SANITARY DRAINAGE PLAN

PROJECT No. 105006-2
REV REV # 06
DRAWING No. 105006-2-SAN

PLANA1.DWG - 841mmx594mm

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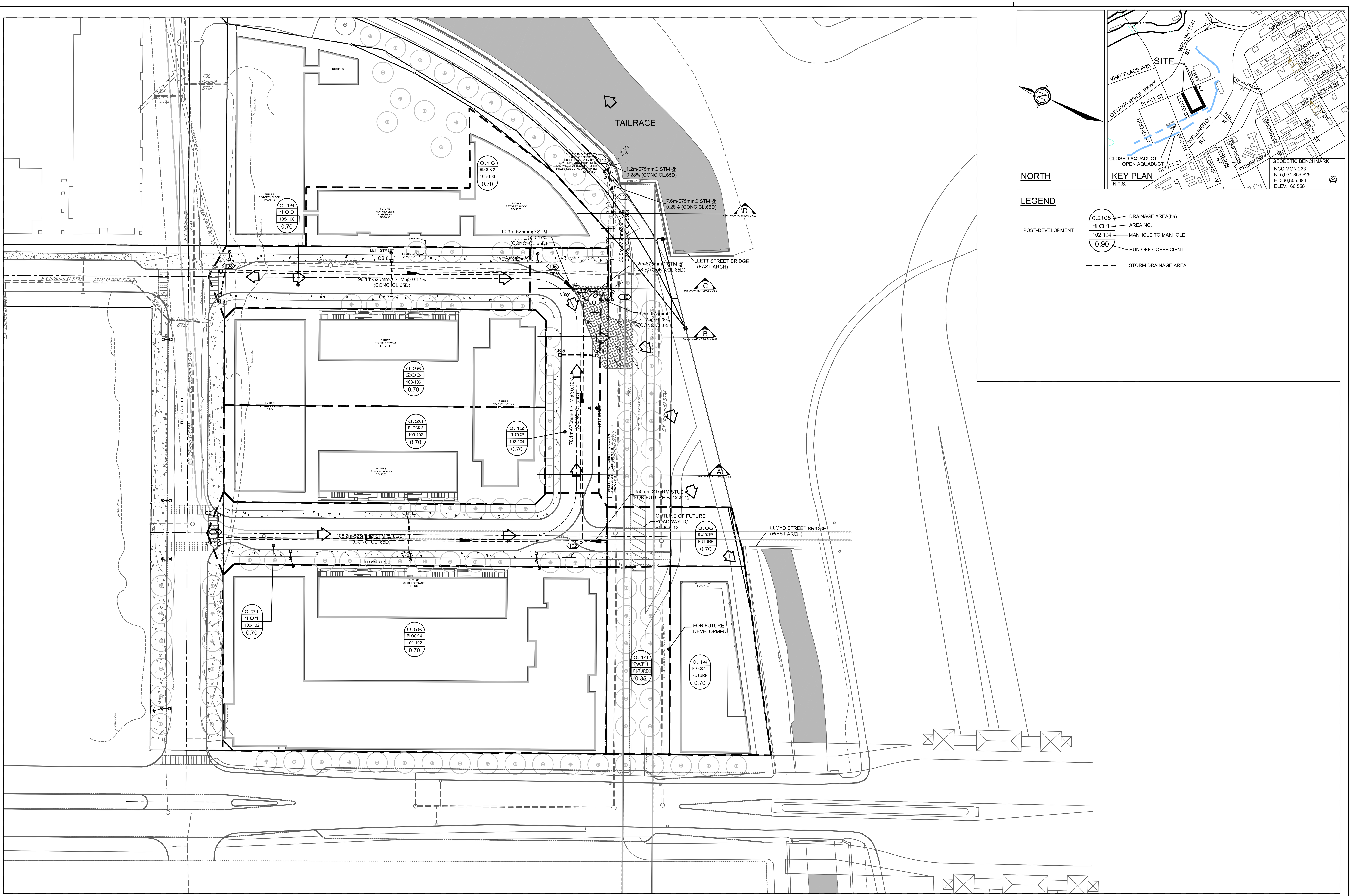

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CLARIDGE HOMES

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SUITE 2001,
210 GLADSTONE AVENUE,
OTTAWA , ONTARIO
K2P 0Y6.

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2	REISSUED TO CITY	OCT 27/10	BHB
1	ISSUED FOR CITY REVIEW	JUN 9/10	BHB

SCALE 1:500

DESIGN BHB
CHECKED GJM
DRAWN SAM
CHECKED BHB
APPROVED GJM

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER B.J. BAHIA 100164647 PROVINCE OF ONTARIO
LICENSED PROFESSIONAL ENGINEER G.J. MacDONALD PROVINCE OF ONTARIO

NOVATECH ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

LOCATION
CITY OF OTTAWA
LEBRETON FLATS - PHASE 2

DRAWING NAME
STORM DRAINAGE PLAN

PROJECT No. 105006-2
REV REV # 07
DRAWING No. 105006-2-STM

LEBRETON FLATS - Lett Street and Lloyd Street
SANITARYSEWER DESIGN SHEET

JOB# 105006

NOVATECH ENGINEERING CONSULTANTS LTD

LOCATION			FLOW												PROPOSED SEWER						
STREET	FROM MH	TO MH	INVERTS		UNITS	RETAIL	INDIVIDUAL		CUMULATIVE		PEAK FACTOR (M)	PCPUL. FLOW	RETAIL FLOW	PEAK EXTRAN. FLOW	PEAK DESIGN FLOW	LENGTH (m)	PIPE SIZE (mm)	TYPE	SLOPE %	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	RATIO (Q/Qfull)
			UPS	DWS	APT.	RETAIL AREA	POPUL. (1000's)	AREA (ha.)	POPUL. (1000's)	AREA (ha.)		Q(p) L/s	Q(r) L/s	Q(e) (L/s)	Q(d) (L/s)							
BLOCK 12	Cap	101	53.88	53.84	400	0	0.720	0.303	0.72	0.303	3.887	11.338	0	0.085	11.423	9.1	250	PVC	0.45	41.617	0.82	27%
LLOYD	101	EX	53.30	52.89	1200	0	2.160	1.151	2.880	1.454	3.457	40.336	0	0.407	40.744	92.2	250	PVC	0.45	41.617	0.82	98%
LETT	103	EX	52.89	52.49	1600	0	2.880	0.910	2.88	0.910	3.457	40.336	0	0.255	40.591	87.0	250	PVC	0.45	41.617	0.82	98%

DESIGN PARAMETERS

Notes:

1) Q(e) = 0.28 L/sec/ha
2) Q(p) = (PxqxM/86,400)
3) Q(d) = Q(p) + Q(e)

Definitions:

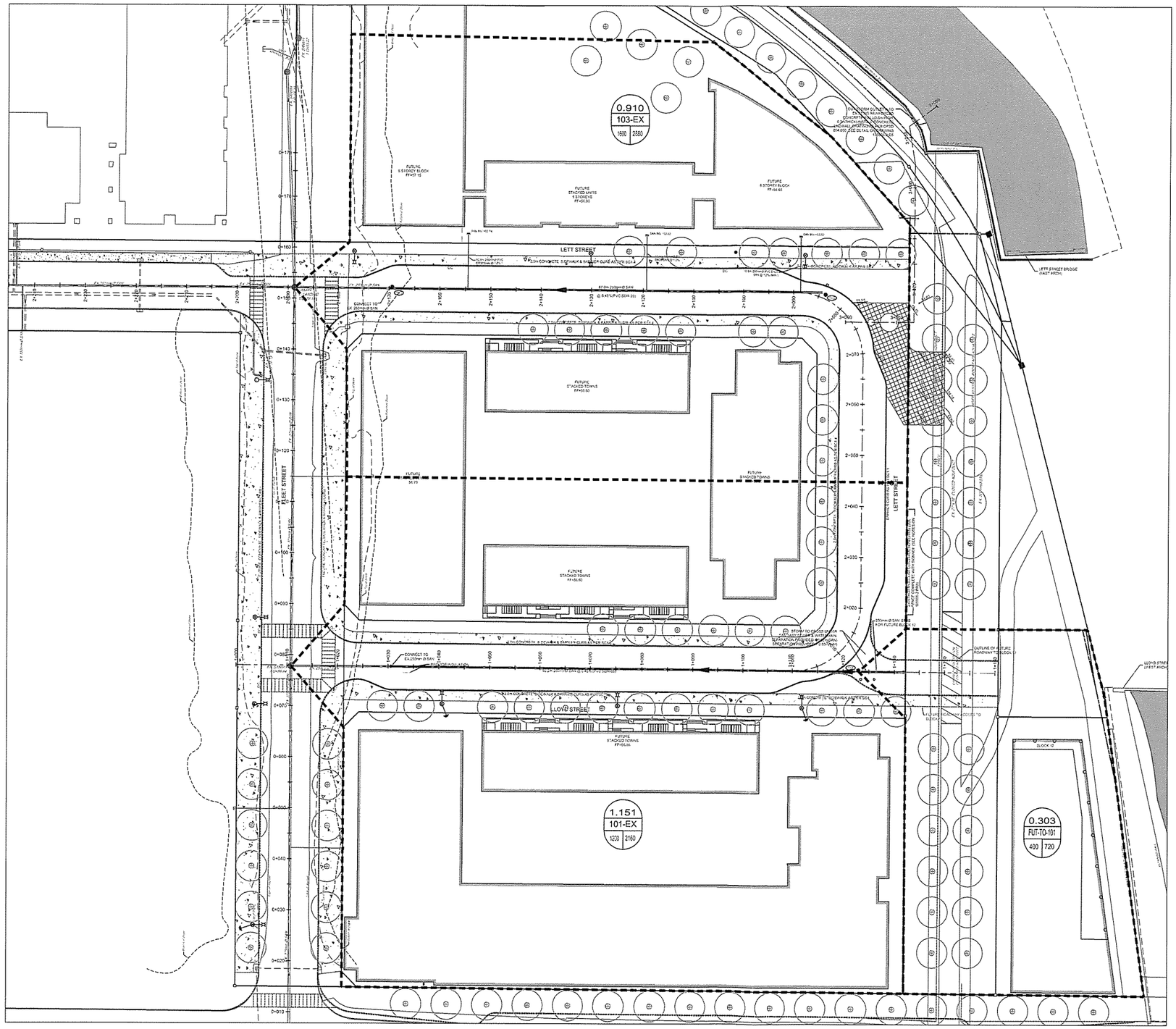
where

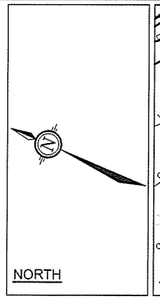
P = Population (1.8 people/per Apartment Unit)
q = Average per capita flow = 350 L/person/day
M = Residential Peaking Factor (Harmon Formula from section 4.4.1 of the City Sewer Design Guidelines):
M = 1+[14/(4+Pop/1000)]^1/2*1 - (Maximum of 4.0)
N = Industrial Peaking Factor (Appendix 4-B "Peaking Factor for Industrial Areas" from City Design Guidelines
Q(d) = Design Flow (L/sec)
Q(p) = Population Flow (L/sec)
Q(r) = Retail Flow (L/sec)
Q(e) = Extraneous Flow (L/sec)

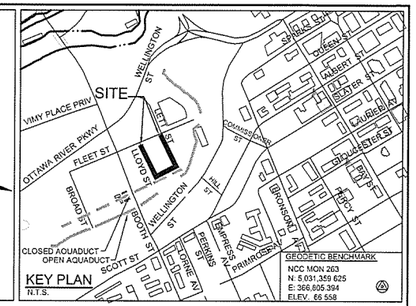
LICENSED PROFESSIONAL ENGINEER
G.J. MacDONALD
PROVINCE OF ONTARIO

LeBreton Flats - Lett Street and Lloyd Street South of Fleet Street
SANITARY SEWER DESIGN SHEET

Date	July 26, 2012					
Design	B.H.B.					
Job No.		Dwg. Reference:		Checked and Stamped:		
105006-2		105006-2-SAN		G.J. MacDONALD		







LEGEND

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- 250 / 525 — POPULATION EQUIVALENT
- NUMBER OF UNITS
- SANITARY DRAINAGE AREA
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SCALE
1:400
1:400
0 4 8 12 16

DESIGN BHB
CHECKED GJM
DRAWN SAM
CHECKED BHB
APPROVED

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER BHB/SAMA 100154947 July 3, 2012 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER G.J. MacDONALD PROVINCE OF ONTARIO

NOVATECH ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
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Facsimile (613) 254-5867
Email: novatech@novatech-eng.com

LOCATION
CITY OF OTTAWA
LEBRETON FLATS - PHASE 2

DRAWING NAME
SANITARY DRAINAGE PLAN

PROJECT No. 105006-2
REV REV # 05
DRAWING No.

LEBRETON FLATS - Lett Street and Lloyd Street
STORM SEWER DESIGN SHEET (5-YEAR EVENT)

JOB# 105006

NOVATECH ENGINEERING CONSULTANTS LTD.

LOCATION			AREA (ha)				FLOW							PROPOSED SEWER							
STREET	FROM MH	TO MH	R= 0.20	R= 0.35	R= 0.70	R= 0.90	INDIV. 2.78 AC	ACCUML. 2.78 AC	TIME OF CONC.	DESIGN STORM	RAINFALL INTENSITY	Peak Flow (L/sec) Q 5YR	Q total	DIA. ACTUAL (mm)	DIA. (mm)	TYPE	SLOPE (%)	LENGTH (m)	CAPACITY (L/s)	VELOCITY (m/s)	FLOW TIME (min)	Ratio (Q/Qfull)
LLOYD	100	102			1.05		2.04	2.04	10.00	5	104.19	212.9	212.9	0.533	525	CONC	0.25	106.2	224.2	1.00	1.76	95%
									11.76													
BLOCK 12	CAP	102		0.1	0.20		0.49	0.49	10.00	5	104.19	50.7	50.7	0.457	450	CONC	0.20	7.2	132.9	0.81	0.15	38%
									10.15													
LETT	102	104			0.12		0.23	2.76	11.76	5	95.71	264.5	264.5	0.686	675	CONC	0.12	70.1	303.6	0.82	1.42	87%
									13.19													
LETT	108	106			0.60		1.17	1.17	10.00	5	104.19	121.7	121.7	0.533	525	CONC	0.17	96.1	184.9	0.83	1.94	66%
LETT	106	104			0.00		0.00	1.17	11.94	5	94.97	110.9	110.9	0.533	525	CONC	0.17	10.3	184.9	0.83	0.21	60%
									12.14													
OUTLET	104	STC 4000					0.00	3.93	13.19	5	89.92	353.5	353.5	0.686	675	CONC	0.28	1.2	463.8	1.26	0.02	76%
OUTLET	STC 4000	110					0.00	3.93	13.20	5	89.86	353.2	353.2	0.686	675	CONC	0.28	3.6	463.8	1.26	0.05	76%
OUTLET	110	112					0.00	3.93	13.25	5	89.67	352.5	352.5	0.686	675	CONC	0.28	30.5	463.8	1.26	0.40	76%
OUTLET	112	114					0.00	3.93	13.65	5	88.17	346.6	346.6	0.686	675	CONC	0.28	7.6	463.8	1.26	0.10	75%
OUTLET	114	Outlet					0.00	3.93	13.76	5	87.81	345.2	345.2	0.686	675	CONC	0.28	1.2	463.8	1.26	0.02	74%
									13.20													

DESIGN PARAMETERS

Definitions:
Q = 2.78 AIR, where
Q= Peak Flow in Litres per Second (l/s)
A= Area in hectares (ha)
I= Rainfall Intensity (mm/hr)
R= Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min Pipe Velocity = 0.80 m/s
3) Tc =10 min (subdivision)

LeBreton Flats - Lett Street and Lloyd Street South of Fleet Street
STORM SEWER DESIGN SHEET

Date	July 26, 2012		
Design	B.H.B.		
Job No.	**Dwg. Reference:**	**Checked and Stamped:**	
105006-2	105006-2-STM	G.J. MacDONALD	

LICENSED PROFESSIONAL ENGINEER
B.H. BAHIA
100164647
Mar. 12, 2013
PROVINCE OF ONTARIO

Stormceptor®

Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	5/11/2012
Project Name	Lebreton Flats
Project Number	105006
Location	Ottawa, ON

Designer Information

Company	Novatech Engineering
Contact	David Smith

Notes

N/A

Drainage Area

Total Area (ha)	2.1
Imperviousness (%)	69

The Stormceptor System model STC 4000 achieves the water quality objective removing 80% TSS for a Fine (organics, silts and sand) particle size distribution.

Rainfall

Name	OTTAWA MACDONALD-CARTIER INT'L A
State	ON
ID	6000
Years of Records	1967 to 2003
Latitude	45°19'N
Longitude	75°40'W

Water Quality Objective

TSS Removal (%)	80

Upstream Storage

Storage (ha-m)	Discharge (L/s)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 300	56
STC 750	68
STC 1000	68
STC 1500	69
STC 2000	75
STC 3000	76
STC 4000	**80**
STC 5000	80
STC 6000	83
STC 9000	87
STC 10000	86
STC 14000	89

Stormceptor®

Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)

Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s
20	20	1.3	0.0004					
60	20	1.8	0.0016					
150	20	2.2	0.0108					
400	20	2.65	0.0647					
2000	20	2.65	0.2870					

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor version 1.0
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 300 is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 750 to STC 6000 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

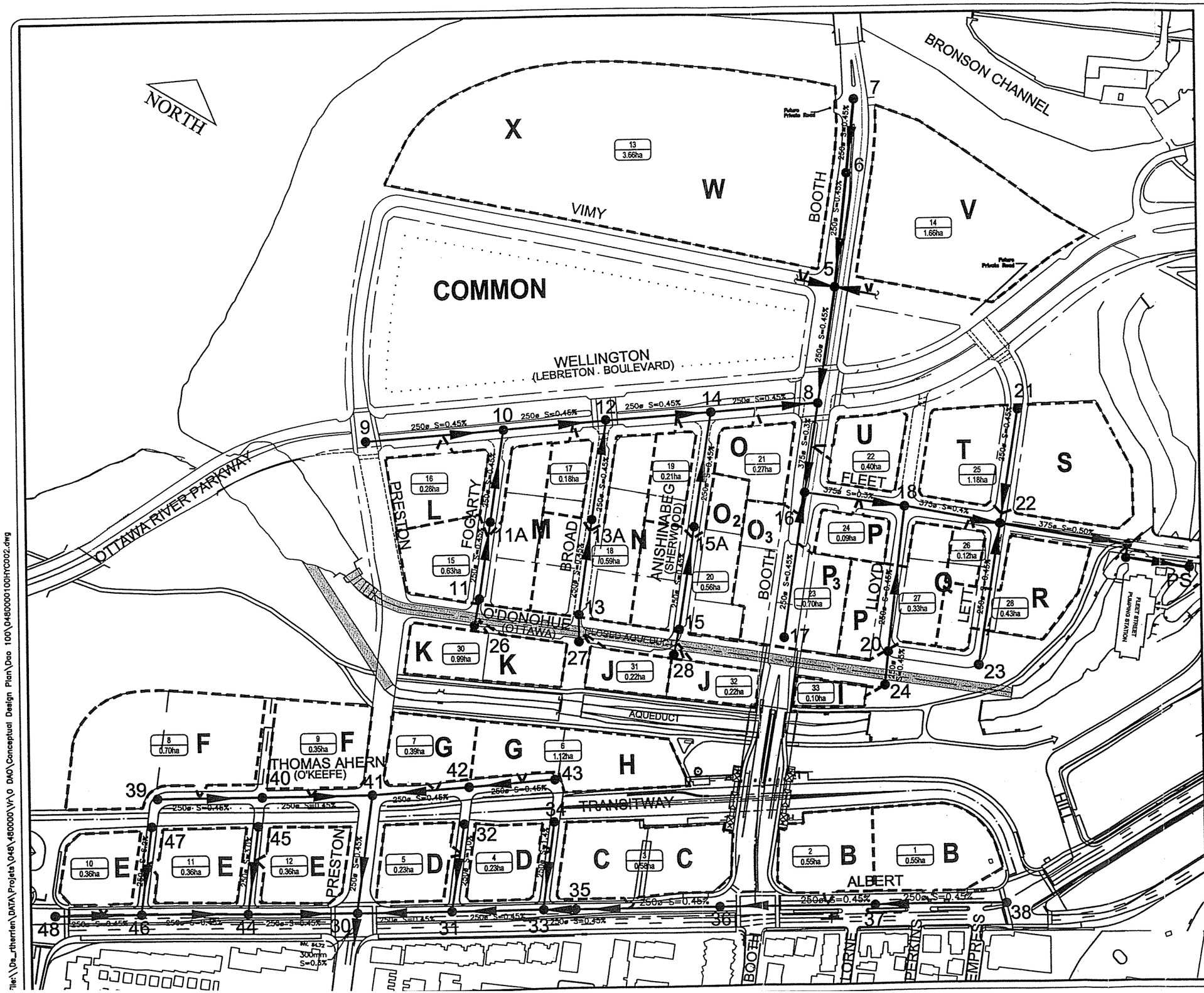
Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 300	STC 750 to STC 6000	STC 9000 to STC 14000
Single inlet pipe	75 mm	25 mm	75 mm
Multiple inlet pipes	75 mm	75 mm	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Imbrium Systems Inc., 1-800-565-4801.

APPENDIX B

Excerpts from the Dessau-Soprin LeBreton Flats Infrastructure and Remediation Project - Master Servicing Report (2004)



Legend

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

LEBRETON FLATS
INFRASTRUCTURE AND REMEDIATION PROJE
MASTER SERVICING REPORT

Titre

SANITARY SUBCATCHMENT

AREA PLAN

DESSAU SOPRIN

Dessau-Sopr
885, boul. de la Carrièr
Hull (Québ
Phone no.: (81
Fax: (81

Prepared N. Vekeman	Department Municipal	Project dir S. Duple
Drawn L. De Gregorio	Scale Not to scale	
Verified D. Deveau	Date May 02, 2003	

Project	Work lot	Dept.	Drawing no.
0 4 8 0 0 0 0	1 0 0	H Y	C 0 0 2

File:\\De_rtherten\DATA\Projets\048\480000\VA\0 DAO\Conceptual Design Plan\Dao 100\0480000100HYC002.dwg

SANITARY SEWER DESIGN SHEET - PRELIMARY

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_{res} (l/s)	Q_{extran} (l/s)	Q_{office} (l/s)	Q_{retail} (l/s)	Q_{total} (l/s)	Diameter (mm)	Slope (%)	Length (m)	$Q_{cap.}$ (l/s)	Velocity (m/s)
					Pop. (persons)	Area (ha)	Pop. (persons)	Area (ha)		Office (m²)	Retail (m²)	Office (m²)	Retail (m²)										
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 - PRELIMARY

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	Individual		Accumulative		Q_{res} (l/s)	Q_{extran} (l/s)	Q_{office} (l/s)	Q_{retail} (l/s)	Q_{total} (l/s)	Diameter (mm)	Slope (%)	Length (m)	$Q_{cap.}$ (l/s)	Velocity (m/s)
					Pop. (persons)	Area (ha)	Pop. (persons)	Area (ha)	factor (M)	Office (m^2)	Retail (m^2)	Office (m^2)	Retail (m^2)										
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^2
- Retail (retail) : 5 l/d/m^2

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

APPENDIX C

Overall Sanitary Drainage Area Plan and Design Sheet

Table 2 - LeBreton Flats Sanitary Flows

NOVATECH
Engineers, Planners & Landscape Architects

AREA	ID	INDIVIDUAL					CUMULATIVE					IND. RES. PEAK FACTOR (M)	CUM. RES. PEAK FACTOR (M)	COMM. PEAK FACTOR	INDIVIDUAL FLOWS					CUMULATIVE FLOWS				
		AREA (ha.)	COMM. FLOOR AREA (m²)	THEATRE / ARENA (SEATS)	RESIDENTIAL UNITS (apartments)	POPUL. (1000's)	AREA (ha.)	COMM. FLOOR AREA (m²)	THEATRE / ARENA (SEATS)	RESID. UNITS (apartments)	POPUL. (1000's)				PEAK POPUL. FLOW Q(p) L/s	PEAK COMM. FLOW Q(c) L/s	PEAK ARENA FLOW L/s	PEAK EXTR. FLOW Q(e) (L/s)	PEAK DESIGN FLOW Q(d) (L/s)	POPUL. FLOW Q(p) L/s	PEAK COMM. FLOW Q(c) L/s	PEAK THEATRE / ARENA FLOW L/s	PEAK EXTRAN. FLOW Q(e) (L/s)	PEAK DESIGN FLOW Q(d) (L/s)
To Fleet Street Sewer																								
	WEST A	6.8	80000		1500	2.700	6.8	80000	0	1500	2.700	2.785	2.785	1.0	24.37	2.59	0.00	2.24	29.2	24.37	2.59	0.00	2.24	29.2
	W	5.1	32000	0	0	0.000	11.9	112000	0	1500	2.700	4.000	2.785	1.0	0.00	1.04	0.00	1.68	2.7	24.37	3.63	0.00	3.93	31.9
	NCC1	1.3	0	0	300	0.540	13.2	112000	0	1800	3.240	3.165	2.731	1.0	5.54	0.00	0.00	0.43	6.0	28.68	3.63	0.00	4.36	36.7
	CL	4.4	12000	0	2050	3.690	17.6	124000	0	3850	6.930	2.692	2.489	1.0	32.19	0.39	0.00	1.45	34.0	55.89	4.02	0.00	5.81	65.7
To West Nepean Collector																								
	LEB S.	8.4	80000	18500	1400	2.520	8.4	80000	18500	1400	2.520	2.804	2.804	1.0	22.90	2.59	42.82	2.77	28.3	22.90	2.59	42.82	2.77	71.1
	WEST B	11.2	100000	0	1500	2.700	19.6	180000	18500	2900	5.220	2.785	2.582	1.0	24.37	3.24	0.00	3.70	31.3	43.68	5.83	42.82	6.47	98.8
	NCC2	2.0	20000	0	0	0.000	21.6	200000	18500	2900	5.220	4.000	2.582	1.0	0.00	0.65	0.00	0.66	1.3	43.68	6.48	42.82	7.13	100.1
	City	1.4	20000	0	0	0.000	23.0	220000	18500	2900	5.220	4.000	2.582	1.0	0.00	0.65	0.00	0.46	1.1	43.68	7.13	42.82	7.59	101.2

Design Parameters:

1) Q(e) = 0.33 L/sec/ha
2) Q(p) = (PxqxM/86,400)
3) Q_{arena} = 50 L/cap/day/seat P.F. = 4.0
4) Q(c) = 28,000 L/d/ha x N
5) Q(d) = Q(p) + Q(pk) + Q(c)+ Q(e)

Definitions:

P = Population PPU = 1.8
q = Average per capita flow = 280 L/cap/day
M = Residential Peaking Factor (Harmon Formula from section 4.4.1 of the City Sewer Design Guidelines):
M = 1+[14/(4+Pop/1000)]^1/2*0.80 (Maximum of 4.0)
N =Commercial / Park Peaking Factor (1.5) from City Design Guidelines for Commercial/Retail percentage greater than 20 %; Otherwise use PF = 1.0
Q(d) = Design Flow (L/sec)
Q(p) = Population Flow (L/sec)
Q(pk) = Park Flow (L/sec)
Q(c) = Commercial Flow (L/sec)
Q(e) = Extraneous Flow (L/sec)

LEBRETON FLATS SANITARY FLOW DESIGN SHEET

Date	6/30/2017, Revised May 23, 2018		
Design	GJM		
Job No.:		**Dwg. Reference:**	**Checked:**
116042			

SUMMARY TABLE

	ID	A (ha)	UNITS RESIDENTIAL	FLOOR AREA (m^2) RETAIL / COMMERCAIL / MUSUEM / PAVILLION	SEATS THEATRE / ARENA	NOTES	SANITARY AVERAGE FLOW RATE
NORTH OF LRT	W	5.1		32000			2.8 L/m²/day
	CL EAST	4.4	2050	12000			280L\cap\day 1.8 ppu 2.8 L/m²/day
	NCC1	1.3	300				280 L\cap\day 1.8 ppu
	WEST A	6.8	1500	80000			280 L\cap\day 1.8 ppu 2.8 L/m²/day
SOUTH OF LRT	LEBS	8.4	1400	80000	18,500	Sports Arena	280L\cap\day 1.8 ppu 2.8 L/m²/day
	WEST B	11.2	1500	100000			
	NCC2	2.0		20000			2.8 L/m²/day
	CITY	1.4		20000			2.8 L/m²/day

LEGEND :

15.8 / LEBN / 900 / 136,416
- AREA (ha)
- ID
- UNITS
- FLOOR AREA - RETAIL/OFFICE/OTHER (m^2)

- Storm Inlet
- Storm Outlet
- Storm Manhole
- Sanitary Manhole
- Combined Manhole
- Combined Pipe
- Sanitary Pipe
- Storm Pipe
- Pipe Cap
- Combined Trunk Sewer
- Sanitary Trunk Sewer
- Storm Trunk Sewer
- Regulator
- Storm Pumping Station
- Storm Water Management Pond
- Sanitary Pumping Station
- Treatment Plant

Pipe Equivalents

nominal (mm)	actual (inches)	nominal (mm)	actual (inches)	nominal (mm)	actual (inches)
100	4	675	27	1800	72
150	6	750	30	1950	78
200	8	825	33	2025	80
250	10	900	36	2100	84
300	12	975	39	2250	90
375	15	1050	42	2400	96
450	18	1200	48	2550	102
525	21	1350	54	2700	108
600	24	1500	60	2850	114
		1650	66	3000	120

Pipe Materials

A - ASBESTOS
CI - CAST IRON
CO - COPPER
CO0 - AWWA C300
CO1 - AWWA C301
CO2 - AWWA C302
CO3 - AWWA C303
DI - DUCTILE IRON
PE - POLYETHYLENE (DR11 TO DR21)
PVC - POLYVINYL CHLORIDE
STC - CONCRETE LINED STEEL PIPE
UCI - UNLINED CAST IRON
UNK - UNKNOWN MATERIAL

COMPLETE RENDEZ-VOUS STATS:

18,500 SEAT NHL ARENA
28000 SEAT OUTDOOR AREA
4400 RESIDENTIAL UNITS
260000m² RETAIL OFFICE

FLEET STREET SANITARY PUMP STATION

5.1 / W / 32000
1.3 / NCC1 / 300
4.4 / CL / 2050 / 12000
1.4 / CITY / 20000
6.8 / WEST A / 1500 / 80000
2.0 / NCC2 / 20,000
8.4 / LEBS / 1400 / 80000
11.2 / WEST B / 1500 / 100000

336-030

LOCATION	CITY of OTTAWA LEBRETON FLATS
DRAWING NAME	SANITARY DRAINAGE AREA PLAN
PROJECT No.	116042-00
REV	REV # 00
DRAWING No.	116042-SDA

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

Ottawa

SCALE
1 : 2500
0 25 50 75 100

APPENDIX D

Fleet Street Sanitary Pump Station
Certificate of Approval and Drawings

Ontario

Ministry of the Environment
Ministère de l'Environnement

CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 9608-7L6RZV
Issue Date: November 10, 2008

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

Site Location: 10 Fleet Street
10 Fleet St 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 375mm duckbill check valve and 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. 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;

2. Design brief outlining description of proposed works prepared by Stantec Consulting Ltd., Consulting Engineer;
3. Geotechnical report entitled "Geotechnical Investigation for a Proposed Wet Well Chamber, Fleet Street Pumping Station, Ottawa, Ontario" prepared by Jacques Whitford;
4. 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;
5. 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;
6. MOE Appendix H (Modified) – Sewage Pump Station Design - Table 1 and 2;
7. MOE Appendix I – Information Required for Pump Station Applications; and
8. 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*.

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**

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

DATED AT TORONTO this 10th day of November, 2008

Zafar Bhatti, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

AA/
c: District Manager, MOE Ottawa District Office
Pierre Pagé, City Clerk & Director, Secretariat Services, City of Ottawa
Joe Mojsej, P.Eng., City of Ottawa
James Ricker, Stantec Consulting Ltd.

Greg MacDonald

From: Zaknoun, Hasnaa <hasnaa.zaknoun@ottawa.ca>
Sent: Tuesday, February 02, 2016 10:38 AM
To: Greg MacDonald
Subject: RE: Fleet Street Sanitary Pump Station
Attachments: 163400648-PS105.pdf; 163400648-PS106.pdf; 163400648-PS301.pdf; 163400648-PS302.pdf; 163400648-PS501.pdf; 163400648-PS502.pdf; 163400648-PS503.pdf; 163400648-PS701.pdf; 163400648-PS101.pdf; 163400648-PS102.pdf; 163400648-PS103.pdf; 163400648-PS104.pdf; Lebreton Flats.JPG

Hello Greg,
I took a look at the Fleet Street Sanitary pumping station and since this station only operates during very high flows the amount of data is very limited, I think that last time this pumping station operated was in June 2014 due to a large rain event. There are two pumps operating in a lead/lad arrangement and the average capacity per pump is ~106L/s, the ECA states that the original design capacity for this station is 111L/s.
I have attached a screenshot of the HMI for this station and some drawings.
Please do not hesitate to contact me if you have any questions.

Thanks
Hasnaa Zaknoun

From: Greg MacDonald [mailto:g.Macdonald@novatech-eng.com]
Sent: Thursday, January 14, 2016 12:39 PM
To: Zaknoun, Hasnaa
Subject: Fleet Street Sanitary Pump Station

It was nice speaking with you, Hasnaa.

As I mentioned we are working with a developer, Claridge Homes, on their vacant site on LeBreton Flats located north of the Aqueduct and east of Booth Street. We have had discussions with the City (John Smit and Abdul Mottalib of PGM, Infrastructure Services Department) with respect to the sanitary servicing capacity in the area, and in particular the Fleet Street Sanitary Pump Station located in the vicinity of Pooley's Bridge. Would you have information on the existing capacity of this pump station? Any drawings that you have handy would also be very helpful.

Thank You in Advance for your assistance and I look forward to receiving any information which you have.

Yours truly,

Greg MacDonald, P. Eng.
Senior Project Manager
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x279 | Cell: 613.890.9705 | Fax: 613.254.5867

REMOVALS

FLEET STREET PUMPING STATION

POOLEY'S BRIDGE (PEDESTRIAN)

REMOVE AND REPLACE EXISTING CB2

REMOVE AND REPLACE EXISTING CB3

CAP EXISTING ABANDONED 610ø WATERMAIN

REMOVE EXISTING PIPE (TYP)

REMOVE EXISTING MANHOLE (TYP)

CAP EXISTING ABANDONED 610ø WATERMAIN

ABANDON/CAP EXISTING 150ø SANITARY SERVICE

PROTECT EXISTING TREE

SEE INSTRUMENTATION DRAWINGS FOR DETAILS OF BELL CABLE REMOVAL

TAILRACE TUNNEL BELOW

ABANDON EXISTING 150ø SANITARY SEWER

SEE ELECTRICAL DRAWINGS FDR WORK WITHIN THE STATION.

REMOVE EXISTING 100ø SANITARY SERVICE TO ALLDW FOR NEW MANHOLE AND CAP EXISTING PIPE TO THE EAST

SEE STRUCTURAL/ELECTRICAL ORAWINGS FOR WORK WITHIN THE STATION.

SEE ELECTRICAL ORAWINGS FDR HYORO CABLE REPLACEMENT

PAD-MOUNTED TRANSFORMER

PROPOSED WORKS

FLEET STREET PUMPING STATION

POOLEY'S BRIDGE (PEDESTRIAN)

CONNECT EXISTING 250mmø STORM TO CATCHBASIN No.1

NEW CATCHBASIN No.1

300mmø PVC STORM SEWER

MANHOLE No.2

300mmø PVC OVERFLOW

NEW CATCHBASIN No.2

375mmø PVC INLET SEWER

PUMP CHAMBER

250mmø O.I. FORCEMAIN

375mmø PVC OUTLET SEWER

100mmø PVC SDR35 VENT PIPE

MANHOLE No.1

CONTIGUOUS LINE ORILLING TO DEPTH TO PROVIDE STRESS RELIEF AND EXPEDITE ROCK REMOVAL

OUTLET SEWER TO BE RE-LINED

EX.375ø INV.47.82
150ø SERVICE INV.47.93

N5031032.010
E366567.218

28.7m-150ø PVC SDR35 SANITARY SERVICE AT 2.1% SLOPE. TO BE INSTALLED. SEE DETAIL ON DWG PS105

SEE INSTRUMENTATION DRAWINGS FOR DETAILS OF BELL CABLE AND FIBRE OPTIC COMMUNICATIONS INSTALLATION IN THIS AREA

TAILRACE TUNNEL BELOW

INV.48.200

INV.48.165

1200ø MANHOLE No.3

PROVIDE BYPASS PUMPING DURING TIE-IN

SEE ELECTRICAL DRAWINGS FOR WORK WITHIN THE STATION.

SEE STRUCTURAL/ELECTRICAL ORAWINGS FOR WORK WITHIN THE STATION.

NEW WINODW WELLS (SEE STRUCTURAL DRAWINGS)

PAD-MOUNTED TRANSFORMER

Ottawa

PUBLIC WORKS AND SERVICES DEPARTMENT

UTILITY SERVICES BRANCH

R.G. Hewitt, P.Eng.
Deputy City Manager

Approved by:
Name: B. Byce
Signed:
Date:
Stamp (If applicable)

Designed by:
Name: J. Ricker
Signed:
Date:

Drawn by:
Name: E. Colberry
Date: 06.11.01

NOTES:

FOR BOREHOLE LOGS SEE DWG.No.13973-PS701

SANITARY FLOWS FROM LEBRETON FLATS TO BE PUMPED ACROSS SITE INTO RECEIVING INTERCEPTOR SEWER FOR DURATION OF CONTRACT AVERAGE FLOW=3 L/S

POOLEY'S BRIDGE AND FLEET STREET PUMPING STATION ARE DESIGNATED HERITAGE STRUCTURES AND MUST BE PROTECTED FROM DAMAGE AT ALL TIMES. WHEN WORKING WITHIN 2.5 METRES OF THESE STRUCTURES, PLYWOOD HOARDING IS TO BE PROVIDED FOR THE WORKING AREA AND 2.5 METRES ON EITHER SIDE. MINIMUM HEIGHT OF HOARDING=2.4 METRES.

BEDROCK EXCAVATION: FOLLOW RECOMMENDATIONS AS SHOWN IN GEOTECHNICAL REPORT No.1012765 BY JACQUES WHITFORD, DATED SEPTEMBER 7, 2008.

SEE DRAWING No.13973-E101 FOR ADDITIONAL SITE WORK RELATED TO NEW UTILITIES AND ELECTRICAL SERVICES.

As Built 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.

Stantec

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K1Z 7T1
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Fax. 613.722.2799
www.stantec.com

No.	Revision	Date
3	AS BUILT	10.03.10
2	ISSUED FOR CONSTRUCTION	09.01.29
1	ISSUED FOR TENDER	08.09.02
0	ISSUED FOR FINAL REVIEW	08.04.16
0	ISSUED FOR 90% REVIEW	07.03.23
0	ISSUED FOR 70% REVIEW	07.01.17

Scales 0 1 3 5m

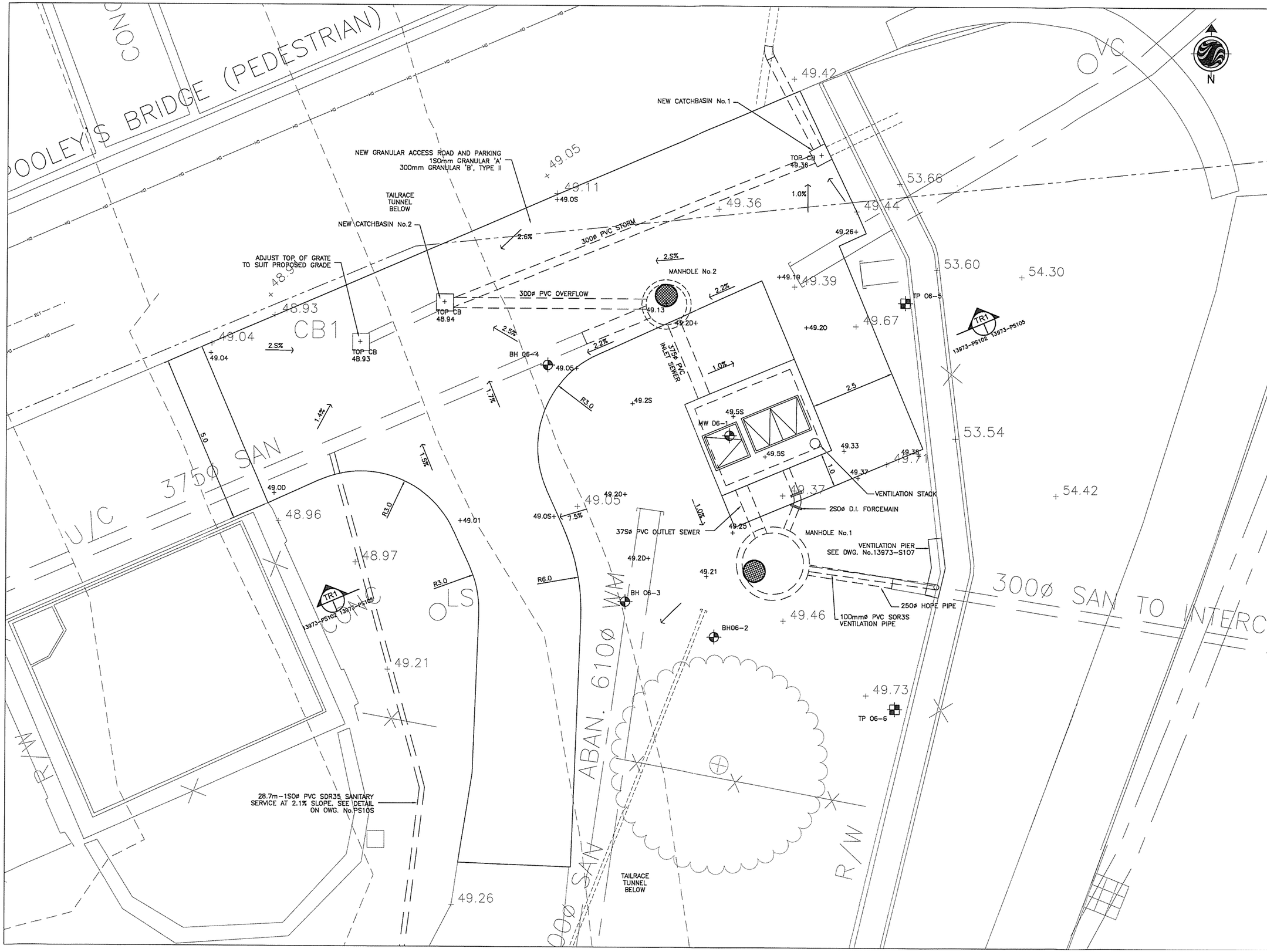
DRAWING TITLE:

FLEET STREET PUMPING STATION ELECTRICAL UPGRADE AND CONSTRUCTION OF LEBRETON FLATS SANITARY PUMPING STATION
CONTRACT No.ISB06-2021

SITE PLAN REMOVALS AND PROPOSED WORKS

Drawing No.: 13973-PS101

Rev. No.: 3



Ottawa

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Name: J. Ricker
Signed:
Date:

Drawn by:
Name: E. Colberry
Date: 06.11.01

NOTES:
FOR BOREHOLE LOGS SEE DWG.No.13973-PS701

NEW GRAVEL AREA

SEE DRAWING No.13973-E101 FOR ADDITIONAL REINSTATEMENT RELATED TO NEW UTILITES AND ELECTRICAL SERVICING

As Built Drawing

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0	ISSUED FOR 90% REVIEW	07.03.23
0	ISSUED FOR 70% REVIEW	07.01.17

Scales
0 0.5 1.5 2.5m

DRAWING TITLE:

FLEET STREET PUMPING STATION ELECTRICAL UPGRADE AND CONSTRUCTION OF LEBRETON FLATS SANITARY PUMPING STATION
CONTRACT No.ISB06-2021

GRADING PLAN

Drawing No.: 13973-PS102
Rev. No.: 3

NEW CATCHBASIN No.1
600x600mm PRECAST CONCRETE
AS PER OPS0-705.010

GRANULAR

2500

C
13973-PS103 13973-PS302

2438

885 900

MANHOLE VENTILATION STACK AS PER CITY
STO.SS0-V4 (SEE OWG.No.13973-PS503)

80 150

150

PUMP
ACCESS
HATCH

1700

3048

MANHOLE No.2
1200ø PRECAST CONCRETE
AS PER OPS0-701.010

B
13973-PS103 13973-PS302

A
13973-PS103 13973-PS301

900

CHAMBER
ACCESS
HATCH

629

1000

MANHOLE No.1
1800ø PRECAST CONCRETE
AS PER OPS0-701.012

B
13973-PS103 13973-PS302

629

A
13973-PS103 13973-PS301

MANHOLE FRAME AND COVER
AS PER CITY STD. No.S24/25

2928

920 900

PELSUE MODEL PNUS102A-SS FLUSH
MOUNTED LIFTING DAVIT. CAST INTO
TOP SLAB c/w DRAIN AND SLEEVE
CAP (PNUS106-SS)

SEALED MANHOLE FRAME AND
COVER. SEE DETAIL THIS DRAWING

2636

C
13973-PS103 13973-PS302

GRANULAR

PLAN AT GRADE

0 200 600 1000mm

WATERTIGHT COVER AS PER MODIFIED
HIS #106 BY H.IMBLEAU & SON LTD.
c/w 8-20mmø BOLT HOLES
SEE DETAIL ON DWG. No.13973-PS502

PREMIUM GRADE BUTYL
RUBBER SEALANT WATERTIGHT
GASKET

8-HILTI HY 150 ADHESIVE ANCHOR
16mmø HAS THREADED S.S. ROD.
EMBEDMENT=191mm

SEALED MANHOLE FRAME AND COVER

0 100 300 500mm

Ottawa

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UTILITY SERVICES BRANCH

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Drawn by:
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Date: 06.11.01

NOTES:

As Built Drawing

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0	ISSUED FOR 70% REVIEW	07.01.17

Scales

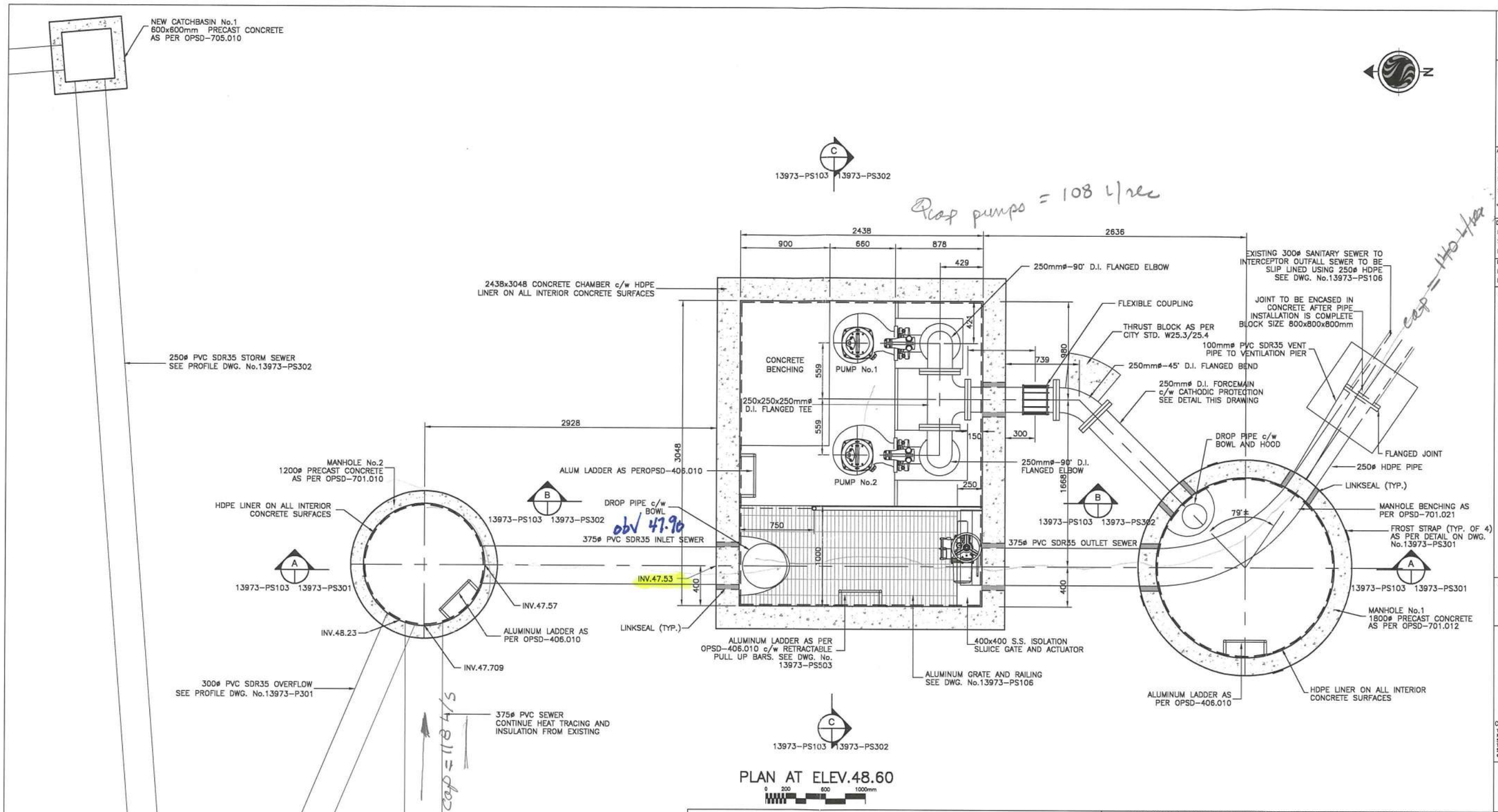
DRAWING TITLE:

FLEET STREET PUMPING STATION ELECTRICAL UPGRADE AND CONSTRUCTION OF LEBRETON FLATS SANITARY PUMPING STATION
CONTRACT No.ISB06-2021

PLAN AT GRADE AND DETAILS

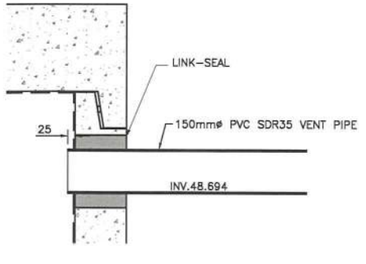
Drawing No.: 13973-PS103

Rev. No.: 3



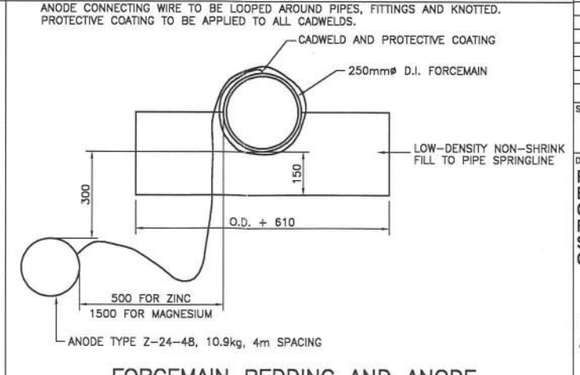
PLAN AT ELEV.48.60

0 200 600 1000mm



VENT PIPE DETAIL

0 100 300 500mm



FORCEMAIN BEDDING AND ANODE PROTECTION DETAIL

0 100 300 500mm

Ottawa

PUBLIC WORKS AND SERVICES DEPARTMENT

UTILITY SERVICES BRANCH

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Deputy City Manager

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Name: J. Ricker
Signed:
Date:

Drawn by:
Name: E. Colberry
Date: 06.11.01

NOTES:

ALL DISCHARGE PIPING, FITTINGS AND FORCEMAIN TO BE DUCTILE IRON.

SEE DRAWING No.13973-PS105 FOR WET WELL DESIGN NOTES.

ALL INTERIOR CONCRETE SURFACES (INCLUDING BENCHING) IN THE WET WELL, MANHOLE No.1 AND MANHOLE No.2 ARE TO HAVE HDPE LINER.

As Built Drawing

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0	ISSUED FOR 70% REVIEW	07.01.17

Scales 0 200 600 1000mm

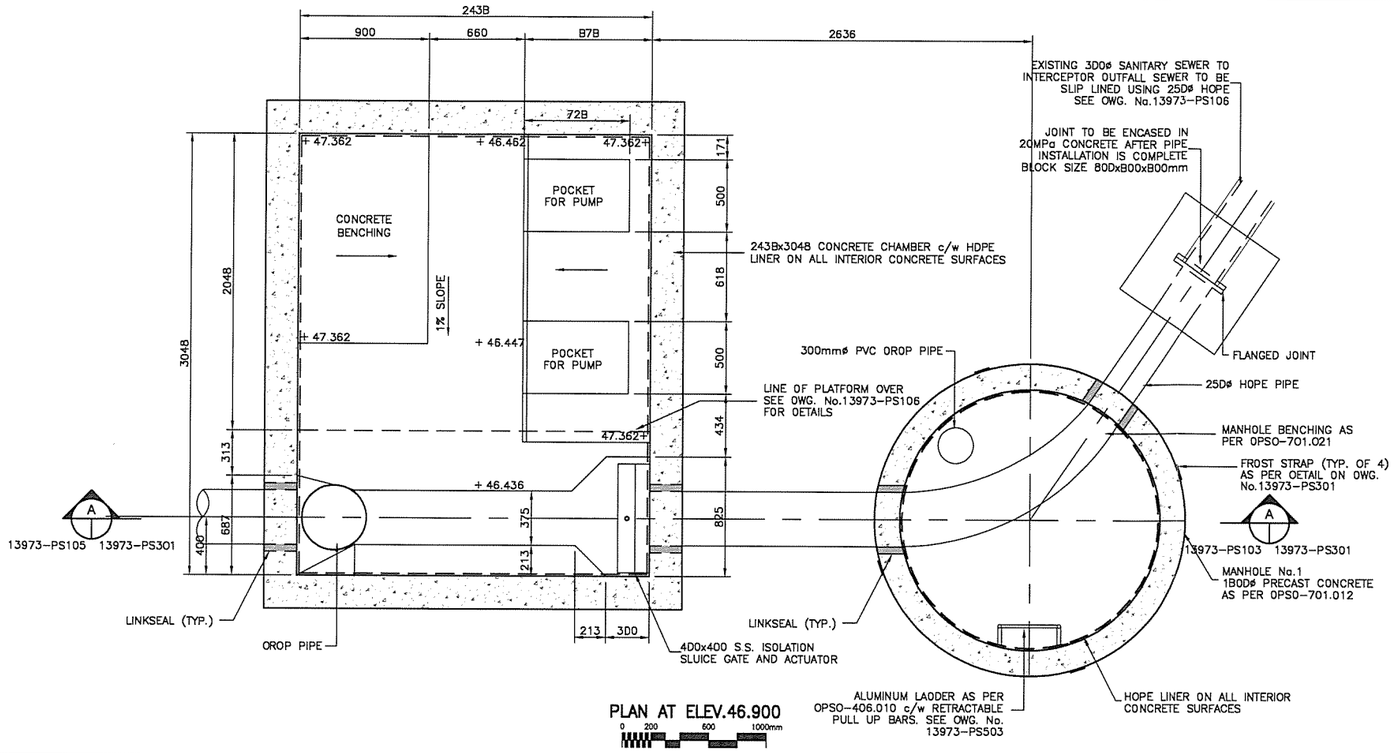
DRAWING TITLE:

FLEET STREET PUMPING STATION ELECTRICAL UPGRADE AND CONSTRUCTION OF LEBRETON FLATS SANITARY PUMPING STATION
CONTRACT No.ISB06-2021

PLAN AT ELEV.48.600 AND DETAILS

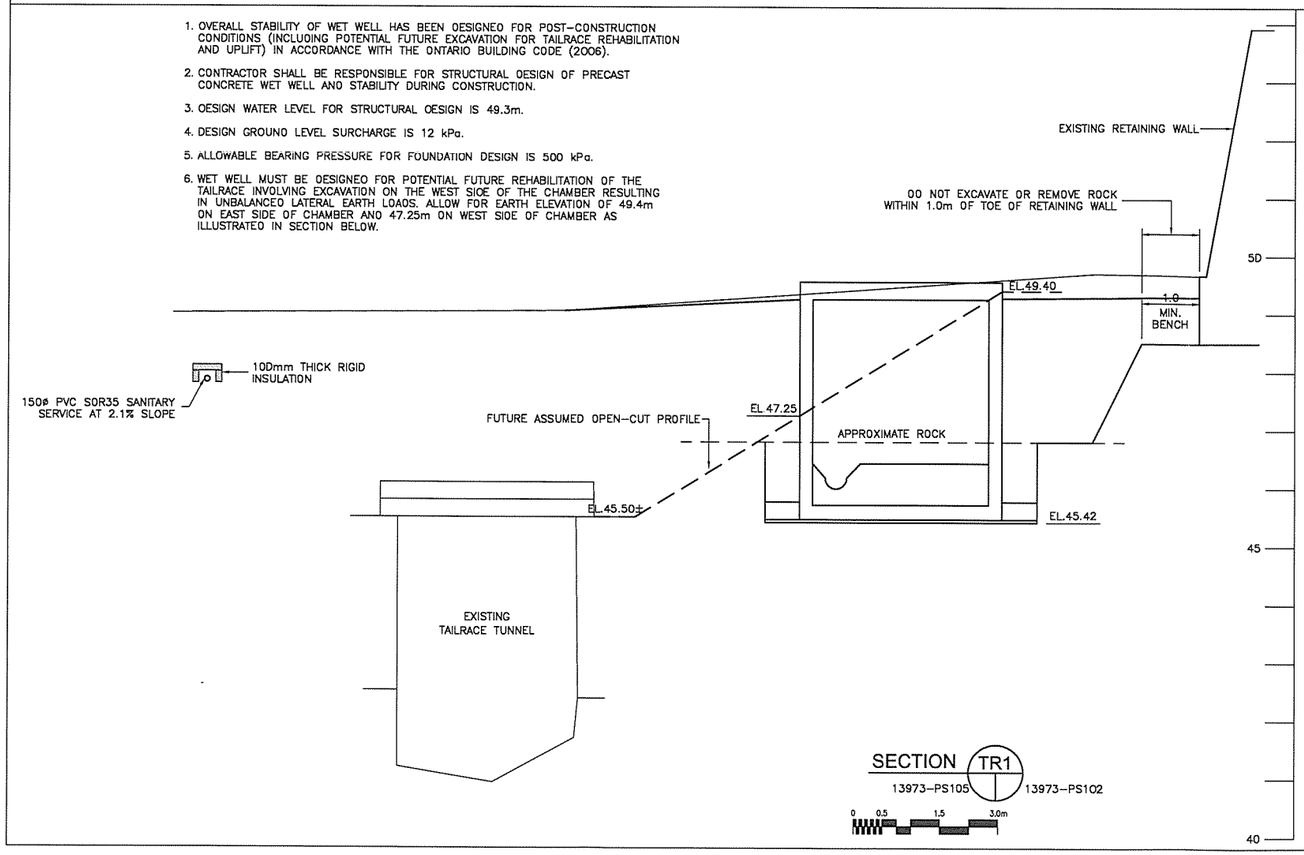
Drawing No.: 13973-PS104

Rev. No.: 3



PLAN AT ELEV.46.900

1. OVERALL STABILITY OF WET WELL HAS BEEN OESIGNEO FOR POST-CONSTRUCTION CONDITIONS (INCLUOING POTENTIAL FUTURE EXCAVATION FOR TAILRACE REHABILITATION AND UPLIFT) IN ACCORDANCE WITH THE ONTARIO BUILDING CODE (2006).
2. CONTRACTOR SHALL BE RESPONSIBLE FOR STRUCTURAL OESIGN OF PRECAST CONCRETE WET WELL ANO STABILITY DURING CONSTRUCTION.
3. OESIGN WATER LEVEL FOR STRUCTURAL OESIGN IS 49.3m.
4. DESIGN GROUNO LEVEL SURCHARGE IS 12 kPa.
5. ALLOWABLE BEARING PRESSURE FOR FOUNDATION DESIGN IS 500 kPa.
6. WET WELL MUST BE OESIGNEO FOR POTENTIAL FUTURE REHABILITATION OF THE TAILRACE INVOLVING EXCAVATION ON THE WEST SIOE OF THE CHAMBER RESULTING IN UNBALANCEO LATERAL EARTH LOAOS. ALLOW FOR EARTH ELEVATION OF 49.4m ON EAST SIDE OF CHAMBER ANO 47.25m ON WEST SIOE OF CHAMBER AS ILLUSTRATEO IN SECTION BELOW.



SECTION TR1

13973-PS105 — 13973-PS102

Ottawa

PUBLIC WORKS AND SERVICES DEPARTMENT

UTILITY SERVICES BRANCH

R.G. Hewitt, P.Eng.
Deputy City Manager

Approved by:
Name: B. Byce
Signed:
Date:
Stamp (if applicable)

Designed by:
Name: J. Ricker
Signed:
Date:

Drawn by:
Name: E. Colberry
Date: 06.11.01

NOTES:

As Built 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.

Stantec Consulting Ltd.
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No.	Revision	Date
3	AS BUILT	10.03.10
2	ISSUED FOR CONSTRUCTION	09.01.29
1	ISSUED FOR TENDER	08.09.02
0	ISSUED FOR FINAL REVIEW	08.04.18
0	ISSUED FOR 90% REVIEW	07.03.23
0	ISSUED FOR 70% REVIEW	07.01.17

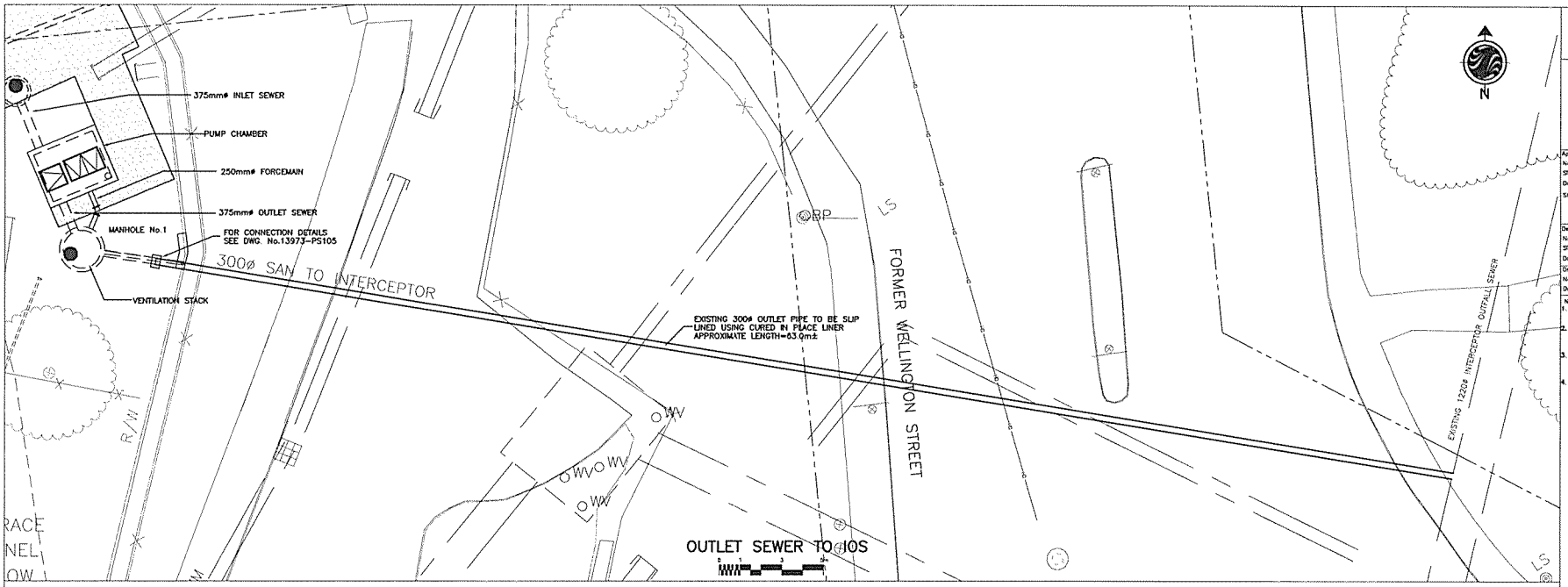
Scales
0 200 600 1000mm

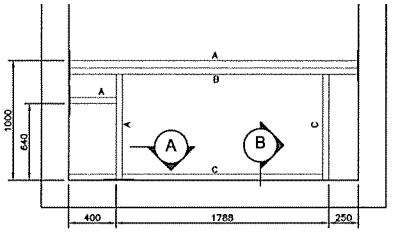
DRAWING TITLE:

FLEET STREET PUMPING STATION ELECTRICAL UPGRADE AND CONSTRUCTION OF LEBRETON FLATS SANITARY PUMPING STATION
CONTRACT No.ISB06-2021

PLAN AT ELEV.46.900
SECTION TR1

Drawing No.:	Rev. No.:
13973-PS105	3

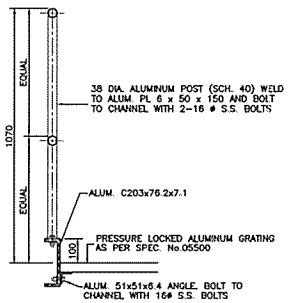




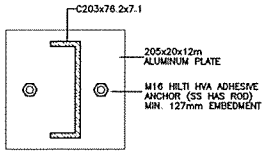
A ALUM. C203x76.2x7.1
B 51x51x6.4 ANGLE BOLTED TO CHANNEL
C 76.2x50.8x6.4 ALUM. ANGLE

DIMENSIONS TO BE FIELD VERIFIED TO SUIT ACTUAL WET WELL DIMENSIONS BEFORE FABRICATION.

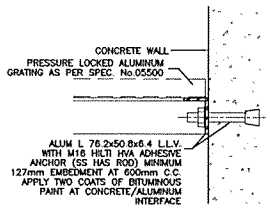
PLATFORM FRAMING



RAILING DETAIL



SECTION A



SECTION B

PLATFORM DETAILS

Ottawa

PUBLIC WORKS AND SERVICES DEPARTMENT

UTILITY SERVICES BRANCH

R.G. Hewitt, P.Eng.
Deputy City Manager

Approved by:
Name: B. Ryce
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Date:
Stamp (if applicable)

Designed by:
Name: J. Ricker
Signed:
Date:

Drawn by:
Name: E. Colberry
Date: 08.11.01

NOTES:
1. CCTV INSPECTION OF EXISTING CONDITION OF 300ø SEWER AVAILABLE FROM ENGINEER.
2. SLIP LINING TO BE COMPLETED UPON REMOVAL OF EXISTING SMH#1 TO PERMIT ACCESS TO 300mmø SANITARY SEWER.
3. SLIP LINING TO BE COMPLETED USING STANDARD HDPE SECTIONS (12m). BUTT FUSE SUBSEQUENT SECTIONS AS SLIP LINING PROCEEDS.
4. WHEN SEWER HAS BEEN LINED TO INTERCEPTOR SEWER (63m±) A 150 LB HDPE FLANGE IS TO BE WELDED TO WEST END OF NEW PIPE.

As Built Drawing

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No.	Revision	Date
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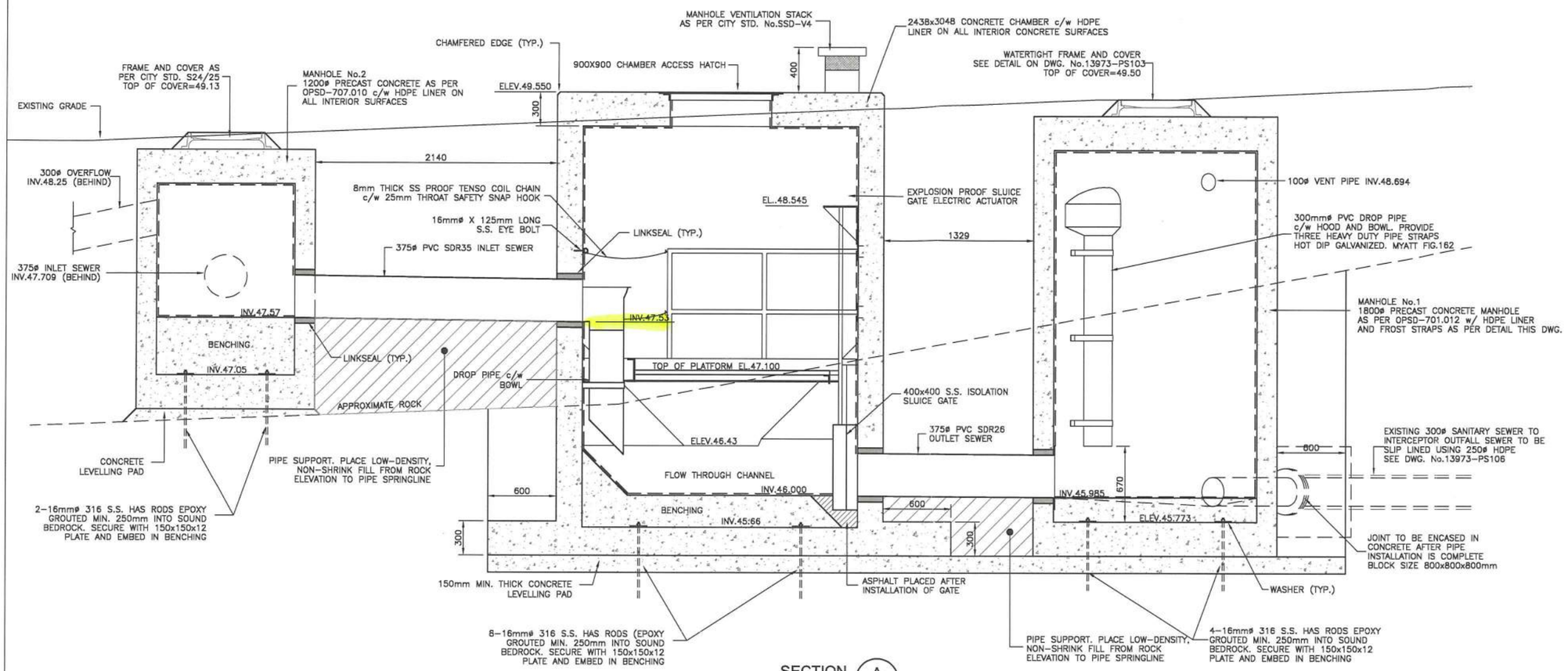
0	ISSUED FOR 80% REVIEW	07.03.23
0	ISSUED FOR 30% REVIEW	97.01.17

Scales: 0 1 3 5m

DRAWING TITLE:
FLEET STREET PUMPING STATION ELECTRICAL UPGRADE AND CONSTRUCTION OF LEBRETON FLATS SANITARY PUMPING STATION
CONTRACT No.ISB06-2021

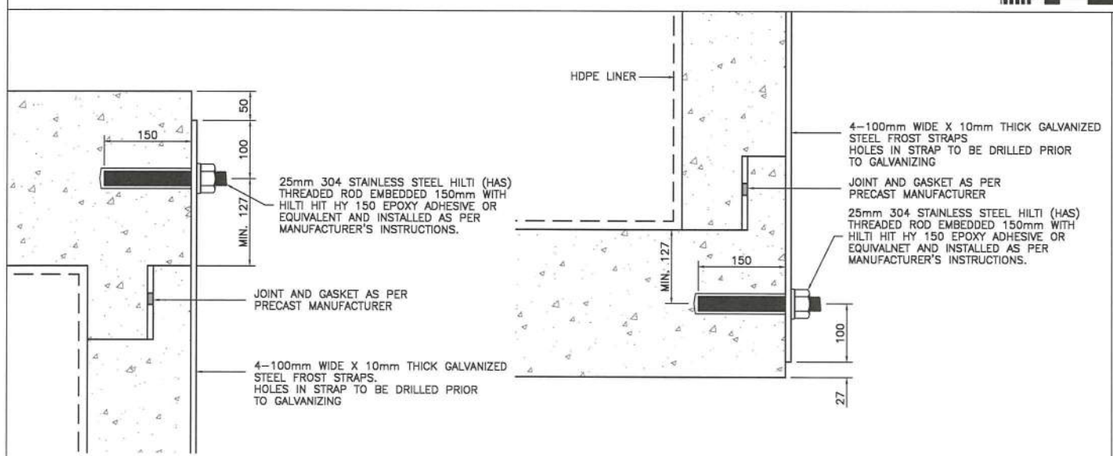
OUTLET SEWER TO IOS
PLATFORM DETAILS

Drawing No.: 13973-PS106
Rev. No.: 3



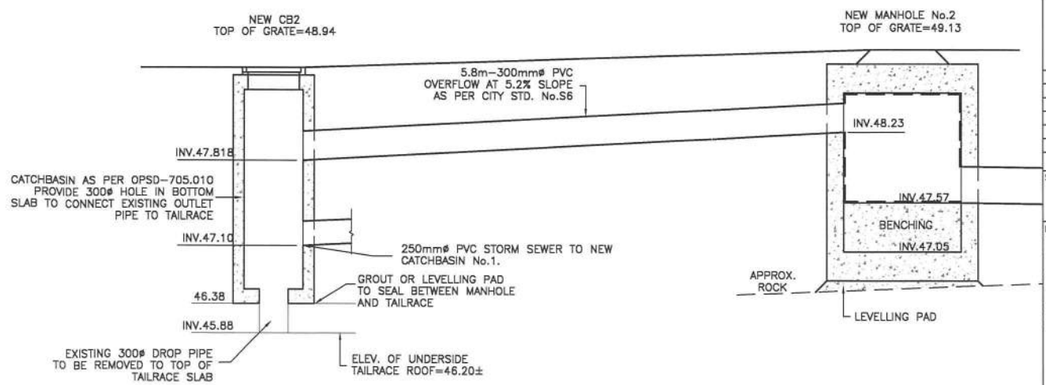
SECTION A (13973-PS301 / 13973-PS103)

0 200 600 1000mm



FROST STRAP INSTALLATION - MANHOLE No.1

0 50 150 250mm



CONTRACTOR TO CONFIRM CATCHBASIN HEIGHT BY TEST PIT

OVERFLOW SEWER PROFILE - MH No.2 TO CB2

0 300 900 1500mm

Ottawa

PUBLIC WORKS AND SERVICES DEPARTMENT

UTILITY SERVICES BRANCH

R.G. Hewitt, P.Eng.
Deputy City Manager

Approved by:
Name: B. Byce
Signed:
Date:
Stamp (if applicable)

Designed by:
Name: J. Ricker
Signed:
Date:

Drawn by:
Name: E. Calberry
Date: 06.11.01

NOTES:
SEE ELECTRICAL DRAWINGS FOR DUCT BANK DETAILS.

As Built Drawing

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0	ISSUED FOR 90% REVIEW	07.03.23
0	ISSUED FOR 70% REVIEW	07.01.17

Scales

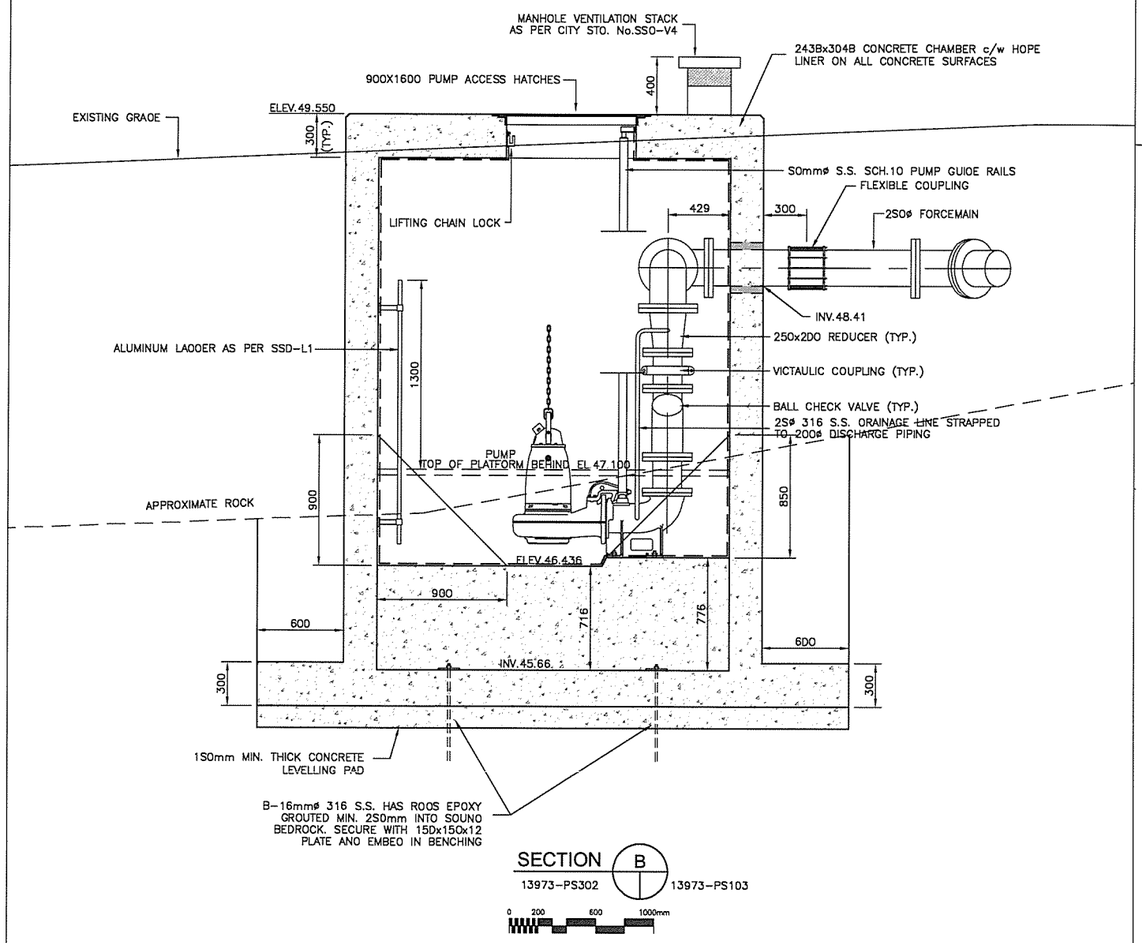
DRAWING TITLE:

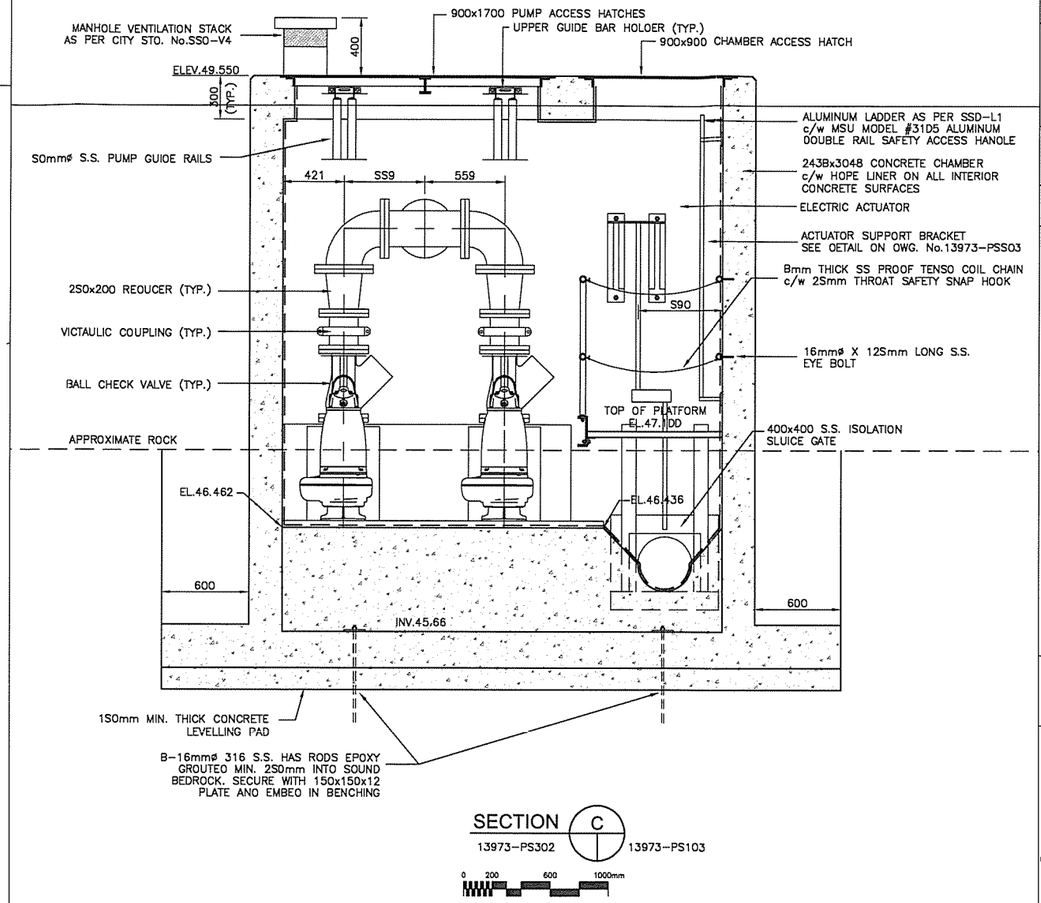
FLEET STREET PUMPING STATION ELECTRICAL UPGRADE AND CONSTRUCTION OF LEBRETON FLATS SANITARY PUMPING STATION
CONTRACT No.ISB06-2021

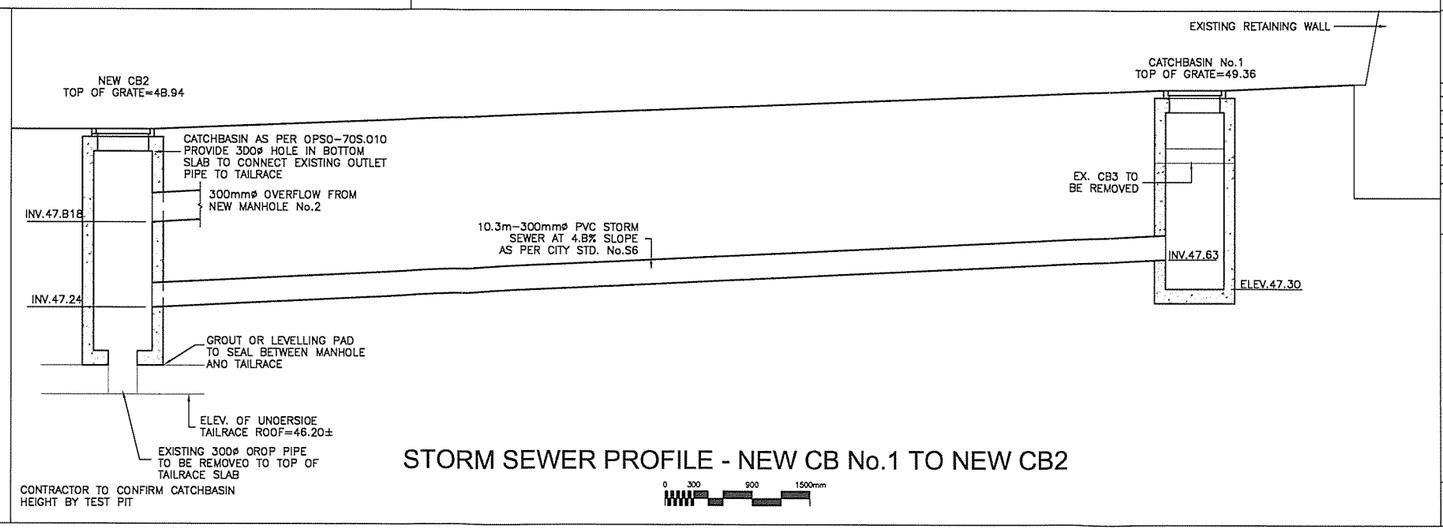
SECTION A-A
FROST STRAP DETAIL
OVERFLOW SEWER PROFILE MH No.2 TO NEW CB2

Drawing No.: 13973-PS301

Rev. No.: 3







Ottawa

PUBLIC WORKS AND SERVICES DEPARTMENT

UTILITY SERVICES BRANCH

R.G. Hewitt, P.Eng.
Deputy City Manager

Approved by:
Name: B. Byce
Signed:
Date:
Stamp (if applicable)

Designed by:
Name: J. Ricker
Signed:
Date:

Drawn by:
Name: E. Colberry
Date: 06.11.01

NOTES:

As Built Drawing

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No.	Revision	Date
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0	ISSUED FOR FINAL REVIEW	08.04.15
0	ISSUED FOR 90% REVIEW	07.03.23
0	ISSUED FOR 70% REVIEW	07.01.17

Scales 0 200 600 1000mm

DRAWING TITLE:

FLEET STREET PUMPING STATION ELECTRICAL UPGRADE AND CONSTRUCTION OF LEBRETON FLATS SANITARY PUMPING STATION
CONTRACT No.ISB06-2021

SECTION B-B
SECTION C-C
STORM SEWER PROFILE
NEW CB1 TO NEW CB2

Drawing No.: 13973-PS302

Rev. No.: 3

APPENDIX E

Water Demand Data

EAST FLATS DEVELOPMENT
WATER DEMAND

Number Residential Units	350	
Persons per Unit	1.8	
Total Population	630	
Average Day Demand	350	L/c/day
Residential Average Day Demand	2.55	L/s
Residential Maximum Day Demand (2.5 x avg. day)	6.38	L/s
Residential Peak Hour Demand (2.2 x avg. day)	14.04	L/s
Retail Area	2,000	m^2
Average Day Demand	5.0	$L/m^2/day$
Retail Average Day Demand	0.12	L/s
Retail Maximum Day Demand (1.5 x avg. day)	0.17	L/s
Retail Peak Hour Demand (1.8 x avg. day)	0.31	L/s
Institutional Area	4,000	m^2
Average Day Demand	2.8	$L/m^2/day$
Institutional Average Day Demand	0.13	L/s
Institutional Maximum Day Demand (1.5 x avg. day)	0.19	L/s
Institutional Peak Hour Demand (1.8 x avg. day)	0.35	L/s
Total Average Day Demand	**2.80**	**L/s**
Total Maximum Day Demand (2.5 x avg. day)	**6.75**	**L/s**
Total Peak Hour Demand (2.2 x avg. day)	**14.70**	**L/s**

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 116042
Project Name: East Flats Development
Date: 4/27/2018
Input By: Miroslav Savic
Reviewed By:

Legend: Input by User; No Information or Input Required

Building Description: 30 Storey Mixed Use Building
Fire Resistive Construction

Step			Choose	Multiplier Options	Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**					
	Coefficient related to type of construction C	Wood frame		1.5	0.7	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Fire resistive construction (< 3 hrs)	Yes	0.7		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Podium Level Footprint (m^2)	5170			
		Total Floors/Storeys (Podium)	2			
		Tower Footprint (m^2)	1720			
		Total Floors/Storeys (Tower)	30			
		Protected Openings (1 hr)	Yes			
		Area of structure considered (m^2)			6,893	
	F	**Base fire flow without reductions**				**13,000**
		$F = 220\ C\ (A)^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**					
	(1)	Non-combustible		-25%	-15%	**11,050**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**					
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-5,525**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Total	**-50%**	
5	**Exposure Surcharge (cumulative %)**					
	(3)	North Side	> 45.1m		0%	**1,105**
		East Side	> 45.1m		0%	
		South Side	> 45.1m		0%	
		West Side	20.1 - 30 m		10%	
				Cumulative Total	**10%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			L/min	**7,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**117**
				or	USGPM	1,849
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2
		Required Volume of Fire Flow (m^3)			m^3	840

Please refer to Guidelines and Technical bulletin ISDTB-2014-02 concerning basic day demands greater than 0.5 L/s.

The following are boundary conditions, HGL, for hydraulic analysis at 133 Booth (zone 1W) assumed to be connected to the 406mm on Lloyd (see attached PDF for location).

Minimum HGL = 107.7m

Maximum HGL = 115.2m; the maximum pressure is estimated to be above 80 psi. A pressure check at completion of construction is recommended to determine if pressure control is required

Max Day + Fire Flow (117 L/s) = 108.5m

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.

Abdul Mottalib, P. Eng.

From: Miro Savic <m.savic@novatech-eng.com>
Sent: May 01, 2018 3:22 PM
To: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Cc: Greg MacDonald <g.Macdonald@novatech-eng.com>
Subject: East Flats Development - Boundary Conditions

Abdul,

Please provide water boundary conditions for the proposed development located at LeBreton Flats (133 Booth Street). The proposed development consists of two residentials towers (10 storey and 30 storey) and a 2 storey podium. The development will include approximately 350 residential units, 2,000 m^2 retail space, and 4,000 m^2 institutional space. Refer to the attached Conceptual Site Plan.

The water service is proposed to be connected to the existing 406mm diameter watermain in Lloyd Street. Refer to the attached sketch for the approximate connection location.

The water demands are estimated as follows:
Average Day Demand = 2.8 L/s
Maximum Day Demand = 6.75 L/s
Peak Hour Demand = 14.7 L/s
Fire Flow Demand (calculated using the Fire Underwriters Survey) = 117 L/s (7,000 L/min).

The water demand calculations are attached for your reference.

Regards,

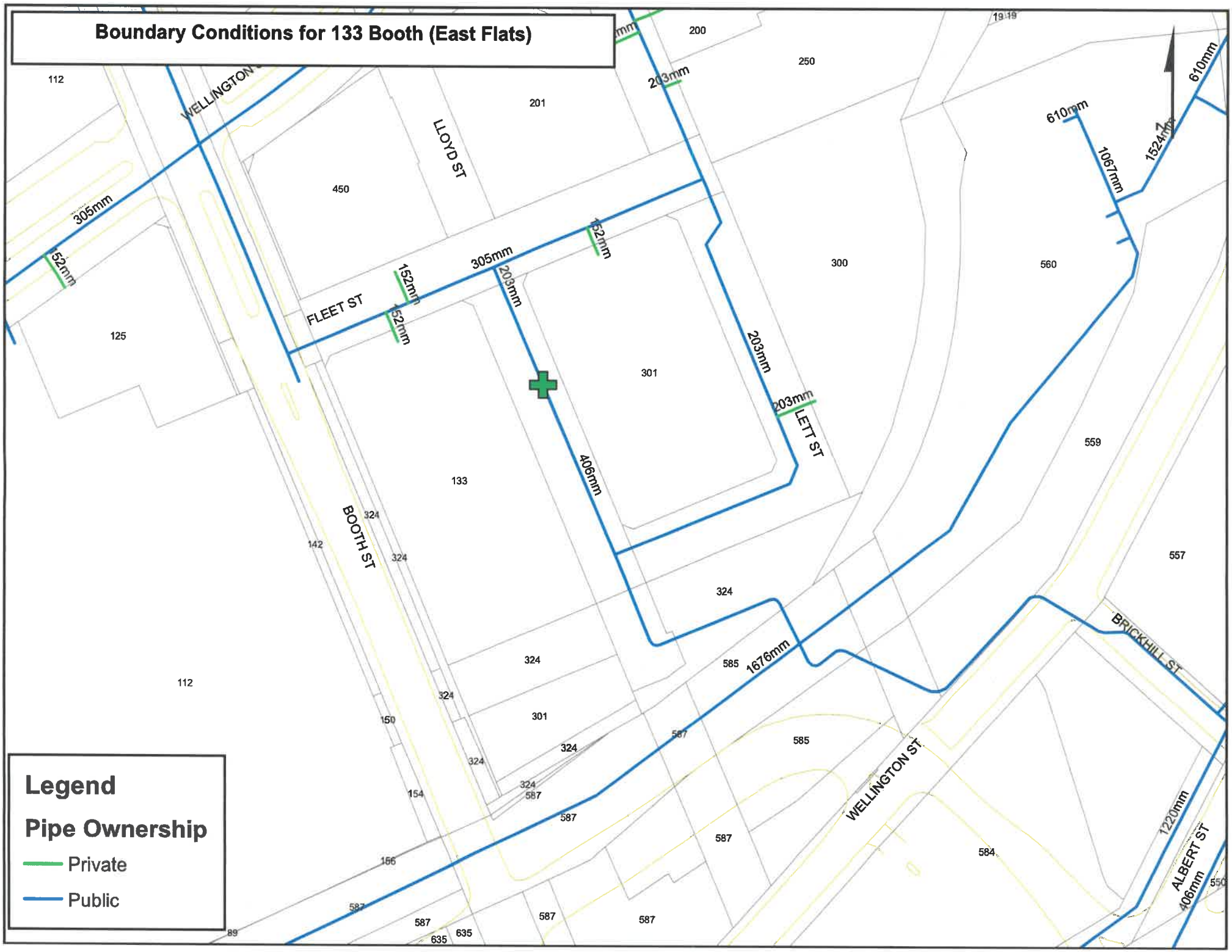

Boundary Conditions for 133 Booth (East Flats)
WELLINGTON
LLOYD ST
FLEET ST
BOOTH ST
LETT ST
WELLINGTON ST
BRICKHILL ST
ALBERT ST
305mm
152mm
203mm
406mm
610mm
1067mm
1524mm
1676mm
1220mm
112
125
133
142
150
154
156
200
201
250
300
301
324
450
557
559
560
584
585
587
635
Legend
Pipe Ownership
Private
Public

Table 10.10.2.1.3 Flow Required to Produce a Velocity of 10 ft/sec (3 m/sec) in Pipes

Pipe Size		Flow Rate	
in.	mm	gpm	L/min
2	51	100	379
2½	63	150	568
3	76	220	833
4	102	390	1,476
5	127	610	2,309
6	152	880	3,331
8	203	1,560	5,905
10	254	2,440	9,235
12	305	3,520	13,323

[**24:** Table 10.10.2.1.3]

Table 10.10.2.2.6 Hydrostatic Testing Allowance at 200 psi (gph/100 ft of Pipe)

Nominal Pipe Diameter (in.)	Testing Allowance
2	0.019
4	0.038
6	0.057
8	0.076
10	0.096
12	0.115
14	0.134
16	0.153
18	0.172
20	0.191
24	0.229

Notes:
(1) For other length, diameters, and pressures, utilize Equation 10.10.2.2.6(a) or 10.10.2.2.6(b) to determine the appropriate testing allowance.
(2) For test sections that contain various sizes and sections of pipe, the testing allowance is the sum of the testing allowances for each size and section.
[**24:** Table 10.10.2.2.6]

Chapter 11 Design Approaches

11.1 General. The requirements of Section 11.1 shall apply to all sprinkler systems unless modified by a specific section of Chapter 11 or Chapter 12.

11.1.1 A building or portion thereof shall be permitted to be protected in accordance with any applicable design approach at the discretion of the designer.

11.1.2* Adjacent Hazards or Design Methods. For buildings with two or more adjacent hazards or design methods, the following shall apply:

(1) Where areas are not physically separated hy a barrier or partition capable of delaying heat from a fire in one area from fusing sprinklers in the adjacent area, the required sprinkler protection for the more demanding design basis shall extend 15 ft (4.6 m) beyond its perimeter.
(2) The requirements of 11.1.2(1) shall not apply where the areas are separated by a barrier partition that is capable of preventing heat from a fire in one area from fusing sprinklers in the adjacent area.
(3) The requirements of 11.1.2(1) shall not apply to the extension of more demanding criteria from an upper ceiling level to beneath a lower ceiling level where the difference in height between the ceiling levels is at least 2 ft (0.6 m).

11.1.3 For hydraulically calculated systems, the total system water supply requirements for each design basis shall be determined in accordance with the procedures of Section 23.4 unless modified by a section of Chapter 11 or Chapter 12.

11.1.4 Water Demand.

11.1.4.1* The water demand requirements shall be determined from the following:

(1) Occupancy hazard fire control approach and special design approaches of Chapter 11
(2) Storage design approaches of Chapter 12 through Chapter 20
(3) Special occupancy approaches of Chapter 22

11.1.4.2* The minimum water demand requirements for a sprinkler system shall be determined hy adding the hose stream allowance to the water demand for sprinklers.

11.1.5 Water Supplies.

11.1.5.1 The minimum water supply shall be available for the minimum duration specified in Chapter 11.

11.1.5.2* Tanks shall be sized to supply the equipment that they serve.

11.1.5.3* Pumps shall be sized to supply the equipment that they serve.

11.1.6 Hose Allowance.

11.1.6.1 Systems with Multiple Hazard Classifications. For systems with multiple hazard classifications, the hose stream allowance and water supply duration shall be in accordance with one of the following:

(1) The water supply requirements for the highest hazard classification within the system shall be used.
(2) The water supply requirements for each individual hazard classification shall he used in the calculations for the design area for that hazard.
(3)*For systems with multiple hazard classifications where the higher classification only lies within single rooms less than or equal to 400 ft^2 (37.2 m^2) in area with no such rooms adjacent, the water supply requirements for the principal occupancy shall be used for the remainder of the system.

11.1.6.2* Water allowance for outside hose shall he added to the sprinkler requirement at the connection to the city main or a private fire hydrant, whichever is closer to the system riser.

11.1.6.3 Where inside hose connections are planned or are required, the following shall apply:

(1) A total water allowance of 50 gpm (189 L/min) for a single hose connection installation shall be added to the sprinkler requirements.
(2) A total water allowance of 100 gpm (379 L/min) for a multiple hose connection installation shall be added to the sprinkler requirements.

(3) The water allowance shall be added in 50 gpm (189 L/min) increments beginning at the most remote hose connection, with each increment added at the pressure required by the sprinkler system design at that point.

11.1.6.4* When hose valves for fire department use are attached to wet pipe sprinkler system risers in accordance with 8.17.5.2, the following shall apply:

(1) The sprinkler system demand shall not be required to he added to standpipe demand as determined from NFPA 14.
(2) Where the combined sprinkler system demand and hose stream allowance of Table 11.2.3.1.2 exceeds the requirements of NFPA 14, this higher demand shall be used.
(3) For partially sprinklered buildings, the sprinkler demand, not including hose stream allowance, as indicated in Figure 11.2.3.1.1 shall be added to the requirements given in NFPA 14.

11.1.7* High Volume Low Speed (HVLS) Fans. The installation of HVLS fans in buildings equipped with sprinklers, including ESFR sprinklers, shall comply with the following:

(1) The maximum fan diameter shall be 24 ft (7.3 m).
(2) The HVLS fan shall be centered approximately between four adjacent sprinklers.
(3) The vertical clearance from the HVLS fan to sprinkler deflector shall be a minimum of 3 ft (0.9 m).
(4) All HVLS fans shall be interlocked to shut down immediately upon receiving a waterflow signal from the alarm system in accordance with the requirements of *NFPA 72*.

11.2 Occupancy Hazard Fire Control Approach for Spray Sprinklers.

11.2.1 General.

11.2.1.1* The water demand requirements shall be determined by either the pipe schedule method in accordance with 11.2.2 or the hydraulic calculation method in accordance with 11.2.3.

11.2.1.2 Occupancy Classifications.

11.2.1.2.1 Occupancy classifications for this standard shall relate to sprinkler installations and their water supplies only.

11.2.1.2.2 Occupancy classifications shall not be used as a general classification of occupancy hazards.

11.2.1.2.3 Occupancies or portions of occupancies shall be classified according to the quantity and combustibility of contents, the expected rates of heat release, the total potential for energy release, the heights of stockpiles, and the presence of flammable and combustible liquids, using the definitions contained in Section 5.2 through Section 5.5.

11.2.1.2.4 Classifications shall be as follows:

(1) Light hazard
(2) Ordinary hazard (Groups 1 and 2)
(3) Extra hazard (Groups 1 and 2)
(4) Special occupancy hazard *(see Chapter 22)*

11.2.2 Water Demand Requirements — Pipe Schedule Method.

11.2.2.1 Table 11.2.2.1 shall be used in determining the minimum water supply requirements for light and ordinary hazard occupancies protected by systems with pipe sized according to the pipe schedules of Section 23.5.

11.2.2.2 Pressure and flow requirements for extra hazard occupancies shall be based on the hydraulic calculation methods of 11.2.3.

Table 11.2.2.1 Water Supply Requirements for Pipe Schedule Sprinkler Systems

Occupancy Classification	Minimum Residual Pressure Required		Acceptable Flow at Base of Riser (Including Hose Stream Allowance)		Duration (minutes)
	psi	bar	gpm	L/min	
Light hazard	15	1	500–750	1893–2839	30–60
Ordinary hazard	20	1.4	850–1500	3218–5678	60–90

11.2.2.3 The pipe schedule method shall be permitted as follows:

(1) Additions or modifications to existing pipe schedule systems sized according to the pipe schedules of Section 23.5
(2) Additions or modifications to existing extra hazard pipe schedule systems
(3) New systems of 5000 ft^2 (465 m^2) or less
(4) New systems exceeding 5000 ft^2 (465 m^2) where the flows required in Table 11.2.2.1 are available at a minimum residual pressure of 50 psi (3.4 bar) at the highest elevation of sprinkler

11.2.2.4 Table 11.2.2.1 shall be used in determining the minimum water supply requirements.

11.2.2.5 The lower duration value of Table 11.2.2.1 shall be acceptable only where the sprinkler system waterflow alarm device(s) and supervisory device(s) are electrically supervised and such supervision is monitored at an approved, constantly attended location.

11.2.2.6* Residual Pressure.

11.2.2.6.1 The residual pressure requirement of Table 11.2.2.1 shall be met at the elevation of the highest sprinkler.

11.2.2.6.2 Friction Loss Due to Backflow Prevention Valves.

11.2.2.6.2.1 When backflow prevention valves are installed on pipe schedule systems, the friction losses of the device shall be accounted for when determining acceptable residual pressure at the top level of sprinklers.

11.2.2.6.2.2 The friction loss of this device [in psi (bar)] shall he added to the elevation loss and the residual pressure at the top row of sprinklers to determine the total pressure needed at the water supply.

11.2.2.7 The lower flow figure of Table 11.2.2.1 shall be permitted only where the building is of noncombustible construction or the potential areas of fire are limited by building size or compartmentation such that no open areas exceed 3000 ft^2 (279 m^2) for light hazard or 4000 ft^2 (372 m^2) for ordinary hazard.

11.2.3 Water Demand Requirements — Hydraulic Calculation Methods.

11.2.3.1 General.

11.2.3.1.1 The water demand for sprinklers shall he determined only from one of the following, at the discretion of the designer:

(1) Density/area curves of Figure 11.2.3.1.1 in accordance with the density/area method of 11.2.3.2

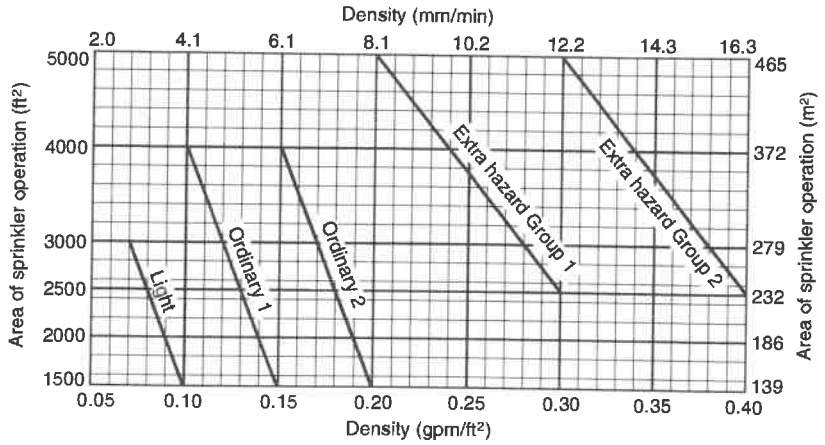


FIGURE 11.2.3.1.1 Density/Area Curves.

(2) The room that creates the greatest demand in accordance with the room design method of 11.2.3.3
(3) Special design areas in accordance with 11.2.3.4

11.2.3.1.2 The minimum water supply shall be available for the minimum duration specified in Table 11.2.3.1.2.

11.2.3.1.3 The lower duration values in Table 11.2.3.1.2 shall be permitted where the sprinkler system waterflow alarm device(s) and supervisory device(s) are electrically supervised and such supervision is monitored at an approved, constantly attended location.

11.2.3.1.4 Restrictions. When either the density/area method or room design method is used, the following shall apply:

(1)*For areas of sprinkler operation less than 1500 ft² (139 m²) used for light and ordinary hazard occupancies, the density for 1500 ft² (139 m²) shall be used.
(2) For areas of sprinkler operation less than 2500 ft² (232 m²) for extra hazard occupancies, the density for 2500 ft² (232 m²) shall be used.
(3)*Unless the requirements of 11.2.3.1.4(4) are met for buildings having unsprinklered combustible concealed spaces, as described in 8.15.1.2 and 8.15.6, the minimum area of sprinkler operation for that portion of the building shall be 3000 ft² (279 m²). The design area of 3000 ft² (279 m²) shall be applied only to the sprinkler system or portions of the sprinkler system that are adjacent to the qualifying combustible concealed space. The term *adjacent* shall apply to any sprinkler system protecting a space above, below, or next to the qualifying concealed space except where a barrier with a fire resistance rating at least equivalent to the water supply duration completely separates the concealed space from the sprinklered area.
(4) The following unsprinklered concealed spaces shall not require a minimum area of sprinkler operation of 3000 ft² (279 m²):
  (a) Noncombustible and limited-combustible concealed spaces with minimal combustible loading having no access. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.
  (b) Noncombustible and limited-combustible concealed spaces with limited access and not permitting occupancy or storage of combustibles. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.
  (c) Combustible concealed spaces filled entirely with noncombustible insulation.
  (d)*Light or ordinary hazard occupancies where noncombustible or limited-combustible ceilings are directly attached to the bottom of solid wood joists or solid limited-combustible construction or noncombustible construction so as to create enclosed joist spaces 160 ft³ (4.5 m³) or less in volume, including space below insulation that is laid directly on top or within the ceiling joists in an otherwise sprinklered concealed space.
  (e) Concealed spaces where rigid materials are used and the exposed surfaces have a flame spread index of 25 or less and the materials have been demonstrated to not propagate fire more than 10.5 ft (3.2 m) when tested in accordance with ASTM E 84, *Standard Test Method of Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, extended for an additional 20 minutes in the form in which they are installed in the space.

Table 11.2.3.1.2 Hose Stream Allowance and Water Supply Duration Requirements for Hydraulically Calculated Systems

Occupancy	Inside Hose		Total Combined Inside and Outside Hose		Duration (minutes)
	gpm	L/min	gpm	L/min	
Light hazard	0, 50, or 100	0, 189, or 379	100	379	30
Ordinary hazard	0, 50, or 100	0, 189, or 379	250	946	60–90
Extra hazard	0, 50, or 100	0, 189, or 379	500	1893	90–120

(f) Concealed spaces in which the exposed materials are constructed entirely of fire-retardant treated wood as defined by NFPA 703.
(g) Concealed spaces over isolated small rooms not exceeding 55 ft^2 (5.1 m^2) in area.
(h) Vertical pipe chases under 10 ft^2 (0.93 m^2), provided that in multifloor buildings the chases are firestopped at each floor using materials equivalent to the floor construction, and where such pipe chases shall contain no sources of ignition, piping shall he noncombustible, and pipe penetrations at each floor shall be properly sealed.
(i) Exterior columns under 10 ft^2 (0.93 m^2) in area formed by studs or wood joists, supporting exterior canopies that are fully protected with a sprinkler system.
(j) *Light or ordinary hazard occupancies where noncombustihle or limited-combustible ceilings are attached to the bottom of composite wood joists either directly or on to metal channels not exceeding 1 in. (25.4 mm) in depth, provided the adjacent joist channels are firestopped into volumes not exceeding 160 ft^3 (4.5 m^3) using materials equivalent to ½ in. (12.7 mm) gypsum board and at least 3½ in. (90 mm) of batt insulation is installed at the bottom of the joist channels when the ceiling is attached utilizing metal channels.

11.2.3.2 Density/Area Method.

11.2.3.2.1 Water Supply.

11.2.3.2.1.1 The water supply requirement for sprinklers only shall be calculated from tbe density/area curves of Figure 11.2.3.1.1 or from Chapter 22 where density/area criteria are specified for special occupancy hazards.

11.2.3.2.1.2 When using Figure 11.2.3.1.1, the calculations shall satisfy any single point on the appropriate density/area curve.

11.2.3.2.1.3 When using Figure 11.2.3.1.1, it shall not be necessary to meet all points on the selected curves.

11.2.3.2.2 Sprinklers.

11.2.3.2.2.1 The densities and areas provided in Figure 11.2.3.1.1 shall be for use only with spray sprinklers.

11.2.3.2.2.2 Quick-response sprinklers shall not be permitted for use in extra hazard occupancies or other occupancies where there are substantial amounts of flammable liquids or combustible dusts.

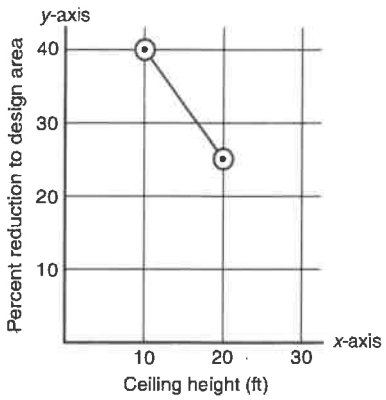
11.2.3.2.2.3 For extended coverage sprinklers, the minimum design area shall be that corresponding to the hazard in Figure 11.2.3.1.1 or the area protected by five sprinklers, whichever is greater.

11.2.3.2.2.4 Extended coverage sprinklers shall be listed with and designed for the minimum flow corresponding to the density for the hazard as specified in Figure 11.2.3.1.1.

11.2.3.2.3 Quick-Response Sprinklers.

11.2.3.2.3.1 Where listed quick-response sprinklers, including extended coverage quick-response sprinklers, are used throughout a system or portion of a system having the same hydraulic design hasis, the system area of operation shall be permitted to be reduced without revising the density as indicated in Figure 11.2.3.2.3.1 when all of the following conditions are satisfied:

(1) Wet pipe system
(2) Light hazard or ordinary hazard occupancy
(3) 20 ft (6.1 m) maximum ceiling heigbt
(4) There are no unprotected ceiling pockets as allowed by 8.6.7 and 8.8.7 exceeding 32 ft^2 (3 m^2)



Note: $y = \frac{-3x}{2} + 55$

For ceiling height ≥10 ft and ≤20 ft, $y = \frac{-3x}{2} + 55$
For ceiling height <10 ft, $y = 40$
For ceiling height >20, $y = 0$
For SI units, 1 ft = 0.31 m.

FIGURE 11.2.3.2.3.1 Design Area Reduction for Quick-Response Sprinklers.

11.2.3.2.3.2 The number of sprinklers in the design area shall never be less than five.

11.2.3.2.3.3 Where quick-response sprinklers are used on a sloped ceiling or roof, the maximum ceiling or roof height shall he used for determining the percent reduction in design area.

11.2.3.2.4 Sloped Ceilings. The system area of operation shall be increased by 30 percent without revising the density when the following types of sprinklers are used on sloped ceilings with a pitch exceeding 1 in 6 (a rise of 2 units in a run of 12 units, a roof slope of 16.7 percent) in nonstorage applications:

(1) Spray sprinklers, including extended coverage sprinklers listed in accordance with 8.4.3(4), and quick-response sprinklers
(2) CMSA sprinklers

11.2.3.2.5* Dry Pipe and Double Interlock Preaction Systems. For dry pipe systems and double interlock preaction systems, the area of sprinkler operation shall be increased by 30 percent without revising the density.

11.2.3.2.6 High-Temperature Sprinklers. Where high-temperature sprinklers are used for extra hazard occupancies, the area of sprinkler operation shall be permitted to be reduced by 25 percent without revising the density, but not to less than 2000 ft^2 (186 m^2).

11.2.3.2.7* Multiple Adjustments.

11.2.3.2.7.1 Where multiple adjustments to the area of operation are required to be made in accordance with 11.2.3.2.3, 11.2.3.2.4, 11.2.3.2.5, or 11.2.3.2.6, these adjustments shall be

APPENDIX F

Servicing Study Guidelines Checklist

Development Servicing Study Checklist

4.1 General Content	Addressed (Y/N/NA)	Section	Comments
Executive Summary (for larger reports only).	NA		
Date and revision number of the report.	Y	Cover	
Location map and plan showing municipal address, boundary, and layout of proposed development.	Y	Fig 1	Municipal address not included
Plan showing the site and location of all existing services.	Y	Fig 3	
Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	NA		
Summary of Pre-consultation Meetings with City and other approval agencies.	NA		
Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	Y	2,3,4	
Statement of objectives and servicing criteria.	Y	1	
Identification of existing and proposed infrastructure available in the immediate area.	Y	Fig 3	
Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	N		Section 3 discusses the area has already received MOE approval
Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighboring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	NA		

Development Servicing Study Checklist

4.1 General Content	Addressed (Y/N/NA)	Section	Comments
Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	NA		
Proposed phasing of the development, if applicable.	Y	1	
Reference to geotechnical studies and recommendations concerning servicing.	NA		
All preliminary and formal site plan submissions should have the following information:			
Metric scale	Y		As indicated on the drawings and figures
North arrow (including construction North)	Y		
Key plan	Y	Fig 1	
Name and contact information of applicant and property owner	Y	1	
Property limits including bearings and dimensions	N		To be included on detailed design drawings
Existing and proposed structures and	Y	Fig 3	
Easements, road widening and rights-of-way	N		To be included on detailed design drawings
Adjacent street names	Y	Fig 1	

Development Servicing Study Checklist

4.2 Water	Addressed (Y/N/NA)	Section	Comments
Confirm consistency with Master Servicing Study, if available.	NA		
Availability of public infrastructure to service proposed development.	Y	4	
Identification of system constraints.	NA		
Identify boundary conditions.	NA		
Confirmation of adequate domestic supply and pressure.	Y	4	
Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Y	4	
Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	NA		
Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design.	NA		
Address reliability requirements such as appropriate location of shut-off valves.	NA		
Check on the necessity of a pressure zone boundary modification.	NA		
Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range.	y	4	
Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	NA		
Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	NA		
Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Y	4	
Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	NA		

Development Servicing Study Checklist

4.3 Wastewater	Addressed (Y/N/NA)	Section	Comments
Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed	Y	2	
Confirm consistency with Master Servicing Study and/or justifications for deviations.	Y	2	
Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N		
Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Y	2	
Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	Y	2	
Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	NA		
Description of proposed sewer network including sewers, pumping stations, and forcemains.	Y	2	
Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	NA		
Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	Y	2	
Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	NA		
Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	NA		
Special considerations such as contamination, corrosive environment etc.	NA		

Development Servicing Study Checklist

4.4 Stormwater	Addressed (Y/N/NA)	Section	Comments
Description of drainage outlets and downstream constraints including legality of outlet (i.e. municipal drain, right-of-way, watercourse, or private property).	Y	3	
Analysis of the available capacity in existing public infrastructure.	Y	3	
A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns and proposed drainage patterns.	Y	Fig 4	
Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Y	3	
Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Y	3	
Description of stormwater management concept with facility locations and descriptions with references and supporting information.	Y	3	
Set-back from private sewage disposal systems.	NA		
Watercourse and hazard lands setbacks.	NA		
Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	NA		
Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	Y	3	
Storage requirements (complete with calcs) and conveyance capacity for 5 yr and 100 yr events.	NA		
Identification of watercourse within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	NA		
Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	NA		
Any proposed diversion of drainage catchment areas from one outlet to another.	NA		
Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and SWM	Y	3	
If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	NA		

Development Servicing Study Checklist

4.4 Stormwater	**Addressed (Y/N/NA)**	**Section**	**Comments**
Identification of municipal drains and related approval requirements.	NA		
Description of how the conveyance and storage capacity will be achieved for the development.	Y	3	
100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	NA		
Inclusion of hydraulic analysis including HGL elevations.	NA		
Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Y	3	
Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	NA		
Identification of fill constrains related to floodplain and geotechnical investigation.	NA		

Development Servicing Study Checklist

4.5 Approval and Permit Requirements	Addressed (Y/N/NA)	Section	Comments
Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	NA		
Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	NA		
Changes to Municipal Drains.	NA		
Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	NA		
4.6 Conclusion	**Addressed (Y/N/NA)**	**Section**	**Comments**
Clearly stated conclusions and recommendations.	Y	5	
Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	NA		
All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario.	Y	5	

APPENDIX G

Stormwater Calculations

Runoff Coefficients

Drainage Area	Total Area (m^2)	Hard Surface Area		Grass Area		5-Year Runoff Coefficient	100-Year Runoff Coefficient
		Area (m^2)	C	Area (m^2)	C		
R-01	81.3	81.3	0.95	0.0	0.20	0.95	1.00
R-02	111.0	111.0	0.95	0.0	0.20	0.95	1.00
R-03	69.4	69.4	0.95	0.0	0.20	0.95	1.00
R-04	47.1	47.1	0.95	0.0	0.20	0.95	1.00
R-05	115.7	115.7	0.95	0.0	0.20	0.95	1.00
R-06	140.5	140.5	0.95	0.0	0.20	0.95	1.00
R-07	68.1	68.1	0.95	0.0	0.20	0.95	1.00
R-08	122.0	122.0	0.95	0.0	0.20	0.95	1.00
R-09	17.6	17.6	0.95	0.0	0.20	0.95	1.00
R-10	762.0	762.0	0.95	0.0	0.20	0.95	1.00
R-11	81.3	81.3	0.95	0.0	0.20	0.95	1.00
R-12	111.0	111.0	0.95	0.0	0.20	0.95	1.00
R-13	69.4	69.4	0.95	0.0	0.20	0.95	1.00
R-14	47.1	47.1	0.95	0.0	0.20	0.95	1.00
R-15	115.7	115.7	0.95	0.0	0.20	0.95	1.00
R-16	140.5	140.5	0.95	0.0	0.20	0.95	1.00
R-17	68.1	68.1	0.95	0.0	0.20	0.95	1.00
R-18	122.0	122.0	0.95	0.0	0.20	0.95	1.00
R-19	17.6	17.6	0.95	0.0	0.20	0.95	1.00
R-20	1048.0	1048.0	0.95	0.0	0.20	0.95	1.00
A-01	88.8	88.8	0.95	0.0	0.20	0.95	1.00
A-02	886.6	886.6	0.95	0.0	0.20	0.95	1.00
A-03	139.2	139.2	0.95	0.0	0.20	0.95	1.00
A-04	424.8	424.8	0.90	0.0	0.20	0.90	1.00
A-05	317.0	317.0	0.90	0.0	0.20	0.90	1.00
Total	**5211.90**	**5211.9**	**0.94**	**0.0**	**0.20**	**0.94**	**1.00**

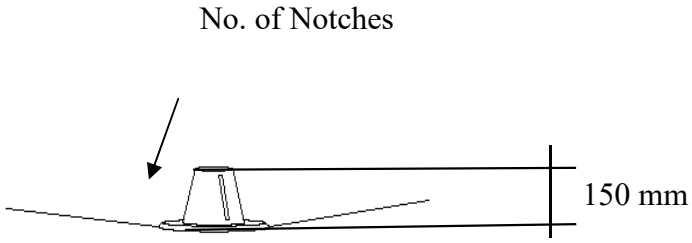
Zurn Roof Drains

Opening	G.P.M. Per Inch of Head	L.P.M. Per Inch (25 mm) of Head	L/s Per Metre of Head	L/s Per 0.15 m of Head
Standard - X1	5.00	22.730	14.915	2.237
Reduced - X2	3.75	17.048	11.186	1.678
Reduced - X3	2.50	11.365	7.458	1.119
Max Reduced - X4	1.25	5.683	3.729	0.559

SAMPLE CALCULATION:

AREA R-01

Number of notches (N) = 1
Head (H) = 0.110 m for 5-year event
Head (H) = 0.141 m for 100-year event



$Q_{5\ all}$ = 3.729 L/s/m/notch x H x N
$Q_{5\ all}$ = 3.729 L/s/m/notch x .11 m x 1 notch
$Q_{5\ all}$ = 0.41 L/s

$Q_{100\ all}$ = 3.729 L/s/m/notch x H x N
$Q_{100\ all}$ = 3.729 L/s/m/notch x .141 m x 1 notch
$Q_{100\ all}$ = 0.52 L/s

Controlled Flow

5 YR

Area No.	Area (ha)	C_{5yr}	Time (min)	intensity mm/hr	Uncontrolled runoff L/s	Control System	Zurn Model Number	Release Rate (L/s/m of head)	Notches	Depth (m)	Controlled Flow (L/s)	Storage available (m^3)	Storage used (m^3)
R-1	0.0081	0.95	10.00	104.19	2.24	Zurn Roof Drain	ZCF121-1W-X4-Z-105-10-	3.73	1	0.110	0.41	3.424	1.35
R-2	0.0111	0.95	10.00	104.19	3.06	Zurn Roof Drain	ZCF121-1W-X4-Z-105-10-	3.73	1	0.113	0.42	4.940	2.11
R-3	0.0069	0.95	10.00	104.19	1.91	Zurn Roof Drain	ZCF121-1W-X4-Z-105-10-	3.73	1	0.107	0.40	2.922	1.07
R-4	0.0047	0.95	10.00	104.19	1.30	Zurn Roof Drain	ZCF121-1W-X4-Z-105-10-	3.73	1	0.098	0.36	2.211	0.62
R-5	0.0116	0.95	10.00	104.19	3.18	Zurn Roof Drain	ZCF121-1W-X4-Z-105-10-	3.73	1	0.112	0.42	5.331	2.23
R-6	0.0140	0.95	10.00	104.19	3.87	Zurn Roof Drain	ZCF121-1W-X4-Z-105-10-	3.73	1	0.114	0.43	6.544	2.91
R-7	0.0068	0.95	10.00	104.19	1.87	Zurn Roof Drain	ZCF121-1W-X4-Z-105-10-	3.73	1	0.104	0.39	3.199	1.06
R-8	0.0122	0.95	10.00	104.19	3.36	Zurn Roof Drain	ZCF121-1W-X4-Z-105-10-	3.73	1	0.113	0.42	5.646	2.41
R-9	0.0018	0.95	10.00	104.19	0.48	Zurn Roof Drain	ZCF121-1W-X4-Z-105-10-	3.73	1	0.080	0.30	0.740	0.11
R-10	0.0762	0.95	10.00	104.19	20.97	Tank	-	#N/A	0	0.000	14.14	0.000	0.00
R-11	0.0081	0.95	10.00	104.19	2.24	Zurn Roof Drain	ZCF121-1W-X4-Z-105-10-	3.73	1	0.110	0.41	3.424	1.35
R-12	0.0111	0.95	10.00	104.19	3.06	Zurn Roof Drain	ZCF121-1W-X4-Z-105-10-	3.73	1	0.113	0.42	4.940	2.11
R-13	0.0069	0.95	10.00	104.19	1.91	Zurn Roof Drain	ZCF121-1W-X4-Z-105-10-	3.73	1	0.107	0.40	2.922	1.07
R-14	0.0047	0.95	10.00	104.19	1.30	Zurn Roof Drain	ZCF121-1W-X4-Z-105-10-	3.73	1	0.098	0.36	2.211	0.62
R-15	0.0116	0.95	10.00	104.19	3.18	Zurn Roof Drain	ZCF121-1W-X4-Z-105-10-	3.73	1	0.112	0.42	5.331	2.23
R-16	0.0140	0.95	10.00	104.19	3.87	Zurn Roof Drain	ZCF121-1W-X4-Z-105-10-	3.73	1	0.114	0.43	6.544	2.91
R-17	0.0068	0.95	10.00	104.19	1.87	Zurn Roof Drain	ZCF121-1W-X4-Z-105-10-	3.73	1	0.104	0.39	3.199	1.06
R-18	0.0122	0.95	10.00	104.19	3.36	Zurn Roof Drain	ZCF121-1W-X4-Z-105-10-	3.73	1	0.113	0.42	5.646	2.41
R-19	0.0018	0.95	10.00	104.19	0.48	Zurn Roof Drain	ZCF121-1W-X4-Z-105-10-	3.73	1	0.080	0.30	0.723	0.11
R-20	0.1048	0.95	10.00	104.19	28.84	Tank	-	#N/A	0	0.000	19.44	0.000	0.00
Roof Storage	**0.1535**	**0.95**	**10.00**	**104.19**	**42.23**	-	-	-	-	-	**40.67**	**70.94**	**27.72**
A-01	0.0089	0.95	10.00	104.19	2.44	Tank	-	-	-	-	-	-	-
A-02	0.0887	0.95	10.00	104.19	24.40	Tank	-	-	-	-	-	-	-
A-03	0.0139	0.95	10.00	104.19	3.83	Tank	-	-	-	-	-	-	-
A-04	0.0425	0.90	10.00	104.19	11.07	no control	-	-	-	-	-	-	-
A-05	0.0317	0.90	10.00	104.19	8.26	no control	-	-	-	-	-	-	-
CB Storage	-	-	-	-	-	-	-	-	-	-	-	-	-
Total:	0.5212				142.78						40.67	69.90	27.72

100 YR

Area ID	Area (ha)	C_{100yr}	Time (min)	intensity mm/hr	Uncontrolled runoff L/s	Control System	Zurn Model Number	Release Rate (L/s/m of head)	Notches	Depth (m)	Controlled Flow (L/s)	Storage available (m^3)	Storage used (m^3)
R-1	0.0081	1.00	10.00	178.56	4.04	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.141	0.52	3.424	2.83
R-2	0.0111	1.00	10.00	178.56	5.51	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.143	0.53	4.940	4.33
R-3	0.0069	1.00	10.00	178.56	3.44	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.138	0.51	2.922	2.27
R-4	0.0047	1.00	10.00	178.56	2.34	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.127	0.47	2.211	1.34
R-5	0.0116	1.00	10.00	178.56	5.74	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.142	0.53	5.331	4.58
R-6	0.0140	1.00	10.00	178.56	6.97	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.145	0.54	6.544	5.92
R-7	0.0068	1.00	10.00	178.56	3.38	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.133	0.50	3.199	2.23
R-8	0.0122	1.00	10.00	178.56	6.05	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.143	0.53	5.646	4.92
R-9	0.0018	1.00	10.00	178.56	0.87	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.109	0.40	0.740	0.28
R-10	0.0762	1.00	10.00	178.56	37.82	Tank	-	#N/A	0	0.000	25.41	0.000	0.00
R-11	0.0081	1.00	10.00	178.56	4.04	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.141	0.52	3.424	2.83
R-12	0.0111	1.00	10.00	178.56	5.51	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.143	0.53	4.940	4.33
R-13	0.0069	1.00	10.00	178.56	3.44	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.138	0.51	2.922	2.27
R-14	0.0047	1.00	10.00	178.56	2.34	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.127	0.47	2.211	1.34
R-15	0.0116	1.00	10.00	178.56	5.74	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.142	0.53	5.331	4.58
R-16	0.0140	1.00	10.00	178.56	6.97	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.145	0.54	6.544	5.92
R-17	0.0068	1.00	10.00	178.56	3.38	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.133	0.50	3.199	2.23
R-18	0.0122	1.00	10.00	178.56	6.05	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.143	0.53	5.646	4.92
R-19	0.0018	1.00	10.00	178.56	0.87	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.109	0.41	0.723	0.28
R-20	0.1048	1.00	10.00	178.56	52.02	Tank	-	#N/A	0	0.000	34.95	0.000	0.00
Roof Storage	**0.1535**	**1.00**	**10.00**	**178.56**	**76.18**	-	-	-	-	-	**69.46**	**69.90**	**57.41**
A-01	0.0089	1.00	10.00	178.56	4.41	Tank	-	-	-	-	-	-	-
A-02	0.0887	1.00	10.00	178.56	44.01	Tank	-	-	-	-	-	-	-
A-03	0.0139	1.00	10.00	178.56	6.91	Tank	-	-	-	-	-	-	-
A-04	0.0425	1.00	10.00	178.56	21.08	no control	-	-	-	-	-	-	-
A-05	0.0317	1.00	10.00	178.56	15.74	no control	-	-	-	-	-	-	-
CB Storage	-	-	-	-	-	-	-	-	-	-	-	-	-
Total:	0.5212				258.72						69.90	69.90	57.41

Note: In all cases, there is only one notch in the Zurn roof drain and and flows through each drain is further reduced with and adjustable weir. See Zurn roof drains sheet and adjustable weir specification for more details on the reduction of flow.

Allowable release rate

Area	0.52	ha
C	0.7	
tc	10	min
i_5	104.19	

Q allowable = 2.78 x C x i x A

105.76 L/s

tank all =	68.94	tank south =	14.61
		tank north =	54.33

REQUIRED STORAGE - 5-YEAR EVENT
AREA R-1 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0081	ha	Qallow =	0.41
C =	0.95		Vol(max) =	1.35
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	3.03	2.62	0.79
10	104.19	2.24	1.83	1.10
15	83.56	1.79	1.38	1.25
20	70.25	1.51	1.10	1.32
25	60.90	1.31	0.90	1.35
30	53.93	1.16	0.75	1.35
35	48.52	1.04	0.63	1.33
40	44.18	0.95	0.54	1.29
45	40.63	0.87	0.46	1.25
50	37.65	0.81	0.40	1.20
55	35.12	0.75	0.34	1.14
60	32.94	0.71	0.30	1.07
65	31.04	0.67	0.26	1.00
70	29.37	0.63	0.22	0.93
75	27.89	0.60	0.19	0.85
80	26.56	0.57	0.16	0.77
85	25.37	0.54	0.13	0.69
90	24.29	0.52	0.11	0.60

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
1	0.01	0.02
3	0.03	0.03
5	0.06	0.04
8	0.13	0.05
11	0.22	0.06
15	0.35	0.07
19	0.52	0.08
25	0.74	0.09
30	1.01	0.10
37	1.35	0.11
44	1.75	0.12
51	2.23	0.13
60	2.78	0.14
68	**3.42**	**0.15**

Linear Interpolation

0.11	H	0.10		H =	0.110 m
1.35	1.35	1.01		Q_{allow} =	0.41 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 100-YEAR EVENT
AREA R-1 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.008	ha	Qallow =	0.52
C =	1.00		Vol(max) =	2.83
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	5.49	4.97	1.49
10	178.56	4.04	3.52	2.11
15	142.89	3.23	2.71	2.44
20	119.95	2.71	2.19	2.63
25	103.85	2.35	1.83	2.74
30	91.87	2.08	1.56	2.80
35	82.58	1.87	1.35	2.83
40	75.15	1.70	1.18	2.83
45	69.05	1.56	1.04	2.81
50	63.95	1.45	0.93	2.78
55	59.62	1.35	0.83	2.73
60	55.89	1.26	0.74	2.68
65	52.65	1.19	0.67	2.61
70	49.79	1.13	0.61	2.54
75	47.26	1.07	0.55	2.47
80	44.99	1.02	0.50	2.39
85	42.95	0.97	0.45	2.30
90	41.11	0.93	0.41	2.21

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
1	0.01	0.02
3	0.03	0.03
5	0.06	0.04
8	0.13	0.05
11	0.22	0.06
15	0.35	0.07
19	0.52	0.08
25	0.74	0.09
30	1.01	0.10
37	1.35	0.11
44	1.75	0.12
51	2.23	0.13
60	2.78	0.14
68	**3.42**	**0.15**

Linear Interpolation

0.15	H	0.14		H =	0.141 m
3.42	2.83	2.78		Q_{allow} =	0.52 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head)

REQUIRED STORAGE - 5-YEAR EVENT
AREA R-2 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0111	ha	Qallow =	0.42
C =	0.95		Vol(max) =	2.11
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	4.14	3.72	1.12
10	104.19	3.06	2.64	1.58
15	83.56	2.45	2.03	1.83
20	70.25	2.06	1.64	1.97
25	60.90	1.79	1.37	2.05
30	53.93	1.58	1.16	2.09
35	48.52	1.42	1.00	2.11
40	44.18	1.30	0.88	2.10
45	40.63	1.19	0.77	2.08
50	37.65	1.10	0.68	2.05
55	35.12	1.03	0.61	2.01
60	32.94	0.97	0.55	1.97
65	31.04	0.91	0.49	1.91
70	29.37	0.86	0.44	1.85
75	27.89	0.82	0.40	1.79
80	26.56	0.78	0.36	1.72
85	25.37	0.74	0.32	1.65
90	24.29	0.71	0.29	1.58

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
7	0.09	0.04
11	0.18	0.05
16	0.32	0.06
22	0.50	0.07
28	0.75	0.08
36	1.07	0.09
44	1.46	0.10
53	1.95	0.11
63	2.53	0.12
74	3.22	0.13
86	4.02	0.14
99	**4.94**	**0.15**

Linear Interpolation

0.12	H	0.11		H =	0.113 m
2.53	2.11	1.95		Q_{allow} =	0.42 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 100-YEAR EVENT
AREA R-2 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.011	ha	Qallow =	0.53
C =	1.00		Vol(max) =	4.33
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	7.49	6.96	2.09
10	178.56	5.51	4.98	2.99
15	142.89	4.41	3.88	3.49
20	119.95	3.70	3.17	3.81
25	103.85	3.21	2.68	4.01
30	91.87	2.84	2.31	4.15
35	82.58	2.55	2.02	4.24
40	75.15	2.32	1.79	4.30
45	69.05	2.13	1.60	4.32
50	63.95	1.97	1.44	4.33
55	59.62	1.84	1.31	4.32
60	55.89	1.73	1.20	4.30
65	52.65	1.63	1.10	4.27
70	49.79	1.54	1.01	4.23
75	47.26	1.46	0.93	4.18
80	44.99	1.39	0.86	4.12
85	42.95	1.33	0.80	4.06
90	41.11	1.27	0.74	3.99

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
7	0.09	0.04
11	0.18	0.05
16	0.32	0.06
22	0.50	0.07
28	0.75	0.08
36	1.07	0.09
44	1.46	0.10
53	1.95	0.11
63	2.53	0.12
74	3.22	0.13
86	4.02	0.14
99	**4.94**	**0.15**

Linear Interpolation

0.15	H	0.14		H =	0.143 m
4.94	4.33	4.02		Q_{allow} =	0.53 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 5-YEAR EVENT
AREA R-3 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0069	ha	Qallow =	0.40
C =	0.95		Vol(max) =	1.07
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	2.59	2.19	0.66
10	104.19	1.91	1.51	0.91
15	83.56	1.53	1.13	1.02
20	70.25	1.29	0.89	1.06
25	60.90	1.12	0.72	1.07
30	53.93	0.99	0.59	1.06
35	48.52	0.89	0.49	1.03
40	44.18	0.81	0.41	0.98
45	40.63	0.74	0.34	0.93
50	37.65	0.69	0.29	0.87
55	35.12	0.64	0.24	0.80
60	32.94	0.60	0.20	0.73
65	31.04	0.57	0.17	0.66
70	29.37	0.54	0.14	0.58
75	27.89	0.51	0.11	0.50
80	26.56	0.49	0.09	0.42
85	25.37	0.46	0.06	0.33
90	24.29	0.45	0.05	0.24

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
1	0.01	0.02
2	0.02	0.03
4	0.06	0.04
6	0.11	0.05
9	0.19	0.06
13	0.30	0.07
17	0.44	0.08
21	0.63	0.09
26	0.87	0.10
31	1.15	0.11
37	1.50	0.12
44	1.90	0.13
51	2.38	0.14
58	**2.92**	**0.15**

Linear Interpolation

0.11	H	0.10		H =	0.107 m
1.15	1.07	0.87		Q_{allow} =	0.40 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 100-YEAR EVENT
AREA R-3 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.007	ha	Qallow =	0.51
C =	1.00		Vol(max) =	2.27
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	4.68	4.17	1.25
10	178.56	3.44	2.93	1.76
15	142.89	2.76	2.25	2.02
20	119.95	2.31	1.80	2.16
25	103.85	2.00	1.49	2.24
30	91.87	1.77	1.26	2.27
35	82.58	1.59	1.08	2.27
40	75.15	1.45	0.94	2.25
45	69.05	1.33	0.82	2.22
50	63.95	1.23	0.72	2.17
55	59.62	1.15	0.64	2.11
60	55.89	1.08	0.57	2.05
65	52.65	1.02	0.51	1.97
70	49.79	0.96	0.45	1.89
75	47.26	0.91	0.40	1.81
80	44.99	0.87	0.36	1.72
85	42.95	0.83	0.32	1.62
90	41.11	0.79	0.28	1.53

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
1	0.01	0.02
2	0.02	0.03
4	0.06	0.04
6	0.11	0.05
9	0.19	0.06
13	0.30	0.07
17	0.44	0.08
21	0.63	0.09
26	0.87	0.10
31	1.15	0.11
37	1.50	0.12
44	1.90	0.13
51	2.38	0.14
58	**2.92**	**0.15**

Linear Interpolation

0.14	H	0.13		H =	0.138 m
2.38	2.27	1.90		Q_{allow} =	0.51 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 5-YEAR EVENT				
AREA R-4 : BUILDING ROOF				
OTTAWA IDF CURVE				
Area = 0.0047 ha			Qallow =	0.36
C = 0.95			Vol(max) =	0.62
			Notches =	1
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	1.76	1.40	0.42
10	104.19	1.30	0.94	0.56
15	83.56	1.04	0.68	0.61
20	70.25	0.87	0.51	0.62
25	60.90	0.76	0.40	0.60
30	53.93	0.67	0.31	0.56
35	48.52	0.60	0.24	0.51
40	44.18	0.55	0.19	0.46
45	40.63	0.51	0.15	0.39
50	37.65	0.47	0.11	0.33
55	35.12	0.44	0.08	0.25
60	32.94	0.41	0.05	0.18
65	31.04	0.39	0.03	0.10
70	29.37	0.37	0.01	0.02
75	27.89	0.35	-0.01	-0.06
80	26.56	0.33	-0.03	-0.14
85	25.37	0.32	-0.04	-0.23
90	24.29	0.30	-0.06	-0.31

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)		
Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
1	0.01	0.02
2	0.02	0.03
3	0.04	0.04
5	0.08	0.05
7	0.14	0.06
10	0.22	0.07
13	0.34	0.08
16	0.48	0.09
20	0.66	0.10
24	0.87	0.11
28	1.13	0.12
33	1.44	0.13
39	1.80	0.14
44	**2.21**	**0.15**

Linear Interpolation					
0.10	H	0.09		H =	0.098 m
0.66	0.62	0.48		Q_{allow} =	0.36 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 100-YEAR EVENT				
AREA R-4 : BUILDING ROOF				
OTTAWA IDF CURVE				
Area = 0.005 ha			Qallow =	0.47
C = 1.00			Vol(max) =	1.34
			Notches =	1
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	3.18	2.71	0.81
10	178.56	2.34	1.87	1.12
15	142.89	1.87	1.40	1.26
20	119.95	1.57	1.10	1.32
25	103.85	1.36	0.89	1.34
30	91.87	1.20	0.73	1.32
35	82.58	1.08	0.61	1.28
40	75.15	0.98	0.51	1.23
45	69.05	0.90	0.43	1.17
50	63.95	0.84	0.37	1.10
55	59.62	0.78	0.31	1.03
60	55.89	0.73	0.26	0.94
65	52.65	0.69	0.22	0.86
70	49.79	0.65	0.18	0.76
75	47.26	0.62	0.15	0.67
80	44.99	0.59	0.12	0.57
85	42.95	0.56	0.09	0.47
90	41.11	0.54	0.07	0.37

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)		
Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
1	0.01	0.02
2	0.02	0.03
3	0.04	0.04
5	0.08	0.05
7	0.14	0.06
10	0.22	0.07
13	0.34	0.08
16	0.48	0.09
20	0.66	0.10
24	0.87	0.11
28	1.13	0.12
33	1.44	0.13
39	1.80	0.14
44	2.21	0.15

Linear Interpolation					
0.13	H	0.12		H =	0.127 m
1.44	1.34	1.13		Q_{allow} =	0.47 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 5-YEAR EVENT				
AREA R-5 : BUILDING ROOF				
OTTAWA IDF CURVE				
Area = 0.0116 ha			Qallow =	0.42
C = 0.95			Vol(max) =	2.23
			Notches =	1
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	4.32	3.90	1.17
10	104.19	3.18	2.76	1.66
15	83.56	2.55	2.13	1.92
20	70.25	2.15	1.73	2.07
25	60.90	1.86	1.44	2.16
30	53.93	1.65	1.23	2.21
35	48.52	1.48	1.06	2.23
40	44.18	1.35	0.93	2.23
45	40.63	1.24	0.82	2.22
50	37.65	1.15	0.73	2.19
55	35.12	1.07	0.65	2.16
60	32.94	1.01	0.59	2.11
65	31.04	0.95	0.53	2.06
70	29.37	0.90	0.48	2.01
75	27.89	0.85	0.43	1.95
80	26.56	0.81	0.39	1.88
85	25.37	0.78	0.36	1.81
90	24.29	0.74	0.32	1.74

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)		
Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
8	0.10	0.04
12	0.20	0.05
17	0.34	0.06
23	0.54	0.07
30	0.81	0.08
38	1.15	0.09
47	1.58	0.10
57	2.10	0.11
68	2.73	0.12
80	3.47	0.13
93	4.33	0.14
107	**5.33**	**0.15**

Linear Interpolation					
0.12	H	0.11		H =	0.112 m
2.73	2.23	2.10		Q_{allow} =	0.42 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 100-YEAR EVENT				
AREA R-5 : BUILDING ROOF				
OTTAWA IDF CURVE				
Area = 0.0116 ha			Qallow =	0.53
C = 1.00			Vol(max) =	4.58
			Notches =	1
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	7.81	7.28	2.18
10	178.56	5.74	5.21	3.13
15	142.89	4.60	4.07	3.66
20	119.95	3.86	3.33	4.00
25	103.85	3.34	2.81	4.22
30	91.87	2.96	2.43	4.37
35	82.58	2.66	2.13	4.47
40	75.15	2.42	1.89	4.53
45	69.05	2.22	1.69	4.57
50	63.95	2.06	1.53	4.58
55	59.62	1.92	1.39	4.58
60	55.89	1.80	1.27	4.57
65	52.65	1.69	1.16	4.54
70	49.79	1.60	1.07	4.50
75	47.26	1.52	0.99	4.46
80	44.99	1.45	0.92	4.40
85	42.95	1.38	0.85	4.35
90	41.11	1.32	0.79	4.28

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)		
Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
8	0.10	0.04
12	0.20	0.05
17	0.34	0.06
23	0.54	0.07
30	0.81	0.08
38	1.15	0.09
47	1.58	0.10
57	2.10	0.11
68	2.73	0.12
80	3.47	0.13
93	4.33	0.14
107	**5.33**	**0.15**

Linear Interpolation					
0.15	H	0.14		H =	0.142 m
5.33	4.58	4.33		Q_{allow} =	0.53 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 5-YEAR EVENT
AREA R-6 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0140	ha	Qallow =	0.43
C =	0.95		Vol(max) =	2.91
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	5.24	4.81	1.44
10	104.19	3.87	3.44	2.06
15	83.56	3.10	2.67	2.40
20	70.25	2.61	2.18	2.61
25	60.90	2.26	1.83	2.74
30	53.93	2.00	1.57	2.83
35	48.52	1.80	1.37	2.88
40	44.18	1.64	1.21	2.90
45	40.63	1.51	1.08	2.91
50	37.65	1.40	0.97	2.90
55	35.12	1.30	0.87	2.88
60	32.94	1.22	0.79	2.85
65	31.04	1.15	0.72	2.82
70	29.37	1.09	0.66	2.77
75	27.89	1.03	0.60	2.72
80	26.56	0.99	0.56	2.67
85	25.37	0.94	0.51	2.61
90	24.29	0.90	0.47	2.54

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
1	0.00	0.01
2	0.02	0.02
5	0.05	0.03
9	0.12	0.04
15	0.24	0.05
21	0.42	0.06
29	0.67	0.07
37	0.99	0.08
47	1.41	0.09
58	1.94	0.10
70	2.58	0.11
84	3.35	0.12
98	4.26	0.13
114	5.32	0.14
131	**6.54**	**0.15**

Linear Interpolation

0.12	H	0.11		H =	0.114 m
3.35	2.91	2.58		Q_{allow} =	0.43 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 100-YEAR EVENT
AREA R-6 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0140	ha	Qallow =	0.54
C =	1.00		Vol(max) =	5.92
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	9.48	8.94	2.68
10	178.56	6.97	6.43	3.86
15	142.89	5.58	5.04	4.54
20	119.95	4.68	4.14	4.97
25	103.85	4.06	3.52	5.27
30	91.87	3.59	3.05	5.49
35	82.58	3.23	2.69	5.64
40	75.15	2.93	2.39	5.75
45	69.05	2.70	2.16	5.82
50	63.95	2.50	1.96	5.87
55	59.62	2.33	1.79	5.90
60	55.89	2.18	1.64	5.92
65	52.65	2.06	1.52	5.91
70	49.79	1.94	1.40	5.90
75	47.26	1.85	1.31	5.88
80	44.99	1.76	1.22	5.84
85	42.95	1.68	1.14	5.80
90	41.11	1.61	1.07	5.75

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
1	0.00	0.01
2	0.02	0.02
5	0.05	0.03
9	0.12	0.04
15	0.24	0.05
21	0.42	0.06
29	0.67	0.07
37	0.99	0.08
47	1.41	0.09
58	1.94	0.10
70	2.58	0.11
84	3.35	0.12
98	4.26	0.13
114	5.32	0.14
131	**6.54**	**0.15**

Linear Interpolation

0.15	H	0.14		H =	0.145 m
6.54	5.92	5.32		Q_{allow} =	0.54 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 5-YEAR EVENT
AREA R-7 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0068	ha	Qallow =	0.39
C =	0.95		Vol(max) =	1.06
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	2.54	2.15	0.65
10	104.19	1.87	1.48	0.89
15	83.56	1.50	1.11	1.00
20	70.25	1.26	0.87	1.05
25	60.90	1.10	0.71	1.06
30	53.93	0.97	0.58	1.04
35	48.52	0.87	0.48	1.01
40	44.18	0.79	0.40	0.97
45	40.63	0.73	0.34	0.92
50	37.65	0.68	0.29	0.86
55	35.12	0.63	0.24	0.80
60	32.94	0.59	0.20	0.73
65	31.04	0.56	0.17	0.66
70	29.37	0.53	0.14	0.58
75	27.89	0.50	0.11	0.50
80	26.56	0.48	0.09	0.42
85	25.37	0.46	0.07	0.34
90	24.29	0.44	0.05	0.25

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
1	0.01	0.02
3	0.03	0.03
5	0.06	0.04
7	0.12	0.05
10	0.20	0.06
14	0.33	0.07
18	0.49	0.08
23	0.69	0.09
28	0.95	0.10
34	1.26	0.11
41	1.64	0.12
48	2.08	0.13
56	2.60	0.14
64	**3.20**	**0.15**

Linear Interpolation

0.11	H	0.10		H =	0.104 m
1.26	1.06	0.95		Q_{allow} =	0.39 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 100-YEAR EVENT
AREA R-7 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0068	ha	Qallow =	0.50
C =	1.00		Vol(max) =	2.23
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	4.60	4.10	1.23
10	178.56	3.38	2.88	1.73
15	142.89	2.71	2.21	1.99
20	119.95	2.27	1.77	2.13
25	103.85	1.97	1.47	2.20
30	91.87	1.74	1.24	2.23
35	82.58	1.56	1.06	2.23
40	75.15	1.42	0.92	2.22
45	69.05	1.31	0.81	2.18
50	63.95	1.21	0.71	2.13
55	59.62	1.13	0.63	2.08
60	55.89	1.06	0.56	2.01
65	52.65	1.00	0.50	1.94
70	49.79	0.94	0.44	1.86
75	47.26	0.89	0.39	1.78
80	44.99	0.85	0.35	1.69
85	42.95	0.81	0.31	1.60
90	41.11	0.78	0.28	1.50

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
1	0.01	0.02
3	0.03	0.03
5	0.06	0.04
7	0.12	0.05
10	0.20	0.06
14	0.33	0.07
18	0.49	0.08
23	0.69	0.09
28	0.95	0.10
34	1.26	0.11
41	1.64	0.12
48	2.08	0.13
56	2.60	0.14
64	**3.20**	**0.15**

Linear Interpolation

0.14	H	0.13		H =	0.133 m
2.60	2.23	2.08		Q_{allow} =	0.50 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 5-YEAR EVENT
AREA R-8 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0122	ha	Qallow =	0.42
C =	0.95		Vol(max) =	2.41
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	4.55	4.13	1.24
10	104.19	3.36	2.94	1.76
15	83.56	2.69	2.27	2.04
20	70.25	2.26	1.84	2.21
25	60.90	1.96	1.54	2.31
30	53.93	1.74	1.32	2.37
35	48.52	1.56	1.14	2.40
40	44.18	1.42	1.00	2.41
45	40.63	1.31	0.89	2.40
50	37.65	1.21	0.79	2.38
55	35.12	1.13	0.71	2.35
60	32.94	1.06	0.64	2.31
65	31.04	1.00	0.58	2.26
70	29.37	0.95	0.53	2.21
75	27.89	0.90	0.48	2.15
80	26.56	0.86	0.44	2.09
85	25.37	0.82	0.40	2.03
90	24.29	0.78	0.36	1.96

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
1	0.00	0.01
2	0.01	0.02
5	0.05	0.03
8	0.11	0.04
13	0.21	0.05
18	0.36	0.06
25	0.57	0.07
32	0.86	0.08
41	1.22	0.09
50	1.67	0.10
61	2.23	0.11
72	2.89	0.12
85	3.68	0.13
98	4.59	0.14
113	**5.65**	**0.15**

Linear Interpolation

0.12	H	0.11		H =	0.113 m
2.89	2.41	2.23		Q_{allow} =	0.42 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 100-YEAR EVENT
AREA R-8 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0122	ha	Qallow =	0.53
C =	1.00		Vol(max) =	4.92
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	8.23	7.70	2.31
10	178.56	6.05	5.52	3.31
15	142.89	4.85	4.32	3.88
20	119.95	4.07	3.54	4.24
25	103.85	3.52	2.99	4.49
30	91.87	3.12	2.59	4.65
35	82.58	2.80	2.27	4.77
40	75.15	2.55	2.02	4.84
45	69.05	2.34	1.81	4.89
50	63.95	2.17	1.64	4.92
55	59.62	2.02	1.49	4.92
60	55.89	1.90	1.37	4.91
65	52.65	1.79	1.26	4.89
70	49.79	1.69	1.16	4.86
75	47.26	1.60	1.07	4.83
80	44.99	1.53	1.00	4.78
85	42.95	1.46	0.93	4.72
90	41.11	1.39	0.86	4.67

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
1	0.00	0.01
2	0.01	0.02
5	0.05	0.03
8	0.11	0.04
13	0.21	0.05
18	0.36	0.06
25	0.57	0.07
32	0.86	0.08
41	1.22	0.09
50	1.67	0.10
61	2.23	0.11
72	2.89	0.12
85	3.68	0.13
98	4.59	0.14
113	**5.65**	**0.15**

Linear Interpolation

0.15	H	0.14		H =	0.143 m
5.65	4.92	4.59		Q_{allow} =	0.53 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 5-YEAR EVENT
AREA R-9 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0018	ha	Qallow =	0.30
C =	0.95		Vol(max) =	0.11
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	0.66	0.36	0.11
10	104.19	0.48	0.18	0.11
15	83.56	0.39	0.09	0.08
20	70.25	0.33	0.03	0.03
25	60.90	0.28	-0.02	-0.03
30	53.93	0.25	-0.05	-0.09
35	48.52	0.23	-0.07	-0.16
40	44.18	0.21	-0.09	-0.23
45	40.63	0.19	-0.11	-0.30
50	37.65	0.18	-0.12	-0.37
55	35.12	0.16	-0.14	-0.45
60	32.94	0.15	-0.15	-0.53
65	31.04	0.14	-0.16	-0.61
70	29.37	0.14	-0.16	-0.69
75	27.89	0.13	-0.17	-0.77
80	26.56	0.12	-0.18	-0.85
85	25.37	0.12	-0.18	-0.93
90	24.29	0.11	-0.19	-1.01

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
0	0.00	0.02
1	0.01	0.03
1	0.01	0.04
2	0.03	0.05
2	0.05	0.06
3	0.08	0.07
4	0.11	0.08
5	0.16	0.09
7	0.22	0.10
8	0.29	0.11
9	0.38	0.12
11	0.48	0.13
13	0.60	0.14
15	**0.74**	**0.15**

Linear Interpolation

0.08	H	0.07		H =	0.080 m
0.11	0.11	0.08		Q_{allow} =	0.30 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 100-YEAR EVENT
AREA R-9 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0018	ha	Qallow =	0.40
C =	1.00		Vol(max) =	0.28
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	1.19	0.78	0.24
10	178.56	0.87	0.47	0.28
15	142.89	0.70	0.30	0.27
20	119.95	0.59	0.18	0.22
25	103.85	0.51	0.10	0.16
30	91.87	0.45	0.05	0.08
35	82.58	0.40	0.00	0.00
40	75.15	0.37	-0.04	-0.09
45	69.05	0.34	-0.07	-0.18
50	63.95	0.31	-0.09	-0.27
55	59.62	0.29	-0.11	-0.37
60	55.89	0.27	-0.13	-0.47
65	52.65	0.26	-0.15	-0.57
70	49.79	0.24	-0.16	-0.68
75	47.26	0.23	-0.17	-0.78
80	44.99	0.22	-0.18	-0.88
85	42.95	0.21	-0.19	-0.99
90	41.11	0.20	-0.20	-1.10

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
0	0.00	0.02
1	0.01	0.03
1	0.01	0.04
2	0.03	0.05
2	0.05	0.06
3	0.08	0.07
4	0.11	0.08
5	0.16	0.09
7	0.22	0.10
8	0.29	0.11
9	0.38	0.12
11	0.48	0.13
13	0.60	0.14
15	**0.74**	**0.15**

Linear Interpolation

0.11	H	0.1		H =	0.109 m
0.29	0.28	0.22		Q_{allow} =	0.40 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 5-YEAR EVENT
AREA R-11 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0081	ha	Qallow =	0.41
C =	0.95		Vol(max) =	1.35
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	3.03	2.62	0.79
10	104.19	2.24	1.83	1.10
15	83.56	1.79	1.38	1.25
20	70.25	1.51	1.10	1.32
25	60.90	1.31	0.90	1.35
30	53.93	1.16	0.75	1.35
35	48.52	1.04	0.63	1.33
40	44.18	0.95	0.54	1.29
45	40.63	0.87	0.46	1.25
50	37.65	0.81	0.40	1.20
55	35.12	0.75	0.34	1.14
60	32.94	0.71	0.30	1.07
65	31.04	0.67	0.26	1.00
70	29.37	0.63	0.22	0.93
75	27.89	0.60	0.19	0.85
80	26.56	0.57	0.16	0.77
85	25.37	0.54	0.13	0.69
90	24.29	0.52	0.11	0.60

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
1	0.01	0.02
3	0.03	0.03
5	0.06	0.04
8	0.13	0.05
11	0.22	0.06
15	0.35	0.07
19	0.52	0.08
25	0.74	0.09
30	1.01	0.10
37	1.35	0.11
44	1.75	0.12
51	2.23	0.13
60	2.78	0.14
68	**3.42**	**0.15**

Linear Interpolation

0.11	H	0.10		H =	0.110 m
1.35	1.35	1.01		Q_{allow} =	0.41 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 100-YEAR EVENT
AREA R-11 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0081	ha	Qallow =	0.52
C =	1.00		Vol(max) =	2.83
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	5.49	4.97	1.49
10	178.56	4.04	3.52	2.11
15	142.89	3.23	2.71	2.44
20	119.95	2.71	2.19	2.63
25	103.85	2.35	1.83	2.74
30	91.87	2.08	1.56	2.80
35	82.58	1.87	1.35	2.83
40	75.15	1.70	1.18	2.83
45	69.05	1.56	1.04	2.81
50	63.95	1.45	0.93	2.78
55	59.62	1.35	0.83	2.73
60	55.89	1.26	0.74	2.68
65	52.65	1.19	0.67	2.61
70	49.79	1.13	0.61	2.54
75	47.26	1.07	0.55	2.47
80	44.99	1.02	0.50	2.39
85	42.95	0.97	0.45	2.30
90	41.11	0.93	0.41	2.21

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
1	0.01	0.02
3	0.03	0.03
5	0.06	0.04
8	0.13	0.05
11	0.22	0.06
15	0.35	0.07
19	0.52	0.08
25	0.74	0.09
30	1.01	0.10
37	1.35	0.11
44	1.75	0.12
51	2.23	0.13
60	2.78	0.14
68	**3.42**	**0.15**

Linear Interpolation

0.15	H	0.14		H =	0.141 m
3.42	2.83	2.78		Q_{allow} =	0.52 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 5-YEAR EVENT
AREA R-12 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0111	ha	Qallow =	0.42
C =	0.95		Vol(max) =	2.11
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	4.14	3.72	1.12
10	104.19	3.06	2.64	1.58
15	83.56	2.45	2.03	1.83
20	70.25	2.06	1.64	1.97
25	60.90	1.79	1.37	2.05
30	53.93	1.58	1.16	2.09
35	48.52	1.42	1.00	2.11
40	44.18	1.30	0.88	2.10
45	40.63	1.19	0.77	2.08
50	37.65	1.10	0.68	2.05
55	35.12	1.03	0.61	2.01
60	32.94	0.97	0.55	1.97
65	31.04	0.91	0.49	1.91
70	29.37	0.86	0.44	1.85
75	27.89	0.82	0.40	1.79
80	26.56	0.78	0.36	1.72
85	25.37	0.74	0.32	1.65
90	24.29	0.71	0.29	1.58

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
7	0.09	0.04
11	0.18	0.05
16	0.32	0.06
22	0.50	0.07
28	0.75	0.08
36	1.07	0.09
44	1.46	0.10
53	1.95	0.11
63	2.53	0.12
74	3.22	0.13
86	4.02	0.14
99	**4.94**	**0.15**

Linear Interpolation

0.12	H	0.11		H =	0.113 m
2.53	2.11	1.95		Q_{allow} =	0.42 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 100-YEAR EVENT
AREA R-12 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0111	ha	Qallow =	0.53
C =	1.00		Vol(max) =	4.33
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	7.49	6.96	2.09
10	178.56	5.51	4.98	2.99
15	142.89	4.41	3.88	3.49
20	119.95	3.70	3.17	3.81
25	103.85	3.21	2.68	4.01
30	91.87	2.84	2.31	4.15
35	82.58	2.55	2.02	4.24
40	75.15	2.32	1.79	4.30
45	69.05	2.13	1.60	4.32
50	63.95	1.97	1.44	4.33
55	59.62	1.84	1.31	4.32
60	55.89	1.73	1.20	4.30
65	52.65	1.63	1.10	4.27
70	49.79	1.54	1.01	4.23
75	47.26	1.46	0.93	4.18
80	44.99	1.39	0.86	4.12
85	42.95	1.33	0.80	4.06
90	41.11	1.27	0.74	3.99

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
7	0.09	0.04
11	0.18	0.05
16	0.32	0.06
22	0.50	0.07
28	0.75	0.08
36	1.07	0.09
44	1.46	0.10
53	1.95	0.11
63	2.53	0.12
74	3.22	0.13
86	4.02	0.14
99	**4.94**	**0.15**

Linear Interpolation

0.15	H	0.14		H =	0.143 m
4.94	4.33	4.02		Q_{allow} =	0.53 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 5-YEAR EVENT
AREA R-13 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0069	ha	Qallow =	0.40
C =	0.95		Vol(max) =	1.07
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	2.59	2.19	0.66
10	104.19	1.91	1.51	0.91
15	83.56	1.53	1.13	1.02
20	70.25	1.29	0.89	1.06
25	60.90	1.12	0.72	1.07
30	53.93	0.99	0.59	1.06
35	48.52	0.89	0.49	1.03
40	44.18	0.81	0.41	0.98
45	40.63	0.74	0.34	0.93
50	37.65	0.69	0.29	0.87
55	35.12	0.64	0.24	0.80
60	32.94	0.60	0.20	0.73
65	31.04	0.57	0.17	0.66
70	29.37	0.54	0.14	0.58
75	27.89	0.51	0.11	0.50
80	26.56	0.49	0.09	0.42
85	25.37	0.46	0.06	0.33
90	24.29	0.45	0.05	0.24

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
1	0.01	0.02
2	0.02	0.03
4	0.06	0.04
6	0.11	0.05
9	0.19	0.06
13	0.30	0.07
17	0.44	0.08
21	0.63	0.09
26	0.87	0.10
31	1.15	0.11
37	1.50	0.12
44	1.90	0.13
51	2.38	0.14
58	**2.92**	**0.15**

Linear Interpolation

0.11	H	0.10		H =	0.107 m
1.15	1.07	0.87		Q_{allow} =	0.40 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 100-YEAR EVENT
AREA R-13 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0069	ha	Qallow =	0.51
C =	1.00		Vol(max) =	2.27
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	4.68	4.17	1.25
10	178.56	3.44	2.93	1.76
15	142.89	2.76	2.25	2.02
20	119.95	2.31	1.80	2.16
25	103.85	2.00	1.49	2.24
30	91.87	1.77	1.26	2.27
35	82.58	1.59	1.08	2.27
40	75.15	1.45	0.94	2.25
45	69.05	1.33	0.82	2.22
50	63.95	1.23	0.72	2.17
55	59.62	1.15	0.64	2.11
60	55.89	1.08	0.57	2.05
65	52.65	1.02	0.51	1.97
70	49.79	0.96	0.45	1.89
75	47.26	0.91	0.40	1.81
80	44.99	0.87	0.36	1.72
85	42.95	0.83	0.32	1.62
90	41.11	0.79	0.28	1.53

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
1	0.01	0.02
2	0.02	0.03
4	0.06	0.04
6	0.11	0.05
9	0.19	0.06
13	0.30	0.07
17	0.44	0.08
21	0.63	0.09
26	0.87	0.10
31	1.15	0.11
37	1.50	0.12
44	1.90	0.13
51	2.38	0.14
58	**2.92**	**0.15**

Linear Interpolation

0.14	H	0.13		H =	0.138 m
2.38	2.27	1.90		Q_{allow} =	0.51 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 5-YEAR EVENT
AREA R-14 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0047	ha	Qallow =	0.36
C =	0.95		Vol(max) =	0.62
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	1.76	1.40	0.42
10	104.19	1.30	0.94	0.56
15	83.56	1.04	0.68	0.61
20	70.25	0.87	0.51	0.62
25	60.90	0.76	0.40	0.60
30	53.93	0.67	0.31	0.56
35	48.52	0.60	0.24	0.51
40	44.18	0.55	0.19	0.46
45	40.63	0.51	0.15	0.39
50	37.65	0.47	0.11	0.33
55	35.12	0.44	0.08	0.25
60	32.94	0.41	0.05	0.18
65	31.04	0.39	0.03	0.10
70	29.37	0.37	0.01	0.02
75	27.89	0.35	-0.01	-0.06
80	26.56	0.33	-0.03	-0.14
85	25.37	0.32	-0.04	-0.23
90	24.29	0.30	-0.06	-0.31

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
1	0.01	0.02
2	0.02	0.03
3	0.04	0.04
5	0.08	0.05
7	0.14	0.06
10	0.22	0.07
13	0.34	0.08
16	0.48	0.09
20	0.66	0.10
24	0.87	0.11
28	1.13	0.12
33	1.44	0.13
39	1.80	0.14
44	**2.21**	**0.15**

Linear Interpolation

0.10	H	0.09		H =	0.098 m
0.66	0.62	0.48		Q_{allow} =	0.36 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 100-YEAR EVENT
AREA R-14 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0047	ha	Qallow =	0.47
C =	1.00		Vol(max) =	1.34
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	3.18	2.71	0.81
10	178.56	2.34	1.87	1.12
15	142.89	1.87	1.40	1.26
20	119.95	1.57	1.10	1.32
25	103.85	1.36	0.89	1.34
30	91.87	1.20	0.73	1.32
35	82.58	1.08	0.61	1.28
40	75.15	0.98	0.51	1.23
45	69.05	0.90	0.43	1.17
50	63.95	0.84	0.37	1.10
55	59.62	0.78	0.31	1.03
60	55.89	0.73	0.26	0.94
65	52.65	0.69	0.22	0.86
70	49.79	0.65	0.18	0.76
75	47.26	0.62	0.15	0.67
80	44.99	0.59	0.12	0.57
85	42.95	0.56	0.09	0.47
90	41.11	0.54	0.07	0.37

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
1	0.01	0.02
2	0.02	0.03
3	0.04	0.04
5	0.08	0.05
7	0.14	0.06
10	0.22	0.07
13	0.34	0.08
16	0.48	0.09
20	0.66	0.10
24	0.87	0.11
28	1.13	0.12
33	1.44	0.13
39	1.80	0.14
44	**2.21**	**0.15**

Linear Interpolation

0.13	H	0.12		H =	0.127 m
1.44	1.34	1.13		Q_{allow} =	0.47 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 5-YEAR EVENT
AREA R-15 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0116	ha	Qallow =	0.42
C =	0.95		Vol(max) =	2.23
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	4.32	3.90	1.17
10	104.19	3.18	2.76	1.66
15	83.56	2.55	2.13	1.92
20	70.25	2.15	1.73	2.07
25	60.90	1.86	1.44	2.16
30	53.93	1.65	1.23	2.21
35	48.52	1.48	1.06	2.23
40	44.18	1.35	0.93	2.23
45	40.63	1.24	0.82	2.22
50	37.65	1.15	0.73	2.19
55	35.12	1.07	0.65	2.16
60	32.94	1.01	0.59	2.11
65	31.04	0.95	0.53	2.06
70	29.37	0.90	0.48	2.01
75	27.89	0.85	0.43	1.95
80	26.56	0.81	0.39	1.88
85	25.37	0.78	0.36	1.81
90	24.29	0.74	0.32	1.74

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
8	0.10	0.04
12	0.20	0.05
17	0.34	0.06
23	0.54	0.07
30	0.81	0.08
38	1.15	0.09
47	1.58	0.10
57	2.10	0.11
68	2.73	0.12
80	3.47	0.13
93	4.33	0.14
107	**5.33**	**0.15**

Linear Interpolation

0.12	H	0.11		H =	0.112 m
2.73	2.23	2.10		Q_{allow} =	0.42 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 100-YEAR EVENT
AREA R-15 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0116	ha	Qallow =	0.53
C =	1.00		Vol(max) =	4.58
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	7.81	7.28	2.18
10	178.56	5.74	5.21	3.13
15	142.89	4.60	4.07	3.66
20	119.95	3.86	3.33	4.00
25	103.85	3.34	2.81	4.22
30	91.87	2.96	2.43	4.37
35	82.58	2.66	2.13	4.47
40	75.15	2.42	1.89	4.53
45	69.05	2.22	1.69	4.57
50	63.95	2.06	1.53	4.58
55	59.62	1.92	1.39	4.58
60	55.89	1.80	1.27	4.57
65	52.65	1.69	1.16	4.54
70	49.79	1.60	1.07	4.50
75	47.26	1.52	0.99	4.46
80	44.99	1.45	0.92	4.40
85	42.95	1.38	0.85	4.35
90	41.11	1.32	0.79	4.28

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
8	0.10	0.04
12	0.20	0.05
17	0.34	0.06
23	0.54	0.07
30	0.81	0.08
38	1.15	0.09
47	1.58	0.10
57	2.10	0.11
68	2.73	0.12
80	3.47	0.13
93	4.33	0.14
107	**5.33**	**0.15**

Linear Interpolation

0.15	H	0.14		H =	0.142 m
5.33	4.58	4.33		Q_{allow} =	0.53 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 5-YEAR EVENT
AREA R-16 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0140	ha	Qallow =	0.43
C =	0.95		Vol(max) =	2.91
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	5.24	4.81	1.44
10	104.19	3.87	3.44	2.06
15	83.56	3.10	2.67	2.40
20	70.25	2.61	2.18	2.61
25	60.90	2.26	1.83	2.74
30	53.93	2.00	1.57	2.83
35	48.52	1.80	1.37	2.88
40	44.18	1.64	1.21	2.90
45	40.63	1.51	1.08	2.91
50	37.65	1.40	0.97	2.90
55	35.12	1.30	0.87	2.88
60	32.94	1.22	0.79	2.85
65	31.04	1.15	0.72	2.82
70	29.37	1.09	0.66	2.77
75	27.89	1.03	0.60	2.72
80	26.56	0.99	0.56	2.67
85	25.37	0.94	0.51	2.61
90	24.29	0.90	0.47	2.54

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
1	0.00	0.01
2	0.02	0.02
5	0.05	0.03
9	0.12	0.04
15	0.24	0.05
21	0.42	0.06
29	0.67	0.07
37	0.99	0.08
47	1.41	0.09
58	1.94	0.10
70	2.58	0.11
84	3.35	0.12
98	4.26	0.13
114	5.32	0.14
131	**6.54**	**0.15**

Linear Interpolation

0.12	H	0.11		H =	0.114 m
3.35	2.91	2.58		Q_{allow} =	0.43 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 100-YEAR EVENT
AREA R-16 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0140	ha	Qallow =	0.54
C =	1.00		Vol(max) =	5.92
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	9.48	8.94	2.68
10	178.56	6.97	6.43	3.86
15	142.89	5.58	5.04	4.54
20	119.95	4.68	4.14	4.97
25	103.85	4.06	3.52	5.27
30	91.87	3.59	3.05	5.49
35	82.58	3.23	2.69	5.64
40	75.15	2.93	2.39	5.75
45	69.05	2.70	2.16	5.82
50	63.95	2.50	1.96	5.87
55	59.62	2.33	1.79	5.90
60	55.89	2.18	1.64	5.92
65	52.65	2.06	1.52	5.91
70	49.79	1.94	1.40	5.90
75	47.26	1.85	1.31	5.88
80	44.99	1.76	1.22	5.84
85	42.95	1.68	1.14	5.80
90	41.11	1.61	1.07	5.75

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
1	0.00	0.01
2	0.02	0.02
5	0.05	0.03
9	0.12	0.04
15	0.24	0.05
21	0.42	0.06
29	0.67	0.07
37	0.99	0.08
47	1.41	0.09
58	1.94	0.10
70	2.58	0.11
84	3.35	0.12
98	4.26	0.13
114	5.32	0.14
131	**6.54**	**0.15**

Linear Interpolation

0.15	H	0.14		H =	0.145 m
6.54	5.92	5.32		Q_{allow} =	0.54 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 5-YEAR EVENT
AREA R-17 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0068	ha	Qallow =	0.39
C =	0.95		Vol(max) =	1.06
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	2.54	2.15	0.65
10	104.19	1.87	1.48	0.89
15	83.56	1.50	1.11	1.00
20	70.25	1.26	0.87	1.05
25	60.90	1.10	0.71	1.06
30	53.93	0.97	0.58	1.04
35	48.52	0.87	0.48	1.01
40	44.18	0.79	0.40	0.97
45	40.63	0.73	0.34	0.92
50	37.65	0.68	0.29	0.86
55	35.12	0.63	0.24	0.80
60	32.94	0.59	0.20	0.73
65	31.04	0.56	0.17	0.66
70	29.37	0.53	0.14	0.58
75	27.89	0.50	0.11	0.50
80	26.56	0.48	0.09	0.42
85	25.37	0.46	0.07	0.34
90	24.29	0.44	0.05	0.25

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
1	0.01	0.02
3	0.03	0.03
5	0.06	0.04
7	0.12	0.05
10	0.20	0.06
14	0.33	0.07
18	0.49	0.08
23	0.69	0.09
28	0.95	0.10
34	1.26	0.11
41	1.64	0.12
48	2.08	0.13
56	2.60	0.14
64	**3.20**	**0.15**

Linear Interpolation

0.11	H	0.10		H =	0.104 m
1.26	1.06	0.95		Q_{allow} =	0.39 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 100-YEAR EVENT
AREA R-17 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0068	ha	Qallow =	0.50
C =	1.00		Vol(max) =	2.23
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	4.60	4.10	1.23
10	178.56	3.38	2.88	1.73
15	142.89	2.71	2.21	1.99
20	119.95	2.27	1.77	2.13
25	103.85	1.97	1.47	2.20
30	91.87	1.74	1.24	2.23
35	82.58	1.56	1.06	2.23
40	75.15	1.42	0.92	2.22
45	69.05	1.31	0.81	2.18
50	63.95	1.21	0.71	2.13
55	59.62	1.13	0.63	2.08
60	55.89	1.06	0.56	2.01
65	52.65	1.00	0.50	1.94
70	49.79	0.94	0.44	1.86
75	47.26	0.89	0.39	1.78
80	44.99	0.85	0.35	1.69
85	42.95	0.81	0.31	1.60
90	41.11	0.78	0.28	1.50

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
1	0.01	0.02
3	0.03	0.03
5	0.06	0.04
7	0.12	0.05
10	0.20	0.06
14	0.33	0.07
18	0.49	0.08
23	0.69	0.09
28	0.95	0.10
34	1.26	0.11
41	1.64	0.12
48	2.08	0.13
56	2.60	0.14
64	**3.20**	**0.15**

Linear Interpolation

0.14	H	0.13		H =	0.133 m
2.60	2.23	2.08		Q_{allow} =	0.50 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 5-YEAR EVENT
AREA R-18 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0122	ha	Qallow =	0.42
C =	0.95		Vol(max) =	2.41
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	4.55	4.13	1.24
10	104.19	3.36	2.94	1.76
15	83.56	2.69	2.27	2.04
20	70.25	2.26	1.84	2.21
25	60.90	1.96	1.54	2.31
30	53.93	1.74	1.32	2.37
35	48.52	1.56	1.14	2.40
40	44.18	1.42	1.00	2.41
45	40.63	1.31	0.89	2.40
50	37.65	1.21	0.79	2.38
55	35.12	1.13	0.71	2.35
60	32.94	1.06	0.64	2.31
65	31.04	1.00	0.58	2.26
70	29.37	0.95	0.53	2.21
75	27.89	0.90	0.48	2.15
80	26.56	0.86	0.44	2.09
85	25.37	0.82	0.40	2.03
90	24.29	0.78	0.36	1.96

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
1	0.00	0.01
2	0.01	0.02
5	0.05	0.03
8	0.11	0.04
13	0.21	0.05
18	0.36	0.06
25	0.57	0.07
32	0.86	0.08
41	1.22	0.09
50	1.67	0.10
61	2.23	0.11
72	2.89	0.12
85	3.68	0.13
98	4.59	0.14
113	**5.65**	**0.15**

Linear Interpolation

0.12	H	0.11		H =	0.113 m
2.89	2.41	2.23		Q_{allow} =	0.42 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 100-YEAR EVENT
AREA R-18 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0122	ha	Qallow =	0.53
C =	1.00		Vol(max) =	4.92
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	8.23	7.70	2.31
10	178.56	6.05	5.52	3.31
15	142.89	4.85	4.32	3.88
20	119.95	4.07	3.54	4.24
25	103.85	3.52	2.99	4.49
30	91.87	3.12	2.59	4.65
35	82.58	2.80	2.27	4.77
40	75.15	2.55	2.02	4.84
45	69.05	2.34	1.81	4.89
50	63.95	2.17	1.64	4.92
55	59.62	2.02	1.49	4.92
60	55.89	1.90	1.37	4.91
65	52.65	1.79	1.26	4.89
70	49.79	1.69	1.16	4.86
75	47.26	1.60	1.07	4.83
80	44.99	1.53	1.00	4.78
85	42.95	1.46	0.93	4.72
90	41.11	1.39	0.86	4.67

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
1	0.00	0.01
2	0.01	0.02
5	0.05	0.03
8	0.11	0.04
13	0.21	0.05
18	0.36	0.06
25	0.57	0.07
32	0.86	0.08
41	1.22	0.09
50	1.67	0.10
61	2.23	0.11
72	2.89	0.12
85	3.68	0.13
98	4.59	0.14
113	**5.65**	**0.15**

Linear Interpolation

0.15	H	0.14		H =	0.143 m
5.65	4.92	4.59		Q_{allow} =	0.53 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 5-YEAR EVENT
AREA R-19 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0018	ha	Qallow =	0.30
C =	0.95		Vol(max) =	0.11
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	0.66	0.36	0.11
10	104.19	0.48	0.18	0.11
15	83.56	0.39	0.09	0.08
20	70.25	0.33	0.03	0.03
25	60.90	0.28	-0.02	-0.03
30	53.93	0.25	-0.05	-0.09
35	48.52	0.23	-0.07	-0.16
40	44.18	0.21	-0.09	-0.23
45	40.63	0.19	-0.11	-0.30
50	37.65	0.18	-0.12	-0.37
55	35.12	0.16	-0.14	-0.45
60	32.94	0.15	-0.15	-0.53
65	31.04	0.14	-0.16	-0.61
70	29.37	0.14	-0.16	-0.69
75	27.89	0.13	-0.17	-0.77
80	26.56	0.12	-0.18	-0.85
85	25.37	0.12	-0.18	-0.93
90	24.29	0.11	-0.19	-1.01

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
0	0.00	0.02
1	0.01	0.03
1	0.01	0.04
2	0.03	0.05
2	0.05	0.06
3	0.07	0.07
4	0.11	0.08
5	0.16	0.09
6	0.21	0.10
8	0.28	0.11
9	0.37	0.12
11	0.47	0.13
13	0.59	0.14
14	**0.72**	**0.15**

Linear Interpolation

0.09	H	0.08		H =	0.080 m
0.16	0.11	0.11		Q_{allow} =	0.30 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 100-YEAR EVENT
AREA R-19 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0018	ha	Qallow =	0.41
C =	1.00		Vol(max) =	0.28
			Notches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	1.19	0.78	0.23
10	178.56	0.87	0.46	0.28
15	142.89	0.70	0.29	0.26
20	119.95	0.59	0.18	0.21
25	103.85	0.51	0.10	0.15
30	91.87	0.45	0.04	0.07
35	82.58	0.40	-0.01	-0.01
40	75.15	0.37	-0.04	-0.10
45	69.05	0.34	-0.07	-0.19
50	63.95	0.31	-0.10	-0.29
55	59.62	0.29	-0.12	-0.39
60	55.89	0.27	-0.14	-0.49
65	52.65	0.26	-0.15	-0.59
70	49.79	0.24	-0.17	-0.70
75	47.26	0.23	-0.18	-0.80
80	44.99	0.22	-0.19	-0.91
85	42.95	0.21	-0.20	-1.02
90	41.11	0.20	-0.21	-1.13

Notes: Vol = Qnet x time
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)

Area m^2	V m^3	H m
0	0.00	0.00
0	0.00	0.01
0	0.00	0.02
1	0.01	0.03
1	0.01	0.04
2	0.03	0.05
2	0.05	0.06
3	0.07	0.07
4	0.11	0.08
5	0.16	0.09
6	0.21	0.10
8	0.28	0.11
9	0.37	0.12
11	0.47	0.13
13	0.59	0.14
14	**0.72**	**0.15**

Linear Interpolation

0.11	H	0.1		H =	0.109 m
0.28	0.28	0.21		Q_{allow} =	0.41 L/s

Note: Qallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

REQUIRED STORAGE - 5-YEAR EVENT
AREA SOUTH BUILDING (+R1 to R9 + R10 + A1/A3) : TANK

OTTAWA IDF CURVE
Area = 0.0228 ha Qallow = 14.61
C = 0.95 Vol(max) = 9.71

Time (min)	Intensity (mm/hr)	$Q_{Uncontrolled}$ (L/s)	$Q_{Controlled}$ (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	8.50	24.52	18.41	5.52
10	104.19	6.27	24.52	16.18	9.71
15	83.56	5.03	20.36	10.79	9.71
20	70.25	4.23	17.69	7.31	8.77
25	60.90	3.67	15.79	4.84	7.27
30	53.93	3.25	14.35	2.99	5.38
35	48.52	2.92	13.24	1.55	3.26
40	44.18	2.66	12.35	0.40	0.95
45	40.63	2.45	11.61	-0.55	-1.48
50	37.65	2.27	11.00	-1.34	-4.02
55	35.12	2.11	10.48	-2.01	-6.64
60	32.94	1.98	10.03	-2.59	-9.34
65	31.04	1.87	9.64	-3.10	-12.09
70	29.37	1.77	9.30	-3.54	-14.88
75	27.89	1.68	8.98	-3.95	-17.78
80	26.56	1.60	8.69	-4.32	-20.74
85	25.37	1.53	8.43	-4.65	-23.73
90	24.29	1.46	8.19	-4.95	-26.75
95	23.31	1.40	7.98	-5.23	-29.80
100	22.41	1.35	7.78	-5.48	-32.87
105	21.58	1.30	7.60	-5.71	-36.00
110	20.82	1.25	7.40	-5.95	-39.29
115	20.12	1.21	7.22	-6.17	-42.61
120	19.47	1.17	7.06	-6.38	-45.94
125	18.86	1.14	6.90	-6.58	-49.32
130	18.29	1.10	6.74	-6.77	-52.78
135	17.76	1.07	6.60	-6.94	-56.25
140	17.27	1.04	6.46	-7.11	-59.74
145	16.80	1.01	6.33	-7.27	-63.24
150	16.36	0.99	6.21	-7.42	-66.75
155	15.95	0.96	6.09	-7.56	-70.27
160	15.56	0.94	5.99	-7.69	-73.80
165	15.18	0.91	5.88	-7.81	-77.35
170	14.83	0.89	5.79	-7.93	-80.90

South

REQUIRED STORAGE - 100-YEAR EVENT
AREA SOUTH BUILDING (+R1 to R9 + R10 + A1/A3) : TANK

OTTAWA IDF CURVE
Area = 0.0228 ha Qallow = 14.61
C = 1.00 Vol(max) = 27.76

Time (min)	Intensity (mm/hr)	$Q_{Uncontrolled}$ (L/s)	$Q_{Controlled}$ (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	15.38	42.35	43.13	12.94
10	178.56	11.32	42.35	39.06	23.44
15	142.89	9.06	34.80	29.25	26.33
20	119.95	7.60	29.94	22.94	27.52
25	103.85	6.58	26.53	18.50	27.76
30	91.87	5.82	23.99	15.21	27.37
35	82.58	5.23	22.03	12.65	26.57
40	75.15	4.76	20.42	10.57	25.36
45	69.05	4.38	19.09	8.86	23.93
50	63.95	4.05	17.99	7.43	22.30
55	59.62	3.78	17.05	6.22	20.53
60	55.89	3.54	16.24	5.18	18.64
65	52.65	3.34	15.54	4.27	16.64
70	49.79	3.16	14.92	3.47	14.56
75	47.26	3.00	14.37	2.76	12.41
80	44.99	2.85	13.88	2.12	10.19
85	42.95	2.72	13.44	1.55	7.91
90	41.11	2.61	13.04	1.04	5.59
95	39.43	2.50	12.68	0.57	3.23
100	37.90	2.40	12.34	0.14	0.82
105	36.50	2.31	12.04	-0.26	-1.62
110	35.20	2.23	11.75	-0.63	-4.15
115	34.01	2.16	11.47	-0.98	-6.76
120	32.89	2.08	11.22	-1.30	-9.40
125	31.86	2.02	10.98	-1.61	-12.06
130	30.90	1.96	10.76	-1.89	-14.74
135	30.00	1.90	10.55	-2.15	-17.45
140	29.15	1.85	10.36	-2.40	-20.18
145	28.36	1.80	10.18	-2.64	-22.93
150	27.61	1.75	10.01	-2.85	-25.69
155	26.91	1.71	9.84	-3.06	-28.47
160	26.24	1.66	9.68	-3.26	-31.33
165	25.61	1.62	9.51	-3.47	-34.38
170	25.01	1.59	9.35	-3.67	-37.44

REQUIRED STORAGE - 5-YEAR EVENT
AREA NORTH BUILDING (+R11 to R19 + R20 + A2) : TANK

OTTAWA IDF CURVE

Area = 0.0887 ha Qallow = 54.33
C = 0.95 Vol(max) = 3.34

Time (min)	Intensity (mm/hr)	$Q_{Uncontrolled}$ (L/s)	$Q_{Controlled}$ (L/s)	Qnet (L/s)	Vol (m^3)
5	141.18	33.06	32.39	11.12	3.34
10	104.19	24.40	32.39	2.46	1.47
15	83.56	19.57	26.68	-8.09	-7.28
20	70.25	16.45	22.99	-14.89	-17.86
25	60.90	14.26	20.39	-19.68	-29.52
30	53.93	12.63	18.43	-23.28	-41.90
35	48.52	11.36	16.90	-26.06	-54.74
40	44.18	10.35	15.69	-28.30	-67.92
45	40.63	9.51	14.68	-30.13	-81.36
50	37.65	8.82	13.85	-31.67	-95.00
55	35.12	8.22	13.13	-32.97	-108.80
60	32.94	7.71	12.52	-34.09	-122.74
65	31.04	7.27	11.99	-35.07	-136.79
70	29.37	6.88	11.52	-35.94	-150.93
75	27.89	6.53	11.09	-36.71	-165.21
80	26.56	6.22	10.70	-37.41	-179.59
85	25.37	5.94	10.35	-38.04	-194.03
90	24.29	5.69	10.03	-38.61	-208.52
95	23.31	5.46	9.74	-39.13	-223.06
100	22.41	5.25	9.47	-39.61	-237.65
105	21.58	5.05	9.23	-40.05	-252.31
110	20.82	4.88	8.98	-40.48	-267.16
115	20.12	4.71	8.74	-40.88	-282.04
120	19.47	4.56	8.53	-41.24	-296.95
125	18.86	4.42	8.32	-41.59	-311.93
130	18.29	4.28	8.12	-41.92	-327.00
135	17.76	4.16	7.94	-42.23	-342.09
140	17.27	4.04	7.76	-42.52	-357.20
145	16.80	3.93	7.60	-42.80	-372.34
150	16.36	3.83	7.44	-43.05	-387.49
155	15.95	3.73	7.30	-43.30	-402.67
160	15.56	3.64	7.16	-43.53	-417.86
165	15.18	3.56	7.03	-43.74	-433.07
170	14.83	3.47	6.91	-43.95	-448.30

North

REQUIRED STORAGE - 100-YEAR EVENT
AREA NORTH BUILDING (+R11 to R19 + R20 + A2) : TANK

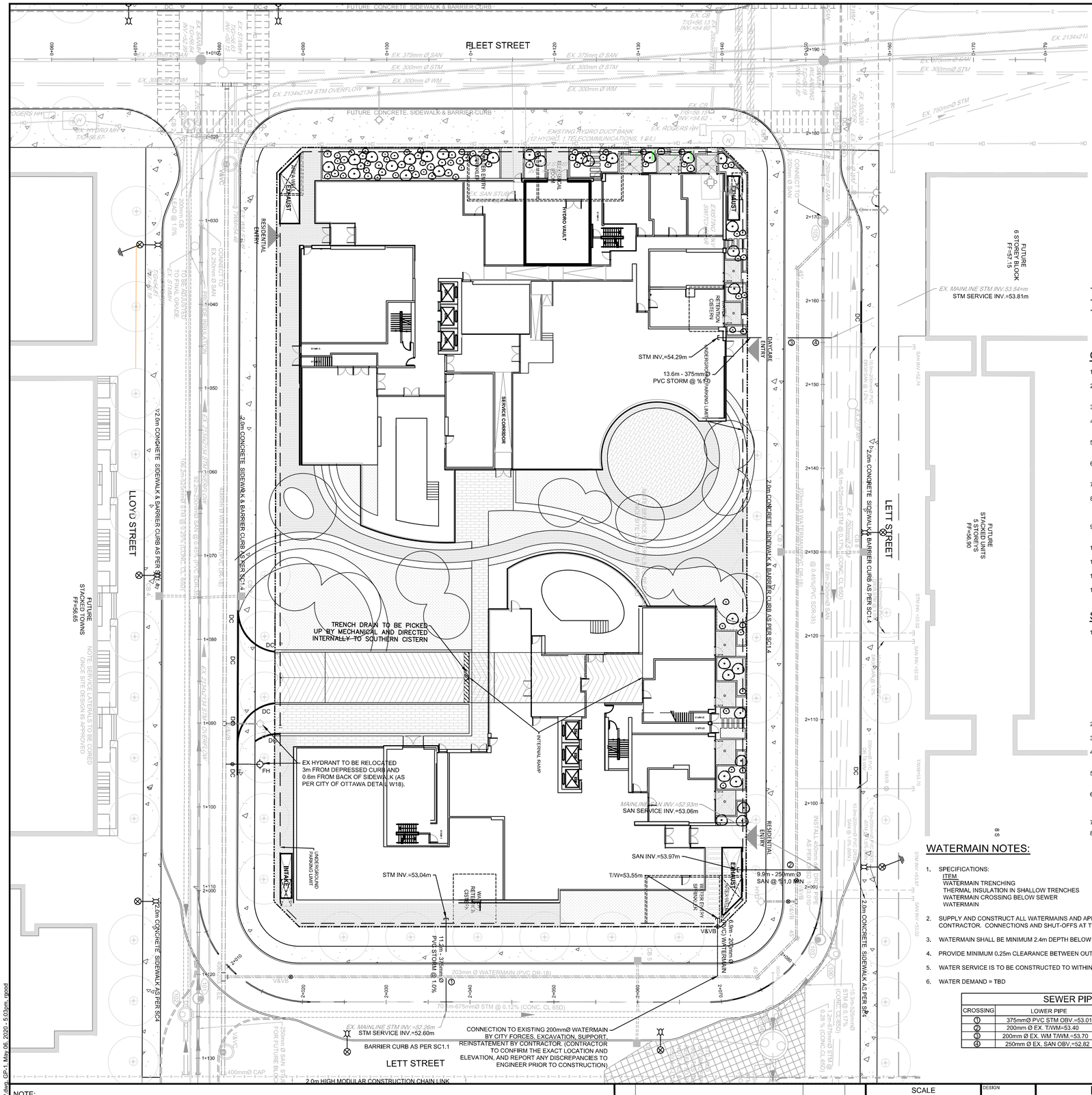
OTTAWA IDF CURVE

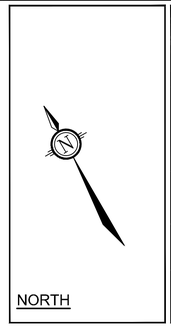
Area = 0.0887 ha Qallow = 54.33
C = 1.00 Vol(max) = 27.75

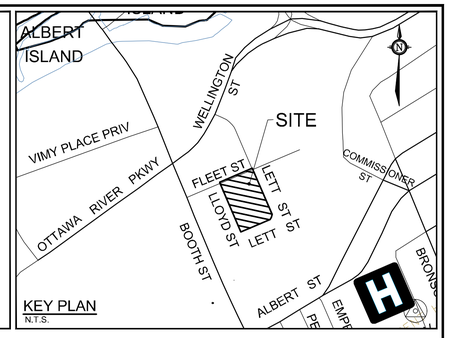
Time (min)	Intensity (mm/hr)	$Q_{Uncontrolled}$ (L/s)	$Q_{Controlled}$ (L/s)	Qnet (L/s)	Vol (m^3)
5	242.70	59.82	56.56	62.05	18.62
10	178.56	44.01	56.56	46.24	27.75
15	142.89	35.22	46.17	27.06	24.36
20	119.95	29.57	39.49	14.72	17.67
25	103.85	25.60	34.80	6.06	9.09
30	91.87	22.64	31.31	-0.38	-0.68
35	82.58	20.35	28.59	-5.38	-11.30
40	75.15	18.52	26.39	-9.42	-22.60
45	69.05	17.02	24.59	-12.72	-34.35
50	63.95	15.76	23.08	-15.49	-46.47
55	59.62	14.70	21.79	-17.84	-58.87
60	55.89	13.78	20.69	-19.86	-71.51
65	52.65	12.98	19.73	-21.63	-84.34
70	49.79	12.27	18.88	-23.18	-97.35
75	47.26	11.65	18.13	-24.55	-110.49
80	44.99	11.09	17.46	-25.78	-123.75
85	42.95	10.59	16.85	-26.89	-137.13
90	41.11	10.13	16.31	-27.89	-150.59
95	39.43	9.72	15.81	-28.80	-164.15
100	37.90	9.34	15.36	-29.63	-177.77
105	36.50	9.00	14.94	-30.39	-191.47
110	35.20	8.68	14.55	-31.10	-205.28
115	34.01	8.38	14.18	-31.77	-219.20
120	32.89	8.11	13.84	-32.39	-233.18
125	31.86	7.85	13.52	-32.96	-247.20
130	30.90	7.62	13.22	-33.50	-261.27
135	30.00	7.39	12.94	-34.00	-275.37
140	29.15	7.19	12.68	-34.47	-289.52
145	28.36	6.99	12.43	-34.91	-303.70
150	27.61	6.81	12.20	-35.32	-317.91
155	26.91	6.63	11.98	-35.71	-332.15
160	26.24	6.47	11.77	-36.09	-346.49
165	25.61	6.31	11.55	-36.47	-361.02
170	25.01	6.16	11.34	-36.82	-375.59

APPENDIX H

Drawings for LeBreton Flats Phase 4 (current development)







PROPOSED PROPERTY LINE
PROPOSED U/G PARKING LIMIT
PROPOSED TRENCH DRAIN
PROPOSED WATERMAIN SERVICE (WITH CAP)
PROPOSED STORM SERVICE (WITH CAP)
PROPOSED SANITARY SERVICE (WITH CAP)
PROPOSED VALVE AND VALVE BOX
PROPOSED FIRE HYDRANT
PROPOSED BARRIER CURB
PROPOSED DEPRESSED CURB
EXISTING WATERMAIN
EXISTING SANITARY
EXISTING STORM
EXISTING DEPRESSED CURB
EXISITING SANITARY MANHOLE
EXISITING STORM MANHOLE
EXISTING CATCHBASIN
EXISTING VALVE & VALVE BOX
EXISTING TOP OF GRATE
EXISTING FIRE HYDRANT
EXISTING LIGHT STANDARD WITH GROUNDING

GENERAL NOTES:

1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF OTTAWA BEFORE COMMENCING CONSTRUCTION.
4. BEFORE COMMENCING CONSTRUCTION OBTAIN AND PROVIDE PROOF OF COMPREHENSIVE, ALL RISK AND OPERATIONAL LIABILITY INSURANCE FOR $5,000,000.00. INSURANCE POLICY TO NAME OWNERS, ENGINEERS AND ARCHITECTS AS CO-INSURED. (amount of liability insurance to be verified on a project by project basis)
5. RESTORE ALL DISTURBED AREAS ON-SITE AND OFF-SITE, INCLUDING TRENCHES AND SURFACES ON PUBLIC ROAD ALLOWANCES TO EXISTING CONDITIONS OR BETTER TO THE SATISFACTION OF THE CITY OF OTTAWA AND ENGINEER.
6. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL, ORGANIC MATERIAL AND DEBRIS UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ANY CONTAMINATED MATERIAL. ALL CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
7. ALL ELEVATIONS ARE GEODETIC.
8. REFER TO GEOTECHNICAL REPORT (No. xxxxxx, DATED xxx xx, xxxx), PREPARED BY _____ FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS. THE GEOTECHNICAL CONSULTANT IS TO REVIEW ON-SITE CONDITIONS AFTER EXCAVATION PRIOR TO PLACEMENT OF THE GRANULAR MATERIAL.
9. REFER TO ARCHITECT'S AND LANDSCAPE ARCHITECT'S DRAWINGS FOR BUILDING AND HARDSURFACE AREAS AND DIMENSIONS.(project teams must review drawing to ensure that this is indicated on someone's plan)
10. REFER TO STORMWATER MANAGEMENT REPORT(R-xxxx-xxx) PREPARED BY NOVATECH ENGINEERING CONSULTANTS LTD.
11. SAW CUT AND KEY GRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE IN POINTS AS PER CITY OF OTTAWA STANDARDS (R10).
12. PROVIDE LINE/PARKING PAINTING.
13. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GENERAL PLAN OF SERVICES INDICATING ALL SERVICING AS-BUILT INFORMATION SHOWN ON THIS PLAN. AS-BUILT INFORMATION MUST INCLUDE: PIPE MATERIAL, SIZES, LENGTHS, SLOPES, INVERT AND T/G ELEVATIONS, STRUCTURE LOCATIONS, VALVE AND HYDRANT LOCATIONS, T/WM ELEVATIONS AND ANY ALIGNMENT CHANGES, ETC. (optional note; usage to be determined on a project by project basis)

SEWER NOTES:

1. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
CATCHBASIN (600x600mm)	705.010	OPSD
STORM / SANITARY MANHOLE (1200Ø)	701.010	OPSD
CB, FRAME & COVER	400.020	OPSD
STORM / SANITARY MH FRAME & COVER	401.010	OPSD
SEWER TRENCH - BEDDING (GRANULAR A) COVER (GRANULAR A OR GRANULAR B TYPE I, WITH MAXIMUM PARTICLE SIZE=25mm)		
STORM SEWER	PVC DR 35	
SANITARY SEWER	PVC DR 35	
CATCHBASIN LEAD	PVC DR 35	

2. INSULATE ALL PIPES (SAN/STM) THAT HAVE LESS THAN 1.5m COVER WITH 50mmX1200mm HI-40 INSULATION. PROVIDE 150mm CLEARANCE BETWEEN PIPE AND INSULATION.
3. SERVICES ARE TO BE CONSTRUCTED TO 1.0m FROM FACE OF BUILDING AT A MINIMUM SLOPE OF 1.0%.
4. PIPE BEDDING, COVER AND BACKFILL ARE TO BE COMPACTED TO AT LEAST xx% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY. THE USE OF CLEAR CRUSHED STONE AS A BEDDING LAYER SHALL NOT BE PERMITTED.
5. FLEXIBLE CONNECTIONS ARE REQUIRED FOR CONNECTING PIPES TO MANHOLES (FOR EXAMPLE KOR-N-SEAL, PSX: POSITIVE SEAL AND DURASEAL). THE CONCRETE CRADLE FOR THE PIPE CAN BE ELIMINATED.
6. THE OWNER SHALL REQUIRE THAT THE SITE SERVICING CONTRACTOR PERFORM FIELD TESTS FOR QUALITY CONTROL OF ALL SANITARY SEWERS, LEAKAGE TESTING SHALL BE COMPLETED IN ACCORDANCE WITH OPSS 410.07.16, 410.07.16.04 AND 407.07.24. DYE TESTING IS TO BE COMPLETED ON ALL SANITARY SERVICES TO CONFIRM PROPER CONNECTION TO THE SANITARY SEWER MAIN. THE FIELD TESTS SHALL BE PERFORMED IN THE PRESENCE OF A CERTIFIED PROFESSIONAL ENGINEER WHO SHALL SUBMIT A CERTIFIED COPY OF THE TEST RESULTS.
7. STORM MANHOLES AND CBMHS ARE TO HAVE 300mm SUMPS UNLESS OTHERWISE INDICATED.
8. CONTRACTOR TO TELEVISE (CCTV) ALL PROPOSED SEWERS, 200mmØ OR GREATER PRIOR TO BASE COURSE ASPHALT. UPON COMPLETION OF CONTRACT, THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS & APPURTENANCES.

WATERMAIN NOTES:

1. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
WATERMAIN TRENCHING	W17	CITY OF OTTAWA
THERMAL INSULATION IN SHALLOW TRENCHES	W22	CITY OF OTTAWA
WATERMAIN CROSSING BELOW SEWER	W25	CITY OF OTTAWA
WATERMAIN	PVC DR 18	

2. SUPPLY AND CONSTRUCT ALL WATERMAINS AND APPURTENANCES IN ACCORDANCE WITH THE CITY OF OTTAWA STANDARDS AND SPECIFICATIONS. EXCAVATION, INSTALLATION, BACKFILL AND RESTORATION OF ALL WATERMAINS BY THE CONTRACTOR. CONNECTIONS AND SHUT-OFFS AT THE MAIN AND CHLORINATION OF THE WATER SYSTEM SHALL BE PERFORMED BY CITY OFFICIALS.
3. WATERMAIN SHALL BE MINIMUM 2.4m DEPTH BELOW GRADE UNLESS OTHERWISE INDICATED.
4. PROVIDE MINIMUM 0.25m CLEARANCE BETWEEN OUTSIDE OF PIPES AT ALL CROSSINGS.
5. WATER SERVICE IS TO BE CONSTRUCTED TO WITHIN 1.0m OF FOUNDATION WALL AND CAPPED, UNLESS OTHERWISE INDICATED.
6. WATER DEMAND = TBD

SEWER PIPE CROSSING TABLE

CROSSING	LOWER PIPE	HIGHER PIPE	CLEARANCE
①	375mmØ PVC STM OBV.=53.01	200mm Ø EX. WM INV. =53.26	0.25m
②	200mm Ø EX. T/WM=53.40	250mm Ø SAN INV.=53.90	0.50m
③	200mm Ø EX. WM T/WM =53.70	375mm Ø STM INV=54.20	0.50m
④	250mm Ø EX. SAN OBV.=52.82	375mm Ø STM INV=54.16	1.34m

200mmØ WATERMAIN TABLE: LETT STREET (A)
(MIN COVER = 2.4m)

STATION	SURFACE ELEVATION	TOP OF WM ELEVATION	DESCRIPTION
0+000	55.72±	53.32± ✱	CONNECT TO EXISTING 200mmØ WATERMAIN
0+01.6	55.69	53.29	WATERMAIN AT EDGE OF PAVEMENT
0+03.6	55.88	53.48	WATERMAIN AT BACK OF SIDEWALK
0+05.9	55.93	53.53	VALVE AND VALVE BOX AT PROPERTY LINE
0+06.9	55.95	53.55	WATERMAIN CAP

✱ EXACT DEPTH OF EXISTING WATERMAIN TO BE DETERMINED AT TIME OF EXCAVATION. CONTRACTOR TO CONFIRM TOP OF WATERMAIN. PROVIDE THERMAL INSULATION AS PER CITY OF OTTAWA DETAIL W23 WHERE COVER IS LESS THAN 2.4m

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
3.	ISSUED FOR SITE PLAN SUBMISSION	JUN 02/20	GJM
2.	RE-ISSUED FOR COORDINATION	APR 29/20	GJM
1.	ISSUED FOR COORDINATION	APR 20/20	GJM

SCALE: 1:250 (1:250, 0 2 4 6 8 10)

DESIGN: JAG
CHECKED: GJM
DRAWN: RJG
CHECKED: JAG
APPROVED: GJM

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER — G.J. MacDONALD — PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
CITY OF OTTAWA
LE BRETON FLATS

DRAWING NAME
GENERAL PLAN OF SERVICES

PROJECT No. 116042-00
REV REV # 3
DRAWING No. 116042-GP1

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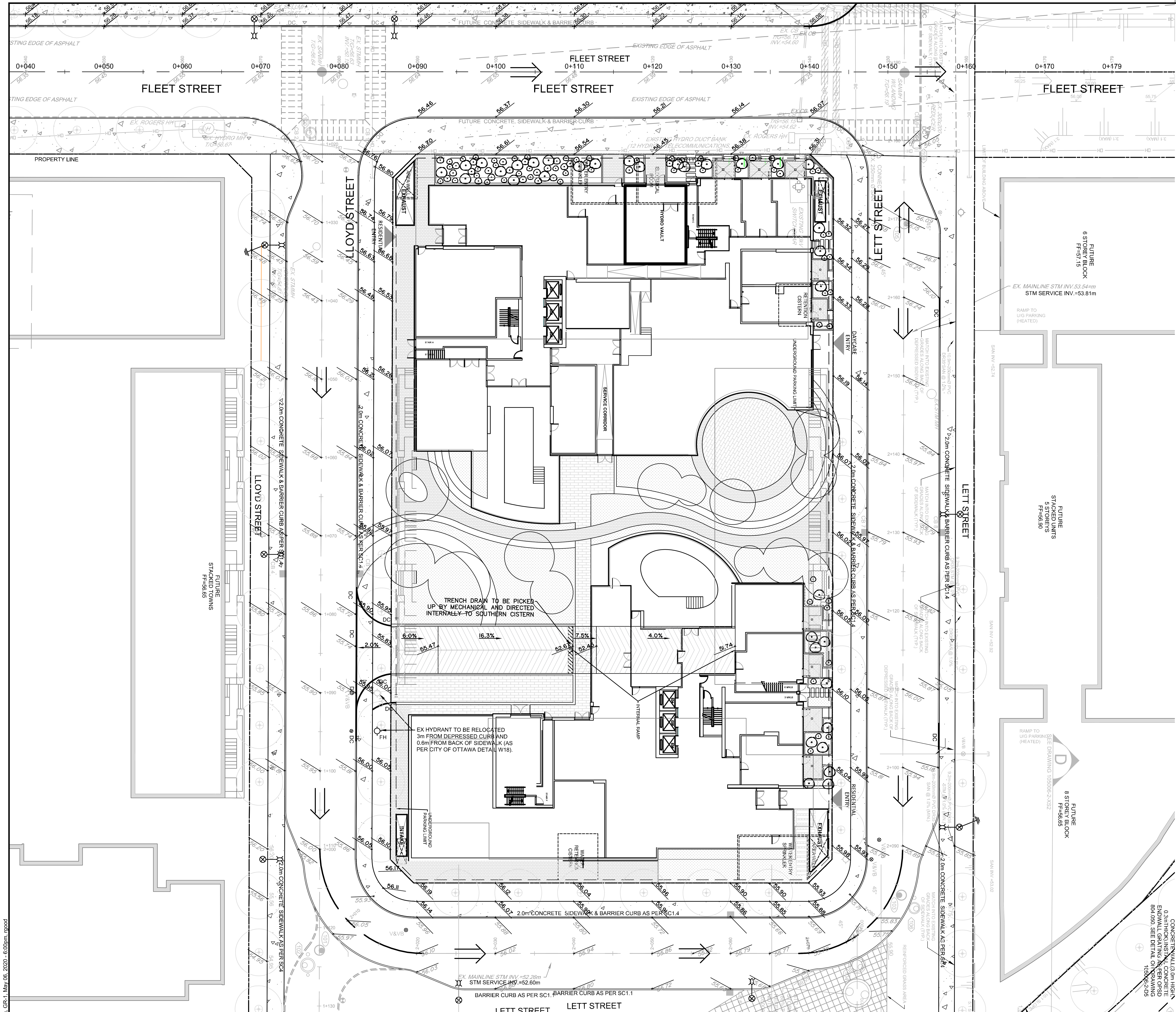

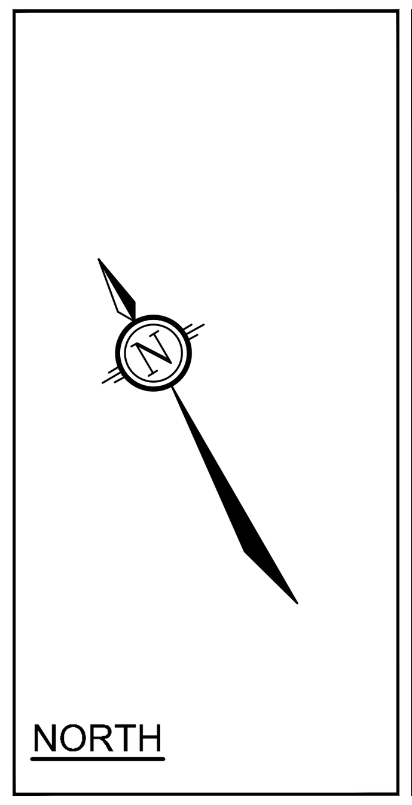

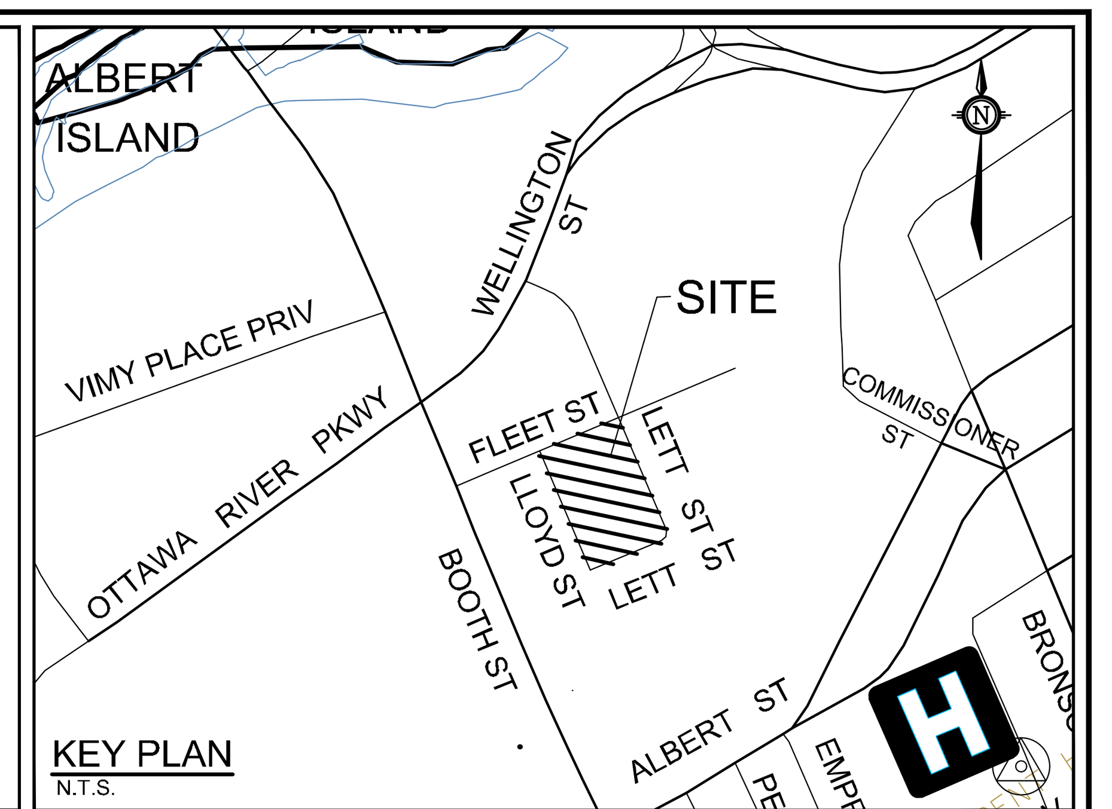

56.28	PROPOSED GRADE
	PROPOSED PROPERTY LINE
	PROPOSED U/G PARKING LIMIT
HYD	PROPOSED HYDRANT LOCATION
2.0%	PROPOSED SLOPE AND DIRECTION
	PROPOSED TRENCH DRAIN
	PROPOSED BARRIER CURB
DC	PROPOSED DEPRESSED CURB
	PROPOSED TREE
	DIRECTION OF MAJOR OVERLAND FLOW ROUTE
EX.SANMH	EXISTING SANITARY MANHOLE
EX.STMMH	EXISTING STORM MANHOLE
EX.CB	EXISTING CATCHBASIN
58.28	EXISTING GRADE
	EXISTING LIGHT STANDARD WITH GROUNDING
	EXISTING TERRACING MAXIMUM 3:1 SIDESLOPE
	EXISTING FIRE HYDRANT

GENERAL NOTES:

1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF OTTAWA BEFORE COMMENCING CONSTRUCTION.
4. BEFORE COMMENCING CONSTRUCTION OBTAIN AND PROVIDE PROOF OF COMPREHENSIVE, ALL RISK AND OPERATIONAL LIABILITY INSURANCE FOR $5,000,000.00. INSURANCE POLICY TO NAME OWNERS, ENGINEERS AND ARCHITECTS AS CO-INSURED. (amount of liability insurance to be verified on a project by project basis)
5. RESTORE ALL DISTURBED AREAS ON-SITE AND OFF-SITE, INCLUDING TRENCHES AND SURFACES ON PUBLIC ROAD ALLOWANCES TO EXISTING CONDITIONS OR BETTER TO THE SATISFACTION OF THE CITY OF OTTAWA AND ENGINEER.
6. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL, ORGANIC MATERIAL AND DEBRIS UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ANY CONTAMINATED MATERIAL. ALL CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
7. ALL ELEVATIONS ARE GEODETIC.
8. REFER TO GEOTECHNICAL REPORT (No. xxxxxx, DATED xxx xx, xxxx), PREPARED BY __________ FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS. THE GEOTECHNICAL CONSULTANT IS TO REVIEW ON-SITE CONDITIONS AFTER EXCAVATION PRIOR TO PLACEMENT OF THE GRANULAR MATERIAL.
9. REFER TO ARCHITECT'S AND LANDSCAPE ARCHITECT'S DRAWINGS FOR BUILDING AND HARDSURFACE AREAS AND DIMENSIONS.(project teams must review drawing to ensure that this is indicated on someone's plan)
10. REFER TO STORMWATER MANAGEMENT REPORT(R-xxxx-xxx) PREPARED BY NOVATECH ENGINEERING CONSULTANTS LTD.
11. SAW CUT AND KEY GRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE IN POINTS AS PER CITY OF OTTAWA STANDARDS (R10).
12. PROVIDE LINE/PARKING PAINTING.

GRADING NOTES:

1. ALL TOPSOIL, ORGANIC OR DELETERIOUS MATERIAL MUST BE ENTIRELY REMOVED FROM BENEATH THE PROPOSED PAVED AREAS AS DIRECTED BY THE SITE ENGINEER OR GEOTECHNICAL ENGINEER.
2. EXPOSED SUBGRADES IN PROPOSED PAVED AREAS SHOULD BE PROOF ROLLED WITH A LARGE STEEL DRUM ROLLER AND INSPECTED BY THE GEOTECHNICAL ENGINEER PRIOR TO THE PLACEMENT OF GRANULARS.
3. ANY SOFT AREAS EVIDENT FROM THE PROOF ROLLING SHOULD BE SUB-EXCAVATED AND REPLACED WITH SUITABLE MATERIAL THAT IS FROST COMPATIBLE WITH THE EXISTING SOILS AS RECOMMENDED BY THE GEOTECHNICAL ENGINEER.
4. THE GRANULAR BASE SHOULD BE COMPACTED TO AT LEAST 100% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE. ANY ADDITIONAL GRANULAR FILL USED BELOW THE PROPOSED PAVEMENT SHOULD BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE.
5. MINIMUM OF 2% GRADE FOR ALL GRASS AREAS UNLESS OTHERWISE NOTED.
6. MAXIMUM TERRACING GRADE TO BE 3:1 UNLESS OTHERWISE NOTED.
7. ALL GRADES BY CURBS ARE EDGE OF PAVEMENT GRADES UNLESS OTHERWISE INDICATED.
8. ALL CURBS SHALL BE BARRIER CURB (150mm) UNLESS OTHERWISE NOTED AND CONSTRUCTED AS PER CITY OF OTTAWA STANDARDS (SC1.1).
9. REFER TO LANDSCAPE PLAN FOR PLANTING AND OTHER LANDSCAPE FEATURE DETAILS.
13. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GRADING PLAN INDICATING AS-BUILT ELEVATIONS OF ALL DESIGN GRADES SHOWN ON THIS PLAN. (optional note; usage to be determined on a project by project basis)

PAVEMENT STRUCTURE:

LIGHT DUTY
55mm HL3
150mm GRAN "A"
250mm GRAN "B" TYPE II

HEAVY DUTY
40mm HL3
50mm HL8
150mm GRAN "A"
400mm GRAN "B" TYPE II

REFER TO __________ FOR ADDITIONAL NOTES

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
3.	ISSUED FOR SITE PLAN SUBMISSION	JUN 02/20	GJM
2.	RE-ISSUED FOR COORDINATION	APR 29/20	GJM
1.	ISSUED FOR COORDINATION	APR 14/20	GJM

SCALE 1:250

DESIGN	JAG
CHECKED	GJM
DRAWN	RJG
CHECKED	JAG
APPROVED	GJM

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER G.J. MacDONALD PROVINCE OF ONTARIO June 2, 2020

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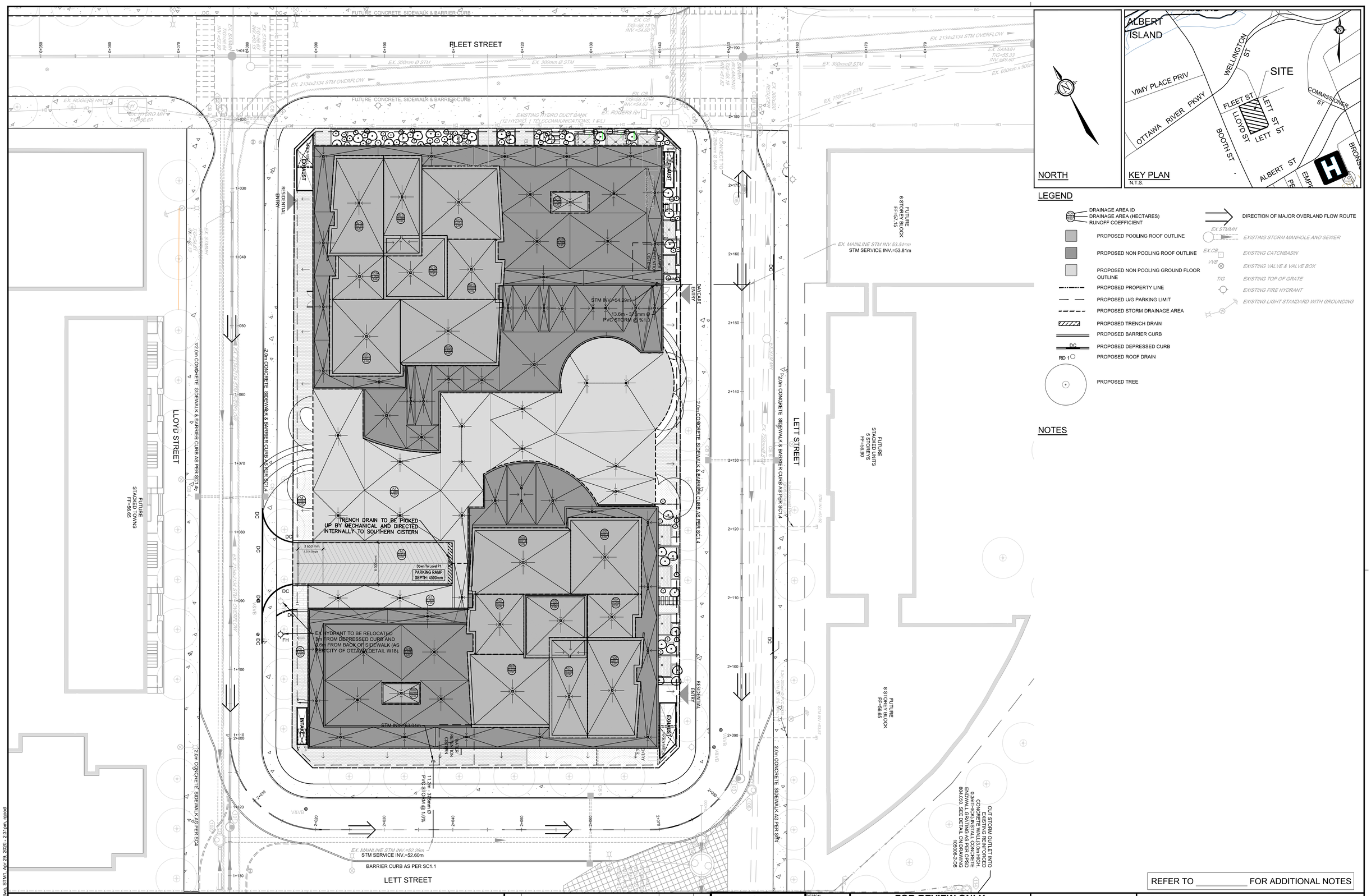
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
CITY OF OTTAWA
LE BRETON FLATS

DRAWING NAME
GRADING AND SEDIMENT CONTROL PLAN

PROJECT No. 116042-00
REV # 3
DRAWING No. 116042-GR1



LEGEND

- DRAINAGE AREA ID / DRAINAGE AREA (HECTARES) / RUNOFF COEFFICIENT
- PROPOSED POOLING ROOF OUTLINE
- PROPOSED NON POOLING ROOF OUTLINE
- PROPOSED NON POOLING GROUND FLOOR OUTLINE
- PROPOSED PROPERTY LINE
- PROPOSED U/G PARKING LIMIT
- PROPOSED STORM DRAINAGE AREA
- PROPOSED TRENCH DRAIN
- PROPOSED BARRIER CURB
- PROPOSED DEPRESSED CURB (DC)
- PROPOSED ROOF DRAIN (RD 1)
- PROPOSED TREE
- DIRECTION OF MAJOR OVERLAND FLOW ROUTE
- *EX.STMMH — EXISTING STORM MANHOLE AND SEWER*
- *EX.CB — EXISTING CATCHBASIN*
- *V/VB — EXISTING VALVE & VALVE BOX*
- *T/G — EXISTING TOP OF GRATE*
- *EXISTING FIRE HYDRANT*
- *EXISTING LIGHT STANDARD WITH GROUNDING*

NOTES

REFER TO _____ FOR ADDITIONAL NOTES

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
2.	ISSUED FOR SITE PLAN SUBMISSION	JUN 02/20	GJM
1.	ISSUED FOR COORDINATION	APR 29/20	GJM

SCALE: 1:250 (1:250, 0 2 4 6 8 10)

DESIGN: JAG
CHECKED: JAG
DRAWN: RJG
CHECKED: JAG
APPROVED: GJM

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER — G.J. MacDONALD — June 2, 2020 — PROVINCE OF ONTARIO

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LOCATION
CITY OF OTTAWA
LE BRETON FLATS

DRAWING NAME
ROOF PLAN

PROJECT No. 116042-00
REV # 2
DRAWING No. 116042-STM

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PLANAT.DWG - 841mmx594mm