Functional Site Servicing and Stormwater Management Report 1009 Trim Road, Ottawa, ON

Client:
Trim 1 GP Inc.
7 de Tellier
Gatineau, QC J8T 8C2

Submitted for:
Official Plan Amendment (OPA) and Zoning By-law Amendment (ZBL)

Project Name:
1009 Trim Road

Project Number:
OTT-00259629-A0

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Date Submitted:
December 17, 2021

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Date Submitted:
December 17, 2021

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1 Introduction

1.1 Overview

EXP Services Inc. (EXP) was retained by Trim 1 GP Inc. to prepare a Functional Site Servicing and Stormwater Management Report for the proposed development of 1009 Trim Road in support of an Official Plan Amendment (OPA) and Zoning By-Law Amendment (ZBL).

The site is situated at the north-east corner of Trim Road and Jeanne D'Arc Boulevard North and as illustrated in **Figure 1-1** below. The site is within the City of Ottawa urban boundary and situated in Orleans Ward (Ward 1).

Figure 1-1 - Site Location

The development proposed will consist of four high-rise buildings. Tower A and C both will be 28 storey, tower B will be 32 storey and tower D will be 24 storeys high. All four towers will be constructed above underground parking. The development proposed will have total 983 residential units and around 5400 m^2 of commercial/retail space. Tower A will have 238 units, tower B will have 278 units, tower C will have 252 units and tower D will have 215 units.

This report will discuss the adequacy of the adjacent municipal watermain, sanitary sewers and storm sewers to provide the required water supply, convey the sewage and stormwater flows that will result from the proposed development.

2 Existing Conditions

2.1 Site Topography

The site is currently undeveloped. The site is bounded to the west by Trim Road, to the south by Jeanne-D'Arc Boulevard North (formerly Inlet Private), to the east by undeveloped land, and to the north by the Ottawa River. **Figure 2-1** below illustrates the topography of the site which slopes in a northerly direction towards the Ottawa River.

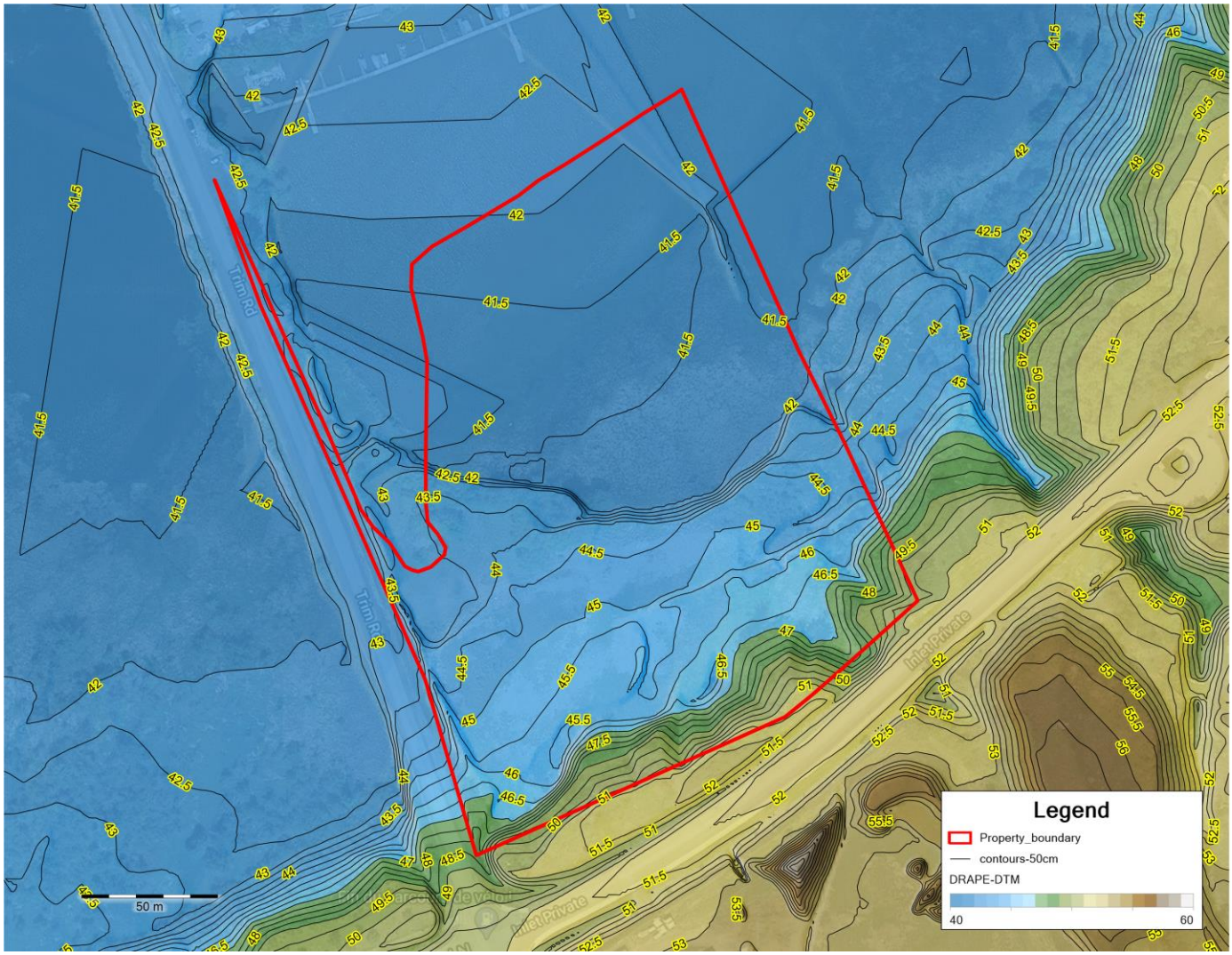

Figure 2-1 - Site Topography

Within the site the topography ranges from ±52m down to ±42m. A digital terrain model (DTM), was derived from the 2014 Digital Raster Acquisition Project of Eastern Ontario (DRAPE) and is shown in **Figure 2-1**. The normal water

surface elevation within the adjacent Ottawa River is approximately ±42.0m, with a 100-year flood elevation being 45.0m.

3 Existing Infrastructure

From review of the sewer and watermain mapping, as-built drawings and the City's GeoOttawa mapping, the following summarizes the onsite and adjacent offsite infrastructure:

Within property

- Subject property is currently undeveloped with no services or utilities

Within Jeanne-D'Arc Boulevard North, opposite the site

- 406 mm watermain and fire hydrants
- 300mm sanitary sewer
- Open drainage ditches on east side of Trim Road and along the north side of Jeanne D'Arc Boulevard North
- Enbridge Consumers Gas
- Overhead hydro lines and communication cables

4 Pre-Consultation / Permits / Approvals

A pre-consultation meeting was held with the City prior to design commencement. This meeting, held June 1, 2020, outlined the submission requirements and provided information to assist with the development proposal.

The proposed site is located within the Rideau Valley Conservation Authority (RVCA) jurisdiction, therefore signoff from the RVCA will be required. From previous development consultation on the property, the RVCA has noted that enhanced protection (80% TSS removal) is required. The RVCA has been contacted to confirm the stormwater management quality control requirements.

Stormwater management quantity control will not be required for the portion of the development that will be discharging directly to the Ottawa River. Additional information on this will be provided in proceeding sections.

Generally, an Environmental Compliance Approval (ECA) would be obtained from the Ministry of Environment, Conservation and Parks (MECP), formerly the Ministry of the Environment and Climate Change (MOECC), for any onsite private sewage works. The onsite sewage works would generally include the onsite stormwater works such as flow controls, associated stormwater detention, and treatment works. An Approval Exemption under Ontario Regulation 525/98 may sometimes be applied. Under Section 3 of O'Reg 525/98, Section 53 (1) and (3) do not apply to the alteration, extension, replacement or a change to a stormwater management facility that 1) is designed to service one lot or parcel of land, b) discharges into a storm sewer that is not a combined sewer, c) does not service industrial land or a structure located on industrial land, and finally d) is not located on industrial land. However, the Exception to obtaining an ECA does not apply to sewage works that drain directly to a watercourse. As it is currently proposed to discharge storm runoff to the Ottawa River directly, an ECA for the onsite stormwater works discharging to the Ottawa River will be necessary. Prior to City signoff, a pre-consultation will be held with the local MECP, to confirm submission requirements.

4.1 Design Guidelines

Various design guidelines were referred to in preparing the current report including:

- Bulletin ISDTB-2012-4 (20 June 2012)
  - Technical Bulletin ISDTB-2014-01 (05 February 2014)
  - Technical Bulletin PIEDTB-2016-01 (September 6, 2016)
  - Technical Bulletin ISDTB-2018-01 (21 March 2018)
  - Technical Bulletin ISDTB-2018-04 (27 June 2018)
- Ottawa Design Guidelines – Water Distribution, July 2010 (WDG001), including:
  - Technical Bulletin ISDTB-2014-02 (May 27, 2014)
  - Technical Bulletin ISTB-2018-02 (21 March 2018)
- Stormwater Management Planning and Design Manual, Ontario Ministry of the Environment and Climate Change, March 2003 (SMPDM).
- Design Guidelines for Drinking-Water Systems, Ontario Ministry of the Environment and Climate Change, 2008 (GDWS).
- Fire Underwriters Survey, Water Supply for Public Fire Protection (FUS), 1999.
- Ontario Building Code 2012, Ministry of Municipal Affairs and Housing.

5 Development Proposal

It is proposed to develop the site with four high-rise multi use towers A, B, C and D. Underground parking levels will be located beneath these four towers' footprint.

Vehicular entrances are proposed off of Jeanne D'Arc Boulevard North, with sidewalk connections along the frontage of the property linking Trim Road (to the west) and realigned Trim Road to the east.

6 Water Servicing

6.1 Water Servicing Design Criteria

Table 6-1 below summarizes the Design Criteria that was used to establish the water demands and the required fire flows, based on the proposed building uses. The design parameters that apply to this project and used for calculations are identified below.

Table 6-1 - Summary of Water Supply Design Criteria

Design Parameter	Value	Applies
Population Density – Single-family Home	3.4 persons/unit	
Population Density – Semi-detached Home	2.7 persons/unit	
Population Density – Townhome or Terrace Flat	1.8 persons/unit	
Population Density – Bachelor Apartment	1.4 persons/unit	
Population Density – Bachelor + Den Apartment	1.4 persons/unit	
Population Density – One Bedroom Apartment	1.4 persons/unit	✓
Population Density – One Bedroom plus Den Apartment	1.4 persons/unit	✓
Population Density – Two Bedroom Apartment	2.1 persons/unit	✓
Population Density – Two Bedroom plus Den Apartment	2.1 persons/unit	
Population Density – Three Bedroom Apartment	3.1 persons/unit	
Average Day Demands – Residential	350 L/person/day	✓
Average Day Demands – Commercial / Institutional	5 L/m^2 floor area/day	✓
Average Day Demands – Light Industrial / Heavy Industrial	35,000 or 55,000 L/gross ha/day	
Maximum Day Demands – Residential	2.5 x Average Day Demands	✓
Maximum Day Demands – Commercial / Institutional	1.5 x Average Day Demands	✓
Peak Hour Demands – Residential	5.5 x Average Day Demands	✓
Peak Hour Demands – Commercial / Institutional	2.7 x Average Day Demands	✓
Fire Flow Requirements Calculation	FUS	✓
Depth of Cover Required	2.4m	✓
Maximum Allowable Pressure	551.6 kPa (80 psi)	✓
Minimum Allowable Pressure	275.8 kPa (40 psi)	✓
Minimum Allowable Pressure during fire flow conditions	137.9 kPa (20 psi)	✓

6.2 Water Servicing Proposal

The proposed development will include ±983 residential units and ±5410 square meters of level 1 and level 2 retail space housed within the four towers.

Architectural plans and rendering of the proposed building along with building statistics are provided in **Appendix E.**

Water supply for the site will be provided by twin 200mm watermains supplied from the existing 406mm watermain on Jeanne D'Arc Boulevard North. The development will require independent and twin watermain, which is the result of the average day water demands exceeding 50 m^3/day. The watermain feeds from the underground parking level will connect directly to the existing 406mm watermain on Jeanne D'Arc Boulevard and will have an isolation valve between them, consistent with City of Ottawa Water Design Guidelines. **Figure A1** in **Appendix A** illustrates the conceptual water servicing of the property.

The buildings will be protected by an automatic sprinkler system. A fire department connection (or siamese) will be located within 45 metres of an adjacent municipally owned fire hydrant. In order to achieve this, it is proposed that a new hydrant will be installed off the existing 406mm watermain within the Jeanne D'Arc Boulevard right-of-way.

6.3 Estimated Water Demands

The following **Table 6-2** below summarizes the anticipated water demands for the proposed development based on following:

- 4 towers having total 983 residential units. Estimated residential population of 1678 persons.
- Commercial spaces on level 1 and 2. Estimated area of 5410 m^2.

Table 6-2 : Water Demand Summary

Water Demand Conditions	Tower A Water Demands (L/sec)	Tower B Water Demands (L/sec)	Tower C Water Demands (L/sec)	Tower D Water Demands (L/sec)	Total Water Demands (L/sec)
Average Day	1.69	1.94	1.89	1.59	7.11
Max Day	4.12	4.76	4.66	3.93	17.46
Peak Hour	9.00	10.40	10.22	8.61	38.23

6.4 Boundary Conditions

Hydraulic Grade Line (HGL) boundary conditions were obtained from the City for design purposes. A copy of the correspondence received from the City is provided in **Appendix D**.

The following hydraulic grade line (HGL) boundary conditions were provided:

- Maximum HGL = 113.6 m
- Peak Hour HGL = 106.7 m
- Max Day Plus Fire Flow 1 = 112.0 m (100 L/sec)
- Max Day Plus Fire Flow 2 = 102.9 m (167 L/sec)

The provided HGL ranges of 106.7 m – 113.6 m were used to estimate pressures at the building. Under Max Day Plus fire flow conditions, the lower HGL of 102.9 m was used, whereas for Peak Hour conditions the HGL of 106.7 m was used.

6.5 Fire Flow Requirements

Water for fire protection will be available utilizing the proposed fire hydrants located along on Jeanne D'Arc Boulevard. The required fire flows for the proposed buildings were calculated based on typical values as established by the Fire Underwriters Survey 1999 (FUS).

The following equation from the Fire Underwriters document "Water Supply for Public Fire Protection", 1991, was used for calculation of the on-site supply rates required to be supplied by the hydrants:

$F = 200 * C * \sqrt{(A)}$

where:

F	=	Required Fire flow in Litres per minute
C	=	Coefficient related to type of Construction
A	=	Total Floor Area in square metres

The proceeding **Table 6-3** summarizes the parameters used for estimating the Required Fire Flows (RFF) based on the Fire Underwriters Survey (FUS) and the latest City of Ottawa Technical Bulletins. The RFFs were estimated in accordance with ISTB-2018-02, and based on floor areas provided by the architect, which are illustrates in **Appendix E.** The following summarizes the parameters used for all buildings.

Table 6-3 - Summary of Design Parameters Used in Calculating Required Fire Flows (RFF) Using FUS

Design Parameter	Value
Coefficient Related to type of Construction C	0.80 (Tower A, B, C, D)
Total Floor Area (m2)	5,834 (Tower A) 5,877 (Tower B) 6,114 (Tower C) 5,961 (Tower D)
Fire Flow. Prior to rounding to closest 1,000 (L/min),	13,443 (Tower A) 13,492 (Tower B) 13,762 (Tower C) 13,589 (Tower D)
Fire Flow. Rounded to closest 1,000 (L/min),	13,000 (Tower A) 13,000 (Tower B) 14,000 (Tower C) 14,000 (Tower D)
Reduction Due to Occupancy Non-combustible (-25%), Limited Combustible (-15%), Combustible (0%), Free Burning (+15%), Rapid Burning (+25%)	-15% (Tower A, B, C, D)
Reduction due to Sprinkler (Max 50%) Sprinkler Conforming to NFPA 13 (-30%), Standard Water Supply (-10%), Fully Supervised Sprinkler (-10%)	-50% (Tower A, B, C, D)
Exposures	+20% (Tower A) +30% (Tower B)

	+30% (Tower C) +15% (Tower D)
Required Fire Flow, RFF, before rounded to closest 1,000 (L/min)	7,735 (Tower A) 8,840 (Tower B) 9,520 (Tower C) 7,735 (Tower D)
Required Fire Flow, RFF, rounded to closest 1,000 (L/min)	8,000 (Tower A) 9,000 (Tower B) 10,000 (Tower C) 8,000 (Tower D)

6.6 Review of Hydrant Spacing

A review of the hydrant spacing was completed to ensure compliance with Appendix I of Technical Bulletin ISTB-2018-02. As per Section 3 of Appendix I all hydrants within 150 metres were reviewed to assess the total possible available flow from these contributing hydrants. For each hydrant the distance to the proposed building was determined to arrive at the contribution of fire flow from each. All hydrants are expected to be of Class AA as per Section 5.1 of Appendix I. For each hydrant the straight-line distance, distance measured along a fire route or roadway, whether its location is accessible, and its contribution to the required fire flow.

Figure 6-1 below illustrates all the hydrants that are within the 75 metre and 150 metre offsets from the subject property. Fire hydrants that are denoted with a number having a HP versus H represents a PRIVATE hydrant rather than a CITY owned hydrant. All hydrants were reviewed to determine if they were accessible or non-accessible. For example, a hydrant would not be accessible if they were located on the opposite side of a median, limiting fire truck access. A summary table of the total fire flows available versus the required fire flows (RFFs) is presented in **Table 6-4** below.

Table 6-4 –Fire Flows Based on Hydrant Spacing

Building	Required Fire Flow (L/min)	Available Fireflow Based on Hydrant Spacing as per ISTB-2018-02 (L/min)
Tower A	8,000 (or 133 L/sec)	11,400
Tower B	9,000 (or 150 L/sec)	17,100
Tower C	10,000 (or 167 L/sec)	19,000
Tower D	8,000 (or 133 L/sec)	15,200

Detailed calculations of the available fire flows based on hydrant spacing is provided in **Table B8** found in **Appendix B.** Therefore, the available flows from hydrants exceed each building's fire flow requirements as identified in Appendix I of Technical Bulletin ISTB-2018-02.

Figure 6-1 – Review of Hydrant Spacing

6.7 Water Servicing Design

The water servicing requirements for the proposed building is designed in accordance with the City Design Guidelines (July 2010). The following steps indicate the basic methodology that was used in our analysis:

- Estimated water demands under average day, maximum day and peak hour conditions. As the total population estimate is greater than 500, standard residential peaking factors were used.
- Estimated the required fire flow (RFF) based on the Fire Underwriters Survey (FUS).
- Reviewed the available flows from hydrants within 150m of the buildings, based on the City's WDG002 and compared to the required fire flows (RFFs) based on the Fire Underwriters Survey (FUS).
- Obtained hydraulic boundary conditions (HGL) from the City, based on the above water demands and required fire flows.

- Boundary condition data and water demands were used to estimate the pressure at the proposed building, and this was compared to the City's design criteria.

Since the average day demand exceed 50 m^3 per day, two watermain feeds for the development will be necessary as per Section 4.31 of the WDG001. Please refer to **Table B1** in **Appendix B** for detailed calculations of the total water demands.

A review of the estimated watermain pressure at the building connection, based on the boundary conditions provided, was completed based on using two watermains. **Table B7** in **Appendix B** provides a comparison of anticipated pressures at the building connection based on using a single or double watermain feed. A single watermain analysis was completed to determined if the water pressure still met the City requirement during either the maximum day plus fire flow or peak hour condition, if one of the laterals was out of service.

Based on the hydraulic grade line (HGL) provided from the City it is evident that high pressures exist in the water distribution system at the property. Static pressures of ± 70 psi – 90 psi are typically available. This is due to the lower elevation relative to the reservoir. Due of the relatively short distance that would be necessary between the buildings and the watermain connection, minimal pressure loss is anticipated. The pressure available at the building connection would be within ±4.6 psi of the pressure in the city main based on a 200mm supply. If only one of the two mains were in operation, the pressure at the building would be ±13.9 psi of the pressure in the city main, under maximum day plus fire flow conditions.

Under peak hour conditions, there is little difference if either one or two 200mm watermains are in use, with anticipated pressure at the building of ±1.5 psi of the city's distribution main pressure.

During the detailed design stage of the project the final selection of the watermain diameter required for each building will be coordinated with the mechanical consultant.

Based on the results, the installation of two 200mm watermains with a shut-off valve between them is proposed. As the maximum hydraulic grade line (HGL) provided by the city indicates pressures greater than 80 psi, pressure reducing measures will be required.

7 Sanitary Sewage Servicing

Sanitary Sewage Design Criteria

The sanitary sewer system is designed based on a population flow and an area-based infiltration allowance. The flows were calculated using City sewer design guidelines (SDG002). **Table 7-1** below summarizes the design parameters used.

Table 7-1 – Summary of Wastewater Design Criteria / Parameters

Design Parameter	Value	Applies
Population Density – Single-family Home	3.4 persons/unit	
Population Density – Semi-detached Home	2.7 persons/unit	
Population Density – Duplex	2.3 persons/unit	
Population Density – Townhome (row)	2.7 persons/unit	
Population Density – Bachelor Apartment	1.4 persons/unit	
Population Density – Bachelor + Den Apartment	1.4 persons/unit	
Population Density – One Bedroom Apartment	1.4 persons/unit	✓
Population Density – One Bedroom plus Den Apartment	1.4 persons/unit	✓
Population Density – Two Bedroom Apartment	2.1 persons/unit	✓
Population Density – Two Bedroom plus Den Apartment	2.1 persons/unit	✓
Population Density – Three Bedroom Apartment	3.1 persons/unit	
Average Daily Residential Sewage Flow	280 L/person/day	✓
Average Daily Commercial / Intuitional Flow	28,000 L/gross ha/day	✓
Average Light / Heavy Industrial Daily Flow	35,000 / 55,000 L/gross ha/day	
Residential Peaking Factor – Harmon Formula (Min = 2.0, Max =4.0, with K=0.8)	$M = 1 + \frac{14}{4 + P^{0.5}} * k$	✓
Commercial Peaking Factor	1.5	✓
Institutional Peaking Factor	1.5	
Industrial Peaking Factor	As per Table 4-B (SDG002)	
Unit of Peak Extraneous Flow (Dry Weather / Wet Weather)	0.05 or 0.28 L/s/gross ha	
Unit of Peak Extraneous Flow (Total I/I)	0.33 L/s/gross ha	✓

7.1 Proposed Sewage Conditions

It is proposed that the mechanical piping from each building to a sanitary manhole onsite, which will then discharge to the existing sanitary sewer on Jeanne-D'Arc Boulevard. This manhole will be installed near the property line and be used as a monitoring manhole.

A 250mm diameter sanitary sewer is proposed with a minimum 2% slope, having a capacity of 68 L/sec based on Manning's Equation under full flow conditions. The estimated peak sanitary flow rate from the proposed property is **±17.1 L/sec** based on City Design Guidelines. Sewage rates include a total infiltration allowance of 0.33 L/ha/sec based on the total gross site area. **Table 7-2** below summarizes the sewage anticipated peak sewage flows for the proposed site.

Table 7-2 – Summary of Anticipated Sewage Rates

Sewage Condition	Sanitary Sewage Flow (L/sec)
Peak Residential Flow (for 1,678 persons)	15.8
Peak Commercial Flow (for 5,410 m2)	0.18
Infiltration Flow (for 3.45 ha)	1.11
Peak Design Flow	17.10

7.2 Offsite Sanitary Sewer Review

The sanitary sewer run on Jeanne D'Arc Boulevard North (from Trim Road easterly to municipal limits) was designed and constructed to allow for the development of Phase I (Tower 1) of Brigil's Petrie's Landing II to proceed. Approximately 320 metres of sanitary sewer was extended from the Trim Road intersection easterly to service Petrie's Landing II. A review of previous reports by David MacManus (DME) for Phase 1, and EXP Services (EXP) for Phase 2, confirmed that the sanitary sewer system on Jeanne D'Arc Boulevard North was sized, not only for the 3.9-hectare Petrie's Landing development site, but also for an additional 9.9 hectares of commercial development along Jeanne D'Arc Boulevard North. The commercial flow allowance established was 50,000 L/ha/day and included an additional infiltration allowance at 0.28 L/ha/sec.

As taken from the DME report, the total peak sanitary flows from both Petrie's Landing development (all 5 phases) and the additional 9.9 hectares was 34.7 L/sec, which included ±23.4 L/sec from Petrie's Landing and ±11.4 L/sec from the additional area along Jeanne D'Arc Boulevard North. At the time of the design of Tower 1 by DME, this was based on a residential population of 1512 persons.

In 2016, during the design of Tower 2 by EXP Services Inc (EXP), further refinement of the sanitary sewage flows from the Petrie's II Landing development was completed, based on number of proposed residential units. A revised population of 1822 persons was used and included the same offsite commercial flow allowance for the 9.9-hectares along Jeanne D'Arc Boulevard North. The peak flow was updated to 39.2 L/sec with 27.8 L/sec from Petrie's Landing development and 11.4 L/sec from the offsite areas.

Now in 2021, the review of all sanitary sewer runs on Jean D'Arc Boulevard North were completed based on the most up to date information. A sanitary sewer design sheet was compiled based on data from the Petrie's Landing II project and based on the City's most recent Technical Bulletins. It should be noted that March 2018, revisions to the City's SDG002, were made to residential flow allowances as noted in Technical Bulletin ISTB-2018-01. The pre capita flow allowance was lowered from 350 L/p/day to 280 L/person/day, along with the addition of the correction factors of 0.8 to the Harmon Formula Peaking Factors. These revised allowances were used to review sanitary sewer capacities.

Table B9 in **Appendix B** summarizes the anticipated peak sewage flows in all sanitary sewers runs up to the Trim Road intersection, whereas **Figure A2** illustrates the sanitary drainage areas tributary to this sewer run.

The total peak flow is estimated at 40.05 L/sec, with includes peak flows of:

- ±20.1 L/sec from the 3.91-hectare Petrie's Landing (all phase), based on population of 1874.4 persons and 1,500m^2 commercial space
- An additional ±5.1 L/sec from 6.17 hectares along Jeanne D'Arc Boulevard North, based on 50,000 L/gross ha of commercial flow

- An additional 17.1 L/sec from proposed site at 1009 Trim Road, based on 1,678 persons and 5,410 m^2 commercial space.

It should be noted that the difference in peak flows from Table 7-2 and the above noted is based on the accumulation of population and the resultant lowering of the peaking factor. It should also be noted that the developer has proposed to acquire Part 9 of Plan 50R-5818 – Jeanne D'Arc ROW at the north east corner of Jeanne D'Arc Boulevard North and Trim Road, from the City. Sanitary manhole #MHSA22037 is proposed to be relocated outside the property line. With this relocation, it is also proposed to upsize the pipes between MHSA22036-MHSA22037-MHSA54993 from 300mm dia. to 375mm dia. as shown on **Figure A1** in **Appendix A**. Based on the total estimated peak flows there will be adequate capacity in all pipe runs, with the most downstream run at 86% capacity.

For the site at 1009 Trim Road, a single 300mm diameter PVC sewer lateral having a slope of 2.0% is proposed to service the development, at this time. The estimated capacity of a 300mm pipe at 2% is ±142 L/sec. A lateral at this slope would permit 8,300 fixture units as per OBC. Further detail will be advanced as the project progresses.

8 Storm Servicing & Stormwater Management

8.1 Design Criteria

The subject property is located within the Rideau Valley subwatershed; therefore, stormwater works are subject to both the Rideau Valley Conservation Authority (RVCA) and City of Ottawa (COO) approval.

The RVCA has noted that (80% TSS removal) quality control requirements for the site will be required.

Also clarified during the pre-consultation meeting, the requirements related to stormwater quantity control are noted as follows:

- *No quantity control is required for this development ONLY if it is discharging to the river.*
- *Please contact the City if this development will require municipal stormwater servicing.*

The proposed stormwater system is designed in conformance with the latest version of the City of Ottawa Design Guidelines (October 2012). Section 5 "Storm and Combined Sewer Design" and Section 8 "Stormwater Management". A summary of the design criteria that relates to this design report is the proceeding sections below.

8.1.1 Minor System Design Criteria

- The storm sewer sizing will be based on the Rational Method and Manning's Equation under free flow conditions for the 2-year storm using a 10-minute inlet time.
- Minimum sewer slopes to be based on minimum velocities for storm sewers of 0.80 m/sec.

8.1.2 Major System Design Criteria

- On-site storage is calculated based on the 100-year design storm. The on-site detention storage requirements will be determined during the Site Plan submission stage. It is proposed that roof top storage be incorporated where possible.
- Overland flow routes will be reviewed during the Site Plan submission stage.
- The vertical distance from the spill elevation on the street and the ground elevation at the buildings is at least 150mm.
- The emergency overflow spill elevation is at least 30 cm below the lowest building opening.

8.2 Runoff Coefficients

Runoff coefficients used were based on actual areas taken from CAD. Runoff coefficients for impervious surfaces (roofs, asphalt, and concrete) were taken as 0.90, whereas those for pervious surfaces (grass/landscaping) were taken as 0.20. Average runoff coefficients were calculated for catchments (or drainage areas) using the area-weighting method in excel. The runoff coefficients for all post-development catchments are provided in **Table B11.**

8.3 Allowable Release Rate

Rather than meeting pre-development release rates, the City of Ottawa allowed for "NO" quantity control of runoff due to the sites proximity to the Ottawa River.

The majority of storm runoff occurring on the site will discharge to roof drains or area drains, which will permit for stormwater storage, simply by using flow-controlled drains. For this reason, an allowable discharge rate based on a runoff coefficient of C=0.50 was established. Peak flows for all storm events were established based on this runoff coefficient.

The 2-yr, 5-yr and 100-yr allowable release rates from the proposed site was estimated at 121.2 L/sec, 164.5 L/sec, 281.7 L/sec, respectively. **Table B10** in **Appendix B** provides detailed calculations on the total allowable peak flow.

Table 8-1 – Summary of Stormwater Peak Flows

Development	Discharge Rates (L/sec)		
	2-year	5-year	100-year
1009 Trim Road	121.2	164.5	281.7

8.4 Proposed Stormwater System

Stormwater runoff from the proposed site will drain from a combination of controlled and uncontrolled areas. A storm drainage plan is illustrated on **Figure A3**. A total six (6) subcatchments (or drainage areas) are shown on this drawing with average runoff coefficients calculated for each drainage area. The stormwater works shall consist of the following elements:

- For Towers A, B, C and D, Flow-control roof drains to be provided.
- Runoff from surface areas surrounding the proposed towers will be collected by area drains and discharge to internal drainage piping in the underground parking structure. This in turn discharges directly to an oil-grit separator manhole, prior to discharging to the Ottawa River

All roof area will utilize flow-controlled weirs and based on the roof areas an estimate of the number of roof drains was completed. WATTS ACCUTROL weirs were used to determine the total discharge rates from the roof areas based on the estimated number of drains. In addition, the total cumulative prism volumes on the roofs were calculated at a maximum permitted depth of 150mm. Information on the estimated 100-year volumes on each roof is provided in **Table B18** to **Table B21** in **Appendix B.**

It should be noted that the Jeanne D'Arc Boulevard will be urbanized as indicated on drawing #EJV-S0O174-RWY-DWG-3915 received from the City. As a result of urbanization and proposed development at 1009 Trim Road, a storm sewer is proposed under Jeanne D'Arc. To allow for the development, the existing culvert and associated upstream drainage area will need to be rerouted to discharge into the proposed storm sewer. Detailed design will be provided at the Site Plan Application after coordination with the City.

8.5 Flow Attenuation & Storage

The attenuation of stormwater will be achieved by utilizing roof storage. Using the release rates estimated on the roofs, the Modified Rational Method was used to determine the 2-year, 5-year, and 100-year volumes that will occur for corresponding release rates.

Table B14 through **Table B17**, provide the storage volumes necessary on the roof to attenuate the controlled release rates. **Table B12** summarizes the combined controlled and uncontrolled flows leaving the subject site. A summary of release rates, storage volume requirements, and provided storage volumes are identified in **Table 8-2** below.

Table 8-2 – Summary of Post-Development Storage

Area	Location	Release Rate (L/s)			Storage Required (m^3)			Storage Provided (m^3)		Control Method
		2-yr	5-yr	100-yr	2-yr	5-yr	100-yr	Roof	Surface	
S01	Tower A roof	5.9	8.0	15.1	10.4	14.1	26.7	44.8		Flow Controlled Roof Drains
S02	Tower B roof	5.9	8.0	15.1	9.6	12.9	24.4	42.4		Flow Controlled Roof Drains
S03	Tower C roof	6.6	8.9	17.0	10.7	14.5	27.4	47.7		Flow Controlled Roof Drains
S04	Tower D roof	6.6	8.9	17.0	10.4	14.1	26.7	46.4		Flow Controlled Roof Drains
S05	Area around Tower A & B	71.0	96.4	193.4						none
S06	Area around Tower C & D	47.8	64.9	139.0						none
Total (All)		**143.8**	**195.0**	**396.7**	**41.2**	**55.5**	**105.2**	**181.3**		

8.6 Quality Control

As a total suspended solids (TSS) removal efficiency of 80% is required, it is proposed to provide an oil grit separator for quality control. The following summarizes the design parameters used in the sizing of the Stormceptor manhole.

Table 8-3 – Design Parameters Used for Oil Grit Separator Sizing

Parameter	Value Used
Drainage Area	1.1347 hectares
Runoff Coefficient	0.85
TSS Removal Requirements	80 %
Runoff Volume Capture	90 %
Flow attenuation upstream of OG separator (taken as 100-yr discharge & storage upstream of OG)	none
Particle distribution	fine

Output from the PCSWMM for Stormceptor program is provided in Appendix E for reference. A Stormceptor model EF06 is necessary to meet the required TSS removal of 80%. The EF06 will provide an approximate TSS removal of 80%.

9 Erosion & Sediment Control

During all construction activities, erosion and sedimentation shall be controlled by the following techniques:

- Filter cloth shall be installed between the frame and cover of all adjacent catch basins and catch basin manhole structures.
- Heavy duty silt fencing will be used to control runoff around the construction area. Silt fencing locations are identified on the site grading and erosion control plan.
- A mud mat will be installed at the construction entrance to help avoid mud from being transported to offsite roads.
- Visual inspection shall be completed daily on sediment control barriers and any damage repaired immediately. Care will be taken to prevent damage during construction operations.
- In some cases, barriers may be removed temporarily to accommodate the construction operations. The affected barriers will be reinstated at night when construction is completed.
- Sediment control devices will be cleaned of accumulated silt as required. The deposits will be disposed of as per the requirements of the contract.
- During the course of construction, if the engineer believes that additional prevention methods are required to control erosion and sedimentation, the contractor will install additional silt fences or other methods as required to the satisfaction of the engineer.
- Construction and maintenance requirements for erosion and sediment controls are to comply with Ontario Provincial Standard Specification (OPSS) OPSS 805 and City of Ottawa specifications.

10 Conclusions and Recommendations

This Functional Servicing & Stormwater Report outlines the rationale which will be used to service the proposed development. The following summarizes the servicing requirements for the site:

Water

- Two parallel 200mm watermains are proposed to service the development, as the average day demands exceed 50 m^3 per day, which is mandatory as per Section 4.31 of the WDG001.
- The Required Fire Flows (RFFs) were estimated at **8,000 L/min** (133 L/sec) for Tower A, **9,000 L/min** (150 L/sec) for Tower B, **10,000 L/min** (167 L/sec) for Tower C and **8,000 L/min** (133 L/sec) for Tower D. The total minimum available flows for firefighting purposes, based on the contribution from hydrants, was estimated at **11,400 L/min, 17,100 L/min, 19,000 L/min and 15,200 L/min** for each building, respectively.
- Based on hydraulic boundary conditions (HGL) provided by the City of Ottawa, a system pressure of **±77.5 psi** under peak hourly demands is anticipated at the proposed building. This exceeds the City's guideline of 40 psi.

Sewage

- Estimated peak sewage flows of **17.1 L/sec** are anticipated. A review of the sanitary sewers on Jeanne D'Arc Boulevard was completed. It was determined that the sanitary main between MHSA 22036 and MHSA 54993 will be upsized from 300mm diameter to 375mm diameter pipes to match with the downstream pipes. It is also determined that the sanitary manhole MHSA 22037 will need to relocated outside the property line as a result of Part 9 of Plan 50R-5818 acquisition.

Stormwater

- For the stormwater system, the total discharge rate from the entire site was calculated based on a runoff coefficient of 0.50 and a time of concentration of 10 minutes. The City did not impose onsite quantity control due to the proximity to the Ottawa River. This is contingent on using a direct connection to the River rather than discharging to a storm sewer.
- The release rate for the entire site was calculated to be using a C_{AVG} of 0.50 for all storms up to the 100-year event. Although runoff does not need to be detained onsite, stormwater on the roof of the proposed buildings will occur.
- Runoff on the building roofs will be controlled using flow-controlled roof drains. Each roof-drain is equipped with WATTS ACCUTROL weirs and set at the OPEN position and having maximum discharge rate of 30 gpm at 150mm depth. An estimate of the number of roof drains, based on roof areas was completed, resulting in maximum 100-year discharge rates of **64.2 L/sec** (Tower A, B, C, D).
- The remaining areas will not have flow controls with 100-yr anticipated peak flows of **332.4 L/sec.** A total 100yr peak flow of **396.7 L/sec** is estimated.
- Based on the discharge rates from the flat roofs a total retention volume of **± 105.2 m^3** is required. These volumes are based on the above release rates, using the Modified Rational Method.
- The volumes available on the roofs are **±181.3 m^3** based on a maximum 150mm ponding depth.
- Runoff from the surface areas above the parking structure will not be controlled.
- An oil-grit separator (OG) is required to meet the TSS removal efficiency of 80%. A Stormceptor Model EF06 was selected which is estimated to have a removal efficiency of **80%.**

11 Legal Notification

This report was prepared by EXP Services Inc. for the account of Trim 1 GP Inc.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. EXP Services Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this project.

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Appendix A – Figures

Figure A1 – Conceptual Servicing Plan

Figure A2 – Sanitary Drainage Plan

Figure A3 – Storm Drainage Plan

New Oil/Grit Separator and outfall to Ottawa River

OUTFALL

OGS

STORM MORNITORING MANHOLE

TOWER A

TOWER B

TOWER C

TOWER D

SAN MONITORING HOLE

MHSA54989

H003

OUTFALL

MHSA54990

MHSA54991

H002

MHSA54992

MHSA54993

H001

H031

MHSA22037

MHSA22037

MHSA22036

H030

New storm outlet as proposed on the LRT drawings

Existing culvert to remain in place

The upstream drainage area from this culvert will need to be picked-up by the proposed storm sewer

Proposed realignment of sanitary manhole MHSA22037 and upsize the pipe to 375mm dia.

New twin 200mm water services to building with shutoff valve in between

New sanitary sewer and MH to building

Jeanne-d'Arc Blvd N

Trim Rd

Trim Rd

LEGEND

- OUTFALL
- STORM MANHOLE
- SANITARY MANHOLE
- EXISTING CULVERT
- PROPOSED STORM PIPE
- EXISTING SANITARY PIPE
- PROPOSED SANITARY PIPE
- PROPERTY LINE
- FIRE HYDRANTS
- WATER MAIN
- PROPOSED DITCH

0 10m 20m 40m

HORIZONTAL 1:1000

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DRAWN	AJ
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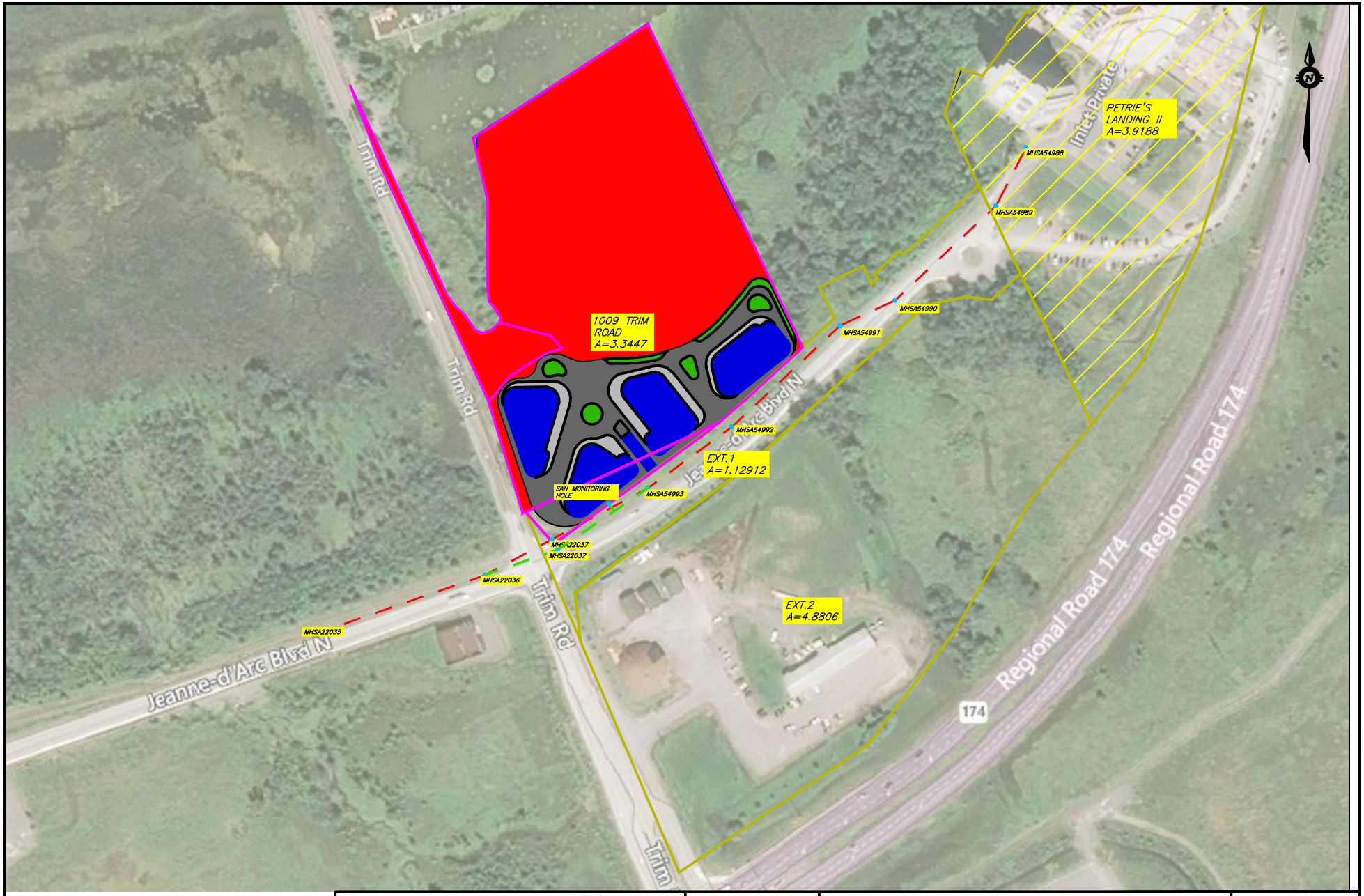
FILE NO	OTT-259629-A0

1009 TRIM ROAD

CONCEPTUAL SERVICING PLAN

SCALE 1:1000

SKETCH NO FIG 1



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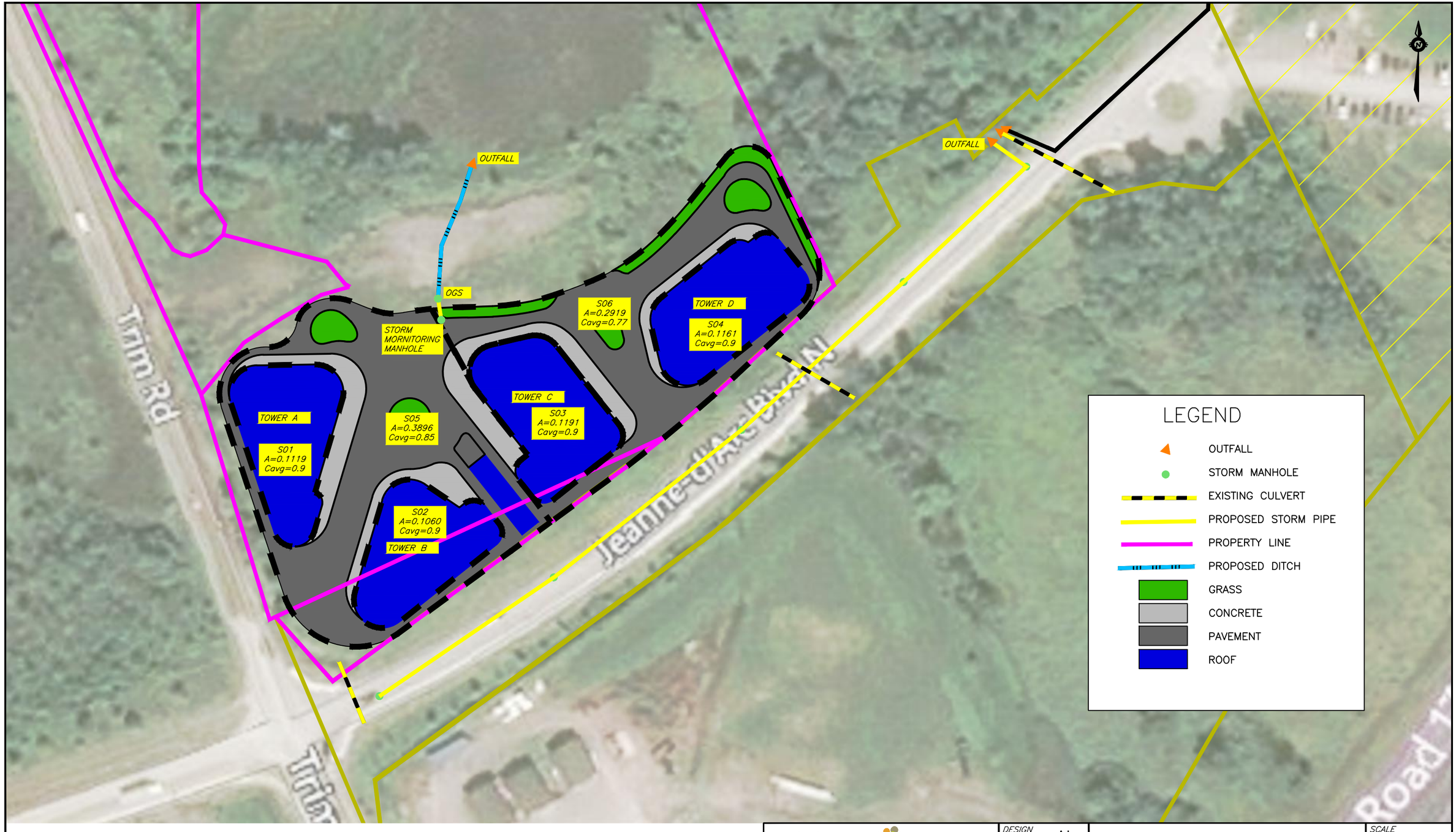
FILE NO	OTT-259629-A0

1009 TRIM ROAD

SANITARY DRAINAGE PLAN

SCALE 1:3000

SKETCH NO FIG 2



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DESIGN	AJ
DRAWN	AJ
DATE	10/12/21
FILE NO	OTT-259629-A0

1009 TRIM ROAD

STORM DRAINAGE PLAN

SCALE 1:1000

SKETCH NO FIG 3

Appendix B – Design Tables

TABLE B1
Water Demand Chart

Junction Number (Building)	No. of Units										Total Pop	Residential Demands					Commercial						Totla Demands in (L/sec)		
	Singles/Semis/Towns				Apartments							Avg Day Demand (L/day)	Max Day Peaking Factor	Max Hour Peaking Factor	Max Day Demand (L/day)	Peak Hourly Demand (L/day)	Area (m^2)	Avg Demand (L/day)	Peaking Factors (x Avg Day)		Max Day Demand (L/day)	Peak Hour Demand (L/day)	Avg Day (L/s)	Max Day (L/s)	Peak Hour (L/s)
	Single Familty	Semi	Duplex	Townhome	Bachelor	1-Bed Apt	1-Bed +Den Apt	2 Bed Apt	3 Bed Apt	Avg Apt.									Max Day	Peak Hour					
Tower A (Trim Rd)						156		82			390.6	136,710	2.5	5.5	341,775	751,905	1884.0	9,420	1.5	2.7	14,130	25,434	1.69	4.12	9.00
Tower B (Trim Rd)						184		94			455.0	159,250	2.5	5.5	398,125	875,875	1696.0	8,480	1.5	2.7	12,720	22,896	1.94	4.76	10.40
Tower C (Trim Rd)						111		141			451.5	158,025	2.5	5.5	395,063	869,138	1031.0	5,155	1.5	2.7	7,733	13,919	1.89	4.66	10.22
Tower D (Trim Rd)						101		114			380.8	133,280	2.5	5.5	333,200	733,040	799.0	3,995	1.5	2.7	5,993	10,787	1.59	3.93	8.61
Totals =						552		431			1677.9	587,265			1,468,163	3,229,958	5410.0				40,575	73,035	7.11	17.46	38.23

Unit Densities	Persons/Unit
Singles	3.4
Semi-Detached	2.7
Duplex	2.3
Townhome	2.7
Bachelor Apt Unit	1.4
1-Bed Apt Unit	1.4
1-Bed + Den Apt Unit	1.4
2-Bed Apt Unit	2.1
3-Bed Apt Unit	3.1
Avg. Apt Unit	1.8

Residential

Residential Consumption (L/pers/day) =	350
Max Day Peaking Factor (* avg day) =	2.5
Peak Hour Factor (* avg day) =	5.5

Industrrial/Commercial/Institutional Water Consumption

Light Industrial (L/gross ha/day) =	35,000
Heavy Industrial (L/gross ha/day) =	55,000
Commer/Instit (L/m^2 floor/day) =	5
Max Day Peaking Factor (* avg day) =	1.5
Peak Hour Factor (* avg day) =	2.7

Project:	
259629 - 1009 Trim Road	
Designed:	Location:
Aaditya Jarwiala, M.Eng.	Ottawa, Ontario
Checked:	
Chris Collins, P.Eng.	
File Reference:	Page No:
259629 Water - Demand Chart, Dec 2021.xlsx	1 of 1

TABLE B2
SUMMARY OF REQUIRED FIREFLOWS (RFFs)

Building #	Description	[1]No of Storeys	Fire Flow, F (L/min)	[2]Type of Constr. Coeff, C	[3]Reduction Due to Occupancy (%)	[4]Reduction Due to Sprinklers (%)	[5]Total Increase due to Exposures	[6]Required Fire Flow in	
								(L/min)	(L/sec)
PROPOSED TOWER A	high-rise condo	28	13,000	0.8	-15%	-50%	20%	8,000	133
PROPOSED TOWER B	high-rise condo	32	13,000	0.8	-15%	-50%	30%	9,000	150
PROPOSED TOWER C	high-rise condo	28	14,000	0.8	-15%	-50%	30%	10,000	167
PROPOSED TOWER D	high-rise condo	24	14,000	0.8	-15%	-50%	15%	8,000	133

Notes

1 - If basements are included (<50% below grade) then denoted as +.

2 -Types of constructions: 0.8 for non-combustible, 1.0 for ordinary construction,1.5 for wood frame construction.

3 - Reductions due to Occupancy are -25% for non-combustible or -15% for limited combustible.

4 - Reductions due to Sprinkler Systems

5 – Increase due to exposures were calculated based on FUS and technical bulletin ISTB-2018-02.

6 – Required Fire Flows are rounded to nearest 1,000 L/min.

TABLE B3 (Tower A)
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999 FOR PROPOSED TOWER A

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where: F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Non-combustible Construction				0.8	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment		
	Floor 11 to 28		827	0%	0	Two largest adjoining floors+ 50% of floors above (up to eight)		
	Floor 10		827	50%	414			
	Floor 9		827	50%	414			
	Floor 8		827	50%	414			
	Floor 7		827	50%	414			
	Floor 6		827	50%	414			
	Floor 5		827	50%	414			
	Floor 4		1117.7	50%	559			
	Floor 3		1117.7	50%	559			
	Floor 2		1117.7	100%	1,118			
	Floor 1 (Ground)		1117.7	100%	1,118			
	Basement (At least 50% below grade, not included)				5,834			
Fire Flow (F)	F = 220 * C * SQRT(A)							13,443
Fire Flow (F)	Rounded to nearest 1,000							**13,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-1,950	11,050
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	Adequate Sprinkler Conforms to NFPA13	-30%	-3,315	7,735
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	-1,105	6,630
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Fully Supervised Sprinkler System	-10%	-1,105	5,525
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1	46	6	> 45.1	Type B	0	0	0	6	0%	20%	2,210	7,735
	Side 2	16	3	10.1 to 20	Type B	37	28	1036	3E	15%			
	Front	37	5	30.1 to 45	Type B	38	28	1064	5E	5%			
	Back	46	6	> 45.1	Type B	0	2	30	6	0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**8,000**
	Total Required Fire Flow, L/s =												**133**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type A	Wood-Frame or non-conbustible
Type B	Ordinary or fire-resisitve with unprotected openings
Type C	Ordinary or fire-resisitve with semi-protected openings
Type D	Ordinary or fire-resisitve with blank wall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B4 (Tower B)
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999 FOR PROPOSED TOWER B

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where: F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Non-combustible Construction				0.8	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment		
	Floor 11 to 32		827	0%	0	Two largest adjoining floors+ 50% of floors above (up to eight)		
	Floor 10		827	50%	414			
	Floor 9		827	50%	414			
	Floor 8		827	50%	414			
	Floor 7		827	50%	414			
	Floor 6		1055.75	50%	528			
	Floor 5		1055.75	50%	528			
	Floor 4		1055.75	50%	528			
	Floor 3		1055.75	50%	528			
	Floor 2		1055.75	100%	1,056			
	Floor 1 (Ground)		1055.75	100%	1,056			
	Basement (At least 50% below grade, not included)				5,877			
Fire Flow (F)	F = 220 * C * SQRT(A)							13,492
Fire Flow (F)	Rounded to nearest 1,000							**13,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-1,950	11,050
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	Adequate Sprinkler Conforms to NFPA13	-30%	-3,315	7,735
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	-1,105	6,630
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Fully Supervised Sprinkler System	-10%	-1,105	5,525
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1	16	3	10.1 to 20	Type B	48	28	1344	3E	15%	30%	3,315	8,840
	Side 2	17	3	10.1 to 20	Type B	40	28	1120	3E	15%			
	Front	46	6	> 45.1	Type B	38	2	76	6	0%			
	Back	46	6	> 45.1	Type B	0	2	30	6	0%			
Obtain Required Fire Flow											Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =		**9,000**
											Total Required Fire Flow, L/s =		**150**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type A	Wood-Frame or non-conbustible
Type B	Ordinary or fire-resisitve with unprotected openings
Type C	Ordinary or fire-resisitve with semi-protected openings
Type D	Ordinary or fire-resisitve with blank wall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B5 (Tower C)
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999 FOR PROPOSED TOWER C

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where: F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Non-combustible Construction				0.8	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment		
	Floor 11 to 28		827	0%	0			
	Floor 10		827	50%	414			
	Floor 9		827	50%	414			
	Floor 8		827	50%	414			
	Floor 7		827	50%	414			
	Floor 6		827	50%	414			
	Floor 5		827	50%	414			
	Floor 4		1211	50%	606			
	Floor 3		1211	50%	606			
	Floor 2		1211	100%	1,211			
	Floor 1 (Ground)		1211	100%	1,211			
	Basement (At least 50% below grade, not included)				6,114			
Fire Flow (F)	F = 220 * C * SQRT(A)							13,762
Fire Flow (F)	Rounded to nearest 1,000							**14,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-2,100	11,900
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	Adequate Sprinkler Conforms to NFPA13	-30%	-3,570	8,330
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	-1,190	7,140
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Fully Supervised Sprinkler System	-10%	-1,190	5,950
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1	17	3	10.1 to 20	Type B	30	28	840	3E	15%	30%	3,570	9,520
	Side 2	19	3	10.1 to 20	Type B	25	24	600	3E	15%			
	Front	46	6	> 45.1	Type B	0	0	0	6	0%			
	Back	46	6	> 45.1	Type B	0	0	0	6	0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**10,000**
	Total Required Fire Flow, L/s =												**167**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type A	Wood-Frame or non-conbustible
Type B	Ordinary or fire-resisitve with unprotected openings
Type C	Ordinary or fire-resisitve with semi-protected openings
Type D	Ordinary or fire-resisitve with blank wall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B6 (Tower D)
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999 FOR PROPOSED TOWER D

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where: F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Non-combustible Construction				0.8	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment		
	Floor 11 to 24		827	0%	0	Two largest adjoining floors+ 50% of floors above (up to eight)		
	Floor 10		827	50%	414			
	Floor 9		827	50%	414			
	Floor 8		827	50%	414			
	Floor 7		827	50%	414			
	Floor 6		827	50%	414			
	Floor 5		827	50%	414			
	Floor 4		1160	50%	580			
	Floor 3		1160	50%	580			
	Floor 2		1160	100%	1,160			
	Floor 1 (Ground)		1160	100%	1,160			
	Basement (At least 50% below grade, not included)				5,961			
Fire Flow (F)	F = 220 * C * SQRT(A)							13,589
Fire Flow (F)	Rounded to nearest 1,000							**14,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-2,100	11,900
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	Adequate Sprinkler Conforms to NFPA13	-30%	-3,570	8,330
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	-1,190	7,140
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Fully Supervised Sprinkler System	-10%	-1,190	5,950
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1	19	3	10.1 to 20	Type B	39	24	936	3E	15%	15%	1,785	7,735
	Side 2	46	6	> 45.1	Type B	0	0	0	6	0%			
	Front	46	6	> 45.1	Type B	0	0	0	6	0%			
	Back	46	6	> 45.1	Type B	0	0	0	6	0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**8,000**
	Total Required Fire Flow, L/s =												**133**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type A	Wood-Frame or non-conbustible
Type B	Ordinary or fire-resisitve with unprotected openings
Type C	Ordinary or fire-resisitve with semi-protected openings
Type D	Ordinary or fire-resisitve with blank wall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B7
ESTIMATED WATER PRESSURE AT PROPOSED BUILDING

Description	From	To	Demand (L/sec)	Pipe Length (m)	Pipe Dia (mm)	Dia (m)	Slope of HGL (m/m)	Head Loss (m)	Elev From (m)	Elev To (m)	*Elev Diff (m)	Pressure From kPa	(psi)	Pressure To kPa	(psi)	Pressure Drop (psi)
Avg Day Conditons																
Single 200mm watermain	Main	Basement	7.110	20 m	204	0.204	0.00043	0.0086	51.60	52.30	-0.7	610.2	(88.5)	603.2	(87.5)	1.0
Double 200mm watermain	Main	Basement	3.555	20 m	204	0.204	0.00012	0.0024	51.60	52.30	-0.7	610.2	(88.5)	603.3	(87.5)	1.0
Max Day Conditons																
Single 200mm watermain	Main	Basement	17.462	20 m	204	0.204	0.00226	0.0452	51.60	52.30	-0.7	610.2	(88.5)	602.9	(87.4)	1.1
Double 200mm watermain	Main	Basement	8.731	20 m	204	0.204	0.00063	0.0125	51.60	52.30	-0.7	610.2	(88.5)	603.2	(87.5)	1.0
Peak Hour Conditons																
Single 200mm watermain	Main	Basement	38.229	20 m	204	0.204	0.00964	0.1928	51.60	52.30	-0.7	542.5	(78.7)	533.7	(77.4)	1.3
Double 200mm watermain	Main	Basement	19.115	20 m	204	0.204	0.00267	0.0534	51.60	52.30	-0.7	542.5	(78.7)	535.1	(77.6)	1.1
Max Day Plus Fireflow Conditons																
Single 200mm watermain	Main	Basement	184.5	20 m	204	0.204	0.1778	3.556	51.60	52.30	-0.7	505.2	(73.3)	463.5	(67.2)	6.1
Double 200mm watermain	Main	Basement	92.231	20 m	204	0.204	0.04925	0.9851	51.60	52.30	-0.7	505.2	(73.3)	488.7	(70.9)	2.4
Max Day Plus Fireflow Conditons (Review of 150mm diameter)																
Single 150mm watermain	Main	Basement	184.5	20 m	150	0.150	0.79483	15.897	51.60	52.30	-0.7	505.2	(73.3)	342.4	(49.7)	23.6
Double 150mm watermain	Main	Basement	92.231	20 m	150	0.150	0.22017	4.4035	51.60	52.30	-0.7	505.2	(73.3)	455.2	(66.0)	7.3

Water Demand Info

Average Demand =	7.11	L/sec
Max Day Demand =	17.46	L/sec
Peak Hr Deamand =	38.23	L/sec
Fireflow Requriement =	167	L/sec (Tower C highest RFF)
Max Day Plus FF Demand =	184.5	L/sec

Pipe Lengths

From watermain to building =	51 m
Hazen Williams C Factor for Friction Loss in Pipe, C=	110

Elevations

At roadway =	51.6
At building (FF) =	52.3

Boundary Conditon

	Min HGL	Max HGL	Peak Hour	Max Day Plus Fireflow	
HGL (m)	100.0	113.6	106.7	102.9	(From City of Ottawa)
Approx Ground Elev (m) =	51.4	51.4	51.4	51.4	(at connection point)
Pressure (m) =	48.6	62.2	55.3	51.5	
Pressure (Pa) =	476,766	610,182	542,493	505,215	
Pressure (psi) =	69.1	88.5	78.7	73.3	

TABLE B8

FIRE FLOW REQUIREMENTS BASED ON HYDRANT SPACING

Hydrant #	Tower A		Tower B		Tower C		Tower D	
	[1]Distance (m)	[2]Fire Flow Contribution (L/min)	[1]Distance (m)	[2]Fire Flow Contribution (L/min)	[1]Distance (m)	[2]Fire Flow Contribution (L/min)	[1]Distance (m)	[2]Fire Flow Contribution (L/min)
H029	175	0	161	0	230	0	276	0
H030	80	3,800	65	5,700	125	3,800	180	0
H031	93	3,800	18	5,700	44	5,700	97	3,800
H001	130	3,800	65	5,700	15	5,700	49	5,700
H002	232	0	166	0	114	3,800	20	5,700
Total (L/min)		11,400		17,100		19,000		15,200
FUS RFF in L/min or (L/sec)		8,000 (133)		9,000 (150)		10,000 (167)		8,000 (133)
Meets Requreiment (Yes/No)		Yes		Yes		Yes		Yes

Notes:

[1]Distance is measured along a road or fire route.

[2]Fire Flow Contribution for Class AA Hydrant from Table 1 of Appendix I, ISTB-2018-02

TABLE B9
SANITARY SEWER CALCULATION SHEET

LOCATION				RESEDENTIAL AREAS AND POPULAITONS														COMMERCIAL				INDUSTRIAL			INSTITUTIONAL		INFILTRATION				SEWER DATA							
						NUMBER OF UNITS									POPULATION					AREA (ha)				AREA (ha)					AREA (ha)									
Street	U/S MH	D/S MH	Desc	Area (ha)	ACCU Area (ha)	Singles	Semis	Towns	Batch Apt.	1-Bed Apt.	1-Bed + Den Apt.	2-Bed Apt.	3-Bed Apt.	Total Units	INDIV	ACCU	Peak Factor	Peak Flow (L/sec)	INDIV	ACCU	% of total	Peak Flow (L/sec)	INDIV	ACCU	Peak Factor (per MOE)	AREA (Ha)	ACCU AREA (Ha)	INDIV	ACCU	INFILT FLOW (L/s)	TOTAL FLOW (L/s)	Nom Dia (mm)	Actual Dia (mm)	Slope (%)	Length (m)	Capacity (L/sec)	Q/Q_{CAP} (%)	Full Velocity (m/s)
Private	*MHSA101*	*MHSA100*	*Tower 4*	*0.6097*	*0.6097*				*1*	*36*	*71*	*72*	*18*	*198*	*358.2*	*358.2*	*4.00*	*4.64*										*0.610*	*0.610*	*0.20*	*4.64*							
			Tower 3	*0.5676*	*1.1773*				*2*	*15*	*75*	*70*		*162*	*275.8*	*634*	*3.34*	*6.86*										*0.568*	*1.177*	*0.39*	*7.25*	*250*	*251.46*	*1.00*	*28.80*	*60.40*	*0.12*	*1.21*
	MHSA100	*MHSA71642*			*1.1773*											*634*	*3.34*	*6.86*											*1.177*	*0.39*	*7.25*	*250*	*251.46*	*0.23*	*34.05*	*29.28*	*0.25*	*0.58*
	MHSA71642	*MHSA70588*			*1.1773*											*634*	*3.34*	*6.86*											*1.177*	*0.39*	*7.25*	*250*	*251.46*	*0.31*	*22.69*	*33.55*	*0.22*	*0.67*
	MHSA70588	*MHSA70591*	*Ex.Tower 2*	*0.6852*	*1.8625*					*84*		*61*		*145*	*245.7*	*879.7*	*3.27*	*9.32*										*0.685*	*1.863*	*0.61*	*9.94*	*250*	*251.46*	*0.35*	*5.79*	*35.50*	*0.28*	*0.71*
	MHSA70591	*MHSA70589*			*1.8625*											*879.7*	*3.27*	*9.32*											*1.863*	*0.61*	*9.94*	*250*	*251.46*	*0.29*	*62.68*	*32.37*	*0.31*	*0.65*
	MHSA70589	*MHSA70590*	*Towers 5A*	*0.7769*	*2.6394*					*54*	*112*	*120*		*286*	*484.4*	*1364.1*	*3.17*	*14.01*	*0.04*	*0.04*	*2%*	*0.01*						*0.777*	*2.639*	*0.87*	*14.90*	*250*	*251.46*	*0.24*	*38.01*	*29.39*	*0.51*	*0.59*
	MHSA70590	*MHSA54986*			*2.6394*											*1364.1*	*3.17*	*14.01*		*0.04*		*0.02*							*2.639*	*0.87*	*14.90*	*250*	*251.46*	*0.54*	*11.04*	*44.53*	*0.33*	*0.89*
	MHSA54986	*MHSA54987*	*Ex.Tower 1*	*0.8895*	*3.5289*					*14*		*75*		*89*	*177.1*	*1541.2*	*3.14*	*15.68*		*0.04*		*0.02*						*0.890*	*3.529*	*1.16*	*16.87*	*250*	*251.46*	*0.51*	*15.66*	*43.17*	*0.39*	*0.86*
	MHSA54987	*MHSA54988*			*3.5289*											*1541.2*	*3.14*	*15.68*		*0.04*		*0.02*							*3.529*	*1.16*	*16.87*	*250*	*251.46*	*0.56*	*12.56*	*45.09*	*0.37*	*0.90*
	MHSA54988	*MHSA54989*	*Towers 5B*	*0.3899*	*3.9188*					*36*	*76*	*84*		*196*	*333.2*	*1874.4*	*3.09*	*18.77*	*0.11*	*0.15*	*3%*	*0.05*						*0.390*	*3.919*	*1.29*	*20.11*	*250*	*251.46*	*0.33*	*33.03*	*34.86*	*0.58*	*0.70*
Jeane D'Arc Blvd North	**MHSA54989**	**MHSA54990**			**3.9188**											**1874.4**	**3.09**	**18.77**		**0.15**		**0.07**							**3.919**	**1.29**	**20.14**	**300**	**299.36**	**0.15**	**79.36**	**37.39**	**0.54**	**0.53**
	MHSA54990	**MHSA54991**	**Ext-1, Ext-2**	**6.1710**	**10.0898**											**1874.4**	**3.09**	**18.77**	**6.171**	**6.321**	**61%**	**3.07**						**6.171**	**10.090**	**3.33**	**25.17**	**300**	**299.36**	**0.29**	**34.70**	**51.62**	**0.49**	**0.73**
	MHSA54991	**MHSA54992**			**10.0898**											**1874.4**	**3.09**	**18.77**		**6.321**		**3.07**							**10.090**	**3.33**	**25.17**	**300**	**299.36**	**0.16**	**85.00**	**39.02**	**0.65**	**0.55**
	MHSA54992	**MHSA54993**			**10.0898**											**1874.40**	**3.09**	**18.77**		**6.32**		**3.07**							**10.09**	**3.33**	**25.17**	**300**	**299.36**	**0.24**	**55.13**	**46.69**	**0.86**	**0.66**
	MHSA54993	**MHSA22037**	*1009 TRIM*	*3.3567*	13.4465					*552*		*431*		*983*	*1677.9*	3552.30	2.9	33.39	0.541	6.862	4%	2.22						3.357	13.447	4.44	40.05	375	375	0.20	66.40	77.58	0.52	0.70
	MHSA22037	**MHSA22036**																														375	375	0.30	66.40	96.03		0.86
	MHSA22036	**MHSA22035**																															375	0.31	66.40	97.62		0.88
	MHSA22035	**MHSA22028**																															375	0.29	66.40	94.42		0.85
	MHSA22028	**MHSA22027**																															375	0.18	66.40	74.39		0.67
																																900	900	0.12	66.40	627.11		0.98
				13.447					**3**	**791**	**334**	**913**	**18**	**2059**	**3552.3**					**6.862**								**13.447**							**916.90**			

Proposed upsized

Residential Avg. Daily Flow, q (L/p/day) =	280	Commercial Peak Factor =	1.5	(when area >20%)	Peak Population Flow, (L/sec) =	P*q*M/86.4	Unit Type	Persons/Unit
Commercial Avg. Daily Flow (L/gross ha/day) =	28,000		1.0	(when area <20%)	Peak Extraneous Flow, (L/sec) =	I*Ac	Singles	3.4
or L/gross ha/sec =	0.324				Residential Peaking Factor, M =	1 + (14/(4+P^0.5)) * K	Semi-Detached	5.7
Institutianal Avg. Daily Flow (L/s/ha) =	28,000	Institutional Peak Factor =	1.5	(when area >20%)	A_c = Cumulative Area (hectares)		Townhomes	2.7
or L/gross ha/sec =	0.324		1.0	(when area <20%)	P = Population (thousands)		Batch Apt. Unit	1.4
Light Industrial Flow (L/gross ha/day) =	35,000						1-bed Apt. Unit	1.4
or L/gross ha/sec =	0.40509	Residential Correction Factor, K =	0.80		Sewer Capacity, Qcap (L/sec) =	1/N $S^{1/2}$ $R^{2/3}$ A_c	1-bed + Den Apt.	1.4
Light Industrial Flow (L/gross ha/day) =	55,000	Manning N =	0.013		(Manning's Equation)		2-bed Apt. Unit	2.1
or L/gross ha/sec =	0.637	Peak extraneous flow, I (L/s/ha) =	0.33	(Total I/I)			3-bed Apt. Unit	3.1

Designed:	Project:
Terry Pascoe, B.Eng.	1009 Trim Road
Checked:	Location:
J. Fitzpatrick, P.Eng.	Ottawa, Ontario
File Reference:	Page No:
259629 Sanitary - Sewer Design Sheet, Dec 2021.xlsx	**1 of 1**

TABLE B10
ESTIMATION OF ALLOWABLE PEAK FLOWS (Based on Max C=0.50 & Tc=10mins)

Catchment No.	Area (ha)	Time of Conc, Tc (min)	Storm = 2 yr			Storm = 5 yr			Storm = 100 yr		
			I_2 (mm/hr)	Cavg	Q_{ALLOW} (L/sec)	I_5 (mm/hr)	Cavg	Q_{ALLOW} (L/sec)	I_5 (mm/hr)	Cavg	Q_{ALLOW} (L/sec)
Pre-Dev	1.1348	10	76.81	0.50	**121.2**	104.29	0.50	**164.5**	178.56	0.50	**281.7**
Total (All)	**1.1348**	**10**			**121.2**			**164.5**			**281.7**

Notes
1) Allowable Capture Rates are based on meeting pre-development peak flows for all storms up to 100-year event. Allowable runoff coefficent based on Cavg or C = 0.50 (maximum)

TABLE B11
AVERAGE RUNOFF COEFFICIENTS FOR POST-DEVELOPMENT

Runoff Coeffients $C_{ASPH/CONC}$ = 0.90 C_{ROOF} = 0.90 C_{GRASS} = 0.20

Area No.	Outlet Location	Asphalt & Conc Areas (m^2)	A * C_{ASPH}	Roof Areas (m^2)	A * C_{ROOF}	Grassed Areas (m^2)	A * C_{GRASS}	Sum AC	Total Area (m^2)	C_{AVG} (see note)	Comment
S01	Roof Drains			1119.17	1007.3			1007.3	1119	0.90	
S02	Roof Drains			1060.09	954.1			954.1	1060	0.90	
S03	Roof Drains			1191.29	1072.2			1072.2	1191	0.90	
S04	Roof Drains			1161.13	1045.0			1045.0	1161	0.90	
S05	Area Drains	3492.62	3143.4	147.24	132.5	256.16	51	3327.1	3896	0.85	
S06	Area Drains	2365.49	2128.9			553.86	111	2239.7	2919	0.77	
Total (All)		**5,858**	**5,272**	**4,679**	**4,211**	**810**	**162**	**9,645**	**11,347**	0.85	

Notes
1) Areas dericed from CAD to calculate CAVG

TABLE B12
SUMMARY OF POST-DEVELOPMENT PEAK FLOWS (Uncontrolled and Controlled)

Area No	Area (ha)	Time of Conc, Tc (min)	Storm = 2 yr				Storm = 5 yr				Storm = 100 yr				Outlet Location	Comments
			C_{AVG}	I_2 (mm/hr)	Q (L/sec)	Q_{CAP} (L/sec)	C_{AVG}	I_5 (mm/hr)	Q (L/sec)	Q_{CAP} (L/sec)	C_{AVG}	I_{100} (mm/hr)	Q (L/sec)	Q_{CAP} (L/sec)		
S01	0.1119	10	0.90	76.81	21.5	**(5.9)**	0.90	104.19	29.2	**(8.0)**	1.00	178.56	55.6	**(15.1)**	Roof Drains	Tower A roof
S02	0.1060	10	0.90	76.81	20.4	**(5.9)**	0.90	104.19	27.6	**(8.0)**	1.00	178.56	52.6	**(15.1)**	Roof Drains	Tower B roof
S03	0.1191	10	0.90	76.81	22.9	**(6.6)**	0.90	104.19	31.1	**(8.9)**	1.00	178.56	59.1	**(17.0)**	Roof Drains	Tower C roof
S04	0.1161	10	0.90	76.81	22.3	**(6.6)**	0.90	104.19	30.3	**(8.9)**	1.00	178.56	57.6	**(17.0)**	Roof Drains	Tower D roof
S05	0.3896	10	0.85	76.81	71.0	**71.0**	0.85	104.19	96.4	**96.4**	1.00	178.56	193.4	**193.4**	Area Drains	Area around Tower A & B
S06	0.2919	10	0.77	76.81	47.8	**47.8**	0.77	104.19	64.9	**64.9**	0.96	178.56	139.0	**139.0**	Area Drains	Area around Tower C & D
Total (All)	**1.1347**				**205.9**	**143.8**			**279.4**	**195.0**			**557.3**	**396.7**		

Notes
2-yr Storm Intensity, I = 732.951/(Tc+6.199)^0.810 (City of Ottawa)
5-yr Storm Intensity, I = 998.071/(Tc+6.035)^0.814 (City of Ottawa)
100-yr Storm Intensity, I = 1735.688/(Tc+6.014)&^0.820 (City of Ottawa)
Time of Concentration (min), Tc = ***10***
For Flows under column Qcap which are shown in brackets ***(0.0)*** *, denotes flows that are controlled*

TABLE B13
SUMMARY OF STORAGE

Area No	Release Rate (L/s)			Storage Required (m^3) (MRM)			Storage Provided (m^3)		Control Method	Area Desc
	2-yr	5-yr	100-yr	2-yr	5-yr	100-yr	Roof	Surface		
S01	5.9	8.0	15.1	10.4	14.1	26.7	44.8		Flow Controlled Roof Drains	Tower A roof
S02	5.9	8.0	15.1	9.6	12.9	24.4	42.4		Flow Controlled Roof Drains	Tower B roof
S03	6.6	8.9	17.0	10.7	14.5	27.4	47.7		Flow Controlled Roof Drains	Tower C roof
S04	6.6	8.9	17.0	10.4	14.1	26.7	46.4		Flow Controlled Roof Drains	Tower D roof
S05	71.0	96.4	193.4						none	
S06	47.8	64.9	139.0						none	
Total (All)	**143.8**	**195.0**	**396.7**	**41.2**	**55.5**	**105.2**	**181.3**			

TABLE B14
Storage Volumes for 2-year, 5-Year and 100-Year Storms (MRM)

Area No: **TOWER A**

C_{AVG} = 0.90 (2-yr)
C_{AVG} = 0.90 (5-yr)
C_{AVG} = 1.00 (100-yr, Max 1.0)
Time Interval = 2.00 (mins)
Drainage Area = 0.1119 (hectares)
Intensity Incr (%) = 0% (Use 20% for Climate Change)

Actual Release Rate (L/sec) = 15.1
Percentage of Actual Rate (City of Ottawa requirement) = 100% (Set to 50% when U/G storage used)
Release Rate Used for Estimation of 100-year Storage (L/sec) = 15.1

Duration (min)	Release Rate = 5.9 (L/sec); Return Period = 2.0 (years); IDF Parameters, A = 733.0, B = 0.810, C = 6.199 ($I = A/(T_c+C)$)					Release Rate = 8.0 (L/sec); Return Period = 5.0 (years); IDF Parameters, A = 998.1, B = 0.814, C = 6.053 ($I = A/(T_c+C)$)					Release Rate = 15.1 (L/sec); Return Period = 100.0 (years); IDF Parameters, A = 1735.7, B = 0.820, C = 6.014 ($I = A/(T_c+C)$)				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	46.8	5.9	41.0	0.0	230.5	64.5	8.0	56.6	0.0	398.6	124.0	15.1	108.9	0.0
2	133.3	37.3	5.9	31.5	3.8	182.7	51.2	8.0	43.2	5.2	315.0	98.0	15.1	82.9	9.9
4	111.7	31.3	5.9	25.4	6.1	152.5	42.7	8.0	34.8	8.3	262.4	81.6	15.1	66.5	16.0
6	96.6	27.1	5.9	21.2	7.6	131.6	36.8	8.0	28.9	10.4	226.0	70.3	15.1	55.2	19.9
8	85.5	23.9	5.9	18.1	8.7	116.1	32.5	8.0	24.6	11.8	199.2	62.0	15.1	46.8	22.5
10	76.8	21.5	5.9	15.6	9.4	104.2	29.2	8.0	21.2	12.7	178.6	55.6	15.1	40.4	24.2
12	69.9	19.6	5.9	13.7	9.9	94.7	26.5	8.0	18.6	13.4	162.1	50.4	15.1	35.3	25.4
14	64.2	18.0	5.9	12.1	10.2	86.9	24.3	8.0	16.4	13.8	148.7	46.3	15.1	31.1	26.1
16	59.5	16.7	5.9	10.8	10.4	80.5	22.5	8.0	14.6	14.0	137.5	42.8	15.1	27.7	26.5
18	55.5	15.5	5.9	9.7	10.4	75.0	21.0	8.0	13.0	14.1	128.1	39.9	15.1	24.7	26.7
20	52.0	14.6	5.9	8.7	10.4	70.3	19.7	8.0	11.7	14.1	120.0	37.3	15.1	22.2	26.6
22	49.0	13.7	5.9	7.9	10.4	66.1	18.5	8.0	10.6	14.0	112.9	35.1	15.1	20.0	26.4
24	46.4	13.0	5.9	7.1	10.3	62.5	17.5	8.0	9.6	13.8	106.7	33.2	15.1	18.0	26.0
26	44.0	12.3	5.9	6.5	10.1	59.3	16.6	8.0	8.7	13.5	101.2	31.5	15.1	16.3	25.5
28	41.9	11.7	5.9	5.9	9.9	56.5	15.8	8.0	7.9	13.2	96.3	30.0	15.1	14.8	24.9
30	40.0	11.2	5.9	5.4	9.6	53.9	15.1	8.0	7.1	12.9	91.9	28.6	15.1	13.4	24.2
32	38.3	10.7	5.9	4.9	9.4	51.6	14.5	8.0	6.5	12.5	87.9	27.3	15.1	12.2	23.4
34	36.8	10.3	5.9	4.4	9.1	49.5	13.9	8.0	5.9	12.1	84.3	26.2	15.1	11.1	22.6
36	35.4	9.9	5.9	4.0	8.7	47.6	13.3	8.0	5.4	11.6	81.0	25.2	15.1	10.0	21.7
38	34.1	9.5	5.9	3.7	8.4	45.8	12.8	8.0	4.9	11.1	77.9	24.2	15.1	9.1	20.8
40	32.9	9.2	5.9	3.3	8.0	44.2	12.4	8.0	4.4	10.6	75.1	23.4	15.1	8.2	19.8
Max =					**10.4**					**14.1**					**26.7**

Notes
1) Peak flow is equal to the product of 2.78 x C x I x A
2) Rainfall Intensity, $I = A/(Tc+C)^{\circ}$
3) Release Rate = Min (Release Rate, Peak Flow)
4) Storage Rate = Peak Flow - Release Rate
5) Storage = Duration x Storage Rate
6) Maximum Storage = Max Storage Over Duration
7) Parameters a,b,c are for City of Ottawa

City of Ottawa IDF Data (from SDG002)

IDF curve equations (Intensity in mm/hr)

100 year Intensity	$= 1735.688 / (\text{Time in min} + 6.014)^{0.820}$
50 year Intensity	$= 1569.580 / (\text{Time in min} + 6.014)^{0.820}$
25 year Intensity	$= 1402.884 / (\text{Time in min} + 6.018)^{0.819}$
10 year Intensity	$= 1174.184 / (\text{Time in min} + 6.014)^{0.816}$
5 year Intensity	$= 998.071 / (\text{Time in min} + 6.053)^{0.814}$
2 year Intensity	$= 732.951 / (\text{Time in min} + 6.199)^{0.810}$

TABLE B15
Storage Volumes for 2-year, 5-Year and 100-Year Storms (MRM)

Area No: **TOWER B**

C_{AVG} = 0.90 (2-yr)
C_{AVG} = 0.90 (5-yr)
C_{AVG} = 1.00 (100-yr, Max 1.0)
Time Interval = 2.00 (mins)
Drainage Area = 0.1060 (hectares)
Intensity Incr (%) = 0% (Use 20% for Climate Change)

Actual Release Rate (L/sec) = 15.1
Percentage of Actual Rate (City of Ottawa requirement) = 100% (Set to 50% when U/G storage used)
Release Rate Used for Estimation of 100-year Storage (L/sec) = 15.1

Duration (min)	Release Rate = 5.9 (L/sec); Return Period = 2.0 (years); IDF Parameters, A = 733.0, B = 0.810, C = 6.199 (I = A/(T_c+C)					Release Rate = 8.0 (L/sec); Return Period = 5.0 (years); IDF Parameters, A = 998.1, B = 0.814, C = 6.053 (I = A/(T_c+C)					Release Rate = 15.1 (L/sec); Return Period = 100.0 (years); IDF Parameters, A = 1735.7, B = 0.820, C = 6.014 (I = A/(T_c+C)				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	44.4	5.9	38.5	0.0	230.5	61.1	8.0	53.2	0.0	398.6	117.5	15.1	102.3	0.0
2	133.3	35.4	5.9	29.5	3.5	182.7	48.5	8.0	40.5	4.9	315.0	92.8	15.1	77.7	9.3
4	111.7	29.6	5.9	23.8	5.7	152.5	40.5	8.0	32.5	7.8	262.4	77.3	15.1	62.2	14.9
6	96.6	25.6	5.9	19.8	7.1	131.6	34.9	8.0	26.9	9.7	226.0	66.6	15.1	51.5	18.5
8	85.5	22.7	5.9	16.8	8.1	116.1	30.8	8.0	22.8	11.0	199.2	58.7	15.1	43.6	20.9
10	76.8	20.4	5.9	14.5	8.7	104.2	27.6	8.0	19.7	11.8	178.6	52.6	15.1	37.5	22.5
12	69.9	18.5	5.9	12.7	9.1	94.7	25.1	8.0	17.2	12.4	162.1	47.8	15.1	32.6	23.5
14	64.2	17.0	5.9	11.2	9.4	86.9	23.1	8.0	15.1	12.7	148.7	43.8	15.1	28.7	24.1
16	59.5	15.8	5.9	9.9	9.5	80.5	21.3	8.0	13.4	12.9	137.5	40.5	15.1	25.4	24.4
18	55.5	14.7	5.9	8.9	9.6	75.0	19.9	8.0	11.9	12.9	128.1	37.7	15.1	22.6	24.4
20	52.0	13.8	5.9	7.9	9.5	70.3	18.6	8.0	10.7	12.8	120.0	35.3	15.1	20.2	24.3
22	49.0	13.0	5.9	7.1	9.4	66.1	17.5	8.0	9.6	12.7	112.9	33.3	15.1	18.1	23.9
24	46.4	12.3	5.9	6.4	9.3	62.5	16.6	8.0	8.6	12.4	106.7	31.4	15.1	16.3	23.5
26	44.0	11.7	5.9	5.8	9.1	59.3	15.7	8.0	7.8	12.1	101.2	29.8	15.1	14.7	22.9
28	41.9	11.1	5.9	5.3	8.8	56.5	15.0	8.0	7.0	11.8	96.3	28.4	15.1	13.2	22.2
30	40.0	10.6	5.9	4.8	8.6	53.9	14.3	8.0	6.4	11.4	91.9	27.1	15.1	11.9	21.5
32	38.3	10.2	5.9	4.3	8.3	51.6	13.7	8.0	5.7	11.0	87.9	25.9	15.1	10.8	20.7
34	36.8	9.8	5.9	3.9	7.9	49.5	13.1	8.0	5.2	10.6	84.3	24.8	15.1	9.7	19.8
36	35.4	9.4	5.9	3.5	7.6	47.6	12.6	8.0	4.7	10.1	81.0	23.9	15.1	8.7	18.8
38	34.1	9.0	5.9	3.2	7.2	45.8	12.2	8.0	4.2	9.6	77.9	23.0	15.1	7.8	17.8
40	32.9	8.7	5.9	2.9	6.9	44.2	11.7	8.0	3.8	9.0	75.1	22.1	15.1	7.0	16.8
Max =					**9.6**					**12.9**					**24.4**

Notes
1) Peak flow is equal to the product of 2.78 x C x I x A
2) Rainfall Intensity, I = A/(Tc+C)^{o}
3) Release Rate = Min (Release Rate, Peak Flow)
4) Storage Rate = Peak Flow - Release Rate
5) Storage = Duration x Storage Rate
6) Maximum Storage = Max Storage Over Duration
7) Parameters a,b,c are for City of Ottawa

IDF curve equations (Intensity in mm/hr)

100 year Intensity = 1735.688 / (Time in min + 6.014) $^{0.820}$
50 year Intensity = 1569.580 / (Time in min + 6.014) $^{0.820}$
25 year Intensity = 1402.884 / (Time in min + 6.018) $^{0.819}$
10 year Intensity = 1174.184 / (Time in min + 6.014) $^{0.816}$
5 year Intensity = 998.071 / (Time in min + 6.053) $^{0.814}$
2 year Intensity = 732.951 / (Time in min + 6.199) $^{0.810}$

TABLE B16
Storage Volumes for 2-year, 5-Year and 100-Year Storms (MRM)

Area No: **TOWER C**

C_{AVG} = 0.90 (2-yr)
C_{AVG} = 0.90 (5-yr)
C_{AVG} = 1.00 (100-yr, Max 1.0)
Time Interval = 3.00 (mins)
Drainage Area = 0.1191 (hectares)
Intensity Incr (%) = 0% (Use 20% for Climate Change)

Actual Release Rate (L/sec) = 17.0
Percentage of Actual Rate (City of Ottawa requirement) = 100% (Set to 50% when U/G storage used)
Release Rate Used for Estimation of 100-year Storage (L/sec) = 17.0

Duration (min)	Release Rate = 6.6 (L/sec), Return Period = 2.0 (years), IDF Parameters, A = 733.0, B = 0.810, (I = A/(T_c+C)), C = 6.199					Release Rate = 8.9 (L/sec), Return Period = 5.0 (years), IDF Parameters, A = 998.1, B = 0.814, (I = A/(T_c+C)), C = 6.053					Release Rate = 17.0 (L/sec), Return Period = 100.0 (years), IDF Parameters, A = 1735.7, B = 0.820, (I = A/(T_c+C)), C = 6.014				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	49.8	6.6	43.2	0.0	230.5	68.7	8.9	59.8	0.0	398.6	132.0	17.0	115.0	0.0
3	121.5	36.2	6.6	29.6	5.3	166.1	49.5	8.9	40.6	7.3	286.0	94.7	17.0	77.7	14.0
6	96.6	28.8	6.6	22.2	8.0	131.6	39.2	8.9	30.3	10.9	226.0	74.8	17.0	57.8	20.8
9	80.9	24.1	6.6	17.5	9.5	109.8	32.7	8.9	23.8	12.8	188.3	62.3	17.0	45.3	24.5
12	69.9	20.8	6.6	14.2	10.3	94.7	28.2	8.9	19.3	13.9	162.1	53.7	17.0	36.7	26.4
15	61.8	18.4	6.6	11.8	10.6	83.6	24.9	8.9	16.0	14.4	142.9	47.3	17.0	30.3	27.3
18	55.5	16.5	6.6	9.9	10.7	75.0	22.3	8.9	13.4	14.5	128.1	42.4	17.0	25.4	27.4
21	50.5	15.0	6.6	8.5	10.6	68.1	20.3	8.9	11.4	14.3	116.3	38.5	17.0	21.5	27.1
24	46.4	13.8	6.6	7.2	10.4	62.5	18.6	8.9	9.7	14.0	106.7	35.3	17.0	18.3	26.3
27	43.0	12.8	6.6	6.2	10.1	57.9	17.3	8.9	8.3	13.5	98.7	32.7	17.0	15.6	25.3
30	40.0	11.9	6.6	5.3	9.6	53.9	16.1	8.9	7.1	12.8	91.9	30.4	17.0	13.4	24.1
33	37.5	11.2	6.6	4.6	9.1	50.5	15.1	8.9	6.1	12.1	86.0	28.5	17.0	11.5	22.7
36	35.4	10.5	6.6	3.9	8.5	47.6	14.2	8.9	5.2	11.3	81.0	26.8	17.0	9.8	21.1
39	33.5	10.0	6.6	3.4	7.9	45.0	13.4	8.9	4.5	10.4	76.5	25.3	17.0	8.3	19.4
42	31.8	9.5	6.6	2.9	7.2	42.7	12.7	8.9	3.8	9.5	72.6	24.0	17.0	7.0	17.6
45	30.2	9.0	6.6	2.4	6.5	40.6	12.1	8.9	3.2	8.5	69.1	22.9	17.0	5.8	15.8
48	28.9	8.6	6.6	2.0	5.8	38.8	11.6	8.9	2.6	7.5	65.9	21.8	17.0	4.8	13.8
51	27.6	8.2	6.6	1.6	5.0	37.1	11.1	8.9	2.1	6.5	63.0	20.9	17.0	3.8	11.8
54	26.5	7.9	6.6	1.3	4.2	35.6	10.6	8.9	1.7	5.4	60.4	20.0	17.0	3.0	9.7
57	25.5	7.6	6.6	1.0	3.4	34.2	10.2	8.9	1.3	4.3	58.1	19.2	17.0	2.2	7.5
60	24.6	7.3	6.6	0.7	2.6	32.9	9.8	8.9	0.9	3.1	55.9	18.5	17.0	1.5	5.3
Max =					**10.7**					**14.5**					**27.4**

Notes
1) Peak flow is equal to the product of 2.78 x C x I x A
2) Rainfall Intensity, I = $A/(Tc+C)^b$
3) Release Rate = Min (Release Rate, Peak Flow)
4) Storage Rate = Peak Flow - Release Rate
5) Storage = Duration x Storage Rate
6) Maximium Storage = Max Storage Over Duration
7) Parameters a,b,c are for City of Ottawa

IDF curve equations (Intensity in mm/hr)

100 year Intensity	$= 1735.688 / (\text{Time in min} + 6.014)^{0.820}$
50 year Intensity	$= 1569.580 / (\text{Time in min} + 6.014)^{0.820}$
25 year Intensity	$= 1402.884 / (\text{Time in min} + 6.018)^{0.819}$
10 year Intensity	$= 1174.184 / (\text{Time in min} + 6.014)^{0.816}$
5 year Intensity	$= 998.071 / (\text{Time in min} + 6.053)^{0.814}$
2 year Intensity	$= 732.951 / (\text{Time in min} + 6.199)^{0.810}$

TABLE B17

Storage Volumes for 2-year, 5-Year and 100-Year Storms (MRM)

Area No: **TOWER D**

C_{AVG} = 0.90 (2-yr)

C_{AVG} = 0.90 (5-yr)

C_{AVG} = 1.00 (100-yr, Max 1.0)

Time Interval = 2.00 (mins)

Drainage Area = 0.1161 (hectares)

Intensity Incr (%) = 0% (Use 20% for Climate Change)

Actual Release Rate (L/sec) = 17.0

Percentage of Actual Rate (City of Ottawa requirement) = 100% (Set to 50% when U/G storage used)

Release Rate Used for Estimation of 100-year Storage (L/sec) = 17.0

Duration (min)	Release Rate = 6.6 (L/sec); Return Period = 2.0 (years); IDF Parameters, A = 733.0, B = 0.810, C = 6.199 ($I = A/(T_c+C)$)					Release Rate = 8.9 (L/sec); Return Period = 5.0 (years); IDF Parameters, A = 998.1, B = 0.814, C = 6.053 ($I = A/(T_c+C)$)					Release Rate = 17.0 (L/sec); Return Period = 100.0 (years); IDF Parameters, A = 1735.7, B = 0.820, C = 6.014 ($I = A/(T_c+C)$)				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	48.6	6.6	42.0	0.0	230.5	67.0	8.9	58.0	0.0	398.6	128.7	17.0	111.6	0.0
2	133.3	38.7	6.6	32.1	3.9	182.7	53.1	8.9	44.1	5.3	315.0	101.7	17.0	84.6	10.2
4	111.7	32.5	6.6	25.9	6.2	152.5	44.3	8.9	35.4	8.5	262.4	84.7	17.0	67.7	16.2
6	96.6	28.1	6.6	21.5	7.7	131.6	38.2	8.9	29.3	10.5	226.0	73.0	17.0	55.9	20.1
8	85.5	24.8	6.6	18.2	8.8	116.1	33.7	8.9	24.8	11.9	199.2	64.3	17.0	47.3	22.7
10	76.8	22.3	6.6	15.7	9.4	104.2	30.3	8.9	21.3	12.8	178.6	57.6	17.0	40.6	24.4
12	69.9	20.3	6.6	13.7	9.9	94.7	27.5	8.9	18.6	13.4	162.1	52.3	17.0	35.3	25.4
14	64.2	18.7	6.6	12.1	10.1	86.9	25.3	8.9	16.3	13.7	148.7	48.0	17.0	31.0	26.0
16	59.5	17.3	6.6	10.7	10.3	80.5	23.4	8.9	14.4	13.9	137.5	44.4	17.0	27.4	26.3
18	55.5	16.1	6.6	9.5	10.3	75.0	21.8	8.9	12.8	13.9	128.1	41.3	17.0	24.3	26.3
20	52.0	15.1	6.6	8.5	10.2	70.3	20.4	8.9	11.5	13.8	120.0	38.7	17.0	21.7	26.0
22	49.0	14.2	6.6	7.6	10.1	66.1	19.2	8.9	10.3	13.6	112.9	36.4	17.0	19.4	25.6
24	46.4	13.5	6.6	6.9	9.9	62.5	18.2	8.9	9.2	13.3	106.7	34.4	17.0	17.4	25.1
26	44.0	12.8	6.6	6.2	9.7	59.3	17.2	8.9	8.3	12.9	101.2	32.7	17.0	15.6	24.4
28	41.9	12.2	6.6	5.6	9.4	56.5	16.4	8.9	7.5	12.5	96.3	31.1	17.0	14.0	23.6
30	40.0	11.6	6.6	5.0	9.1	53.9	15.7	8.9	6.7	12.1	91.9	29.7	17.0	12.6	22.7
32	38.3	11.1	6.6	4.5	8.7	51.6	15.0	8.9	6.0	11.6	87.9	28.4	17.0	11.3	21.8
34	36.8	10.7	6.6	4.1	8.3	49.5	14.4	8.9	5.4	11.1	84.3	27.2	17.0	10.2	20.7
36	35.4	10.3	6.6	3.7	7.9	47.6	13.8	8.9	4.9	10.5	81.0	26.1	17.0	9.1	19.7
38	34.1	9.9	6.6	3.3	7.5	45.8	13.3	8.9	4.4	9.9	77.9	25.2	17.0	8.1	18.5
40	32.9	9.5	6.6	3.0	7.1	44.2	12.8	8.9	3.9	9.3	75.1	24.3	17.0	7.2	17.3
Max =					**10.3**					**13.9**					**26.3**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A

2) Rainfall Intensity, $I = A/(Tc+C)^{\circ}$

3) Release Rate = Min (Release Rate, Peak Flow)

4) Storage Rate = Peak Flow - Release Rate

5) Storage = Duration x Storage Rate

6) Maximium Storage = Max Storage Over Duration

7) Parameters a,b,c are for City of Ottawa

IDF curve equations (Intensity in mm/hr)

100 year Intensity = $1735.688 / (\text{Time in min} + 6.014)^{0.820}$

50 year Intensity = $1569.580 / (\text{Time in min} + 6.014)^{0.820}$

25 year Intensity = $1402.884 / (\text{Time in min} + 6.018)^{0.819}$

10 year Intensity = $1174.184 / (\text{Time in min} + 6.014)^{0.816}$

5 year Intensity = $998.071 / (\text{Time in min} + 6.053)^{0.814}$

2 year Intensity = $732.951 / (\text{Time in min} + 6.199)^{0.810}$

TABLE B18
ESTIMATION OF ROOF STORAGE AND OUTFLOW - TOWER A

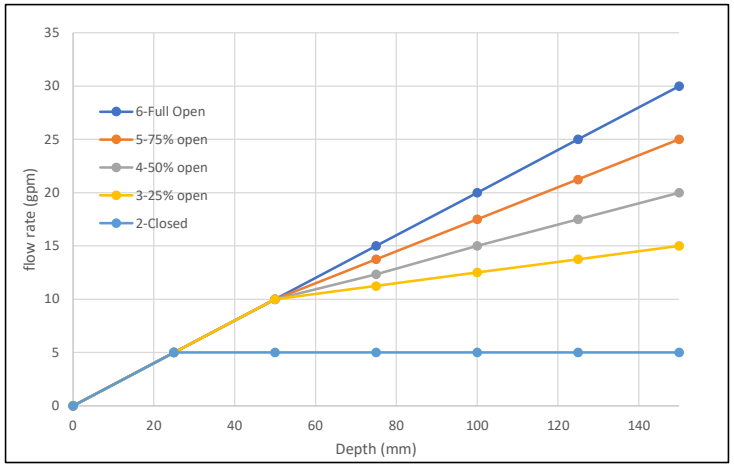
WATTS ADJ ACCUTROL WEIR FLOW RATES (Flow Rates at Various Depths)

Depth	Weir Position					
	1-None	2-Closed	3-25% open	4-50% open	5-75% open	6-Full Open
	Max Flow Rate per wier @150mm in gpm					
0	0	0	0	0	0	0
0.025	0	5	5	5	5	5
0.05	0	5	10	10	10	10
0.075	0	5	11.25	12.35	13.75	15
0.1	0	5	12.5	15	17.5	20
0.125	0	5	13.75	17.5	21.25	25
0.15	0	5	15	20	25	30

WATTS ADJ ACCUTROL WEIR FLOW RATES (Data From Manufacturer's Catalog)

Weir Position	Flow (gpm) per depth							Max Flow Rate per Weir @150mm
	0	25	50	75	100	125	150	
	0	0.025	0.05	0.075	0.1	0.125	0.15	
1-None	0	0	0	0	0	0	0	0
2-Closed	0	5	5	5	5	5	5	0.315
3-25% open	0	5	10	11.25	12.5	13.75	15	0.946
4-50% open	0	5	10	12.35	15	17.5	20	1.262
5-75% open	0	5	10	13.75	17.5	21.25	25	1.577
6-Full Open	0	5	10	15	20	25	30	1.893

GRAPH OF FLOW RATE VERSUS DEPTH FOR VARIOUS WEIR POSITIONS



BUILDING ROOF INFORMATION

Buidling Number	**Tower B1**	
Total Roof Area (m2)	**1119**	
Minimium Number of Drains Required	1.2	*Minimium of 1 drain every 900 sqaure metres (OBC 7.4.10.4)*
15-min Rainfall Factor for Ottawa (mm)	**23**	*(OBC Supp SB-1)*
Max Permitted Load from All Drains (Litres)	25,741	
Max Permitted Load from All Drains (L/sec)	28.6	*Hydraulic Load expressed in L/sec (OBC Section 7.4.10.3)*
Estimated area per drain (m2)	144	
Estimated Distance from roof edge to drains (m)	**6**	*Not more than 15m from Edge of Roof and 30m to Adjacent Dains (OBC Section 7.4.10.3)*
Estimated No. of Drains Requried	8	*Based on Total Roof Area / Area per Drain*
Actual No. of Drains Used	8	*Use if known*
Effecive Roof Percentage (%)	**80%**	*Allowance for Mechanical units on roof*
Effecive Total Roof Area (m2)	895	
Area per Drain (m2)	112	*Based on Effectiive Roof Area / Actual Number of Drains Used*
Max Depth of Ponding at Drains (mm)	**150**	
Estimated Total Volume for Ponding on Roof (m3)	56.0	*Prisim formula, V = 1/3*A*d*
Maximium release rate per drain at 150mm (usgpm)	**30**	*Based on 1 Wier Per Drain and Fully Open Position*
Max Release Rate from Roof (L/sec)	15.1	*Based on Maximum Depth of Ponding of 150mm*
Equiv Runoff C for 100-yr Storm	0.27	*Based on 100-yr storm Intensity of 178.6 mm/hr, where I =1735.688 / (Tc + 6.014)^0.820, with Tc=10min)*

RATING CURVE FOR ROOF

DISCHARGE VERSUS DEPTH				AREA VERSUS DEPTH			Total Ponding Volume - All Drains (m3)
Ponding Depth (m)	Discharge Rate Per Drain (gpm)	Discharge Rate Per Drain (m3/sec)	Total Discharge All Drains (m3/sec)	Ponding Depth (m)	Ponding Area (m2)	Ponding Volume Per Drain (m3)	
0	0	0.00	0.00000	0	0.0	0.0	0.0
0.025	5	0.32	0.00252	0.025	3.1	0.0	0.2
0.05	10	0.63	0.00505	0.05	12.4	0.2	1.7
0.075	15	0.95	0.00757	0.075	28.0	0.7	5.6
0.1	20	1.26	0.01009	0.1	49.7	1.7	13.3
0.125	25	1.58	0.01262	0.125	77.7	3.2	25.9
0.15	30	1.89	0.01514	0.15	111.9	5.6	44.8
Weir Position = **6-Full Open**							

RATING CURVE FOR MODELLING OUTLET

Head or Ponding Depth (m)	Outlfow (L/sec)
0	0.0000
0.025	2.5236
0.05	5.0472
0.075	7.5708
0.1	10.0944
0.125	12.6180
0.15	15.1416

RATING CURVE FOR MODELLING ROOF STORAGE

Head or Ponding Depth (m)	Ponding Area (m2)
0	0.0
0.025	3.1
0.05	12.4
0.075	28.0
0.1	49.7
0.125	77.7
0.15	111.9

TABLE B19
ESTIMATION OF ROOF STORAGE AND OUTFLOW - TOWER B

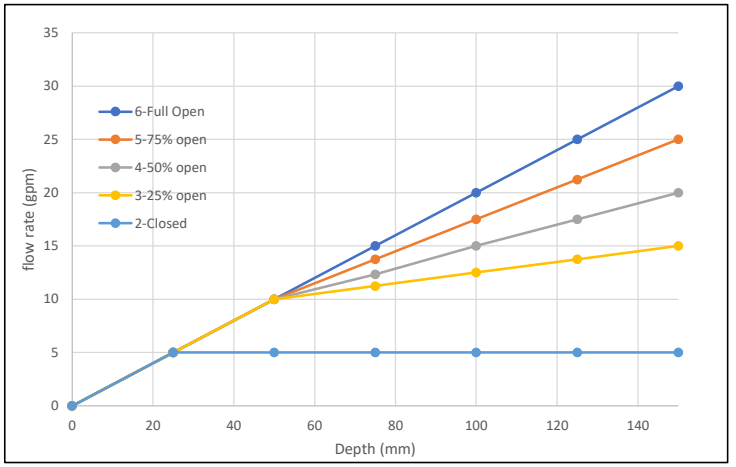
WATTS ADJ ACCUTROL WEIR FLOW RATES (Flow Rates at Various Depths)

Depth	Weir Position					
	1-None	2-Closed	3-25% open	4-50% open	5-75% open	6-Full Open
	Max Flow Rate per wier @150mm in gpm					
0	0	0	0	0	0	0
0.025	0	5	5	5	5	5
0.05	0	5	10	10	10	10
0.075	0	5	11.25	12.35	13.75	15
0.1	0	5	12.5	15	17.5	20
0.125	0	5	13.75	17.5	21.25	25
0.15	0	5	15	20	25	30

WATTS ADJ ACCUTROL WEIR FLOW RATES (Data From Manufacturer's Catalog)

Weir Position	Flow (gpm) per depth							Max Flow Rate per Weir @150mm
	0	25	50	75	100	125	150	
	0	0.025	0.05	0.075	0.1	0.125	0.15	
1-None	0	0	0	0	0	0	0	0
2-Closed	0	5	5	5	5	5	5	0.315
3-25% open	0	5	10	11.25	12.5	13.75	15	0.946
4-50% open	0	5	10	12.35	15	17.5	20	1.262
5-75% open	0	5	10	13.75	17.5	21.25	25	1.577
6-Full Open	0	5	10	15	20	25	30	1.893

GRAPH OF FLOW RATE VERSUS DEPTH FOR VARIOUS WEIR POSITIONS



BUILDING ROOF INFORMATION

Buidling Number	**Podium B1 / B2**	
Total Roof Area (m2)	**1060**	
Minimum Number of Drains Required	1.2	*Minimium of 1 drain every 900 sqaure metres (OBC 7.4.10.4)*
15-min Rainfall Factor for Ottawa (mm)	**23**	*(OBC Supp SB-1)*
Max Permitted Load from All Drains (Litres)	24,382	
Max Permitted Load from All Drains (L/sec)	27.1	*Hydraulic Load expressed in L/sec (OBC Section 7.4.10.3)*
Estimated area per drain (m2)	144	
Estimated Distance from roof edge to drains (m)	**6**	*Not more than 15m from Edge of Roof and 30m to Adjacent Dains (OBC Section 7.4.10.3)*
Estimated No. of Drains Requried	8	*Based on Total Roof Area / Area per Drain*
Actual No. of Drains Used	8	*Use if known*
Effecive Roof Percentage (%)	**80%**	*Allowance for Mechanical units on roof*
Effecive Total Roof Area (m2)	848	
Area per Drain (m2)	106	*Based on Effectiive Roof Area / Actual Number of Drains Used*
Max Depth of Ponding at Drains (mm)	**150**	
Estimated Total Volume for Ponding on Roof (m3)	53.0	*Prisim formula, V = 1/3*A*d*
Maximium release rate per drain at 150mm (usgpm)	**30**	*Based on 1 Wier Per Drain and Fully Open Position*
Max Release Rate from Roof (L/sec)	15.1	*Based on Maximum Depth of Ponding of 150mm*
Equiv Runoff C for 100-yr Storm	0.29	*Based on 100-yr storm Intensity of 178.6 mm/hr, where I =1735.688 / (Tc + 6.014)^0.820, with Tc=10min)*

RATING CURVE FOR ROOF

DISCHARGE VERSUS DEPTH				AREA VERSUS DEPTH			Total Ponding Volume - All Drains (m3)
Ponding Depth (m)	Discharge Rate Per Drain (gpm)	Discharge Rate Per Drain (m3/sec)	Total Discharge All Drains (m3/sec)	Ponding Depth (m)	Ponding Area (m2)	Ponding Volume Per Drain (m3)	
0	0	0.00	0.00000	0	0.0	0.0	0.0
0.025	5	0.32	0.00252	0.025	2.9	0.0	0.2
0.05	10	0.63	0.00505	0.05	11.8	0.2	1.6
0.075	15	0.95	0.00757	0.075	26.5	0.7	5.3
0.1	20	1.26	0.01009	0.1	47.1	1.6	12.6
0.125	25	1.58	0.01262	0.125	73.6	3.1	24.5
0.15	30	1.89	0.01514	0.15	106.0	5.3	42.4
Weir Position = **6-Full Open**							

RATING CURVE FOR MODELLING OUTLET

Head or Ponding Depth (m)	Outlfow (L/sec)
0	0.0000
0.025	2.5236
0.05	5.0472
0.075	7.5708
0.1	10.0944
0.125	12.6180
0.15	15.1416

RATING CURVE FOR MODELLING ROOF STORAGE

Head or Ponding Depth (m)	Ponding Area (m2)
0	0.0
0.025	2.9
0.05	11.8
0.075	26.5
0.1	47.1
0.125	73.6
0.15	106.0

TABLE B20
ESTIMATION OF ROOF STORAGE AND OUTFLOW - TOWER C

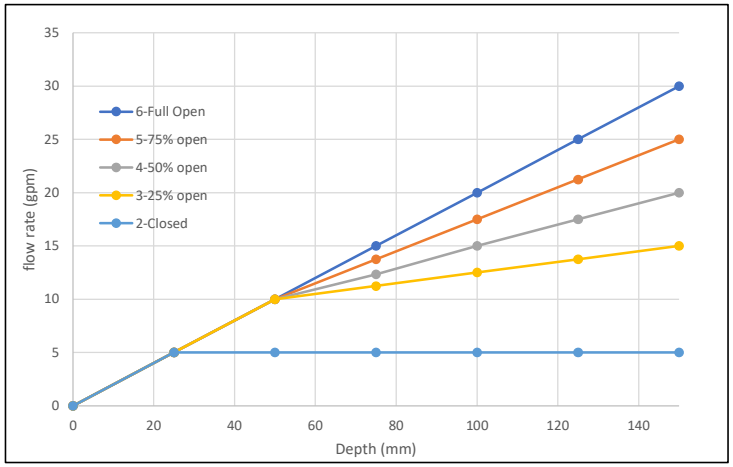
WATTS ADJ ACCUTROL WEIR FLOW RATES (Flow Rates at Various Depths)

Depth	Weir Position					
	1-None	2-Closed	3-25% open	4-50% open	5-75% open	6-Full Open
	Max Flow Rate per wier @150mm in gpm					
0	0	0	0	0	0	0
0.025	0	5	5	5	5	5
0.05	0	5	10	10	10	10
0.075	0	5	11.25	12.35	13.75	15
0.1	0	5	12.5	15	17.5	20
0.125	0	5	13.75	17.5	21.25	25
0.15	0	5	15	20	25	30

WATTS ADJ ACCUTROL WEIR FLOW RATES (Data From Manufacturer's Catalog)

Weir Position	Flow (gpm) per depth							Max Flow Rate per Weir @150mm
	0	25	50	75	100	125	150	
	0	0.025	0.05	0.075	0.1	0.125	0.15	
1-None	0	0	0	0	0	0	0	0
2-Closed	0	5	5	5	5	5	5	0.315
3-25% open	0	5	10	11.25	12.5	13.75	15	0.946
4-50% open	0	5	10	12.35	15	17.5	20	1.262
5-75% open	0	5	10	13.75	17.5	21.25	25	1.577
6-Full Open	0	5	10	15	20	25	30	1.893

GRAPH OF FLOW RATE VERSUS DEPTH FOR VARIOUS WEIR POSITIONS



BUILDING ROOF INFORMATION

Buidling Number	**Tower B2**	
Total Roof Area (m2)	**1191**	
Minimum Number of Drains Required	1.3	*Minimium of 1 drain every 900 sqaure metres (OBC 7.4.10.4)*
15-min Rainfall Factor for Ottawa (mm)	**23**	*(OBC Supp SB-1)*
Max Permitted Load from All Drains (Litres)	27,400	
Max Permitted Load from All Drains (L/sec)	30.4	*Hydraulic Load expressed in L/sec (OBC Section 7.4.10.3)*
Estimated area per drain (m2)	144	
Estimated Distance from roof edge to drains (m)	**6**	*Not more than 15m from Edge of Roof and 30m to Adjacent Dains (OBC Section 7.4.10.3)*
Estimated No. of Drains Requried	9	*Based on Total Roof Area / Area per Drain*
Actual No. of Drains Used	9	*Use if known*
Effecive Roof Percentage (%)	**80%**	*N0 Allowance for Mechanical units on this roof*
Effecive Total Roof Area (m2)	953	
Area per Drain (m2)	106	*Based on Effectiive Roof Area / Actual Number of Drains Used*
Max Depth of Ponding at Drains (mm)	**150**	
Estimated Total Volume for Ponding on Roof (m3)	59.6	*Prisim formula, V = 1/3*A*d*
Maximium release rate per drain at 150mm (usgpm)	**30**	*Based on 1 Wier Per Drain and Fully Open Position*
Max Release Rate from Roof (L/sec)	17.0	*Based on Maximum Depth of Ponding of 150mm*
Equiv Runoff C for 100-yr Storm	0.29	*Based on 100-yr storm Intensity of 178.6 mm/hr, where I =1735.688 / (Tc + 6.014)^0.820, with Tc=10min)*

RATING CURVE FOR ROOF

DISCHARGE VERSUS DEPTH				AREA VERSUS DEPTH			Total Ponding Volume - All Drains (m3)
Ponding Depth (m)	Discharge Rate Per Drain (gpm)	Discharge Rate Per Drain (m3/sec)	Total Discharge All Drains (m3/sec)	Ponding Depth (m)	Ponding Area (m2)	Ponding Volume Per Drain (m3)	
0	0	0.00	0.00000	0	0.0	0.0	0.0
0.025	5	0.32	0.00284	0.025	2.9	0.0	0.2
0.05	10	0.63	0.00568	0.05	11.8	0.2	1.8
0.075	15	0.95	0.00852	0.075	26.5	0.7	6.0
0.1	20	1.26	0.01136	0.1	47.1	1.6	14.1
0.125	25	1.58	0.01420	0.125	73.5	3.1	27.6
0.15	30	1.89	0.01703	0.15	105.9	5.3	47.7
Weir Position = **6-Full Open**							

RATING CURVE FOR MODELLING OUTLET

Head or Ponding Depth (m)	Outlfow (L/sec)
0	0.0000
0.025	2.8391
0.05	5.6781
0.075	8.5172
0.1	11.3562
0.125	14.1953
0.15	17.0344

RATING CURVE FOR MODELLING ROOF STORAGE

Head or Ponding Depth (m)	Ponding Area (m2)
0	0.0
0.025	2.9
0.05	11.8
0.075	26.5
0.1	47.1
0.125	73.5
0.15	105.9

TABLE B21
ESTIMATION OF ROOF STORAGE AND OUTFLOW - TOWER D

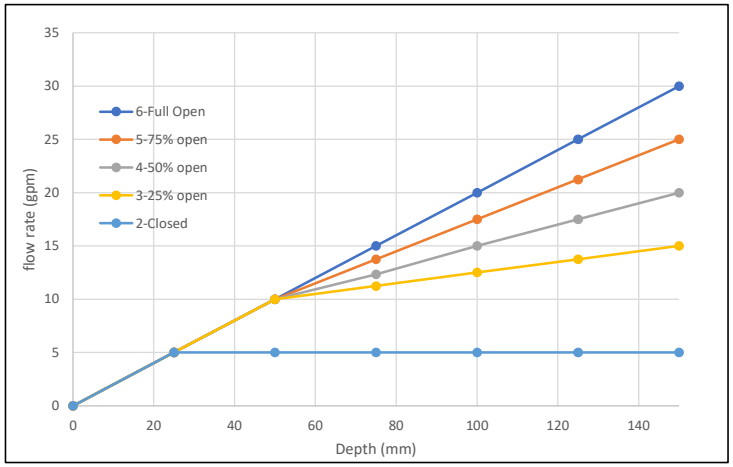
WATTS ADJ ACCUTROL WEIR FLOW RATES (Flow Rates at Various Depths)

Depth	Weir Position					
	1-None	2-Closed	3-25% open	4-50% open	5-75% open	6-Full Open
	Max Flow Rate per wier @150mm in gpm					
0	0	0	0	0	0	0
0.025	0	5	5	5	5	5
0.05	0	5	10	10	10	10
0.075	0	5	11.25	12.35	13.75	15
0.1	0	5	12.5	15	17.5	20
0.125	0	5	13.75	17.5	21.25	25
0.15	0	5	15	20	25	30

WATTS ADJ ACCUTROL WEIR FLOW RATES (Data From Manufacturer's Catalog)

Weir Position	Flow (gpm) per depth							Max Flow Rate per Weir @150mm
	0	25	50	75	100	125	150	
	0	0.025	0.05	0.075	0.1	0.125	0.15	
1-None	0	0	0	0	0	0	0	0
2-Closed	0	5	5	5	5	5	5	0.315
3-25% open	0	5	10	11.25	12.5	13.75	15	0.946
4-50% open	0	5	10	12.35	15	17.5	20	1.262
5-75% open	0	5	10	13.75	17.5	21.25	25	1.577
6-Full Open	0	5	10	15	20	25	30	1.893

GRAPH OF FLOW RATE VERSUS DEPTH FOR VARIOUS WEIR POSITIONS



BUILDING ROOF INFORMATION

Buidling Number	**Podium B2 / B3**	
Total Roof Area (m2)	**1161**	
Minimum Number of Drains Required	1.3	*Minimium of 1 drain every 900 sqaure metres (OBC 7.4.10.4)*
15-min Rainfall Factor for Ottawa (mm)	**23**	*(OBC Supp SB-1)*
Max Permitted Load from All Drains (Litres)	26,706	
Max Permitted Load from All Drains (L/sec)	29.7	*Hydraulic Load expressed in L/sec (OBC Section 7.4.10.3)*
Estimated area per drain (m2)	144	
Estimated Distance from roof edge to drains (m)	**6**	*Not more than 15m from Edge of Roof and 30m to Adjacent Dains (OBC Section 7.4.10.3)*
Estimated No. of Drains Requried	9	*Based on Total Roof Area / Area per Drain*
Actual No. of Drains Used	9	*Use if known*
Effecive Roof Percentage (%)	**80%**	*N0 Allowance for Mechanical units on this roof*
Effecive Total Roof Area (m2)	929	
Area per Drain (m2)	103	*Based on Effectiive Roof Area / Actual Number of Drains Used*
Max Depth of Ponding at Drains (mm)	**150**	
Estimated Total Volume for Ponding on Roof (m3)	58.1	*Prisim formula, V = 1/3*A*d*
Maximium release rate per drain at 150mm (usgpm)	**30**	*Based on 1 Wier Per Drain and Fully Open Position*
Max Release Rate from Roof (L/sec)	17.0	*Based on Maximum Depth of Ponding of 150mm*
Equiv Runoff C for 100-yr Storm	0.30	*Based on 100-yr storm Intensity of 178.6 mm/hr, where I =1735.688 / (Tc + 6.014)^0.820, with Tc=10min)*

RATING CURVE FOR ROOF

DISCHARGE VERSUS DEPTH				AREA VERSUS DEPTH			Total Ponding Volume - All Drains (m3)
Ponding Depth (m)	Discharge Rate Per Drain (gpm)	Discharge Rate Per Drain (m3/sec)	Total Discharge All Drains (m3/sec)	Ponding Depth (m)	Ponding Area (m2)	Ponding Volume Per Drain (m3)	
0	0	0.00	0.00000	0	0.0	0.0	0.0
0.025	5	0.32	0.00284	0.025	2.9	0.0	0.2
0.05	10	0.63	0.00568	0.05	11.5	0.2	1.7
0.075	15	0.95	0.00852	0.075	25.8	0.6	5.8
0.1	20	1.26	0.01136	0.1	45.9	1.5	13.8
0.125	25	1.58	0.01420	0.125	71.7	3.0	26.9
0.15	30	1.89	0.01703	0.15	103.2	5.2	46.4
Weir Position = **6-Full Open**							

RATING CURVE FOR MODELLING OUTLET

Head or Ponding Depth (m)	Outlfow (L/sec)
0	0.0000
0.025	2.8391
0.05	5.6781
0.075	8.5172
0.1	11.3562
0.125	14.1953
0.15	17.0344

RATING CURVE FOR MODELLING ROOF STORAGE

Head or Ponding Depth (m)	Ponding Area (m2)
0	0.0
0.025	2.9
0.05	11.5
0.075	25.8
0.1	45.9
0.125	71.7
0.15	103.2

Appendix C – Manufacturers Information

Watts ACCUTROL Flow Control Specification

Stormceptor Sizing Report

Stormceptor EF Brochure

Stormceptor EF06 Detail

WATTS®	Adjustable Accutrol Weir Tag: _____	Adjustable Flow Control for Roof Drains

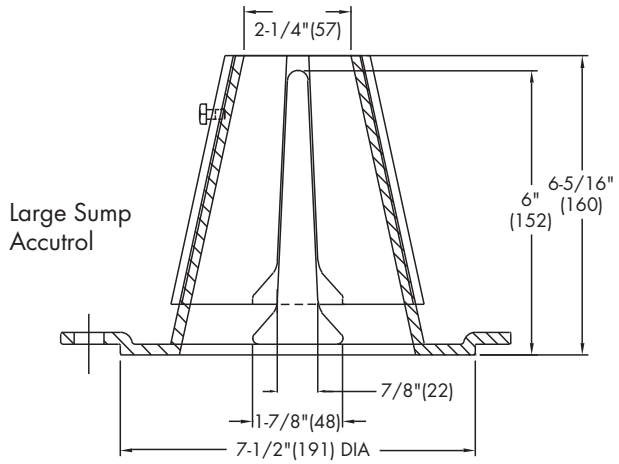
ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)

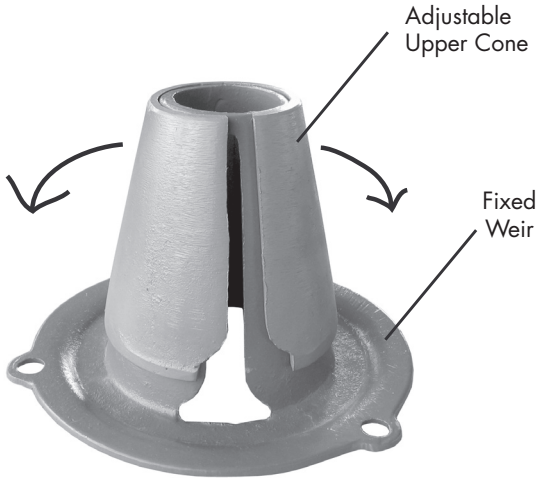
For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the flow rate for depths over 2" of head, set the slot in the adjustable upper cone according to the flow rate required. Refer to Table 1 below.
Note: Flow rates are directly proportional to the amount of weir opening that is exposed.

EXAMPLE:

For example, if the adjustable upper cone is set to cover 1/2 of the weir opening, flow rates above 2"of head will be restricted to 2-1/2 gpm per inch of head.

Therefore, at 3"of head, the flow rate through the Accutrol Weir that has 1/2 the slot exposed will be:
[5 gpm (per inch of head) x 2 inches of head] + 2-1/2 gpm (for the third inch of head) = 12-1/2 gpm.





1/2 Weir Opening Exposed Shown Above

TABLE 1. Adjustable Accutrol Flow Rate Settings

Weir Opening Exposed	1"	2"	3"	4"	5"	6"
	Flow Rate (gallons per minute)					
Fully Exposed	5	10	15	20	25	30
3/4	5	10	13.75	17.5	21.25	25
1/2	5	10	12.5	15	17.5	20
1/4	5	10	11.25	12.5	13.75	15
Closed	5	5	5	5	5	5

Job Name _____ Contractor _____

Job Location _____ Contractor's P.O. No. _____

Engineer _____ Representative _____

USA: Tel: (800) 338-2581 • Fax: (828) 248-3929 • Watts.com
Canada: Tel: (905) 332-4090 • Fax: (905) 332-7068 • Watts.ca
Latin America: Tel: (52) 81-1001-8600 • Fax: (52) 81-8000-7091 • Watts.com

WATTS®
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Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

12/10/2021

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Site Name:	1009 Trim Road

Drainage Area (ha):	1.135
Runoff Coefficient 'c':	0.85

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	32.73
Oil / Fuel Spill Risk Site?	No
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	1009 Trim Road
Project Number:	259629
Designer Name:	Aaditya Jariwala
Designer Company:	EXP Inc
Designer Email:	aaditya.jariwala@exp.com
Designer Phone:	613-816-5961
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EF4	70
EF6	80
EF8	86
EF10	91
EF12	94

Recommended Stormceptor EF Model: EF6

Estimated Net Annual Sediment (TSS) Load Reduction (%): 80

Water Quality Runoff Volume Capture (%): > 90

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THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

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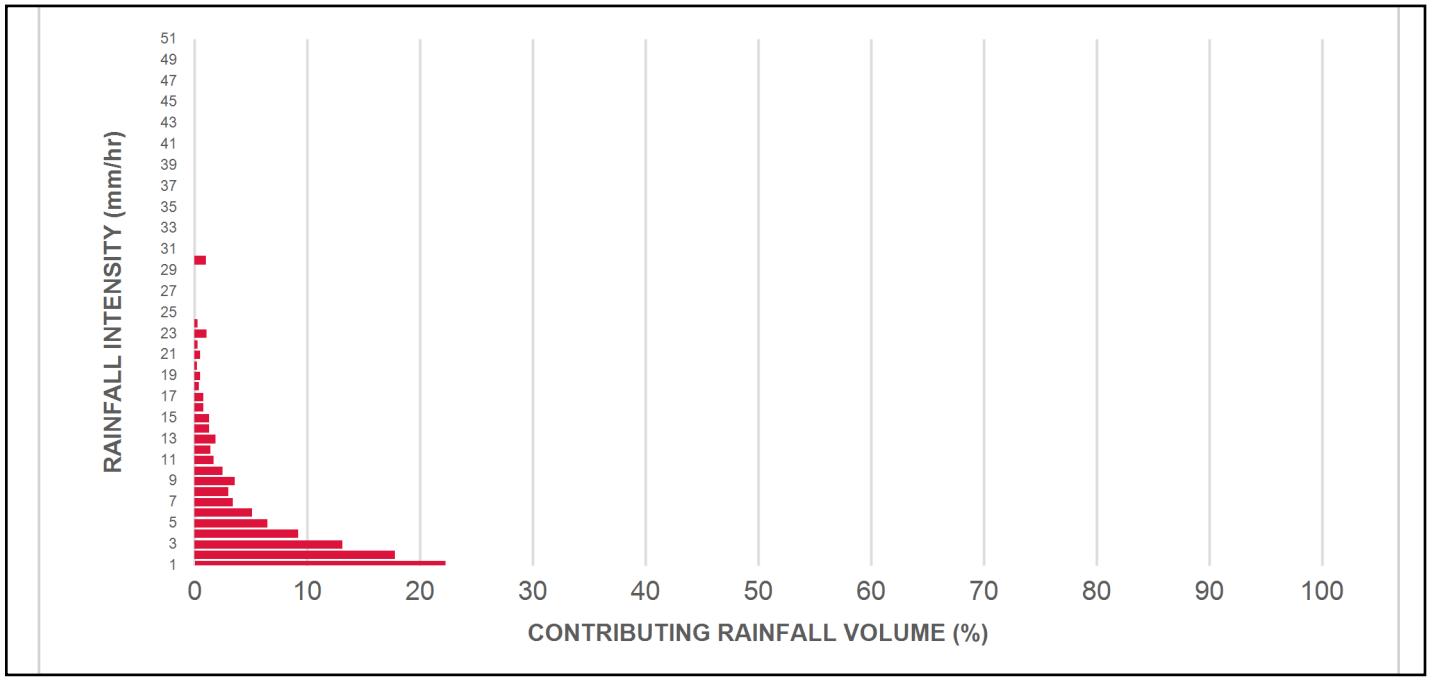
Stormceptor® EF Sizing Report

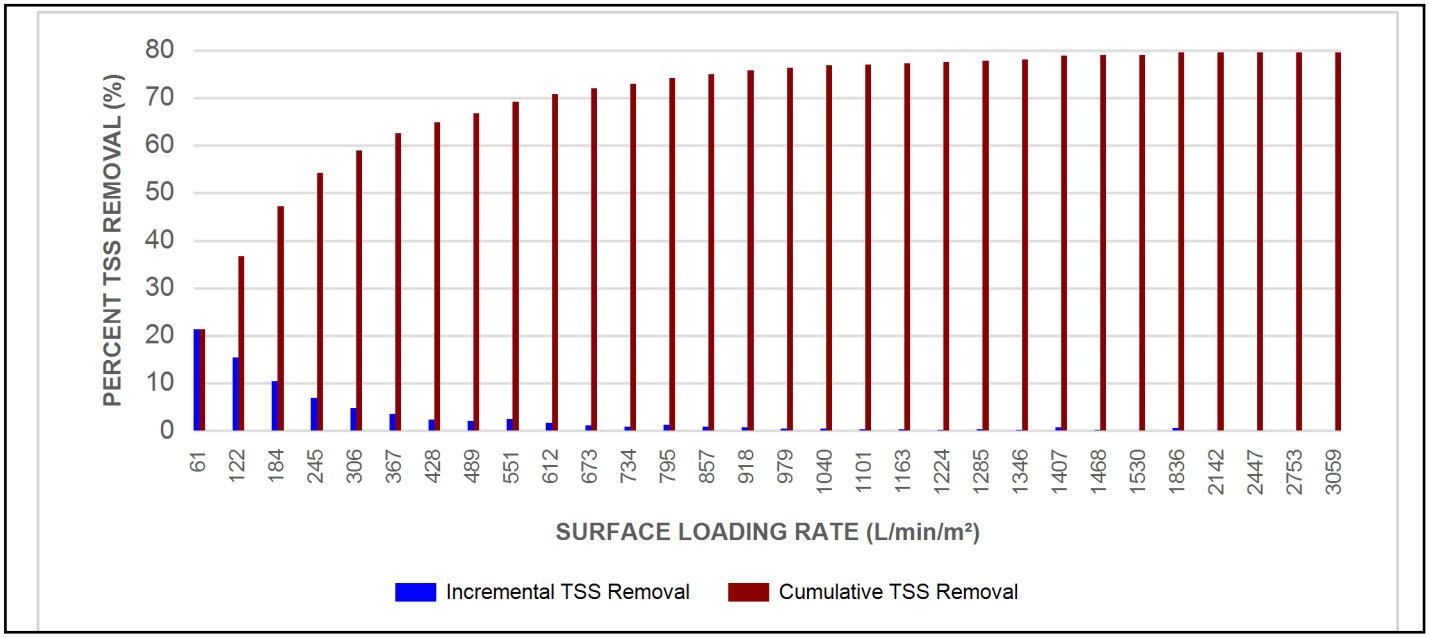
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	22.3	22.3	2.68	161.0	61.0	96	21.4	21.4
2	17.8	40.0	5.36	322.0	122.0	87	15.4	36.7
3	13.1	53.1	8.05	483.0	184.0	80	10.4	47.2
4	9.2	62.4	10.73	644.0	245.0	75	7.0	54.2
5	6.5	68.9	13.41	805.0	306.0	73	4.7	58.9
6	5.1	74.0	16.09	966.0	367.0	70	3.6	62.5
7	3.4	77.3	18.77	1126.0	428.0	68	2.3	64.8
8	3.0	80.3	21.46	1287.0	489.0	67	2.0	66.8
9	3.6	84.0	24.14	1448.0	551.0	66	2.4	69.2
10	2.5	86.5	26.82	1609.0	612.0	66	1.7	70.8
11	1.7	88.2	29.50	1770.0	673.0	65	1.1	72.0
12	1.4	89.6	32.18	1931.0	734.0	65	0.9	72.9
13	1.9	91.5	34.87	2092.0	795.0	64	1.2	74.1
14	1.3	92.8	37.55	2253.0	857.0	64	0.9	75.0
15	1.3	94.1	40.23	2414.0	918.0	64	0.8	75.8
16	0.8	94.9	42.91	2575.0	979.0	63	0.5	76.3
17	0.8	95.7	45.59	2736.0	1040.0	64	0.5	76.8
18	0.4	96.1	48.28	2897.0	1101.0	65	0.3	77.0
19	0.5	96.6	50.96	3057.0	1163.0	66	0.3	77.3
20	0.2	96.8	53.64	3218.0	1224.0	67	0.2	77.5
21	0.5	97.3	56.32	3379.0	1285.0	68	0.3	77.8
22	0.3	97.6	59.00	3540.0	1346.0	69	0.2	78.0
23	1.1	98.7	61.69	3701.0	1407.0	70	0.8	78.8
24	0.3	99.0	64.37	3862.0	1468.0	67	0.2	79.0
25	0.0	99.0	67.05	4023.0	1530.0	64	0.0	79.0
30	1.0	100.0	80.46	4828.0	1836.0	54	0.5	79.5
35	0.0	100.0	93.87	5632.0	2142.0	46	0.0	79.5
40	0.0	100.0	107.28	6437.0	2447.0	40	0.0	79.5
45	0.0	100.0	120.69	7241.0	2753.0	36	0.0	79.5
50	0.0	100.0	134.10	8046.0	3059.0	33	0.0	79.5
Estimated Net Annual Sediment (TSS) Load Reduction =								**80 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



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Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

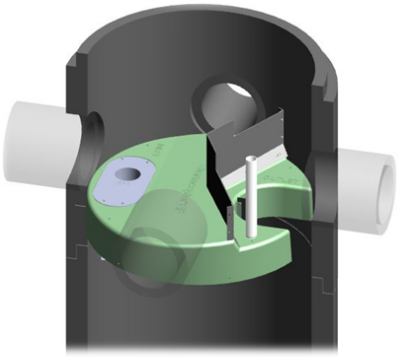
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

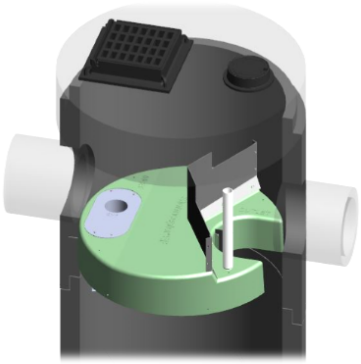
DESIGN FLEXIBILITY

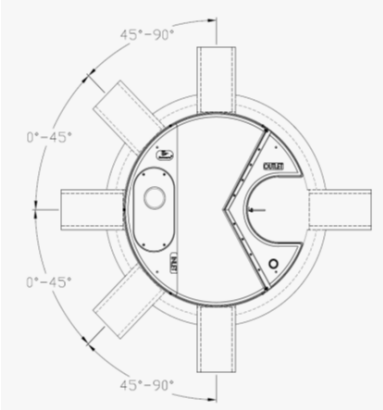
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The **minimum** sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1

4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing shall be determined using historical rainfall data and a sediment removal performance curve derived from the actual third-party verified laboratory testing data. The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

Stormceptor® EF

Stormceptor® EF Overview

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About Imbrium® Systems

Imbrium® Systems is dedicated to protecting Canada's waterways. Based on our knowledge and experience in the Canadian stormwater industry, we have the ability to provide the most effective stormwater treatment technologies that capture and retain harmful pollutants from urban runoff before it enters our streams, rivers, lakes, and oceans.

Imbrium's engineered treatment solutions have been third-party tested and verified in accordance with the ISO 14034 Environmental Technology Verification (ETV) protocol to ensure performance in real-world conditions as designed. Our team of highly skilled engineers and partners provide the highest level of service from design to installation and long-term maintenance.

By working with Imbrium and our partners, you can expect superior treatment technology, unparalleled customer service, compliance with local stormwater regulations, and cleaner water. To find your local representative, please visit **www.imbriumsystems.com/localrep**.

Learn About the Stormceptor® EF

Go online and watch our animation to learn how the Stormceptor EF works. The animation highlights important features of the Stormceptor EF including:

- Functionality
- Applications
- Inspection and Maintenance

To view the Stormceptor EF animation, visit **www.imbriumsystems.com/stormceptoref**

Stormceptor® EF

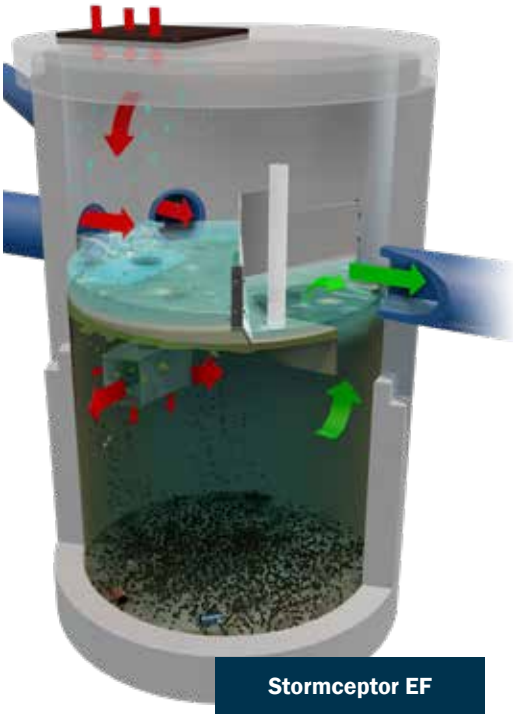
A CONTINUATION AND EVOLUTION OF THE MOST GLOBALLY RECOGNIZED OIL GRIT SEPARATOR (OGS) STORMWATER TREATMENT TECHNOLOGY

Stormceptor EF effectively targets sediment (TSS), free oils, gross pollutants and other pollutants that attach to particles, such as nutrients and metals. Stormceptor EF's independently tested and verified, patent- pending treatment and scour prevention platform ensures pollutants are captured and contained during all rainfall events.

Stormceptor EF also offers design flexibility in one platform, accepting flow from a single inlet pipe, multiple inlet pipes, and from the surface through an inlet grate. Stormceptor EF can also accommodate a 90-degree inlet to outlet bend angle, and tailwater conditions.

Ideal Uses

- Sediment (TSS) removal
- Hydrocarbon control and hotspots (Stormceptor EF)
- Debris and small floatables capture
- Pretreatment for filtration, detention/retention systems, ponds, wetlands, and bioretention
- Retrofit and redevelopment projects

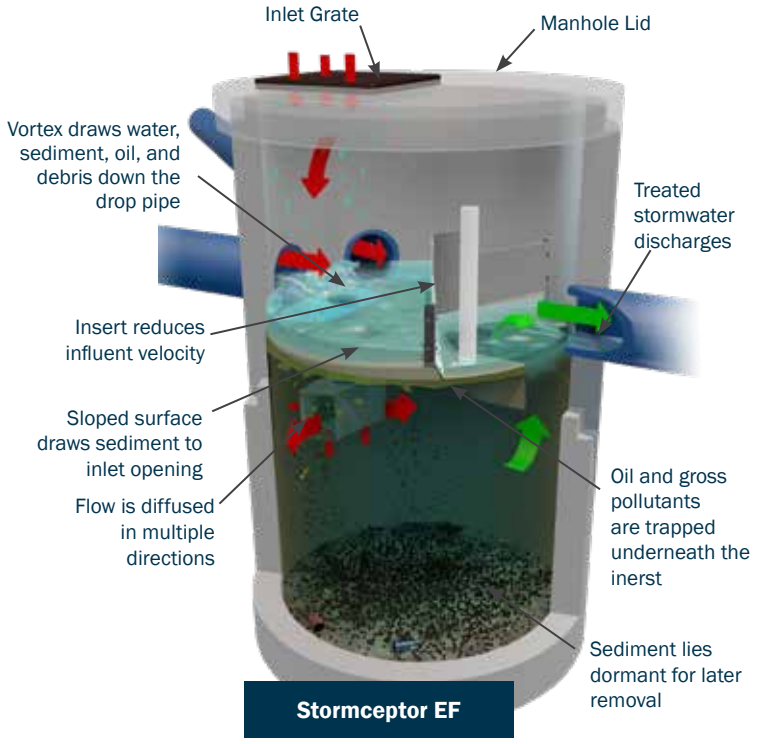


Stormceptor EF

Stormceptor EF and Stormceptor EFO have been verified in accordance with ISO 14034 Environment Management - Environmental Technology Verification (ETV) protocol.

How the Stormceptor® EF Works

- Flow enters the Stormceptor through one or more inlet pipes or an inlet grate.
- A specially designed insert reduces influent velocity by creating a pond upstream of the weir, allowing sediments to begin settling.
- Swirling flow sweeps water and pollutants across the sloped insert surface to the drop pipe, where a strong vortex draws water, sediment, oil, and debris down the drop pipe cone and into the lower chamber.
- Flow exits the drop pipe through two large rectangular openings, while also diffusing through perforations in multiple directions. This reduces stream velocities and increases pollutant removal efficiency while preventing resuspension and washout of previously captured pollutants.
- Floatables, such as oil and gross pollutants, rise up and are trapped beneath the insert.
- Sediment settles to the sump.
- Treated stormwater discharges to the top side of the insert downstream of the weir, where it exits through the outlet pipe.
- During intense storm events excess influent passes over the weir and exits through the outlet pipe. The pond continues to separate sediment from all incoming flows, while full treatment in the lower chamber continues at the maximum flow rate, without scour of previously captured pollutants.

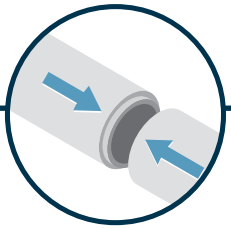


* Fiberglass system is an option

Stormceptor® EF Features & Benefits

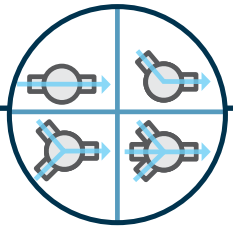
EASY TO INSTALL

Small footprint saves time and money with limited disruption to your site.



SEAMLESS

Minimal drop between inlet and outlet pipes makes Stormceptor ideal for retrofits and new development projects.



FLEXIBLE

Multiple inlets can connect to a single unit. Can be used as a bend structure.

FEATURES	BENEFITS
Patent-pending enhanced flow treatment and scour prevention technology	Superior, third-party verified performance
Third-party verified light liquid capture and retention (EFO version)	Proven performance for fuel/oil hotspot locations
Functions as bend, junction or inlet structure	Cost savings and design flexibility
Minimal drop between inlet and outlet	Site installation ease
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade

Stormceptor® EF Standard Configurations

Single Inlet Pipe

Multiple Inlet Pipes

Grate Inlet

High Tailwater

OPTIONS & ACCESSORIES

The following options and accessories are available for specific functions and site conditions:

- **Tailwater/Submerged Site** – For sites with standing water during dry weather periods, weir modifications can be implemented to ensure optimal performance.
- **Additional Sediment Storage Volume** – For sites with high pollutant loads or remote sites, additional sediment storage volume can easily be added.
- **Oil Alarm** – To mitigate spill liability, a monitoring system can be employed to trigger a visual and audible alarm when an oil or fuel spill occurs.
- **Additional Oil Capture** – A draw-off tank can be incorporated to increase spill storage capacity.
- **High Load** – Standard design loading is CHBDC or AASHTO H-20. Specialized loading can be designed to withstand very high loadings typical of airports and port facilities.
- **Lightweight** – Sites that required lightweight or above ground units are available as complete fiberglass systems.

Optional Oil Alarm

For any of these options or accessories, please contact your Stormceptor representative for design assistance.

Stormceptor® EFO

Accidents and spills happen, whether it is a fueling station, port, ndustrial site, or general hot spot with daily vehicle traffic. Protect the environment and your site from potentially costly clean-up, remediation, litigation and fines with the Stormceptor EFO configuration.

The Stormceptor EFO has been third-party tested to ensure oil capture, and retention during high flow events. The hydraulics of the Stormceptor EFO have been optimized to enhance oil and hydrocarbon capture.

STORMCEPTOR EFO – HYDROCARBON SPILL PROTECTION

- Stormceptor EFO configuration has been third-party performance tested for safe oil capture and retention.
- Patent-pending technology ensures captured oil and sediment are retained even during the largest rain events, for secure storage, environmental protection and easy removal.
- Stormceptor EFO provides double wall containment for captured hydrocarbons.
- Stormceptor EFO is ideal for gas stations, fuel depots, ports, garages, loading docks, industrial sites, fast food locations, high-collision intersections and other hotspots with spill-prone areas.
- Stormceptor EFO can accommodate an optional oil alarm and additional storage to increase spill storage capacity.

Stormceptor® Inspection & Maintenance

Conducted at grade, the Stormceptor EF design makes inspection and maintenance an easy and inexpensive process. Once maintained, the Stormceptor EF is functionally restored as designed, with full pollutant capture capacity.

MAINTENANCE RECOMMENDATIONS:

- Inspect every six months for the first year to determine the pollutant accumulation rate.
- In subsequent years, inspections can be based on observations or local requirements.
- Inspect the unit immediately after an oil, fuel or chemical spill. A licensed waste management company should remove oil and sediment, and dispose responsibly.

Stormceptor maintenance is performed at grade with a standard vacuum truck

FILTERRA BIORETENTION

The Filterra® Bioretention System is an engineered biofiltration device with components that make it similar to bioretention in pollutant removal and application, but has been optimized for high volume/flow treatment in a compact system.

JELLYFISH FILTER

The Jellyfish® Filter is a stormwater treatment technology featuring pretreatment and membrane filtration in a compact stand-alone treatment system that removes a high level and a wide variety of stormwater pollutants.

LITTATRAP CATCH BASIN

The LittaTrap™ is a simple and effective solution to remove sediment and trash from stormwater systems at its source. The LittaTrap sits inside the storm drain and captures and retains sediment and trash before it enters stormwater infrastructure, effectively pretreating downstream structures and aiding in pollutant removal.

LEARN MORE

- Access project profiles, photos, videos, and more online at **www.imbriumsystems.com/stormceptoref.**

REQUEST DESIGN ASSISTANCE

- Call us at (888) 279-8826 or 301-279-8827 to talk to one of our engineers for technical support or design assistance.

START A PROJECT

- Submit your system requirements on our product Design Worksheet at **www.imbriumsystems.com/pdw.**

FIND A LOCAL REPRESENTATIVE

- Visit **www.imbrumsystems.com/localrep** for contact information for your local Imbrium representative.

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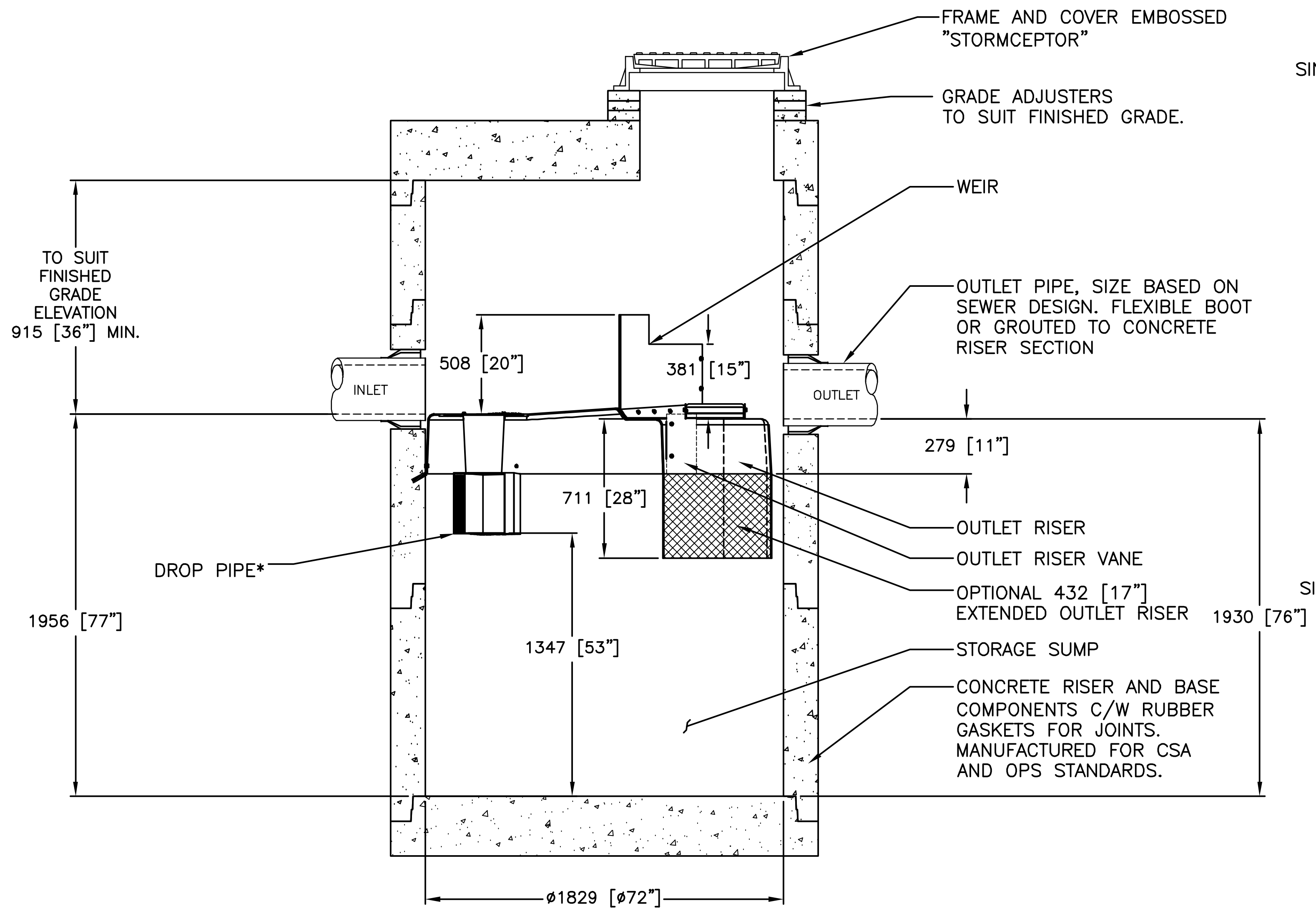
Imbrium® Systems is an engineered stormwater treatment company that designs and manufactures stormwater treatment solutions that protect water resources from harmful pollutants. By developing technologies to address the long-term impact of urban runoff, Imbrium ensures our clients' projects are compliant with government water quality regulations. For information, visit www.imbriumsystems.com or call +1 416-960-9900.

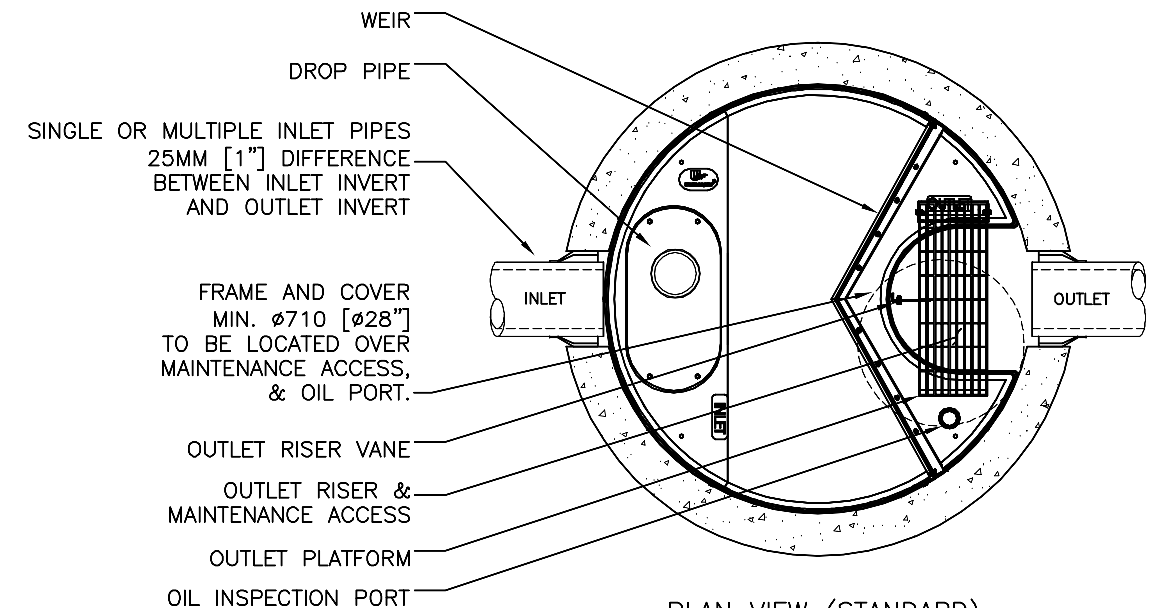
Get Social With Us!

IB-Stormceptor EF Bro 5/19 PDF

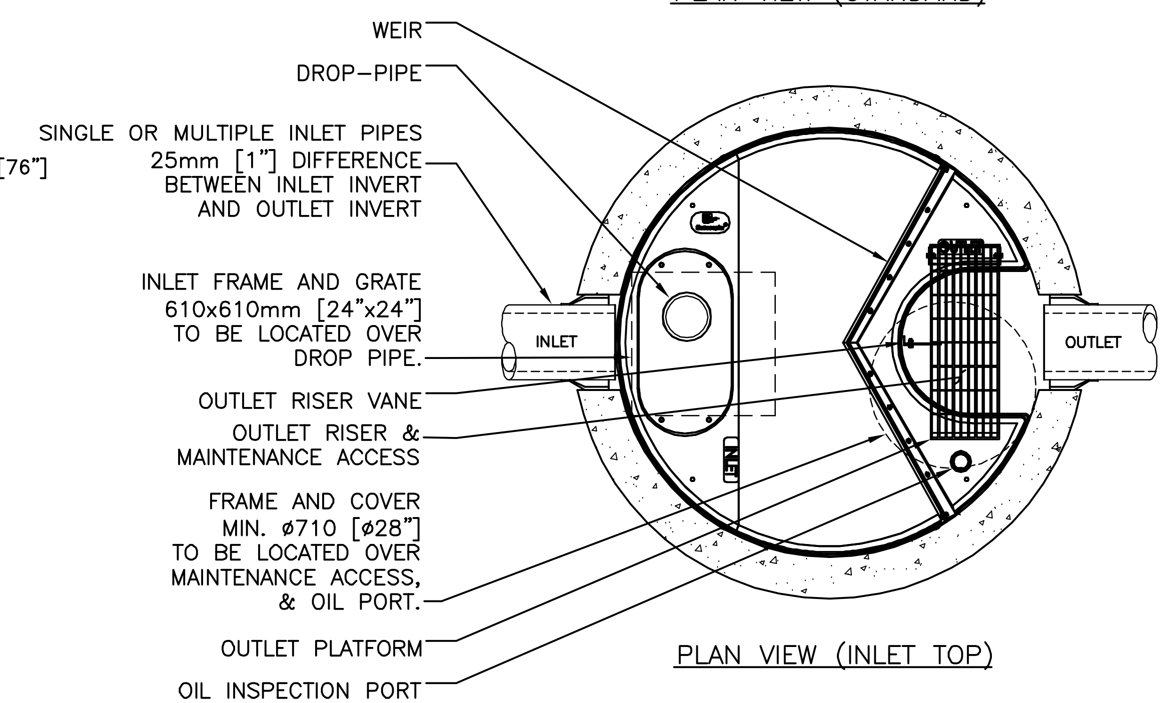
DRAWING NOT TO BE USED FOR CONSTRUCTION



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF6 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO6 (OIL CAPTURE CONFIGURATION).

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EFO6				
STRUCTURE ID					*
HYDROCARBON STORAGE REQ'D (L)					*
WATER QUALITY FLOW RATE (L/s)					*
PEAK FLOW RATE (L/s)					*
RETURN PERIOD OF PEAK FLOW (yrs)					*
DRAINAGE AREA (HA)					*
DRAINAGE AREA IMPERVIOUSNESS (%)					*
PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

MARK	DATE	REVISION DESCRIPTION	BY
####	####	####	####
####	####	####	####
####	####	####	####
1	6/8/18	OUTLET PLATFORM	JSK
0	05/26/17	INITIAL RELEASE	JSK

Stormceptor® EF

SCALE = NTS

imbrium®

407 FAIRVIEW DRIVE, WHITBY, ON L1N 3A9
TF 800-565-4801 CA 416-960-9900 INTL +1-416-960-9900

DATE: 10/13/2017	
DESIGNED: JSK	DRAWN: JSK
CHECKED: BSF	APPROVED: SP
PROJECT No.: EFO6	SEQUENCE No.: *
SHEET: 1 OF 1	

I:\IMBRIUM\PRODUCTS\STORMCEPTOR EF\40 DRAWINGS & DETAILS\STANDARD DETAILS\EFO STANDARD DETAILS\EFO6-DETAIL.DWG 4/12/2019 11:05 AM

Appendix D – Consultation / Correspondence

City of Ottawa Pre-Application Consolation Notes, June 01, 2020

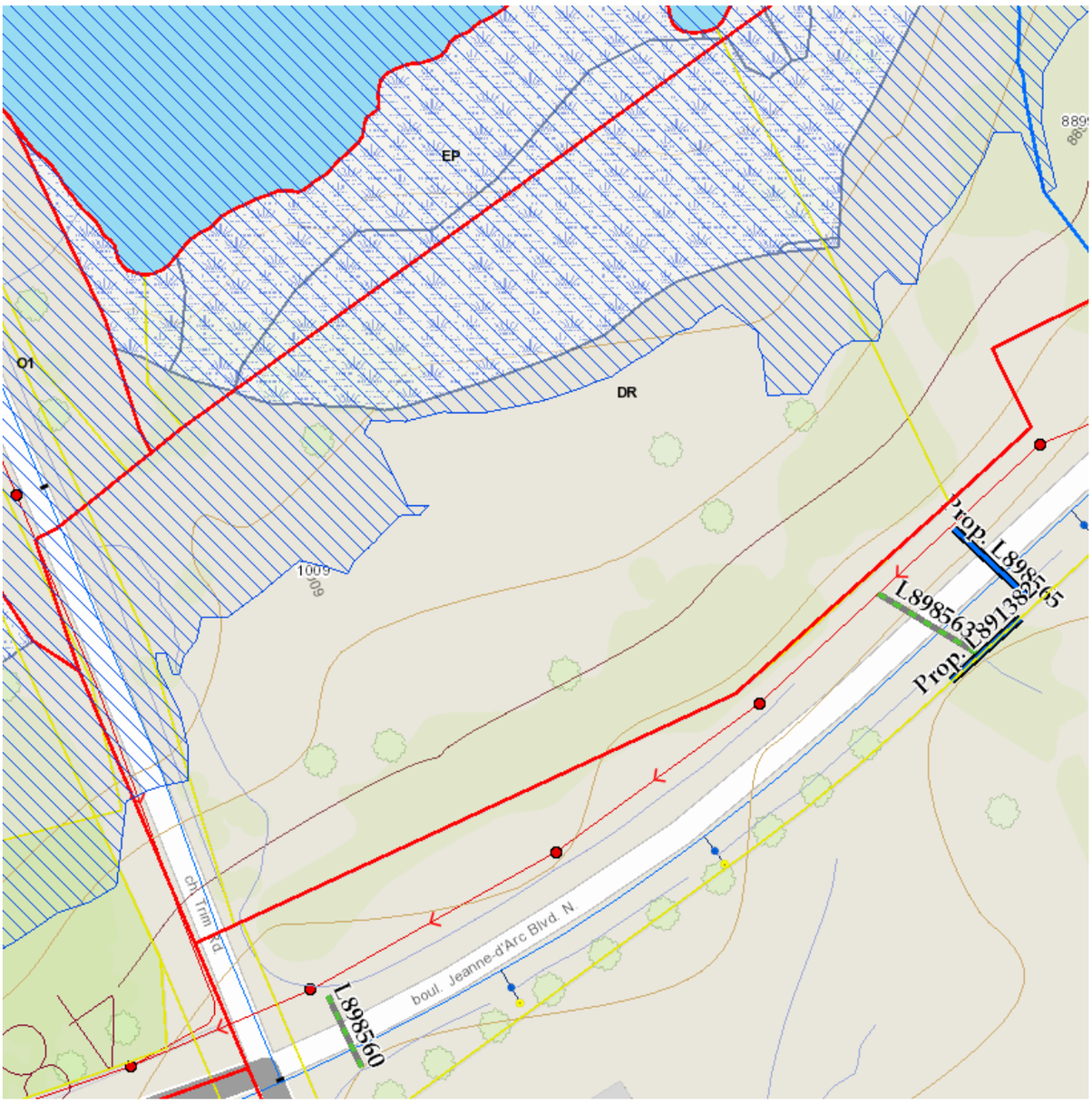
Email from City of Ottawa on Water System Boundary Conditions

OPA and ZBL Pre- Application Consultation Notes

Date: 1 June 2020
Site Location: 1009 Trim Rd
Type of Development: ☒ **Residential (**☐ **townhomes,** ☐ **stacked,** ☐ **singles,** ☒ **apartments),** ☐ **Office Space,** ☒ **Commercial,** ☐ **Retail,** ☐ **Institutional,** ☐ **Industrial, Other:** N/A

Project Manager: Will Curry / Natasha Baird
Assigned Planner: Shoma Murshid

Infrastructure



Water

Water District Plan No: 384-040
Existing public services:

- Jeanne d'Arc N Blvd – 406mm PVC

Boundary conditions:
Civil consultant must request boundary conditions from the City's assigned Project Manager prior to first submission.

- Water boundary condition requests must include the location of the service(s) and the expected loads required by the proposed developments. Please provide all the following information:

    - Location of service(s)
    - Type of development and the amount of fire flow required (as per FUS, 1999).
    - Average daily demand: ___ l/s.
    - Maximum daily demand: ___l/s.
    - Maximum hourly daily demand: ___ l/s.
- Fire protection (Fire demand, Hydrant Locations)

General comments

- At time of Site Plan Control, a water meter sizing questionnaire [water card] will have to be completed prior to receiving a water permit (water card will be provided post approval).
- Service areas with a basic demand greater than 50 m^3/day shall be connected with a minimum of two water services, separated by an isolation valve, to avoid creation of vulnerable service area.

Sanitary Sewer

Existing public services:

- Jeanne d'Arc N Blvd – 300mm PVC

Is a monitoring manhole required on private property? ☒ **Yes** ☐ **No**

General comments

- Adequacy of servicing will be required at the OPA stage for this development.
- Any premise in which there is commercial or institutional food preparation shall install a grease and oil inceptor on all fixtures.
- The Environmental Site Assessment (ESA) may provide recommendations where site contamination may be present. The recommendations from the ESA need to be coordinated with the servicing report to ensure compliance with the Sewer Use By-Law.

Storm Sewer

Existing public services:

- 2 culvert are located on Jeanne d'Arc N Blvd: 900mm CSP

General comments

- Adequacy of servicing will be required at the OPA stage for this development. An Environmental Assessment will be required if a storm outlet is discharging to the river is required.
- The site is required to accommodate the road drainage and the existing flow out-letting from the culverts towards the river.

Stormwater Management

Quality Control:

- Rideau Valley Conservation Authority to confirm quality control requirements.

Quantity Control:

- No quantity control is required for this development ONLY if it is discharging to the river.
- Please contact the City if this development will require municipal stormwater servicing.

Ministry of Environment, Conservation and Parks (MECEP)

At time of site plan control, this site will require an ECA for the outlet(s) to the river through direct submission.

a. Pre-consultation with local District office of MECP is recommended for direct submission.
b. Consultant completes an MECP request form for a pre-consultation. Sends request to moeccottawasewage@ontario.ca

NOTE: Site Plan Approval, or Draft Approval, is required before any Ministry of the Environment and Climate Change (MOECC) application is sent

General Service Design Comments

- The City of Ottawa requests that all new services be located within the existing service trench to minimize necessary road cuts.

- Monitoring manholes should be located within the property near the property line in an accessible location to City forces and free from obstruction (i.e. not a parking).
- Where service length is greater than 30 m between the building and the first maintenance hole / connection, a cleanout is required.
- Manholes are required for connections to sanitary or combined trunk sewers as per City of Ottawa Standards S13.
- The City of Ottawa Standard Detail Drawings should be referenced where possible for all work within the Public Right-of-Way.
- The upstream and downstream manhole top of grate and invert elevations are required for all new sewer connections.
- Services crossing the existing watermain or sewers need to clearly provide the obvert/invert elevations to demonstration minimum separation distances. A watermain crossing table may be provided.

Geotechnical and Slope Stability Analysis

- This development requires a geotechnical analysis and a slope stability analysis prior to the OPA to determine the developable lands. The site is adjacent to a waterway and is on sensitive clays with a slope. The City will require geotechnical information to ensure that the height and type of building supported by the OPA and ZA is satisfied.
- Provide an updated geotechnical report and slope stability analysis certified by a qualified engineer.
- Development shall comply to the current City of Ottawa Geotechnical Guideline: https://documents.ottawa.ca/sites/documents/files/documents/cap137602.pdf
- Development shall comply to the current City of Ottawa Slope Stability Guidelines for Development Applications: https://documents.ottawa.ca/sites/documents/files/documents/cap137604.pdf

Environmental Site Assessment

- As per the Official Plan, the environmental site assessment shall be completed as per Environmental Protection Act - O. Reg. 153/04, Part VII & VIII.
- Any reports older than 2 years shall be updated.

Other

At time of site plan control application, it will be required to verify if:

- Capital Works Projects will be within proximity to application.
- Watermain Frontage Fees are applicable.

References and Resources

- As per section 53 of the Professional Engineers Act, O. Reg 941/40, R.S.O. 1990, all documents prepared by engineers must be signed and dated on the seal.
- All required plans are to be submitted on standard A1 size sheets (594mm x 841mm) sheets, utilizing a reasonable and appropriate metric scale as per City of Ottawa Servicing and Grading Plan Requirements: title blocks are to be placed on the right of the sheets and not along the bottom. Engineering plans may be combined, but the Site Plans must be provided separately. Plans shall include the survey monument used to confirm datum. Information shall be provided to enable a non-surveyor to locate the survey monument presented by the consultant.
- All required plans & reports are to be provided in *.pdf format (at application submission and for any, and all, re-submissions)
- Please find relevant City of Ottawa Links to Preparing Studies and Plans below: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#standards-policies-and-guidelines
- To request City of Ottawa plan(s) or report information please contact the City of Ottawa Information Centre: InformationCentre@ottawa.ca<mailto:InformationCentre@ottawa.ca>

(613) 580-2424 ext. 44455

- geoOttawa
  http://maps.ottawa.ca/geoOttawa/

Boundary Conditions
1009 Trim Road

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	342	5.70
Maximum Daily Demand	852	14.20
Peak Hour	1,866	31.10
Fire Flow Demand #1	6,000	100.00
Fire Flow Demand #2	10,020	167.00

Location

Results

Connection 1 – Jeanne D'Arc Blvd.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	113.6	88.5
Peak Hour	106.7	78.6
Max Day plus Fire 1	112.0	86.2
Max Day plus Fire 2	102.9	73.3

[1] Ground Elevation = 51.4 m

Connection 2 – Jeanne D'Arc Blvd.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	113.6	89.2
Peak Hour	106.7	79.3
Max Day plus Fire 1	107.7	80.7
Max Day plus Fire 2	102.9	74.0

[1] Ground Elevation = 50.9 m

Notes

1. A second connection to the watermain is required to decrease vulnerability of the water system in case of breaks.
2. As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
    a. If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
    b. Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

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. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

Appendix E – Drawings

Architectural Plans (17 pages)

TOTAL SITE AREA:	33,567 sq.m	361,311 SF
SITE AREA ABOVE 30m FROM NORMAL HIGH WATER MARK OF OTTAWA RIVER:	12,220 sq.m	131,539 SF
AREA GIVEN TO CITY OF OTTAWA:	1,371 sq.m	14,752 SF
CITY AREA ACQUIRED:	1,450 sq.m	15,609 SF
SITE COVERAGE (BUILT-UP PARKING):	11,242 sq.m	121,011 SF
BUILDING FOOTPRINTS:	4,544 sq.m	48,912 SF

BUILDING A - 28 STOREYS	GFA	UNITS/FLOOR
L1	12,031 SF	0
L2	12,031 SF	0
L3-4	12,031 SF	11
L5-28	8,901 SF	9
TOTAL	**261,748 SF**	**238**

BUILDING B - 32 STOREYS	GFA	UNITS/FLOOR
L1	11,364 SF	0
L2	11,364 SF	0
L3-6	11,364 SF	11
L7-32	8,901 SF	9
TOTAL	**299,610 SF**	**278**

BUILDING C - 28 STOREYS	GFA	UNITS/FLOOR
L1	13,035 SF	0
L2-4	13,035 SF	12
L5-26	8,901 SF	9
L27	7,490 SF	9
L28	6,981 SF	8
TOTAL	**262,433 SF**	**234**

BUILDING D - 24 STOREYS	GFA	UNITS/FLOOR
L1	12,482 SF	0
L2-4	12,482 SF	12
L5-22	8,901 SF	9
L23	7,490 SF	9
L24	6,981 SF	8
TOTAL	**224,617 SF**	**206**

TOTAL GFA	TOTAL UNITS
1,048,408 SF	956

rla/architecture

CONTEXT PLAN

SCALE: 1 : 2000

DATE: 25/11/2021

1009 TRIM ROAD

OTTAWA ONTARIO

K4A 3P4

SHEET # D001

PROJ. No. 2017

PLOT DATE: 2021-11-02 11:58:50 AM

PLOT SCALE: 1:1

PAPER SIZE: ANSI B Tabloid 11" x 17" (279.40 x 431.80mm)

TWEDDLE ROAD

TOWER A -
28 STOREY

L4 ROOF

TOWER B -
32 STOREY

L6 ROOF

L3 ROOF
L4 ROOF
L26 ROOF
L27 ROOF

TOWER C -
28 STOREY

L4 ROOF

L22 ROOF
L23 ROOF

TOWER D -
24 STOREY

L4 ROOF
L3 ROOF

JEANNE-D'ARC BLVD NORTH

rla / architecture

SITE PLAN
SCALE: 1 : 500
DATE: 25/11/2021

OTTAWA 1009 TRIM ROAD ONTARIO
K4A 3P4

SHEET # D010
PROJ. No. 2017

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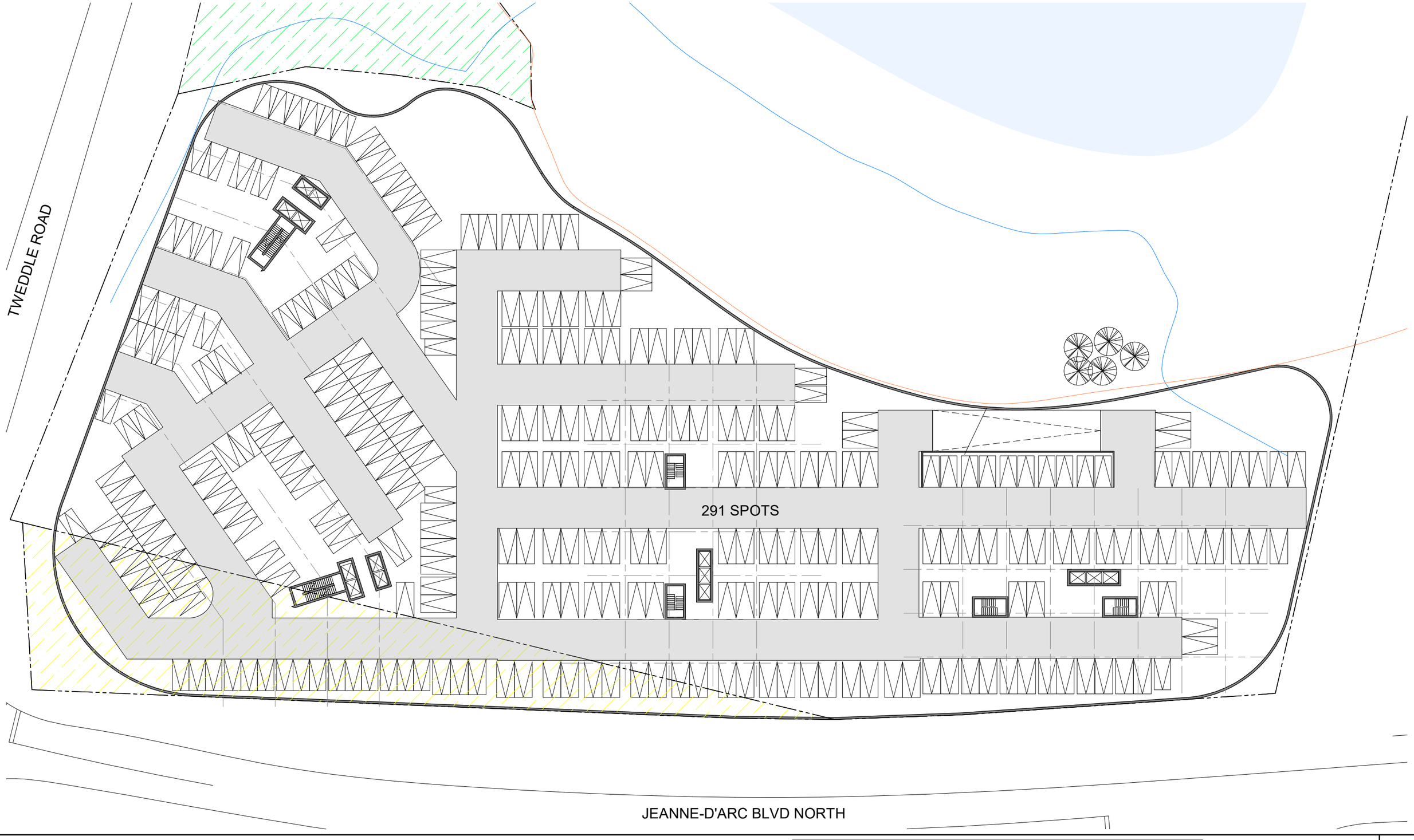

rla/architecture

P2 PLAN

SCALE: 1 : 500

DATE: 25/11/2021

1009 TRIM ROAD

OTTAWA ONTARIO

K4A 3P4

SHEET # D100

PROJ. No. 2017

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PLOT SCALE: 1:1

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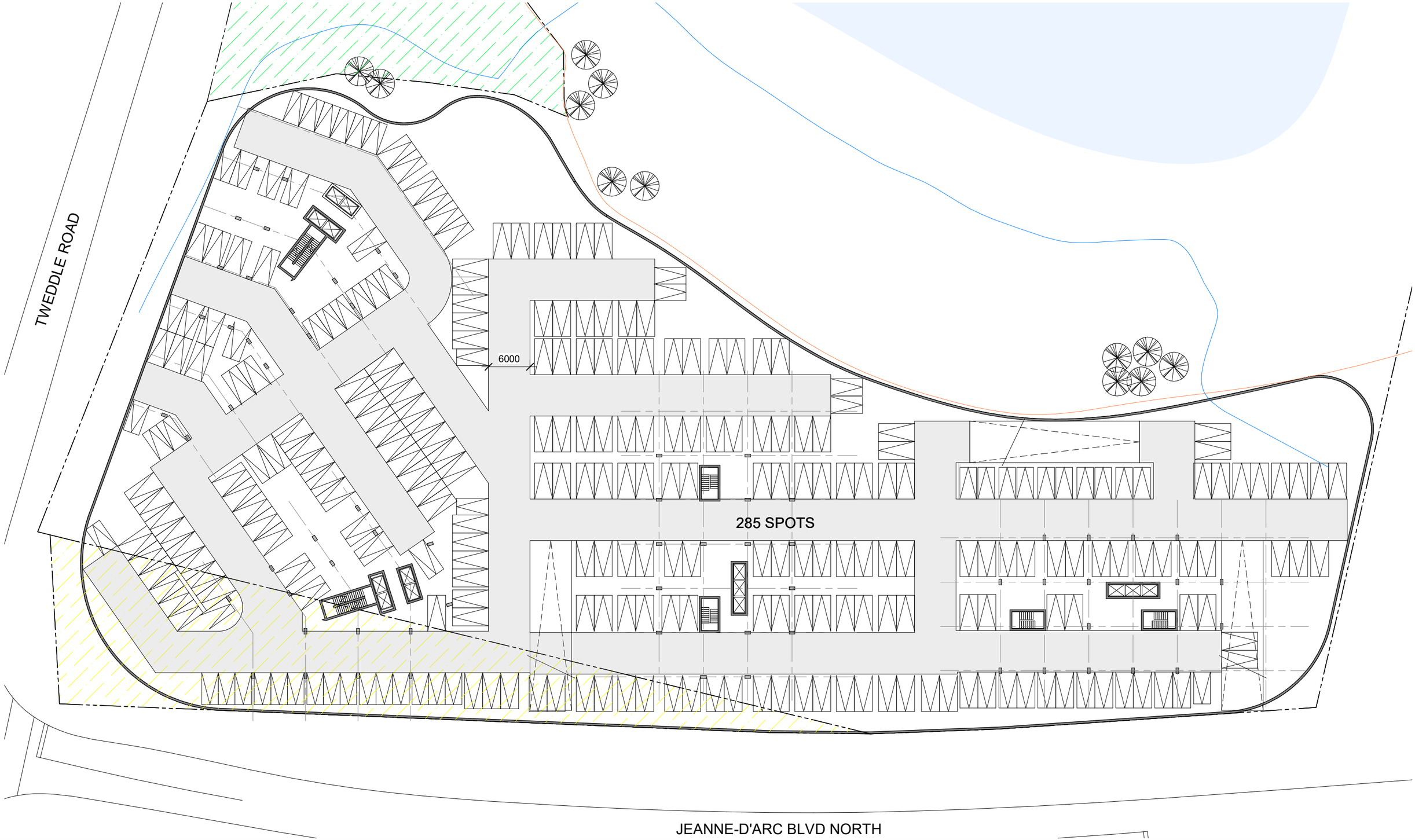

rla / architecture

P1 PLAN

SCALE: 1 : 500

DATE: 25/11/2021

1009 TRIM ROAD

OTTAWA ONTARIO

K4A 3P4

SHEET # D101

PROJ. No. 2017

PLOT DATE: 2021-11-25 12:01:29 PM

PLOT SCALE: 1:1

PAPER SIZE: ANSI B Tabloid 11" x 17" (279.40 x 431.80mm)

TWEDDLE ROAD

RESTAURANT
3,099 ft²

HEALTH CLUB
2,835 ft²

LOBBY
885 ft²

RETAIL
3,332 ft²

CAFE
2,457 ft²

RETAIL
6,087 ft²

LOBBY
1,848 ft²

RESTAURANT
4,198 ft²

BUSINESS CENTER
1,599 ft²

RETAIL
3,776 ft²

LOBBY
950 ft²

RETAIL
1,528 ft²

SPA
8,598 ft²

LOBBY
923 ft²

JEANNE-D'ARC BLVD NORTH

rla/architecture

GROUND FLOOR PLAN

SCALE: 1 : 500

DATE: 25/11/2021

OTTAWA — 1009 TRIM ROAD — ONTARIO

K4A 3P4

SHEET # D102

PROJ. No. 2017

PLOT DATE: 2021-11-25 12:01:36 PM

PLOT SCALE: 1:1

PAPER SIZE: ANSI B Tabloid 11" x 17" (279.40 x 431.80mm)

TWEDDLE ROAD

OFFICE SPACE
10,132 ft²

OFFICE SPACE
9,718 ft²

2 BED
1,322 ft²

2 BED
1,042 ft²

1 BED
635 ft²

1 BED
772 ft²

1 BED
772 ft²

2 BED
1,192 ft²

1 BED
690 ft²

2 BED
1,315 ft²

1 BED
690 ft²

2 BED
843 ft²

2 BED
951 ft²

2 BED
833 ft²

2 BED
979 ft²

1 BED
772 ft²

1 BED
690 ft²

1 BED
690 ft²

2 BED
1,008 ft²

1 BED
704 ft²

2 BED
1,420 ft²

2 BED
1,033 ft²

1 BED
772 ft²

1 BED
629 ft²

1 BED
772 ft²

2 BED
1,121 ft²

JEANNE-D'ARC BLVD NORTH

rla/architecture

L2 PLAN

SCALE: 1 : 500

DATE: 25/11/2021

OTTAWA

1009 TRIM ROAD

K4A 3P4

ONTARIO

SHEET #

D103

PROJ. No. 2017

PLOT DATE: 2021-11-25 12:01:45 PM

PLOT SCALE: 1:1

PAPER SIZE: ANSI B Tabloid 11" x 17" (279.40 x 431.80mm)

TWEDDLE ROAD

2 BED 1,148 ft²
1 BED 686 ft²
1 BED 704 ft²
2 BED 1,146 ft²
1 BED 663 ft²
1 BED 704 ft²
2 BED 1,101 ft²
1 BED 663 ft²
1 BED 643 ft²
2 BED 835 ft²
2 BED 933 ft²

2 BED 1,322 ft²
2 BED 1,042 ft²
1 BED 635 ft²
1 BED 772 ft²
1 BED 772 ft²
2 BED 1,192 ft²
1 BED 690 ft²
1 BED 690 ft²
2 BED 1,315 ft²
2 BED 843 ft²
2 BED 951 ft²
2 BED 833 ft²

2 BED 1,150 ft²
1 BED 704 ft²
1 BED 663 ft²
2 BED 823 ft²
1 BED 642 ft²
2 BED 930 ft²
2 BED 1,318 ft²
1 BED 642 ft²
1 BED 663 ft²
1 BED 663 ft²
1 BED 663 ft²

2 BED 979 ft²
1 BED 772 ft²
1 BED 690 ft²
1 BED 690 ft²
2 BED 1,008 ft²
1 BED 704 ft²
2 BED 1,420 ft²
2 BED 1,033 ft²
1 BED 772 ft²
1 BED 629 ft²
1 BED 772 ft²
2 BED 1,121 ft²

JEANNE-D'ARC BLVD NORTH

rla/architecture

PODIUM PLAN

SCALE: 1 : 500

DATE: 25/11/2021

1009 TRIM ROAD

OTTAWA ONTARIO

K4A 3P4

SHEET # D104

PROJ. No. 2017

PLOT DATE: 2021-11-25 12:01:57 PM

PLOT SCALE: 1:1

PAPER SIZE: ANSI B Tabloid 11" x 17" (279.40 x 431.80mm)

TWEDDLE ROAD

2 BED
1,054 ft²
1 BED
662 ft²
2 BED
1,054 ft²
1 BED
582 ft²
1 BED
662 ft²
1 BED
560 ft²
1 BED
582 ft²
1 BED
560 ft²
2 BED
873 ft²

BUILDING A
8,108 ft²

2 BED
1,103 ft²
2 BED
1,224 ft²
1 BED
703 ft²
2 BED
960 ft²
1 BED
703 ft²
1 BED
621 ft²
1 BED
560 ft²
2 BED
786 ft²
2 BED
786 ft²

BUILDING C
8,348 ft²

1 BED
662 ft²
2 BED
1,054 ft²
1 BED
582 ft²
1 BED
560 ft²
2 BED
873 ft²
1 BED
560 ft²
1 BED
582 ft²
1 BED
662 ft²
2 BED
1,054 ft²

BUILDING B
8,108 ft²

2 BED
1,224 ft²
2 BED
960 ft²
1 BED
621 ft²
2 BED
786 ft²
2 BED
1,103 ft²
1 BED
703 ft²
1 BED
703 ft²
1 BED
560 ft²
2 BED
786 ft²

BUILDING D
8,348 ft²

JEANNE-D'ARC BLVD NORTH

rla/architecture

TYPICAL TOWER PLAN

SCALE: 1 : 500

DATE: 25/11/2021

1009 TRIM ROAD

OTTAWA ONTARIO

K4A 3P4

SHEET # D107

PROJ. No. 2017

PLOT DATE: 2021-11-25 12:02:12 PM

PLOT SCALE: 1:1

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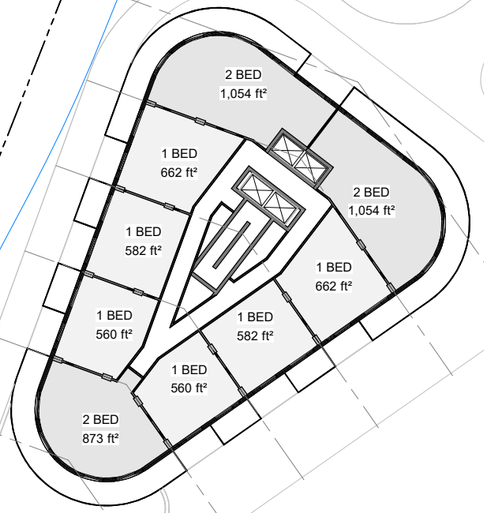

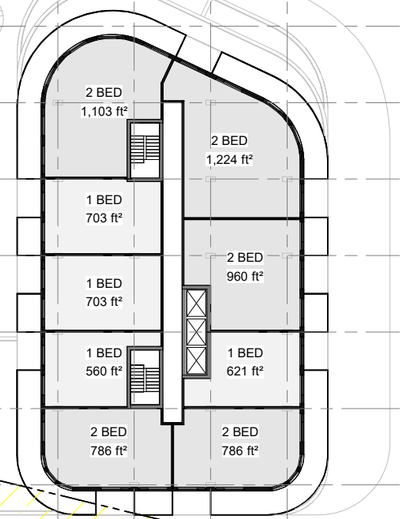

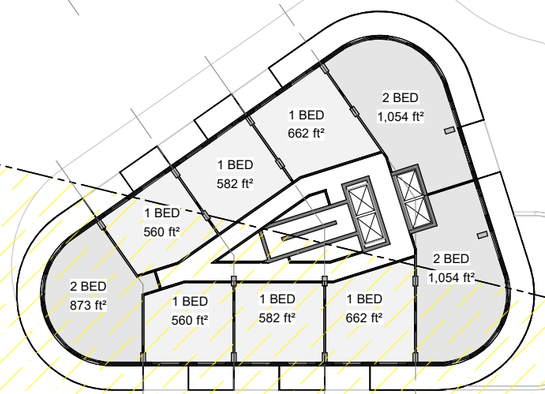

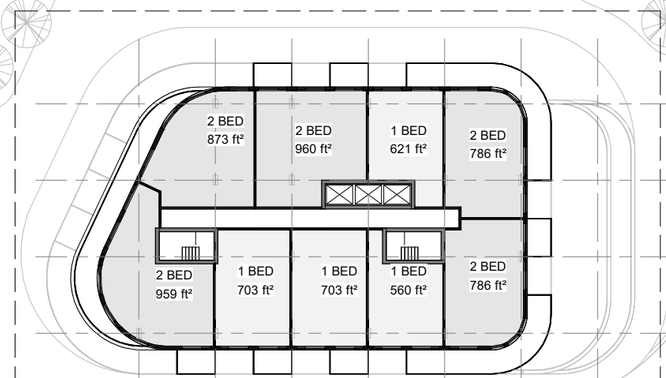

TYPICAL PENTHOUSE PLAN

BUILDING C - L27
BUILDING D - L23

JEANNE-D'ARC BLVD NORTH

rla/architecture

PENTHOUSE PLAN - C/D - L23/L27

SCALE: 1 : 500

DATE: 25/11/2021

OTTAWA 1009 TRIM ROAD ONTARIO

K4A 3P4

SHEET # D108

PROJ. No. 2017

PLOT DATE: 2021-11-25 12:02:28 PM

PLOT SCALE: 1:1

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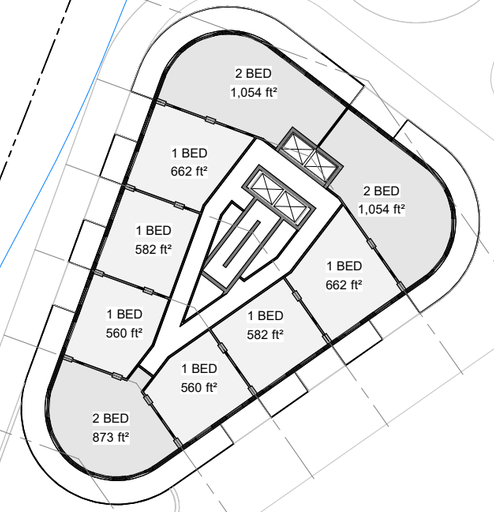
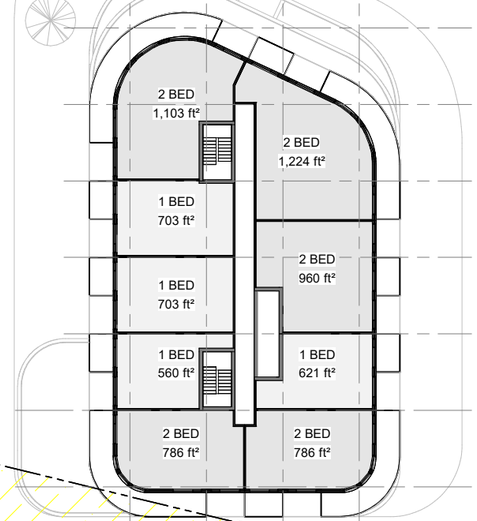
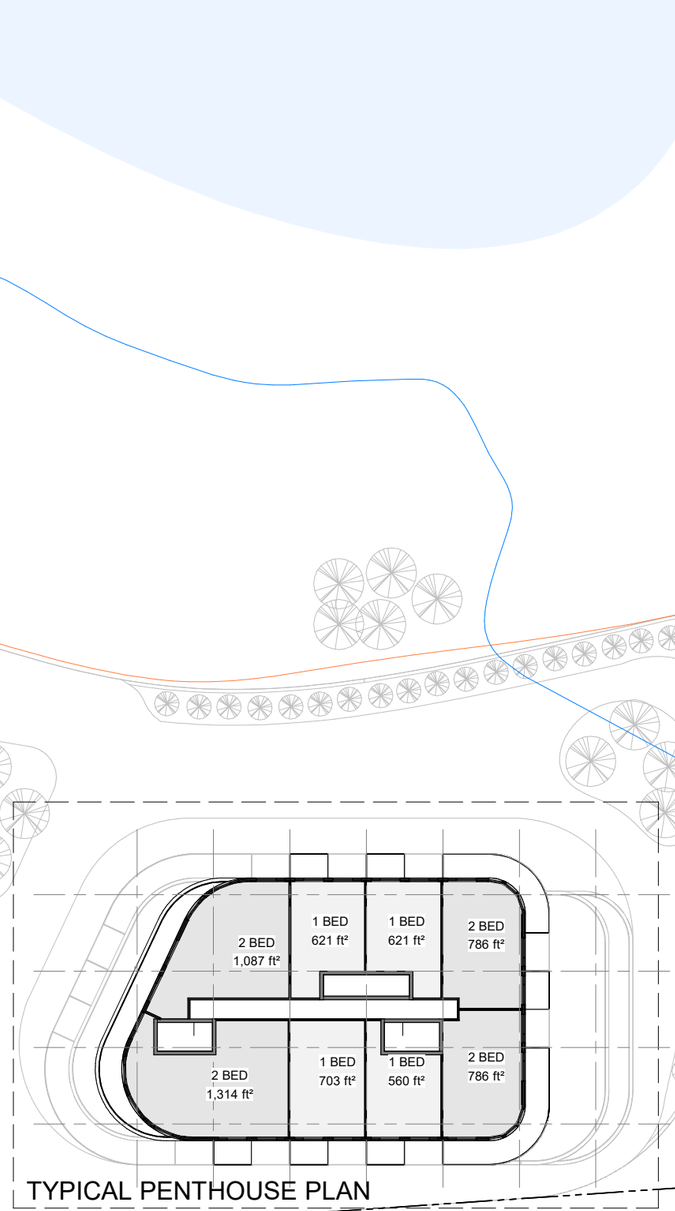
TWEDDLE ROAD







TYPICAL PENTHOUSE PLAN

BUILDING C --L28
BUILDING D - L24

JEANNE-D'ARC BLVD NORTH

rla/architecture

PENTHOUSE PLAN - C/D - L24/L28

SCALE: 1 : 500

DATE: 25/11/2021

OTTAWA — 1009 TRIM ROAD — ONTARIO

K4A 3P4

SHEET # D109

PROJ. No. 2017

PLOT DATE: 2021-11-25 12:02:43 PM

PLOT SCALE: 1:1

PAPER SIZE: ANSI B Tabloid 11" x 17" (279.40 x 431.80mm)

rla/architecture

NORTH ELEVATION

SCALE: 1 : 500

DATE: 25/11/2021

1009 TRIM ROAD

OTTAWA ONTARIO

K4A 3P4

SHEET # D300

PROJ. No. 2017

rla/architecture

SOUTH ELEVATION

SCALE: 1 : 500

DATE: 25/11/2021

1009 TRIM ROAD

OTTAWA ONTARIO

K4A 3P4

SHEET #

D301

PROJ. No. 2017

PLOT DATE: 2021-11-25 12:04:06 PM

PLOT SCALE: 1:1

PAPER SIZE: ANSI B Tabloid 11" x 17" (279.40 x 431.80mm)

rla/architecture

EAST ELEVATION

SCALE: 1 : 500

DATE: 25/11/2021

1009 TRIM ROAD

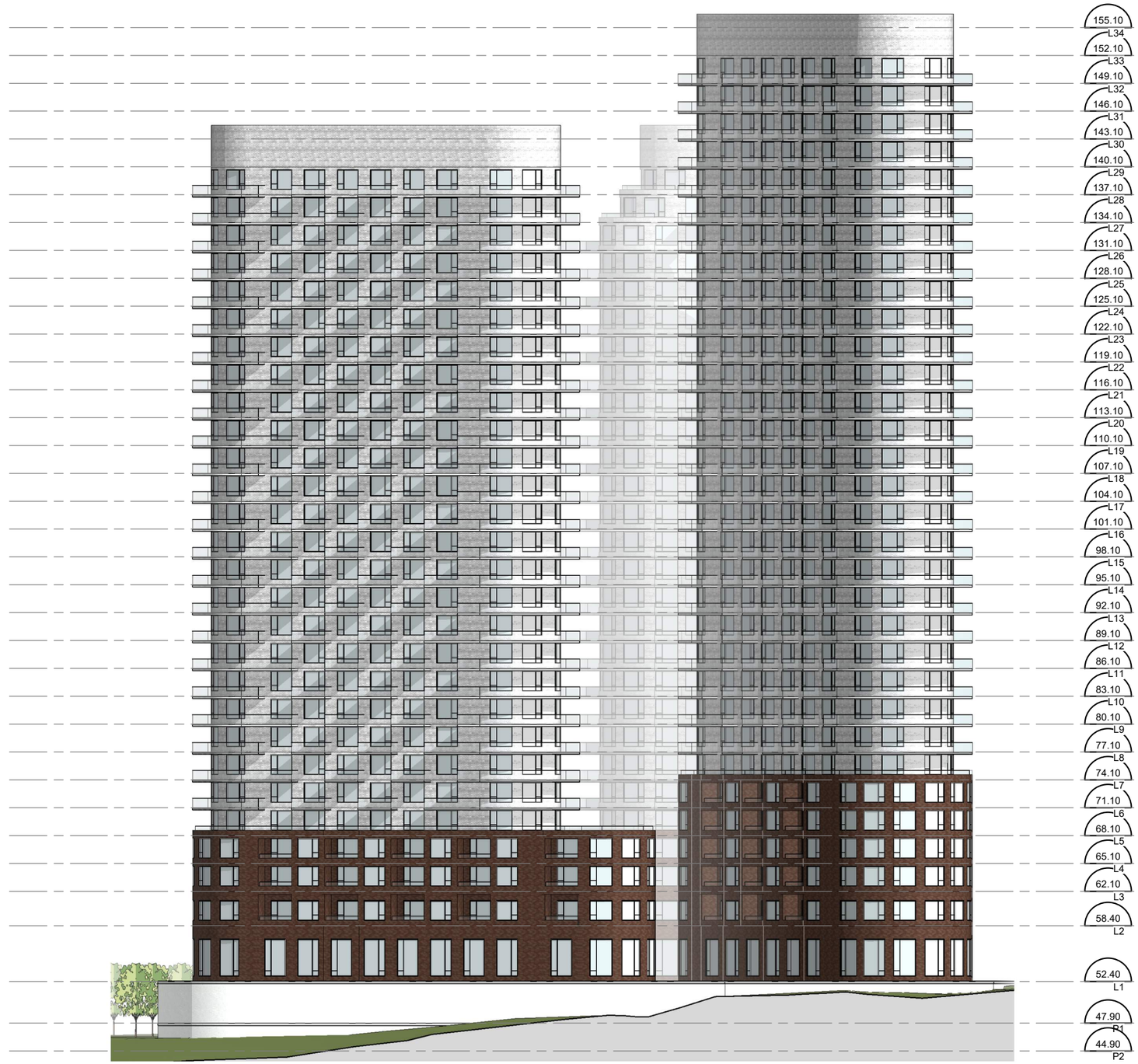
OTTAWA ONTARIO

K4A 3P4

SHEET #

D302

PROJ. No. 2017



rla/architecture

WEST ELEVATION

SCALE: 1 : 500

DATE: 25/11/2021

OTTAWA — ONTARIO

1009 TRIM ROAD

K4A 3P4

SHEET # D303

PROJ. No. 2017

PLOT DATE: 2021-11-25 12:04:56 PM

PLOT SCALE: 1:1

PAPER SIZE: ANSI B Tabloid 11" x 17" (279.40 x 431.80mm)

rla/architecture

PERSPECTIVE

SCALE:

DATE: 25/11/2021

1009 TRIM ROAD

OTTAWA ONTARIO

K4A 3P4

SHEET #

D304

PROJ. No. 2017

PLOT DATE: 2021-11-25 12:11:49 PM

PLOT SCALE: 1:1

PAPER SIZE: ANSI B Tabloid 11" x 17" (279.40 x 431.80mm)

rla/architecture

PERSPECTIVE VIEW

SCALE:

DATE: 25/11/2021

1009 TRIM ROAD

OTTAWA ONTARIO

K4A 3P4

SHEET #

D400

PROJ. No. 2017

PLOT DATE: 2021-11-25 12:12:16 PM

PLOT SCALE: 1:1

PAPER SIZE: ANSI B Tabloid 11" x 17" (279.40 x 431.80mm)

rla/architecture

PERSPECTIVE VIEW

SCALE:

DATE: 25/11/2021

1009 TRIM ROAD

OTTAWA ONTARIO

K4A 3P4

SHEET #

D401

PROJ. No. 2017

PLOT DATE: 2021-11-25 12:19:19 PM

PLOT SCALE: 1:1

PAPER SIZE: ANSI B Tabloid 11" x 17" (279.40 x 431.80mm)