STORMWATER MANAGEMENT AND SERVICEABILITY REPORT

Revision 01

77 METCALFE STREET
OTTAWA

CITY OF OTTAWA, ONTARIO

LICENSED PROFESSIONAL ENGINEER
B. BRAY
100568973
PROVINCE OF ONTARIO

ÉQUIPE LAURENCE INC.
File: 60.11.01
September 2025

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PROJECT: 77 METCALFE STREET – City of Ottawa
Stormwater Management and Serviceability Report

FILE: 60.11.01

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ISSUE (REVISION): September 11th, 2025,

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APPENDICES

1.0 INTRODUCTION

This project consists of the residential development located at 77 Metcalfe Street in the city of Ottawa. Équipe Laurence Inc. was mandated to carry out the design of the drinking water, storm and sanitary sewer systems that serve the proposed building as well as the stormwater management report. The preliminary civil engineering plans depicting the general features of the site, such as the sewer structures and landscaping is attached to this report in Appendix A.

In this report, the design and calculations of the sanitary sewer, domestic water and stormwater management systems will be discussed. The design was completed in accordance with the following design guidelines and regulations:

- Ottawa Sewer Design Guidelines (October 2012)
- *Pre-Consultation Preliminary Assessment* written by Ann O'Connor, Development Review- Central. File No. PC2024-0315
- Ottawa Design Guidelines – Water Distribution (July 2010)
- Ottawa Technical Bulletin ISTB-2018-02 (March 2018)
- Water Supply for Public Fire Protection, *Fire Underwriters Survey* (2020)

2.0 STORMWATER MANAGEMENT

As part of the stormwater management system, the flow of water will be controlled on-site and discharged through a 300 mm diameter service connection. This pipe will be connected to the existing 900 mm diameter storm sewer below Metcalfe Street as shown on the attached plans.

According to a complementary land survey completed by *Annis, O'Sullivan, Vollebekk Ltd.* on August 7th, 2024, attached in Appendix B, the subject site is primarily occupied by an existing 12 storey office building and a ramp to an underground parking garage.

For the design of the stormwater management system, the calculations were done to ensure that the post-development flows are equivalent to or lesser than the pre-development overland flow. Hence, the stormwater flows for the developed site as well as the storage requirements will be explored in the following sections.

2.1 Calculation of Pre-development Flows

The pre-development overland flow was determined using the criteria outlined in the *Ottawa Sewer Design Guidelines (2012)* as well as the following site information:

- The proposed site area of 0.12 hectare.
- The Rational Method for the calculation of flow as indicated in Section 5.4.4.1 of the design guideline.
- The IDF curves and equations as indicated in Section 5.4.2 of the design guideline.
- The runoff coefficients as shown in Table 5.7 of the design guideline.

The time concentration used for the calculations of the 2-yr storm event of the pre-developed site flow is 10 minutes. The runoff coefficient was determined to be 0.5. These specifications were calculated as described in the *Ottawa Design Guidelines*.

Using these values, the pre-development overland flow is 13 L/s for the 2-yr storm events. The detailed calculations are attached in Appendix C.

2.2 Design Criteria for Post-Development Flows

According to the *Pre-Consultation Preliminary Assessment*, the allowable release rate to the minor system for the proposed site will be equivalent to the pre-development flow of the 2-year storm event. As mentioned in the previous section, the pre-development flow for the 2-year storm is 13 L/s. Moreover, it is mentioned that flows in excess of the 2-yr storm allowable release rate, up to and including the 100-yr storm event, must be detained on site. Hence, these storm events must be considered for the post-development flow calculations.

In addition, to account for the effects of climate change, a 20% increase will be added to the rainfall intensities of the 100-yr storm event, as per the *Ottawa Sewer Design Guideline*.

2.3 Post-Development: Uncontrolled Flows

For the proposed stormwater management system, there is an uncontrolled flow on the side of the building – i.e. on the surfaces parallel to the Albert Street and Metcalfe Street. The total uncontrolled surface is of 62 m², and the calculated time of concentration is of 10 minutes. The runoff coefficient used for the post-development flow calculations of the 100-year storm event for concrete and roof areas is 1.00. The 100-year runoff coefficient is determined by increasing the minor system coefficient by 25%, as per the *Ottawa Sewer Design Guideline*. Therefore, the uncontrolled flows for the 100-year storm events are 3.7 L/s, from the concrete sidewalks area. The detailed calculations are described in the Appendix C.

The uncontrolled flow will be subtracted to the pre-development flowrate for 2-year event to determine the allowable flowrate for the design recurrence.

2.4 Post-Development: Controlled Flows and Storage Requirements

The controlled flow for the developed site as well as the required storage were calculated using the Rational Method. The outflow to the storm sewers will be the subtraction of the 100-year uncontrolled flow to the 2-year pre-development flow, resulting in a maximum allowable flowrate of 9.3 L/s for the whole site.

According to the pre-consultation memo, the city of Ottawa requires an average release rate equal to 50% of the peak allowable rate to estimate the necessary storage volume. Therefore, a flowrate of 4.65 L/s, which is the total allowable release rate divided by two, is used to calculate the required on-site storage volume.

As a result, the project will have a maximum flowrate of 9.3 L/s and a total retention requirement of 69.4 m^3. This is the maximum requirement including the 20% increase for the climate change as required by the city and using the average release rate and a 10% increase to the volume as a safety factor. The detailed calculations are found in Appendix C.

A maximum flowrate of 9.3 L/s will be controlled by an ICD at the exit of the underground concrete retention basin, for water coming from stormwater stemming from the roof drains. Thus, the required storage will be retained partly on the roof as well as in an underground concrete tank as shown on the C-204 drawings (Appendix A). Furthermore, an overflow pipe will be incorporated into the retention tank with an invert at the water retention elevation, directing excess water into the city sewer. The proposed stormwater storage distribution is shown in Table 1.

Table 1: Proposed Stormwater Storage – 77 Metcalfe Street

Parameters	Values	Units
100-year required storage of the project[1,2]	69.4	m^3
Volume retained in underground concrete tank	63.3	m^3
Volume retained on the roof (to be validated by mechanical ing)	23.3	m^3
Total storage volume available	86.6	m^3

1 - A 10% increase was included in the volume requirement as an extra safety measure
2 - A 20% increase to rainfall was included for the climate change effects

The following item related to rooftop drainage will need to be completed by the mechanical and structural engineer responsible for the design:

- Design of the underground concrete tank
- Flow Control Roof Drainage Declaration

The roof drains used are the *AJUSTABLE FLOW CONTROL* DRAIN, see Appendix C. The assumptions are that the drains will have a 12.7mm opening which will allow a total flowrate of 1.9 L/s in each drain.

The ICD proposed is a vortex flow regulator model 75 VHV-1 by the company John Meunier. The water head is 2.1m, see Appendix C. The ICD will have an overflow, see plans for more details.

2.5 Erosion and Sediment Control

Prior to, during and after construction, the following erosion and sediment control measures should be implemented to avoid the sediment transfer to existing streams and storm sewer systems.

Pre-Construction

- Installation of a silt fence (geotextile)
- Installation of inserts inside all existing manholes adjacent to construction zone
- Control measures to be inspected once installed
- Installation of a mud mat at the site access point

Construction

- Minimize the extent of disturbed areas
- Protect disturbed areas of runoff
- Provide cover if disturbed areas will not be reinstated within a reasonable period.
- Inspect silt fence regularly during construction. Clean and repair, as required.
- Control dust during construction

After Construction

- Provide permanent cover to disturbed areas (i.e. topsoil and seed)
- Remove all temporary erosion and sediment control items (silt fence and filter cloths) once disturbed areas have been reinstated

Inspections

- Erosion and sediment control measures will be inspected upon completion
- Control measures are to be inspected weekly

All control measures are to be inspected once installed as well as during construction.

3.0 SANITARY SEWER DESIGN FLOWS

The proposed sanitary sewer service connection for the new building is 250 mm in diameter and made of PVC. The pipe will be connected on the existing 375 mm diameter municipal sewer pipe under Albert Street.

The proposed sanitary system is designed in accordance with the City of Ottawa's Sewer Design Guidelines. The calculations for the proposed development flows are shown in the following sections.

3.1 Population Density

The population density of the proposed development is calculated using the number and type of housing units within this development. The detailed calculations are shown in Table 2 below and in the Appendix D.

Table 2: Population Density Calculation

Unit Types	Number of Units	Persons Per Unit	Population Density
Studio	66	1.4	92
1-bedroom	109	1.4	153
2-bedroom	45	2.1	95
3-bedroom	21	3.1	65
		Total	405

Using the values in Table 4.2 of the Sewer Design Guidelines for per unit populations, the population density of the proposed development is found to be 405 persons. This value will be used in the following sections to determine the sewer design flows.

3.2 Average Wastewater Flows and Peaking Factors

The average wastewater flow coefficient for residential developments is 280 L/c/d according to the Sewer Design Guidelines. The new building will also include 469 m^2 of commercial areas, therefore the average wastewater flow coefficient for commercial use is 28,000 L/gross ha/d. Using this information, the total average wastewater flow for the proposed development is calculated below.

Average wastewater flow per capita for residential use:	280	L/c/d
Average wastewater flow for residential use:	113 288	L/d
Average wastewater flow for commercial use:	28,000	L/gross ha/d
Commercial areas: 469 m^2	1 313	L/d

The Harmon equation is then used to calculate the residential peak factor. Moreover, a peak factor of 1.50 is used for commercial areas.

$$P.F. = 1 + \left(\frac{14}{4 + \left(\frac{P}{1000}\right)^{1/2}} \right) \times K, \qquad where\ K = 1$$

Hence, the peak factor for residential use is of 4.02.

3.3 Extraneous Flows

In accordance with Article 4.4.1.4 of the Sewer Design Guidelines, an allowance for flows from extraneous sources must be considered in the calculation of the peak design flow.

The average infiltration allowance is of 0.28 L/s/gross ha for wet-weather inflow into the manholes and pipes. Therefore, with a total site area of 0.12 ha, the infiltration flow is 0.03 L/s.

3.4 Total Sanitary Sewer Design Flow

Combining the results from the above calculations, the total sanitary sewer design flow is calculated as follows:

$$Q_{design} = [(4.02 \times 113\,288\ L/d) + (1.50 \times 1\,313 L/d)] \times \frac{1}{86\,400\ sec/d} + 0.03\ L/s$$

$$Q_{design} = 5.33\ L/s$$

The summary of this calculation is shown in Appendix D.

4.0 DOMESTIC WATER DEMAND

The proposed water service connection for the new building will consist of two separate branch connections, both on Albert Street. Each connection will be 200 mm in diameter and made of PVC. Both connections will be connected to the existing 203 mm diameter municipal watermain on Albert Street. Two shutoff valves will be installed at the property line for each connection as per the City guidelines. Additionally, both connections will be looped at the service entry inside the building, and an isolation valve will be placed between the two water service connections. Isolation valves allow the shutdown of specific sections of the water pipeline during repairs, maintenance or emergencies, without disturbing the entire water flow system.

The proposed water system is designed in accordance with the City of Ottawa's Design Guidelines for water distribution. The calculations for the proposed water demand are shown in the following sections.

We can determine the average day demand for the proposed development using the values found in Table 4.2 of the Design Guidelines as the population density of the development was determined to be 405 people in Section 3.1. Hence, average day demands of 280 L/c/d and 28,000 L/gross ha/d are used for the residential and commercial spaces, respectively.

Average day demand per capita for residential use:			280	L/c/d
Average day demand for residential use:			113 288	L/d
Average day demand for other commercial use:			28,000	L/gross ha/d
Commercial Area:	469	m²	1 313	L/d

Therefore, the total average day demand is:

$$Q_{avg,day} = \left(113\ 288\frac{L}{d} + 1\ 313\ L/d\right) \times \frac{1}{86{,}400} sec/d = 1.33\ L/s$$

The maximum daily demand and the maximum hour demand are calculated using the factors found in Table 4.2 of the Design Guidelines.

$$Q_{max,day} = \left(2.5 \times 113\ 288\frac{L}{d} + 1.5 \times 1\ 313\ \ L/d\right) \times \frac{1}{86{,}400} sec/d = 3.30\ L/s$$

$$Q_{max,hr} = \left(2.2 \times 2.5 \times 113\ 288\frac{L}{d} + 1.8 \times 1.5 \times 1\ 313\ L/d\right) \times \frac{1}{86{,}400} sec/d$$

$$Q_{max,hr} = 7.25\ L/s$$

The detailed calculations for domestic water demand are found in Appendix E.

4.1 Boundary Conditions

This section presents the existing boundary conditions for the water distribution system for the connection sites. Note, this information is based on current operation of the city's water distribution system.

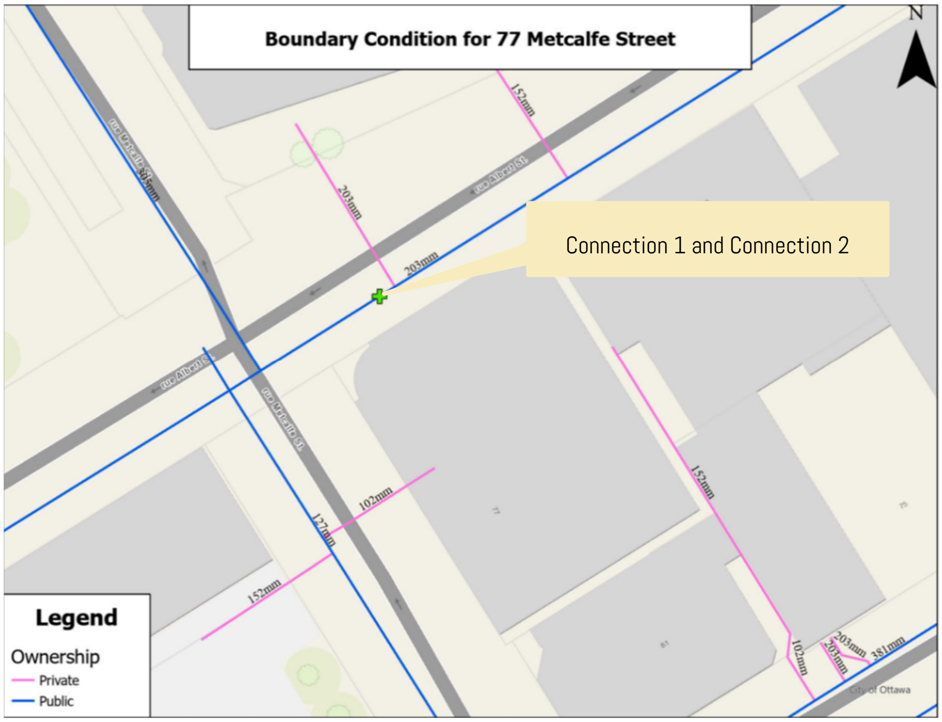


Figure 1: Service connection locations for the water distribution system (City of Ottawa)

Table 5: Connection on Albert Street (City of Ottawa)

Demand Scenario	Head (m)
Maximum HGL	115.1
Minimum HGL	107.0
Max Day + Fire Demand (116.7 L/s)	107.1

The pressure at the service points on Albert Street has been calculated, with detailed calculations provided in Appendix E of this report.

It must be noted that the static pressure at any fixture shall not exceed 552 kPa (80 psi) according to the Ontario Building Code for areas that may be occupied. Hence, the following pressure control measures shall be considered:

1. If possible, the systems are to be designed to residual pressures 345 to 552 kPa (50 to 80 psi) for all occupied areas outside of the public right-of-way without special pressure control equipment.
2. Pressure reducing valves are to be installed immediately downstream of the isolation valve in the building, located downstream of the meter so that it is maintained by the owner.

These pressure control measures are presented in order of preference.

5.0 REQUIRED FIRE DEMAND

The flow rates required for fire protection vary according to the zoning, the type of units, the fire resistivity of the construction materials, the ground floor area as well as many other factors. The method described in *Water Supply for Public Fire Protection*, written by the Fire Underwriters Survey (FUS) (2020) is used to estimate the fire demand required for fire protection, as per the City Guidelines.

Essentially, the required flow rate (F), expressed in liters per minute, is calculated based on the floor area of the building (A) in square meters and the type of construction (C), using the following equation.

$$F = 220 \times C\sqrt{A}$$

The value of C used is 0.8 for a non-combustible construction. According to the FUS, a non-combustible construction is “any structure having all structural members including walls, columns, piers, beams, girders, trusses, floors and roofs made of non-combustible material and not qualifying as fire-resistive construction.” In this case, the building will be full non-combustible construction both for the construction type and exterior cladding.

The value of A represents the gross floor area of the building, that is, the sum of the surface area of all floors. See in the table below that surface area of each floor. The effective area is to be calculated as per the 2020 regulations for the Water Supply for Public Fire Protection in Canada, the total effective area is to be calculated as the largest floor with the addition of 25% of the next 2 adjacent floors.

Table 6: Gross Floor Area for the Proposed Development

Floor	Surface Area Per Floor (m²)	Number of Floors	Floor Area (m²)
Ground Floor	1 019	1	1 019
Level 2	882	1	882
Levels 3-10	954	8	7 632
Levels 11-15	779	5	3 895
Levels 16-23	716	8	5 728
		Total	19 156

Finally, according to the FUS method, certain reductions and increases may be applied depending on a variety of factors such as the combustibility of the occupying materials or furniture, the presence of automatic sprinklers systems as well as the development's distance from neighbouring buildings. For example, for buildings protected by automatic sprinklers designed in accordance with the NPFA 13, the flow rate required for fire protection, F, can be reduced by 50%.

Using this method, the total fire demand was determined to be 7 000 L/min. Moreover, for a duration of water supply of 2 hours, the required volume of water is 840 m³. The details of the fire flow calculations are shown in the Appendix F.

6.0 REFERENCES

W.R. Newell, P. Eng., Sewer Design Guidelines, Second Edition (2012), City of Ottawa.

W.R. Newell, P. Eng., Ottawa Design Guidelines – Water distribution, First Edition (2010), City of Ottawa.

Fire Underwriters Survey, Water Supply for Public Fire Protection – A guide to recommended practice in Canada (2020).

APPENDIX A

Civil Engineering Plans

APPENDIX B

Land Survey by Annis, O'Sullivan, Vollebekk Ltd. on August 7th, 2024

ELEVATION NOTES

1. Elevations shown are geodetic and are referred to the CGVD28 geodetic datum, derived from HCM No. 2011-0073 having an elevation of 71.653 metres.
2. It is the responsibility of the user of this information to verify that the job benchmark has not been altered or disturbed and that it's relative elevation and description agrees with the information shown on this drawing.

Bearings are grid, derived from Southerly limit of Albert Street having a bearing of N58°01'25"E as shown on Plan 4R-34312 and are referred to the Central Meridian of MTM Zone 9 (76°30' West Longitude) NAD-83 (original).
For bearing comparisons, a rotation of 0°33'45" counter-clockwise was applied to bearings on P2.

ANNIS, O'SULLIVAN, VOLLEBEKK LTD. grants to GROUPE MACH ("The Client"), their solicitors, mortgagees, and other related parties, permission to use original, signed, sealed copies of the Surveyor's Real Property Report in transactions involving The Client.

PART 2
THIS PLAN MUST BE READ IN CONJUNCTION WITH SURVEY REPORT DATED: August 6, 2024

Notes & Legend

	Denotes	
—□—	"	Survey Monument Planted
—■—	"	Survey Monument Found
SIB	"	Standard Iron Bar
SSIB	"	Short Standard Iron Bar
IB	"	Iron Bar
CC	"	Cut Cross
CP	"	Concrete Pin
(WIT)	"	Witness
Meas.	"	Measured
(AOG)	"	Annis, O'Sullivan, Vollebekk Ltd.
(PI)	"	(AOG) Plan Dated April 25, 2024
(P2)	"	(AOG) Plan Dated August 26, 1996
Deed	"	Inst. N515612
MH-ST	"	Maintenance Hole (Storm Sewer)
MH-S	"	Maintenance Hole (Sanitary)
MH-B	"	Maintenance Hole (Bell)
MH-T	"	Maintenance Hole (Traffic)
MH-H	"	Maintenance Hole (Hydro)
MH	"	Maintenance Hole (Unidentified)
VC	"	Valve Chamber (Watermain)
FH	"	Fire Hydrant
WV	"	Water Valve
HH	"	Handhole
LS	"	Light Standard
CB	"	Catch Basin
S	"	Sign
MF	"	Metal Fence
+ 65.00	"	Location of Elevations
+ 65.00	"	Top of Concrete Curb / Wall Elevation
Fdn.	"	Foundation
AC	"	Air Conditioner
CRW	"	Concrete Retaining Wall
RW	"	Retaining Wall

SURVEYOR'S REAL PROPERTY REPORT

PART 1 Plan of LOT 52 AND PART OF LOT 53 (SOUTH ALBERT STREET) AND PART OF LOTS 52 AND 53 (NORTH SLATER STREET) REGISTERED PLAN 3922 CITY OF OTTAWA

Surveyed by Annis, O'Sullivan, Vollebekk Ltd.

Sheet 1 of 3

Scale 1 : 100

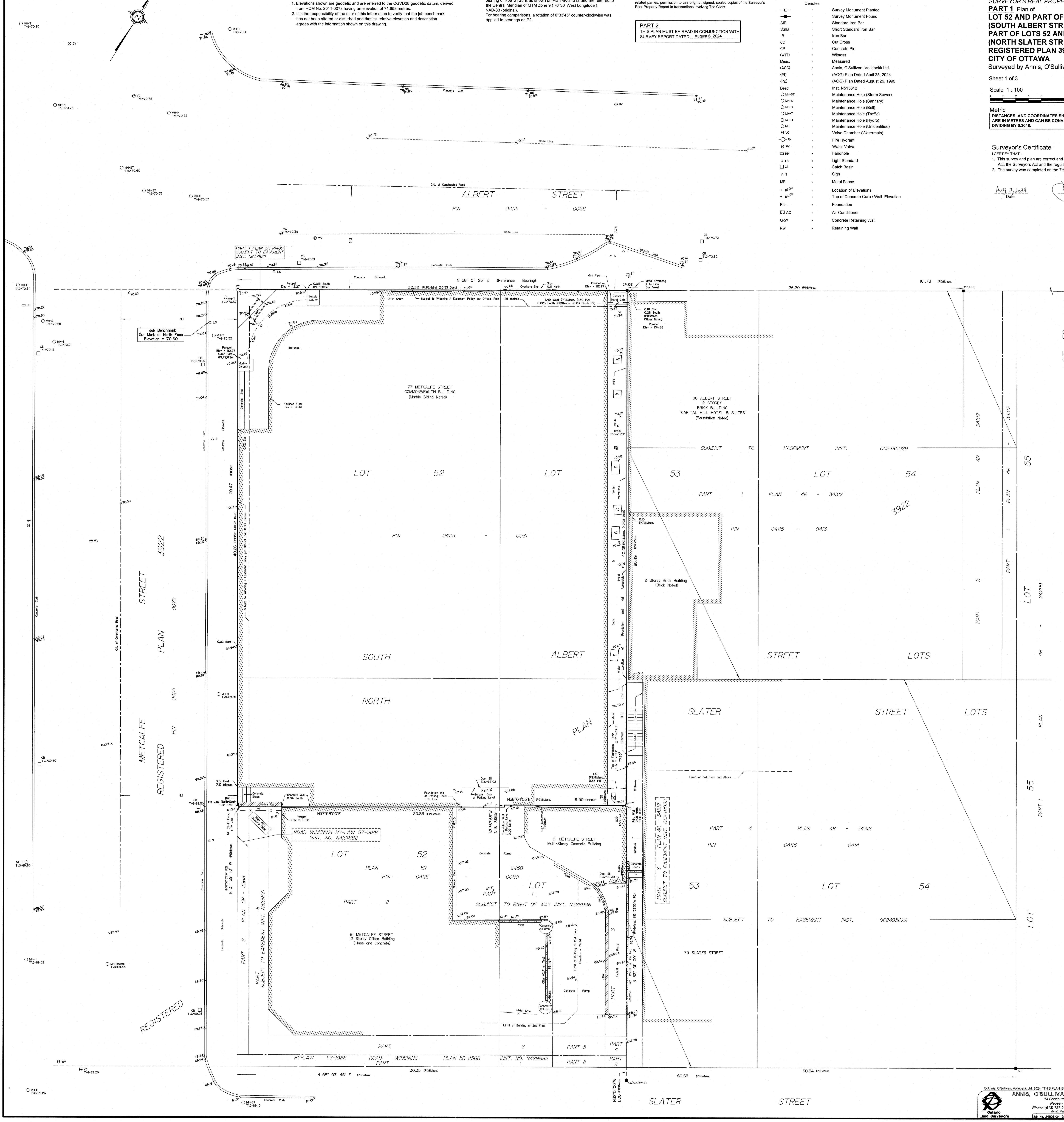
Metric
DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

Surveyor's Certificate

I CERTIFY THAT :
1. This survey and plan are correct and in accordance with the Surveys Act, the Surveyors Act and the regulations made under them.
2. The survey was completed on the 7th day of August, 2024.

Aug 7, 2024
Date

Jamie Leslie
Ontario Land Surveyor



ASSOCIATION OF ONTARIO LAND SURVEYORS
PLAN SUBMISSION FORM
V-84270
THIS PLAN IS NOT VALID UNLESS IT IS AN EMBOSSED ORIGINAL COPY ISSUED BY THE SURVEYOR In accordance with Regulation 1026, Section 29 (3).

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Job No. 24806-24 Groupe Mach Lts 52 & 53 PL3922 D-E F2 | FS

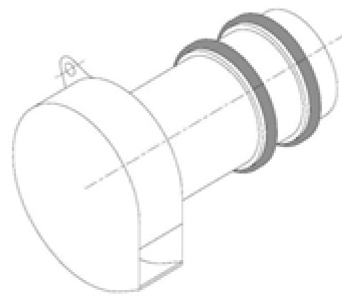
APPENDIX C

Stormwater Flows and Storage Requirements

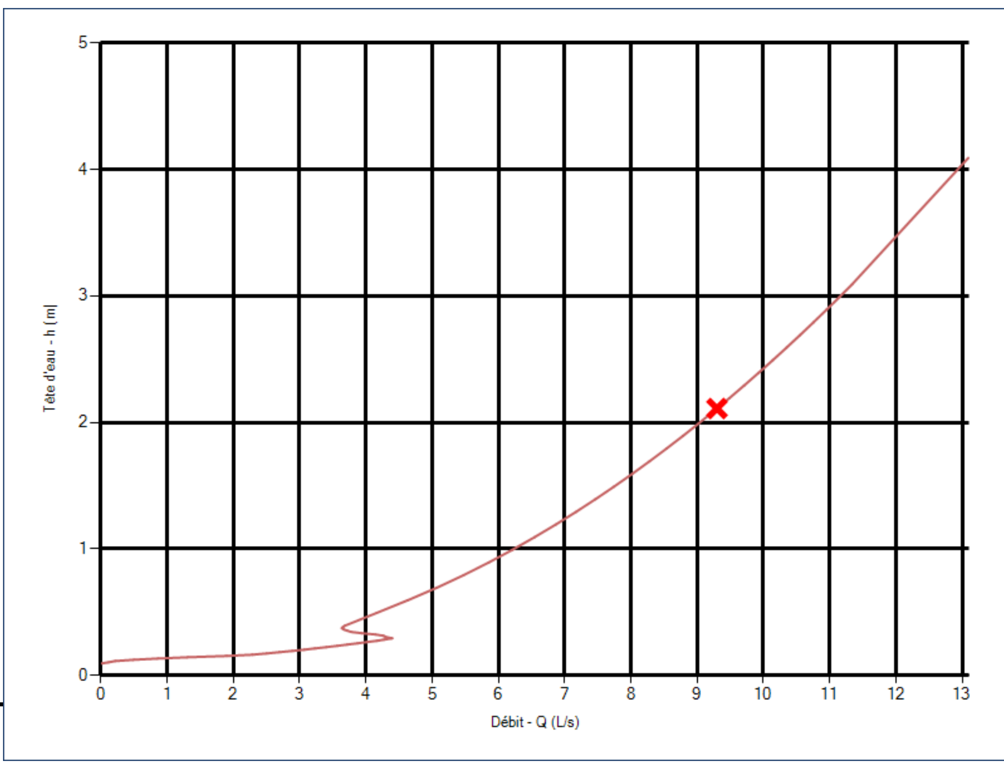
Detailed calculations

INFORMATION GÉNÉRALE

Application	Eau Pluviale	
Nom du projet	601101	
Numéro de projet		
Commentaire		
Identification	Bassin	
Débit de conception (Q)	9.3	L/s
Charge d'eau de conception (h)	2.11	m
Diamètre de la conduite de sortie (C)	300	mm
Type de conduite	PVC	
Modèle	75 VHV-1,12,OF	
Item #	PRIPHY200275	
Quantité	1	
Dégagement minimum (H)	150	mm
Diamètre minimum du regard (B)	900	mm

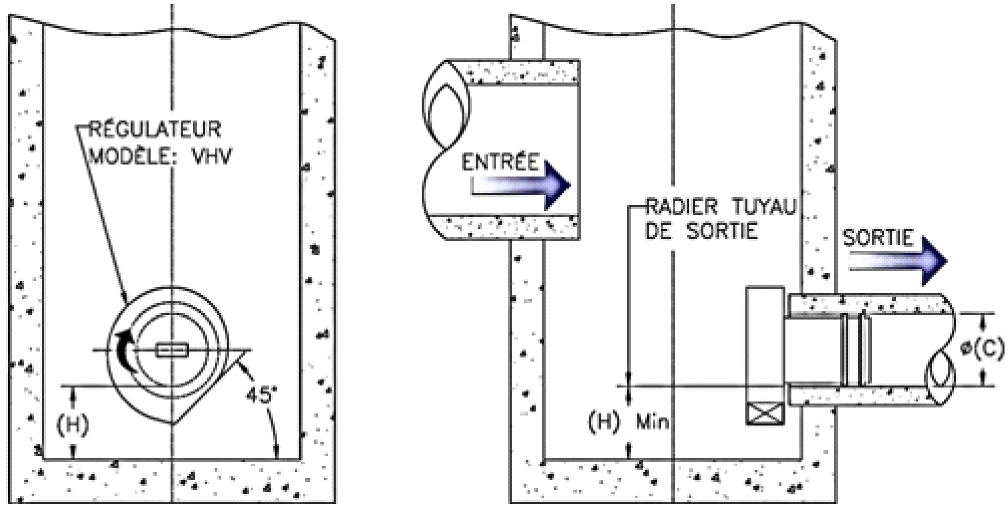


COURBE DE DÉBIT



Q (L/s)	h (m)
0.000	0.092
1.308	0.142
2.889	0.192
3.717	0.242
4.397	0.292
3.777	0.342
3.687	0.392
5.856	0.892
7.465	1.392
8.784	1.892
9.929	2.392
10.956	2.892
16.037	6.092
20.704	10.092

INSTALLATION TYPIQUE



SPÉCIFICATIONS

Le régulateur de débit sera du type statique utilisant le principe du vortex et n'aura aucune partie mobile. Le débit sera régularisé sur toute la charge en utilisant uniquement les propriétés hydrauliques de l'unité. Le régulateur sera auto activé et ne nécessitera pas d'instrumentation ou alimentation externe.

Chaque régulateur de débit est constitué d’un corps à l’intérieur duquel s’effectue le contrôle de débit. Un manchon est soudé au corps pour permettre son insertion convenable à l’intérieur du tuyau de sortie du regard. Deux joints toriques en caoutchouc assurent l’étanchéité et le maintien du manchon dans le tuyau. Deux barres soudées au manchon empêchent les joints toriques de se déplacer durant l’installation et le fonctionnement.

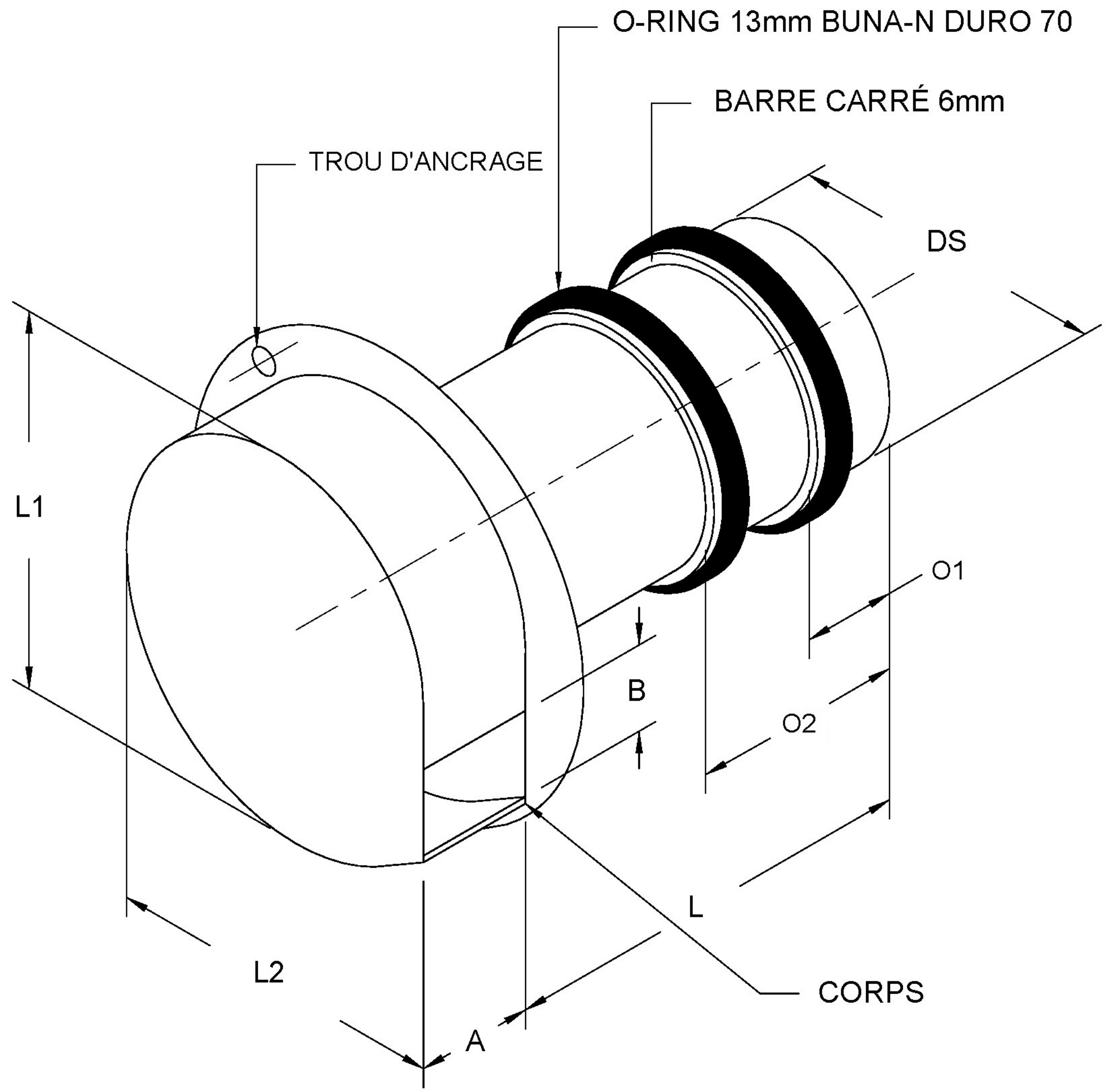
Le régulateur sera construit entièrement à partir d’acier inoxydable 304 avec soudures continues, tel que fabriqué par Veolia Water Technologies Canada Inc. (John Meunier), 514-334-7230, cso@veolia.com.

VEOLIA

HYDROVEX®

Nom du projet:	601101
Numéro de projet:	
Identification:	Bassin
Débit (Q):	9.3 L/s
Charge d'eau (h):	2.11 m
Modèle:	75 VHV-1,12,OF
# item:	PRIPHY200275
Quantité:	1

Dimensions (mm)	
A	75
B	62
L1	272
L2	246
L	200
DS	275
O1	38
O2	100
Ø ÉVENT	N/A



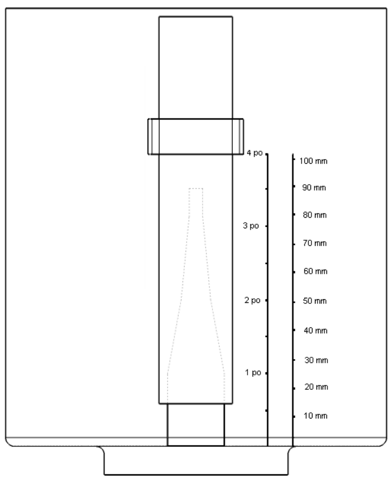
Toutes les dimensions sont en milimètres à moins avis du contraire

2025-07-09

DONNÉES TECHNIQUES

CYLINDRE DE CONTRÔLE DE DÉBIT AJUSTABLE

DESCRIPTION



Le cylindre de contrôle de débit ajustable pour drain de toit est compatible avec tous les drains de la série ULTRA DUO PROCAST de MURPHCO et est fabriqué en aluminium. La base en protégée avec un enduit de type caoutchouc

Il comporte une languette d'ajustement permettant un ajustement sur la totalité de la plage de contrôle du débit.

CARACTÉRISTIQUES

- Installation simple et facile;
- Compatible et **vendu seulement** avec la série de drain Ultra Duo procast de Murphco
- Ajustement facile, sur toute la plage de contrôle du débit.

MATÉRIAUX ET DESCRIPTION TECHNIQUE

Aluminium : Base : épaisseur : 0.064 po (1,62 mm).
Cylindre : épaisseur : 0.064 po (1,62 mm)

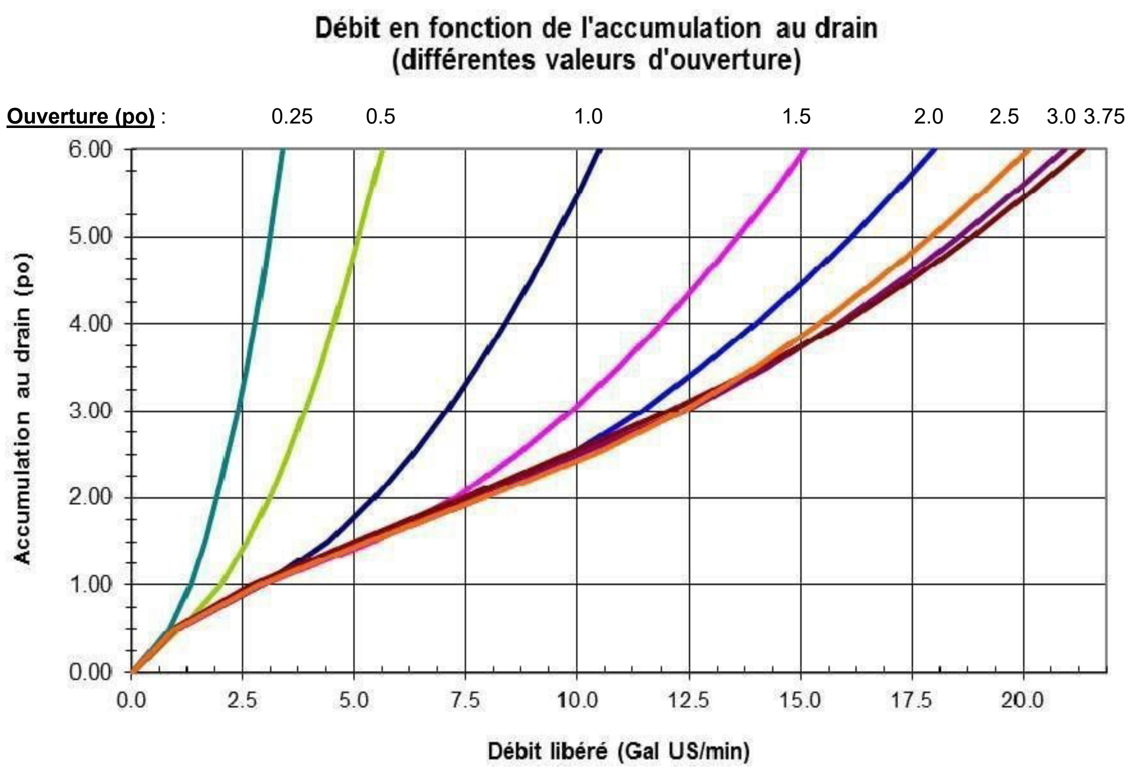
GARANTIE

- Garanti contre la corrosion.
- Garanti contre tout défaut de fabrication.

DONNÉES TECHNIQUES

Tableau 1 : Débit libéré par la cloche en fonction de l'accumulation au drain pour les différentes positions d'ouverture (système impérial)

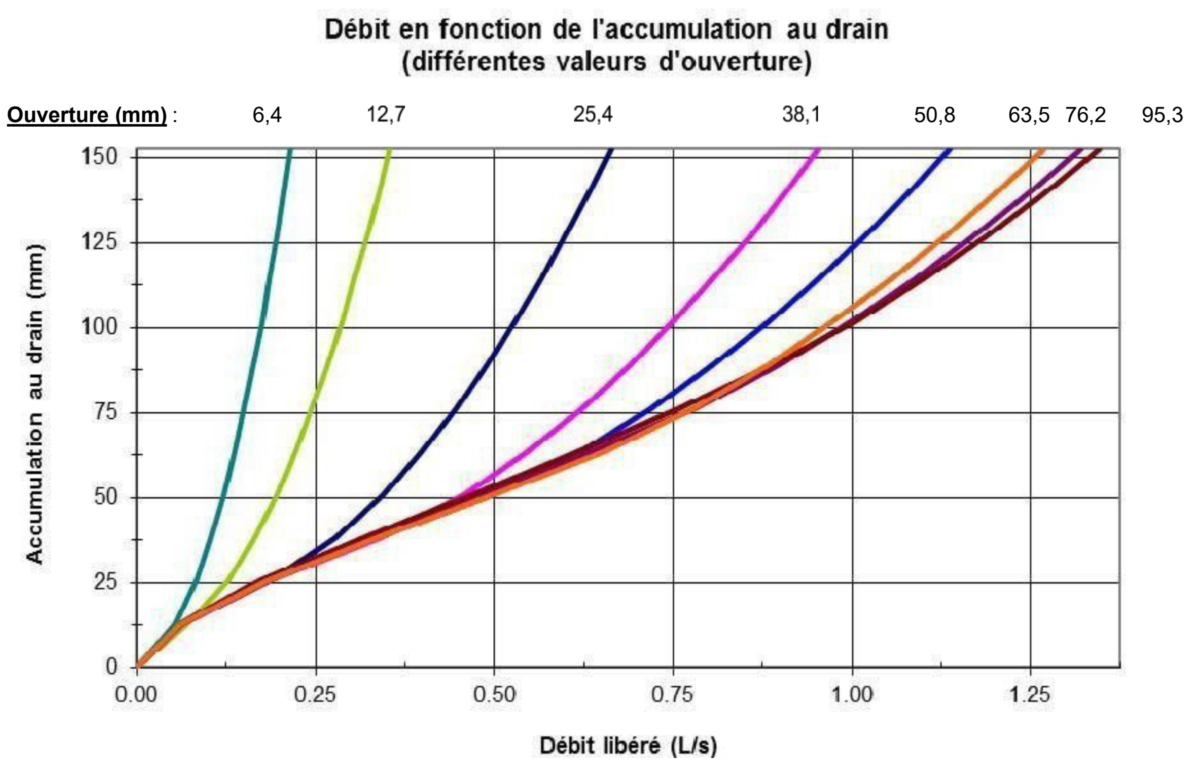
Accumulation au drain (po)	Débit en fonction de l'accumulation au drain (Gal Us/min, selon l'ouverture en po)							
	0.25	**0.50**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**3.75**
6	3.4	5.6	10.5	15.1	18.0	20.1	20.9	21.4
5.5	3.3	5.4	10.0	14.4	17.1	19.1	19.8	20.1
5	3.1	5.1	9.5	13.6	16.1	17.9	18.6	18.9
4.5	2.9	4.8	9.0	12.8	15.1	16.7	17.3	17.5
4	2.8	4.5	8.4	11.9	14.0	15.4	15.8	15.9
3.5	2.6	4.2	7.8	10.9	12.8	14.0	14.2	14.1
3	2.4	3.9	7.1	9.9	11.4	12.4	12.4	12.0
2.5	2.2	3.5	6.3	8.7	9.9	10.4	10.1	9.8
2	1.9	3.1	5.4	7.3	7.9	7.9	7.7	7.4
1.5	1.6	2.6	4.4	5.4	5.3	5.3	5.2	5.0
1	1.3	2.0	2.9	2.9	2.9	2.9	2.8	2.7
0.5	0.9	1.1	1.0	1.0	1.0	1.0	0.9	0.9
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



DONNÉES TECHNIQUES

Tableau 2 : Débit libéré par la cloche en fonction de l'accumulation au drain pour les différentes positions d'ouverture (système international)

Accumulation au drain (mm)	Débit en fonction de l'accumulation au drain (L/s, selon l'ouverture en mm)							
	6,4	12,7	25,4	38,1	50,8	63,5	76,2	95,3
152,4	0,22	0,35	0,66	0,95	1,14	1,27	1,32	1,35
139,7	0,21	0,34	0,63	0,91	1,08	1,20	1,25	1,27
127	0,20	0,32	0,60	0,86	1,02	1,13	1,17	1,19
114,3	0,19	0,30	0,57	0,81	0,95	1,06	1,09	1,10
101,6	0,17	0,29	0,53	0,75	0,88	0,97	1,00	1,00
88,9	0,16	0,27	0,49	0,69	0,81	0,88	0,90	0,89
76,2	0,15	0,24	0,45	0,62	0,72	0,78	0,78	0,76
63,5	0,14	0,22	0,40	0,55	0,62	0,65	0,64	0,62
50,8	0,12	0,20	0,34	0,46	0,50	0,50	0,48	0,47
38,1	0,10	0,16	0,28	0,34	0,34	0,34	0,33	0,32
25,4	0,08	0,13	0,19	0,18	0,18	0,18	0,18	0,17
12,7	0,05	0,07	0,06	0,06	0,06	0,06	0,06	0,06
0	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00



CONÇU ET FABRIQUÉ PAR LES PRODUITS MURPHCO LTÉE

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AVERTISSEMENT

Les renseignements et les spécifications contenus dans le présent document représentent les informations applicables au moment de la publication. Ces informations sont le résumé de plusieurs résultats exacts faits à partir d'essais véridiques, mais elles ne doivent pas être considérées comme absolues. En outre, ***Les Produits MURPHCO Ltée*** se réserve le droit de modifier, sans préavis, les renseignements et les spécifications contenus dans cette publication en raison de sa politique permanente de recherche et de développement de ses produits.

STORMWATER CALCULATIONS

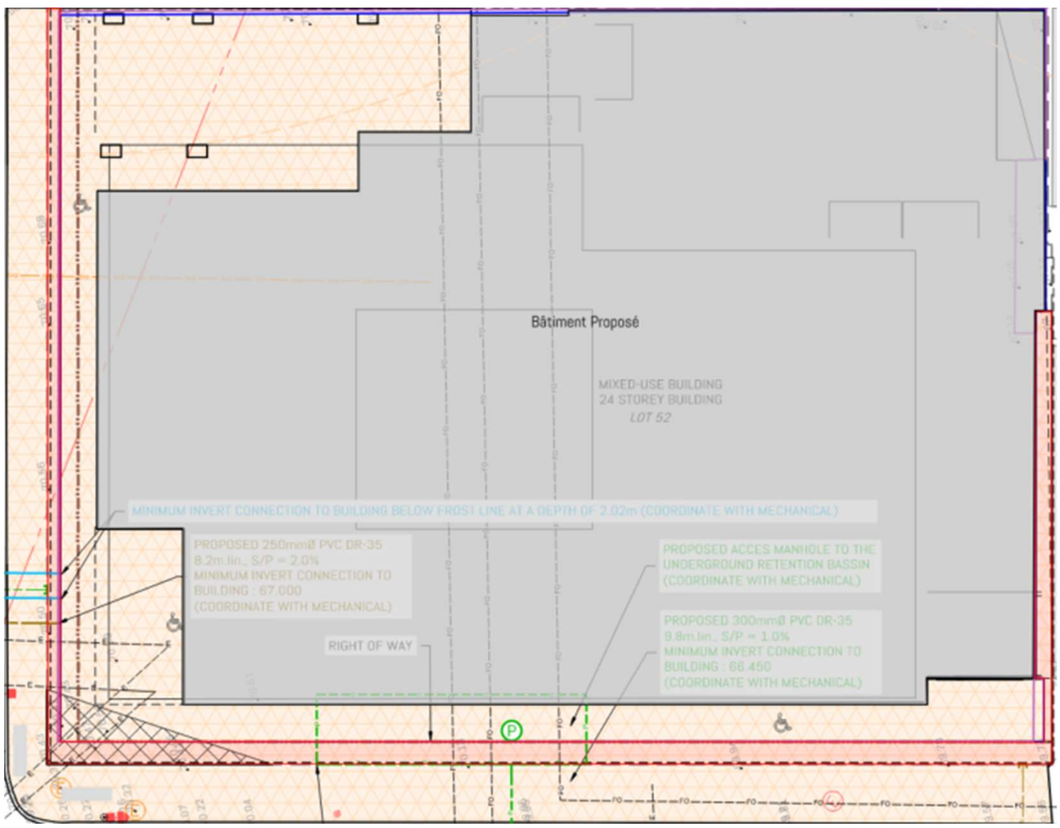
IDF CURVES FOR THE CITY OF OTTAWA

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

WATERSHED

The watersheds of the project are as displayed in the drawing below. The red zones represent the areas that are considered uncontrolled flow as the water will lease the site without control, and the grey zone represents the building.



HYPOTHESE

- The roof is a part of the drainage areas draining downstream of the underground tank.

Here are the calculations for the pre-development flowrate as asked by the city. The IDF curves provided above and a runoff coefficient of 0.50 were used.

TABLE 1 - 2-YEAR PRE-DEVELOPMENT

Time of concentration (min)	Intensity (mm/hr)	Flowrate (L/s)
5.0	103.57	0.018
10.0	**76.81**	**0.013**
15.0	61.77	0.010
20.0	52.03	0.009

*The IDF curves were taken from the city of Ottawa sewer design guidelines and C=0.50.

*The total area of the project is 1 217m^2

TABLE 2 – PROPOSED POST-DEVELOPMENT CATCHMENT AREAS

Drainage area	Total area (m²)	Impervious surfaces		Grass surfaces		100-year runoff coefficient
		Area (m²)	Runoff coefficient	Area (m²)	Runoff coefficient	
Building	1155	1155	0.9	0	-	1.0
Total Regulated	1155	1155	-	0	-	1.0
UNR-01	62	62	0.9	0	-	1.0
Total Unregulated	62	62	-	0	-	1.0

RUNOFF COEFFICIENT CALCULATION

$$C = \frac{\sum(Ai \times Ci)}{\sum A}$$

Where Ai is the Area of a certain material type

Ci is the runoff coefficient of a certain material type

Example:

$$C_{CB-04} = \frac{698 \times 0.900 + 186 \times 0.250}{698 + 186} = 0.763$$

TABLE 3 - PROPOSED UNCONTROLLED FLOW

Parameters	Values	Units
Impervious surfaces	62	m²
Grass surfaces	0	m²
Total area	62	m²
100-year Runoff coefficient	1.0	-
Time of concentration	10	min
Uncontrolled 100-year flow	3.7	ℓ/s

* The 100-year runoff coefficients are determined by increasing the 2-year runoff coefficients by 25% as per the city of Ottawa sewer design guidelines.

TABLE 4 - PROPOSED CONTROLLED FLOW

Parameters	Values	Units
2-year pre-development flow	13	ℓ/s
100-year uncontrolled flow	3.7	ℓ/s
Allowable release rate / Controlled flow	9,3	ℓ/s
Average release rate for calculations	4.65	ℓ/s
Release rate controlled by ICD 1 (submersible pump)	9.3	ℓ/s
100-year storage requirement *	**69.4**	m³

*Storage requirement calculations includes a 20% increase in rainfall

*Storage requirement calculations includes a 10% increase in volume

TABLE 5 - PROPOSED STORMWATER STORAGE

Parameters	Values	Units
100-year required storage[1,2]	**69.4**	m³
Volume retained in underground concrete tank	63.3	m³
Volume retained on the roof (to be validated by mechanical ing)	23.3	m³
Total storage volume available	86.6	m³

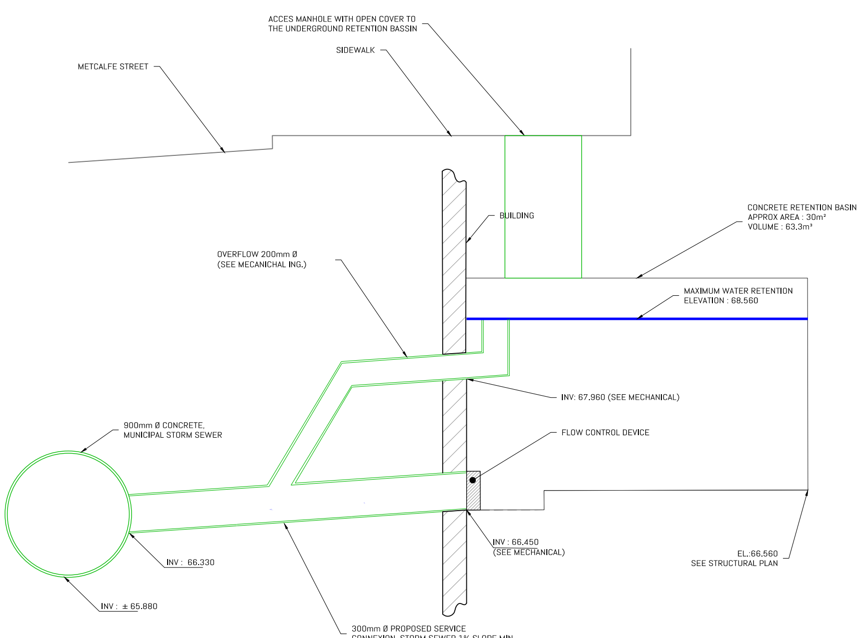
1 - A 10% increase was included in the volume requirement as an extra safety measure

2 - A 20% increase to rainfall was included for the climate change effects

TABLE 6 – INLET CONTROL DEVICE (ICD)

Zone	Pipe	Flowrate (L/s)	Water level	Invert (m)	Water head (m)	Type *
1	300 mm PVC	9.3	68.560	66.450	2.1	Submersible pump

*The type of ICD and specifications has to be validated with the manufacturer and mechanical engineer



APPENDIX D

Sanitary Sewer Design Flows

Detailed Calculations

File : 601101
Project : 77 Metcalfe

SANITARY SEWER DESIGN FLOWS - 77 Metcalfe

Reference : Ottawa Sewer Design Guidelines, *Infrastructure Services Department* , October 2012

A. Population Density

(Article 4.3, Table 4.2)	Number of units	Persons Per Unit	Population Density
Studio	66	1,4	92
1-bedroom	109	1,4	153
2-bedroom	45	2,1	95
3-bedroom	21	3,1	65
		Total population density:	404,6

B. Average Wastewater Flows

(Article 4.4.1, Figure 4.3)

Average wastewater flow per capita for residential use: 280 L/c/d
Average wastewater flow for residential use: 113 288 L/d

Average wastewater flow for commercial use: 28 000 L/gross ha/d
Commercial Areas: 469 m² 1 313 L/d

C. Peaking Factors

(Article 4.4.1, Figure 4.3)

Residential peak factor: Harmon Equation
K=1

$$P.F. = 1 + \left(\frac{14}{4 + \left(\frac{P}{1000}\right)^{1/2}}\right) \times K$$

Residential peak factor: 4,02
Commercial peak factor: 1,50

D. Extraneous Flows

(Article 4.4.1.4)

Infiltration allowance: 0,28 L/s/effective gross ha for 0.12 ha
Inflitration flow: 0,03 L/s

F. Total Wastewater Design Flow

Q_{design} = [(4.02 x 113 288 L/d) + (1.50 x 1 313 L/d)] x 1/86 400 sec/d + 0.03 L/s

Q_{design} = 5,33 L/s

SANITARY SEWER CALCULATION SHEET

Manning's n = 0,013

LOCATION			RESIDENTIAL AREA AND POPULATION						COMM		INDUST			INST		C+I+I	INFILTRATION				PIPE				
STREET	FROM M.H.	TO M.H.	AREA (ha)	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FACTOR (per	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	LENGTH (m)	DIA. (mm)	SLOPE (%)	CAP. (FULL) (l/s)	VEL. (FULL) (m/s)
Metcalfe	BUILD.	City		405			4,02	5,27	0,0469	0,0469	-	-	1,5	-	-	0,0228	0,1200		0,03	5,32	8,20	250	2,00	84,10	1,71

DESIGN PARAMETERS

Average Daily Flow =	280 l/p/day	Industrial Peak Factor =	as per MOE Graph
Comm/Inst Flow =	28000 L/ha/da	Extraneous Flow =	0,28 L/s/ha
Industrial Flow =	28000 L/ha/da	Minimum Velocity =	0,86 m/s
Max Res. Peak Factor =	4,02	Manning's n =	0,013
Commercial / Inst Peak Factor =	1,50		

Designed:

Checked:

PROJECT: 77 METCALFE

LOCATION: 77 METCALFE STREET, OTTAWA, ON

Dwg. Reference:	File Ref.:	Date:	Sheet No.
C-204	601101	2025-06-25	1 of 1

APPENDIX E

Domestic Water Demand

Detailed Calculations

Watermain Pressure

File : 601101
Project :77 Metcalfe

DOMESTIC WATER DEMAND CALCULATION

Reference : Ottawa Design Guidelines - Water Distribution, *Infrastructure Services department* , July 2010

A. Population Density

(Article 4.2.8, Table 4.1)	Number of units	Persons Per Unit	Population Density
Studio	66	1,4	92,4
1-bedroom	109	1,4	152,6
2-bedroom	45	2,1	94,5
3-bedroom	21	3,1	65,1
		Total population density:	405

B. Average Day Demand

(Article 4.2.8, Table 4.2)

Average day demand per capita for residential use: 280 L/c/d
Average day demand for residential use: 113 288 L/d

Average day demand for other commercial use: 28 000 L/gross ha/d
Commercial Areas: 469 m² 1 313 L/d

Total average day demand: 114 601 L/d = 1,33 L/s

C. Maximum Daily Demand

(Article 4.2.8, Table 4.2)

Maximum daily demand = 2.5 x 113 288 L/d + 1.5 x 1 313 L/d
= 283 220 L/d + 1 970 L/d = 285 190 L/d
= 3,30 L/s

D. Maximum Hour Demand

(Article 4.2.8, Table 4.2 and Technical Bulletin ISD-2010-2)

Maximum hour demand = 2.2 x (Max $Day_{res)}$ L/d + 1.8 x (Max $Day_{com)}$ L/d
Maximum hour demand = 2.2 x 283,220 L/d + 1.8 x 1,970 L/d = 626 630 L/d
= 7,25 L/s

F. Results

Population density = 405 people
Average day demand = 1,33 L/s

File : 601101
Project :77 Metcalfe

Maximum daily demand =	3,30	L/s
Maximum hour demand =	7,25	L/s

1. Data and hypothesis

Maximum flow

Max total flow (max day + fire flow)	0,1167 m^3/s	*Data given by Brett Hughes of the city of Ottawa

Piping between the street and the service point

Pipe nominal diameter	200 mm	
Pipe material	PVC DR-18	
Pipe inside diameter	204 mm	
Pipe length	6,72 m	*4,7 m + 2,02 m, See plan reference on page 3

Pressure data

Minimum HGL	107 m	
Maximum HGL	115,1 m	
Elevation	70,37 m	*See plan reference on page 3

*The HGL value is taken from a computer model simulation of the network. The value was provided by Brett Hugues of the city of Ottawa

2. Pressure at the street service point (ground level)

Maximum flow pressure	36,63 m	=	52,05 psi
Minimum flow pressure	44,73 m	=	63,56 psi

3. Pressure at the building main water pipe (ground level)

*The pressure loss is calculated for the worst case scenario (maximum flow flowing through only one of the two main entry pipes), from the main water valve to the ground level in the

Dynamic pressure loss

Hazen-Williams equation
Équation de Hazen-Williams :

$$Hf = 10,654 \times \left(\frac{Q}{C}\right)^{\frac{1}{0,54}} \times \left(\frac{1}{D^{4,87}}\right) \times L$$

Q =	Flow rate (m^3/s)	0,1167	(m^3/s)
C =	Hazen-Williams coefficient	130	*Hypothesis, new PVC pipe
D =	Pipe internal diameter	0,204	m
L =	Pipe length	6,72	m
Hf =	Friction pressure loss	0,38	m
	Security factor	10%	
Hf =	Friction pressure loss	0,59	psi

Static pressure loss

Ground elevation at the street service point			70,37	m	*See plan reference on page 3
Ground elevation at the building			70,50	m	

Static pressure loss	0,13	m	=	0,18	psi

Singularity pressure loss

Water main valve (Cv value from clow valve)	0,054	m	=	0,08	psi
90° Elbow	0,16	m	=	0,23	psi
Security factor	10%				
Singularity pressure loss	0,24	m	=	0,34	psi

Result

Dynamic pressure at the water main valve (max flow)	50,9 psi
Static pressure at the water main valve (min flow)	62,5 psi

Conclusion and discussion

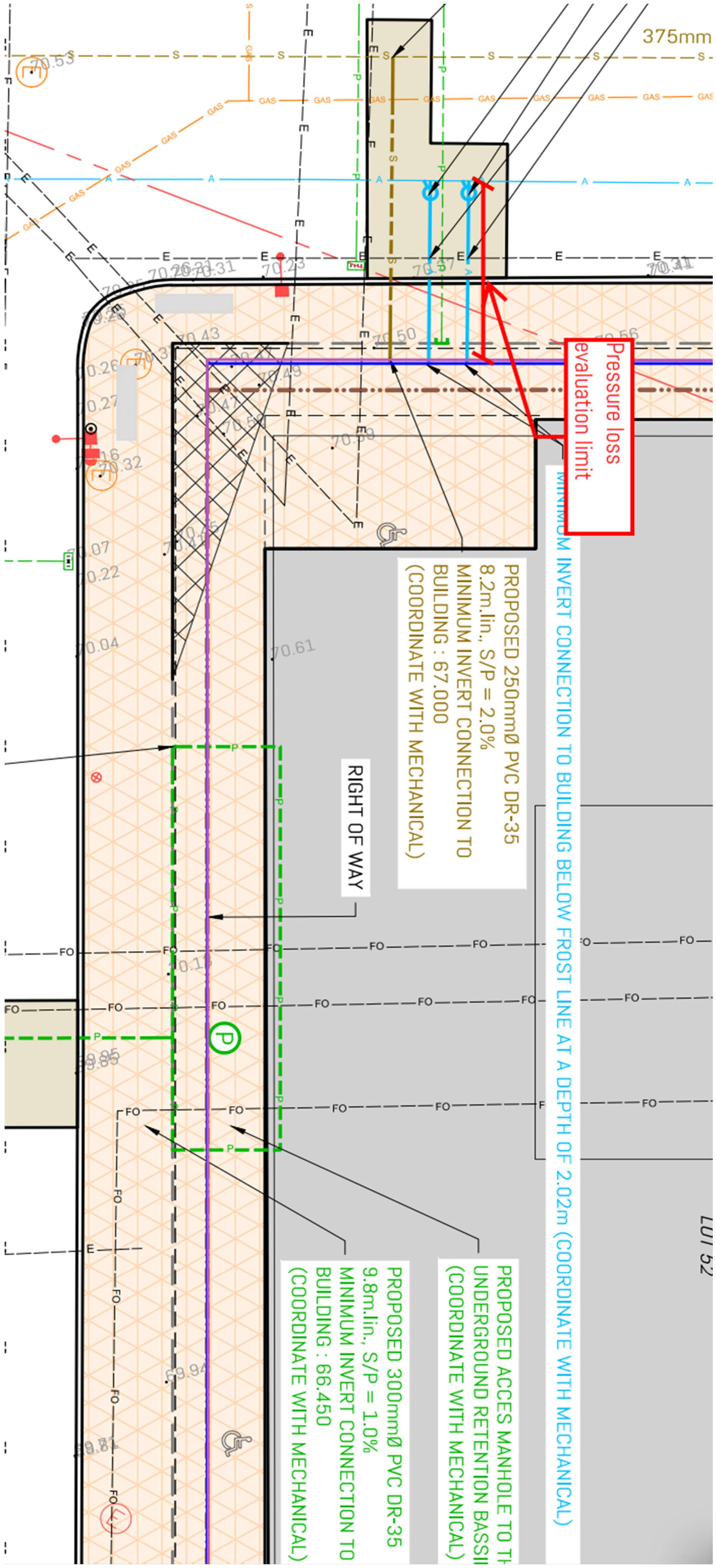
According to the Design Guideline for Drinking-Water Systems, chapter 10, the minimum pressure under maximum day demand plus fire flow is 20 psi and the minimum pressure in normal operation is 40 psi.

The calculated dynamic pressure (50,9 psi) is greater than the minimum of 20 psi and the calculated static pressure (62,5 psi) is greater than the minimum of 40 psi.

The pressure is therefore compliant to the Design guideline for Drinking-Water Systems.

Prepared by Benoit Bray, eng.
100568973

Signature Benoit Bray



Taken from the plans 77 METCALFE STREET, OTTAWA, PLAN VIEW, SITE SERVICING PLANS AND DRAINAGE AREA issued for SITE PLAN APPLICATION on july 4th 2025, by Équipe Laurence

De : Hughes, Brett <brett.hughes@ottawa.ca>
Envoyé : 8 juillet 2025 09:29
À : Halimo Moussa Fahyeh <hmfahyeh@equipelaurence.ca>
Cc : Valérie Mercier <vmercier@equipelaurence.ca>; Benoit Bray <bbray@equipelaurence.ca>; Wu, John <John.Wu@ottawa.ca>
Objet : RE: 77 Metcalfe Street - Boundary condition analysis

Halimo,
The following are boundary conditions, HGL, for hydraulic analysis at 77 Metcalfe Street (zone 1W) assumed to be a dual connection to the 203mm watermain on Albert Street (see attached PDF for location).

Minimum HGL: 107.0 m
Maximum HGL: 115.1 m
Max Day + Fire Flow (116.7 L/s): 107.1 m

These are for current conditions and are based on computer model simulation.
Disclaimer:
The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. 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.
"The IWSD has recently updated their water modelling software. Any significant difference between previously received BC results and newly received BC results could be attributed to this update."

Regards,
Brett Hughes BEng.
Project Manager, Infrastructure
Development Review Central
Planning, Development & Building Services (PDBS)
110 Laurier Ave West | 4th Floor | Ottawa, ON | K1P 1J1
City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 32541

*Electronic mail sent by Brett Hugues to Équipe Laurence on the 8th of july 2025.

APPENDIX F

Required Fire Demand

Detailed Calculations

File : 601101
Project : 77 Metcalfe

REQUIRED FIRE DEMAND CALCULATION

References : Ottawa Technical Bulletin ISTB-2018-02, March 2018
Water Supply for Public Fire Protection, *Fire Underwriters Survey*, 1999

A. Type of construction

Non-combustible construction : C = 0,8

B. Total Floor Area

	Surface Area Per Floor	Number of Floors	Floor Area
Ground Floor	1 019 m²	1	1 019 m²
Level 2	882 m²	1	882 m²
Levels 3-10	954 m²	8	7 632 m²
Levels 11-15	779 m²	5	3 895 m²
Levels 16-23	716 m²	8	5 728 m²

A = Largest floor area + 25% of each of the two immediately adjoining floors

A = 1 019m^2 + 25% * 882 m^2 + 25% * 954 m^2

A = 1478 m^2

D. Base Fire Flow

$$F = 220 \times C\sqrt{A}$$ = 6 766 L/min

The base fire flow must be rounded up to the nearest 1,000 L/min, hence : *F =* 7 000 L/min

E. Fire Flow Adjustments

E.1 Building occupancy (adjustments to the value obtained in D) (1)

Occupancy : Limited Combustible -15% *F =* 5 950 L/min

E.2 Automatic sprinkler system (adjustments to the value obtained in E.1)

NPFA 13 Designed system:	Yes	-30%
Standard water supply:	Yes	-10%
Fully supervised system:	Yes	-10%

E.3 Exposure surcharge (adjustments to the value obtained in E.1)

Length-Height Factors (no impact on exposure surcharge calculations since distances > 30m)

North side	L (56.32) * H (1 storeys above)= 56.32
East side	Height of adjacent building < building height
South side	Height of adjacent building < building height
West side	Height of adjacent building < building height

North side	33.03m (30.1 to 45m)	5%
East side	2.65m (0 to 3m)	25%
South side	0m (0 to 3m)	25%
West side	20.31m (20.1 to 30m)	10%

Reductions from E.2 = -50% = -2 975 L/min (2)

Increases from E.3 = 65% = 3 868 L/min (3)

(1) + (2) + (3) *F =* 6 843 L/min

The fire flow must be rounded up to the nearest 1,000 L/min, hence : *F =* 7 000 L/min

F. volume of Water Required During the Fire

The duration of water supply for a fire is: 2 hours

Required Volume = 840 000 L = 840 m³

Fire Demand =	7 000	L/min	Required Volume =	840	m³