SERVICING & STORMWATER MANAGEMENT REPORT 5-STOREY RESIDENTIAL BUILDING – 949 NORTH RIVER ROAD

Project No.: CCO-21-2796

City File No.: D07-12-XX-XXXX

Prepared for:

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2021-09-24

McINTOSH PERRY

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1.0 PROJECT OVERVIEW

1.1 Purpose

McIntosh Perry (MP) has been retained by Gemstone Corporation to prepare this Servicing and Stormwater Management Report in support of the Site Plan Control application for the proposed 5-Storey Residential Building, located at 949 North River Road within the City of Ottawa.

The main purpose of this report is to present a servicing and stormwater management design for the development in accordance with the recommendations and guidelines provided by the City of Ottawa (City), the Rideau Valley Conservation Authority (RVCA), and the Ministry of the Environment, Conservation and Parks (MECP). This report will address the water, sanitary and storm sewer servicing for the development, ensuring that existing infrastructure available will adequately service the proposed development.

This report should be read in conjunction with the following drawing:

- CCO-21-2796, C101 – Site Grading. Servicing and Drainage Plan.

1.2 Site Description

The subject property, herein referred to as the site, is located at 949 North River Road within the Rideau-Rockcliffe Ward. The legal description of the site is Lot 8, Concession Junction Gore, Geographic Township of Gloucester, City of Ottawa. The site covers approximately 0.17 ha and is located between North River Road and Ontario Street as shown by Figure 1 below. The site is zoned for Residential Use (R4UC)

Figure 1: Site Map

Additional details are included on the Site Location Plan included in Appendix 'A'.

1.3 Proposed Development and Statistics

The proposed development consists of a 5 storey, residential building. The Site Plan proposes to have 48 residential units, with 287 m^2 of amenity. Underground parking with an access ramp will be provided internal to the site. There will be one site access for the development from Ontario Street. Visitor surface parking will be located at the north of the site.

1.4 Existing Conditions and Infrastructure

The existing site is located within the City of Ottawa's Rideau River Sub-Watershed and is currently developed as a multi-unit two-storey residential building. The site is sloped at approximal 0.7 % towards North River Road and 0.5% towards Ontario Street as shown by drawing PRE located within Appendix E. The existing site is assumed to have water and sanitary services. It is assumed that storm runoff from the existing site flows to the City's right-of -ways in North River Road and Ontario Street.

Sewer and watermain mapping collected from the City of Ottawa indicate that the following services exist across the property frontages within the adjacent municipal right-of-ways:

- Ontario Street
  - 203 mm dia. PVC Watermain
  - 225 mm dia. PVC. Sanitary Sewer tributary to the Rideau River Collector Twin and ultimately the Interceptor Sewer
  - 600 mm dia. Conc Storm Sewer, tributary to the Rideau River
- North River Road
  - 203 mm dia. PVC Watermain
  - 1950 mm dia. Conc. Sanitary Sewer tributary to the Rideau River Collector Twin and ultimately the Interceptor Sewer
  - 900 mm dia. Conc Storm Sewer, tributary to the Rideau River

1.5 Approvals

The contemplated development is subject to the City of Ottawa site plan control approval process. Site plan control requires the City to review, provided concurrence and approve the engineering design package. Permits to construct can be requested once the City has issued a site plan agreement.

An Environmental Compliance Approval (ECA) through the Ministry of Environment, Conservation and Parks (MECP) is not anticipated to be required for the contemplated development as the stormwater management system meets the exemption requirements under O.Reg 525/90. It is a

single parcel, stormwater is not proposed to outlet to a combined sewer and is not zoned or proposed to be an industrial use.

2.0 BACKROUND STUDIES, STANDARDS AND REFERENCES

2.1 Background Reports / Reference Information

As-built drawings of existing services, provided by the City of Ottawa Information centre, within the vicinity of the proposed site were reviewed in order to identify infrastructure available to service the proposed development.

A topographic survey (2139123) of the site was completed by Farley, Smith & Denis Surveying Ltd. dated March 23, 2021.

The Site Plan, A105 was prepared by Figurr Architects Collective dated September 20, 2021 (Site Plan).

2.2 Applicable Guidelines and Standards

City of Ottawa:

- Ottawa Sewer Design Guidelines, City of Ottawa, SDG002, October 2012. (Ottawa Sewer Guidelines)
  - Technical Bulletin ISTB-2014-01 City of Ottawa, February 2014. (ISTB-2014-01)
  - Technical Bulletin ISTB-2018-01 City of Ottawa, January 2018. (ISTB-2018-01)
  - Technical Bulletin ISTB-2018-03 City of Ottawa, March 2018. (ISTB-2018-03)
  - Technical Bulletin ISTB-2019-01 City of Ottawa, January 2019. (ISTB-2019-01)
  - Technical Bulletin ISTB-2019-02 City of Ottawa, February 2019. (ISTB-2019-02)
- Ottawa Design Guidelines – Water Distribution City of Ottawa, July 2010. (Ottawa Water Guidelines)
  - Technical Bulletin ISD-2010-2 City of Ottawa, December 15, 2010. (ISD-2010-2)
  - Technical Bulletin ISDTB-2014-02 City of Ottawa, May, 2014. (ISDTB-2014-02)
  - Technical Bulletin ISTB-2018-03 City of Ottawa, March 2018. (ISTB-2018-03)

Ministry of Environment, Conservation and Parks:

- Stormwater Planning and Design Manual, Ministry of the Environment, March 2003. (MECP Stormwater Design Manual)
- Design Guidelines for Sewage Works, Ministry of the Environment, 2008. (MECP Sewer Design Guidelines)

3.0 PRE-CONSULTATION SUMMARY

A pre-consultation meeting was conducted on October 9, 2020 regarding the proposed site. Specific design parameters to be incorporated within this design include the following.

- Pre-development and post-development flows shall be calculated using a time of concentration (Tc) with a minimum Tc of 10 minutes.
- Coefficient (C) of runoff determined as per existing conditions but in no case more
- than 0.5.
- Any storm events greater than 2 year, up to 100 year, and including 100-year storm
- event must be detained on site.
- Roof drains are to be connected downstream of any incorporated ICD within the storm water management system.
- RCVA to provide quality control requirements.

The notes from the City of Ottawa pre-consultation can be found in Appendix B.

4.0 WATERMAIN

4.1 Existing Watermain

There is an existing 203 mm diameter PVC watermain within Ontario Street as well as a 203 mm diameter watermain within North River Road.

4.2 Proposed Watermain

A 150 mm diameter PVC water lateral is proposed to service the site complete with a valve located 0.3 m from the proposed connection. It will be connected to the existing 200 mm diameter watermain within Ontario Street. The lateral is designed to have a minimum of 2.4m cover.

The Fire Underwriters Survey 1999 (FUS) method was utilized to estimate the required fire flow for the site. Fire flow requirements were calculated per City of Ottawa Technical Bulletin ISTB-2018-03. The following parameters were coordinated with the architect:

- Type of construction – Non-Combustible Construction;
- Occupancy type – Limited Combustible;
- and Sprinkler Protection –Fully supervised.

The results of the calculations yielded a required fire flow of 12,000 L/min (200 L/s). The detailed calculations for the FUS can be found in Appendix C.

The water demands for the proposed building have been calculated to adhere to Ottawa Water Guidelines and can be found in Appendix C. The results have been summarized below:

Table 1: Water Supply Design Criteria and Water Demands

Site Area	0.17 ha
Amenity Space	287 m^2
Residential	280 L/day/person
Commercial/Amenity	2,500 L/(1000 m^2/day)
Average Day Demand (L/s)	0.29
Maximum Daily Demand (L/s)	1.38
Peak Hourly Demand (L/s)	2.09
FUS Fire Flow Requirement (L/s)	200.00

The City provided the estimated water pressures at both for the average day scenario, peak hour scenario and the max day plus fire flow scenario for the demands indicated by the correspondence in Appendix C. The resulting pressures for the boundary conditions results are shown in Table 2 below.

Table 2: Boundary Conditions Results

Scenario	Proposed Demands (L/S)	Connection 1 HGL (m H_2O)* / kPa
Average Day Demand	0.29	60.10 / 589.4
Maximum Daily + Fire Flow Demand	200.00	30.8 / 302.0
Peak Hourly Demand	2.09	51.1 / 501.1
* Adjusted for an estimated ground elevation of 58.42 above the connection point for both connections		

The normal operating pressure range is anticipated to be 302.0 kPa to 589.4 kPa and will not be less than 275 kPa (40 psi). The proposed watermains will meet the minimum required 20 psi (140 kPa) from the Ottawa Water Guidelines at the ground level under maximum day demand and fire flow conditions. However, the proposed watermains will exceed 552 kPa (80 psi) during normal operating conditions therefore a pressure check at the completion of construction is required to confirm that pressure control is required.

To confirm the adequacy of fire flow to protect the proposed development, public and private fire hydrants within 150 m of the proposed building were accounted for per ISTB 2018-03 Appendix I, Table 3. as demonstrated below.

Table 3: Fire Protection Confirmation

Building	Fire Flow Demand (L/min.)	Fire Hydrant(s) within 75m	Fire Hydrant(s) within 150m	Combined Fire Flow (L/min.)
949 North River Road	12,000	2	1	15,200

5.0 SANITARY DESIGN

5.1 Existing Sanitary Sewer

There is an existing 225 mm diameter concrete sanitary collection sewer tributary to the Rideau River Collector Twin within Ontario Street.

5.2 Proposed Sanitary Sewer

A new 200 mm diameter gravity sanitary service will be connected to the existing 225 mm diameter sanitary sewer within Ontario Street.

Table 4: Sanitary Design Criteria

Design Parameter	Value
Average Residential 1 Bedroom / Studio Apartment	1.8 persons/unit
Average Daily Demand	280 L/day/person
Commercial / Amenity Space	2500 L/(1000m² /day)

Table 5: Summary of Estimated Sanitary Flow

Design Parameter	Total Flow (L/S)
Total Estimated Average Dry Weather Flow	0.73
Total Estimated Peak Dry Weather Flow	2.91
Total Estimated Peak Wet Weather Flow	2.97

The estimated sanitary flow based on the Site Plan results in a peak wet weather flow of 2.97 L/s. The proposed 200 mm diameter gravity sanitary service will be installed with a minimum full flow target velocity (cleansing velocity) of 0.6 m/s and a full flow velocity of not more than 3.0 m/s. Design parameters for the site include an infiltration rate of 0.28 l/s/ha. The proposed service for the site will be connected to existing 250 mm diameter sanitary sewer within Ontario Street.

6.0 STORM SEWER DESIGN

6.1 Existing Storm Sewers

It is assumed that runoff from the existing site is directed to the existing 600 mm sewer within Ontario Street. Stormwater runoff from the existing site is tributary to the Rideau River within the Ottawa Central sub-watershed.

6.2 Proposed Storm Sewers

A new 250 mm diameter storm service will be extended from the existing 600 mm diameter storm sewer within Ontario Street.

Runoff collected on the roof of the proposed building will be stored and controlled internally using five roof drains. Roof drains will be used to limit the flow from the roof to the specified allowable release rate. For calculation purposes a Watts Accutrol roof drain was used estimate a reasonable roof flow. Other products maybe specified at detailed building design so long as release rates and storage volumes are respected.

Runoff from the proposed surface parking lot area will be directed to a swale where it will be treated for quality, stored and controlled. Storm flows from this will be controlled by an inlet control device (ICD) to limit the flow to the specified allowable release rate.

See CCO-21-2796 - POST and Storm Sewer Design Sheet in Appendix 'F' of this report for more details. The Stormwater Management design for the subject property will be outlined in Section 7.0.

7.0 PROPOSED STORMWATER MANAGEMENT

7.1 Design Criteria and Methodology

Stormwater management for the proposed site will be maintained through two methods. The first will store and control runoff collected on the roof of the proposed building. It is estimated that five Watts Accutrol Weirs will be used to control the release rate of the stormwater. The flow will be directed to the existing 600 mm storm sewer located within Ontario Street.

The second method involves using positive drainage away from the proposed building and parking lot to direct the flow towards a Filterra Bioscape Vault Basin which will provide quality control for the storm water runoff. Treated flow from the Bioscape Vault Basin will be directed to a swale (as per City of Ottawa Standard S29) which will provide storage in the 250 mm diameter pipe and the void space between the 25 mm clear stone in the trench. The swale will direct the flow to a catch basin that is installed with an ICD to control the release rate into the City's right of way within Ontario Street.

In summary, the following design criteria have been employed in developing the stormwater management design for the site as directed by the RVCA and City:

Quality Control

- Based on the proximity of the site to the Rideau River, it was anticipated that enhanced quality control measures are required.

Quantity Control

- Post-development 2-year is to be restricted to match the 2-year pre-development flow with a maximum C value of 0.50.
- Post-development 5 & 100-year flow is to be restricted to match the 5-year pre-development flow with a maximum C value of 0.50.

7.2 Runoff Calculations

Runoff calculations presented in this report are derived using the Rational Method, given as:

$$Q = 2.78CIA \quad (L/s)$$

Where C = Runoff coefficient
I = Rainfall intensity in mm/hr (City of Ottawa IDF curves)
A = Drainage area in hectares

It is recognized that the Rational Method tends to overestimate runoff rates. As a result, the conservative calculation of runoff ensures that any SWM facility sized using this method is expected to function as intended.

The following coefficients were used to develop an average C for each area:

Roofs/Concrete/Asphalt	0.90
Gravel	0.60
Undeveloped and Grass	0.20

As per the Ottawa Sewer Guidelines, the 5-year balanced 'C' value must be increased by 25% for a 100-year storm event to a maximum of 1.0.

As per the pre-consultation meeting with the City of Ottawa the time of concentration (Tc) used for pre-development shall be calculated and no less than 10 minutes and post-development flows shall be calculated and no less than 10 minutes.

7.3 Pre-Development Drainage

The existing site drainage limits are demonstrated on the Pre-Development Drainage Area Plan. A summary of the Pre-Development Runoff Calculations can be found below.

Table 6: Pre-Development Runoff Summary

Drainage Area	Area (ha)	Runoff Coefficient (2/5-Year)	Runoff Coefficient (100-Year)	2-year Peak Flow (L/s)	5-year Peak Flow (L/s)	100-year Peak Flow (L/s)
A1	0.168	0.71	0.79	25.25	34.25	65.86
Total	0.168			25.25	34.25	65.86

See CCO-21-2796 - PRE in Appendix E and Appendix G for calculations.

7.4 Post-Development Drainage

The proposed site drainage limits are demonstrated on the Post-Development Drainage Area Plan. See CCO-21-2796 - POST in Appendix F of this report for more details. A summary of the Post-Development Runoff Calculations can be found below.

Table 7: Post-Development Runoff Summary

Drainage Area	Area (ha)	Runoff Coefficient (2/5-Year)	Runoff Coefficient (100-Year)	2-year Peak Flow (L/s)	5-year Peak Flow (L/s)	100-year Peak Flow (L/s)
B1	0.084	0.90	1.00	16.14	21.89	41.69
B2	0.041	0.59	0.67	5.14	6.97	13.52
B3	0.043	0.59	0.67	5.43	7.73	14.30
Total	0.168			26.71	36.24	69.50

See Appendix G for calculations. Runoff for area B1 will be restricted using roof drains. The Accutrol Weirs will restrict the 2 through 100-year flows creating the need for roof storage. Runoff for areas B2 will be restricted before outletting to the existing storm system within Ontario Street. The flow will be controlled within a catch basin installed with an ICD. The flow from Area B3 directed to the City's right of ways without restriction.

7.5 Quantity Control

After discussing the stormwater management criteria for the site with City staff, the total post-development runoff for this site has been restricted to match the 2-year pre-development flow rate with a combined C value of 0.50. (See Appendix E for pre-consultation notes). The site is required to restrict flow to a maximum release rate of 17.89 L/s for events up to and including a 2-year storm event and a maximum release rate of 24.27 L/s for events up to and including a 100-year storm event.

See Appendix G for calculations.

Table 8: Post-Development Restricted Runoff Summary

Drainage Area	Post Development Unrestricted Flow (L/s)			Post Development Restricted Flow (L/s)		
	2-Year	5-Year	100-Year	2-Year	5-Year	100-Year
B1 (Restricted)	16.14	21.89	41.69	3.04	1.90	3.45
B2 (Restricted)	5.14	6.97	13.52	1.50	1.80	3.00
B3 (Unrestricted)	5.43	7.37	14.30	5.43	7.37	14.30
Total	26.71	36.24	69.50	8.53	11.07	20.75

Runoff for area B1 will be stored on the roof of the proposed building and restricted internally using an Accutrol Weir and will provide up to 34.56 m^3 of storage. The runoff from Areas B2 will be restricted through an Ipex Temptest LMF ICD or approved equivalent that will control the flows for the 2, 5 & 100-year storm events to 1.50 L/s, 1.80 L/s and 3.00 L/s, respectively. The proposed swale that directs flow to the ICD will provide up to 11.56 m^3 of storage.

See Appendix G for calculations.

7.6 Quality Control

It is anticipated that enhanced quality control measures are required based on the proposed above ground parking and site's proximity to the Rideau River. This will be provided by directing flow from the parking lot to a Filterra Bioscape Vault Basin. The drainage area being directed into to the

Vault Basin is approximately 0.031 ha. The 1219 x 1219 mm Bioscape Vault Basin is designed to treat a drainage area of 0.035 ha and will provide a TSS removal of 85%. See Appendix G for a specification sheet.

8.0 EROSION AND SEDIMENT CONTROL

8.1 Temporary Measures

Before construction begins, temporary silt fence, straw bale or rock flow check dams will be installed at all-natural runoff outlets from the property. It is crucial that these controls be maintained throughout construction and inspection of sediment and erosion control will be facilitated by the Contractor or Contract Administration staff throughout the construction period.

Silt fences will be installed where shown on the final engineering plans, specifically along the downstream property limits. The Contractor, at their discretion or at the instruction of the City, Conservation Authority or the Contract Administrator shall increase the quantity of sediment and erosion controls on-site to ensure that the site is operating as intended and no additional sediment finds its way off site. The rock flow, straw bale & silt fence check dams and barriers shall be inspected weekly and after rainfall events. Care shall be taken to properly remove sediment from the fences and check dams as required. Fibre roll barriers are to be installed at all existing curb inlet catch basins and filter fabric is to be placed under the grates of all existing catch basins and manholes along the frontage of the site and any new structures immediately upon installation. The measures for the existing/proposed structures is to be removed only after all areas have been paved. Care shall be taken at the removal stage to ensure that any silt that has accumulated is properly handled and disposed of. Removal of silt fences without prior removal of the sediments shall not be permitted.

Although not anticipated, work through winter months shall be closely monitored for erosion along sloped areas. Should erosion be noted, the Contractor shall be alerted and shall take all necessary steps to rectify the situation. Should the Contractor's efforts fail at remediating the eroded areas, the Contractor shall contact the City and/or Conservation Authority to review the site conditions and determine the appropriate course of action. As the ground begins to thaw, the Contractor shall place silt fencing at all required locations as soon as ground conditions warrant. Please see the Site Grading, Drainage and Sediment & Erosion Control Plan for additional details regarding the temporary measures to be installed and their appropriate OPSD references.

8.2 Permanent Measures

Rip-rap will be placed at all locations that have the potential for concentrated flow. It is crucial that the Contractor ensure that the geotextile is keyed in properly to ensure runoff does not undermine the rip rapped area. Additional rip rap is to be placed at erosion prone locations as identified by the Contractor / Contract Administrator / City or Conservation Authority.

It is expected that the Contractor will promptly ensure that all disturbed areas receive topsoil and seed/sod and that grass be established as soon as possible. Any areas of excess fill shall be removed or levelled as soon as possible and must be located a sufficient distance from any watercourse to ensure that no sediment is washed out into the watercourse. As the vegetation growth within the site provides a key component to the control of sediment for the site, it must be properly maintained once established. Once the construction is complete, it will be up to the landowner to maintain the vegetation and ensure that the vegetation is not overgrown or impeded by foreign objects.

9.0 SUMMARY

- A new 5 storey residential building is proposed to be constructed along the west property line at 949 North River Road.
- A 150 mm diameter water service is proposed to service the site, connecting to the watermain within Ontario Street.
- A 200 mm sanitary service lateral will be installed to service the proposed building and connect to the sanitary sewer within Ontario.
- A 250 mm diameter storm service lateral is proposed to connect to the existing storm sewer within Ontario Street.
- Storage for the 2-through 100-year storm events will be provided via the roof of the proposed building and in a swale.

10.0 RECOMMENDATION

Based on the information presented in this report, we recommend that City of Ottawa approve this Servicing and Stormwater Management Report in support of the proposed 949 North River Road Development.

This report is respectfully being submitted for approval.

Regards,

McIntosh Perry Consulting Engineers Ltd.

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11.0 STATEMENT OF LIMITATIONS

This report was produced for the exclusive use of Gemstone Corporation. The purpose of the report is to assess the existing stormwater management system and provide recommendations and designs for the post-construction scenario that are in compliance with the guidelines and standards from the Ministry of the Environment, Conservation and Parks, City of Ottawa and local approval agencies. McIntosh Perry reviewed the site information and background documents listed in Section 2.0 of this report. While the previous data was reviewed by McIntosh Perry and site visits were performed, no field verification/measures of any information were conducted.

Any use of this review by a third party, or any reliance on decisions made based on it, without a reliance report is the responsibility of such third parties. McIntosh Perry accepts no responsibility for damages, if any, suffered by any third party as a result of decisions or actions made based on this review.

The findings, conclusions and/or recommendations of this report are only valid as of the date of this report. No assurance is made regarding any changes in conditions subsequent to this date. If additional information is discovered or becomes available at a future date, McIntosh Perry should be requested to re-evaluate the conclusions presented in this report, and provide amendments, if required.

APPENDIX A
KEY PLAN

McINTOSH PERRY

LEGEND

- Site Location
- Local Road
- Major Road
- Railroad
- Watercourse
- Waterbody
- Wooded Area

600 300 0 600

Scale 1:25,000 Metres

REFERENCE

GIS data provided by the Ontario Ministry of Natural Resources and Forestry, 2021.

CLIENT: GEMSTONE DEVELOPMENTS

PROJECT: 5-STOREY RESIDENTIAL BUILDING
949 NORTH RIVER ROAD, OTTAWA, ON

TITLE: SITE LOCATION

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PROJECT NO:	CCO-21-2796
Date	Jul., 13, 2021
GIS	EU
Checked By	RR

FIGURE: 1

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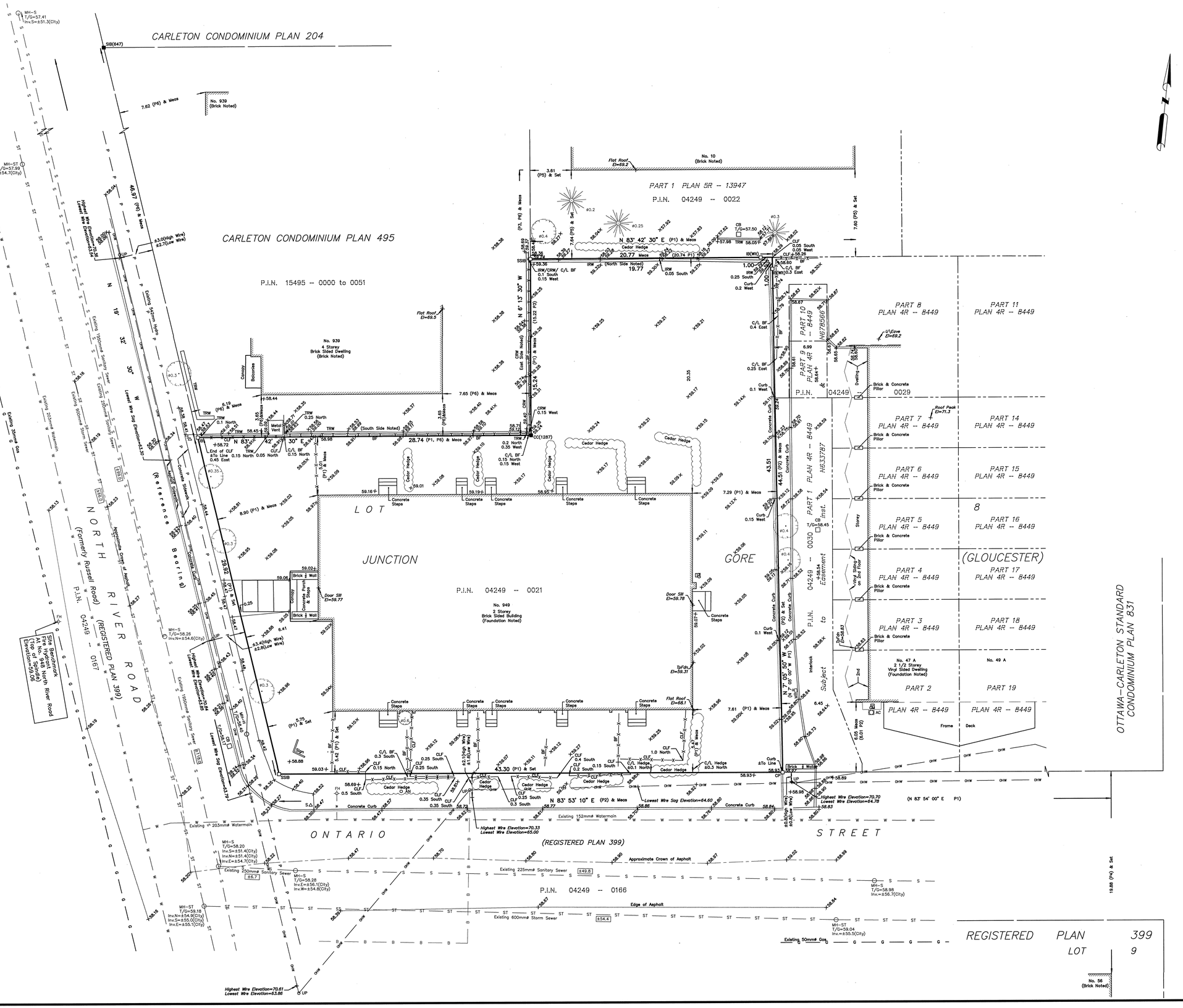
APPENDIX B
BACKGROUND DOCUMENTS

McINTOSH PERRY



TOPOGRAPHIC PLAN OF SURVEY OF

PART OF LOT 8
CONCESSION JUNCTION GORE
GEOGRAPHIC TOWNSHIP OF GLOUCESTER
CITY OF OTTAWA

FARLEY, SMITH & DENIS SURVEYING LTD. 2021

Scale 1: 150

0 1.5 3 6 9 12 15 metres

Metric Note
Distances and coordinates on this plan are in metres and can be converted to feet by dividing by 0.3048.

Distance Note
Distances shown on this plan are ground distances and can be converted to grid distances by multiplying by the combined scale factor of 0.99995.

Bearing Note
Bearings hereon are grid bearings derived from the Can-Net Real Time Network 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°28'30" counter-clockwise was applied to bearings on P1, P2, P3 & P6.

Elevation Notes
1. Elevations shown are geodetic and are referred to Geodetic Datum CGVD-1928 :1978.(FSD File No. 01-17)
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.

Utility Notes
1. This drawing cannot be accepted as acknowledging all of the utilities and it will be the responsibility of the user to contact the respective utility authorities for confirmation.
2. Only visible surface utilities were located.
3. Underground utility data compiled from City of Ottawa utility sheet reference: E-16-08, E-16-15, 13904 and D36-2.
4. Sanitary and storm sewer grades and inverts were derived\compiled from: Field measurement \ City of Ottawa
5. A field location of underground plant by the pertinent utility authority is mandatory before any work involving breaking ground, probing, excavating etc.

Notes & Legend

		Denotes
⊡	=	Survey Monument Planted
⊡	=	Survey Monument Found
SIB	=	Standard Iron Bar
SSIB	=	Short Standard Iron Bar
IB	=	Iron Bar
(Wit)	=	Witness
Meas	=	Measured
(P1)	=	Plan by (857) dated November 6, 1985 (Ref. No. 15-8 (J.G) GR)
(P2)	=	Plan 4R-8449
(P3)	=	Plan 5R-12500
(P4)	=	Plan 4R-22440
(P5)	=	Plan by (1287) dated May 28, 1991 (Job No. 37-91)
(P6)	=	CARLETON CONDOMINIUM PLAN 495
○ MH--ST	=	Maintenance Hole (Storm)
○ MH--S	=	Maintenance Hole (Sanitary)
○ MH--H	=	Maintenance Hole (Hydro)
—— ST ——	=	Underground Storm Sewer
—— S ——	=	Underground Sanitary Sewer
—— W ——	=	Underground Water
—— P ——	=	Underground Power
—— G ——	=	Underground Gas
—— OHW ——	=	Overhead Wires
—— B ——	=	Underground Bell
○ UP	=	Utility Pole
○ AN	=	Anchor
□ CB	=	Catch Basin
○ FH	=	Fire Hydrant
▭ GM	=	Gas Meter
	=	Deciduous Tree - The Symbol shown denotes location and trunk diameter only. Size of its' root system/overhead canopy may be smaller/larger than the symbol size depicted on this plan.
	=	Coniferous Tree - The Symbol shown denotes location and trunk diameter only. Size of its' root system/overhead canopy may be smaller/larger than the symbol size depicted on this plan.
△ S	=	Sign
□ AC	=	Air Conditioner
Ø	=	Diameter
CLF	=	Chain Link Fence
BF	=	Board Fence
CRW	=	Concrete Retaining Wall
TRW	=	Timber Retaining Wall
Inv.	=	Invert
T/G	=	Top of Grate
El	=	Elevation
U/Eave	=	Underside of Eave
T/Fdn	=	Top of Foundation
C/L	=	Centreline
+65.00	=	Location of Elevations
+65.00	=	Top of Concrete Curb Elevation

ASSOCIATION OF ONTARIO LAND SURVEYORS
PLAN SUBMISSION FORM
V-10891

THIS PLAN IS NOT VALID UNLESS IT IS AN EMBOSSED ORIGINAL COPY ISSUED BY THE SURVEYOR
In accordance with Regulation 1026, Section 29 (3).

TOPOGRAPHIC DATA WAS COLLECTED UNDER WINTER CONDITIONS. SNOW COVER AND ICE PRECLUDE DETERMINING LOCATION AND ELEVATION OF SOME TOPOGRAPHICAL DATA THAT IS OTHERWISE VISIBLE.

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 11th day of March, 2021.

March 23/2021
Date

Emad Alrefaai
Ontario Land Surveyor

FARLEY, SMITH & DENIS SURVEYING LTD.
ONTARIO LAND SURVEYORS
CANADA LAND SURVEYORS
190 COLONNADE ROAD, OTTAWA, ONTARIO K2E 7J5
TEL. (613) 727-8226 FAX. (613) 727-1826

FILE No. : 53-21

TOPO 24X36

J:\2021\53-21_949 North River Rd, Ontario St_topo\Final\53-21 949 North River Rd_LT8 C JG GL_Topo_F.dwg

949 North River Road– Infrastructure Notes

Available Infrastructure:

Ontario Street:
Sanitary: 225mm Conc (Install 1967)
Storm: 600mm Conc (Install 1967)
Water: 150mm UCI (Install unknown)

North River Road:
Sanitary: 1950mm Conc (Install 2007)
Storm: 900mm Conc (Install 1968)
Water: 200mm PVC (Install 1995)

Note: Infrastructure is available on North River Road however the preferred connection is Ontario Street as the sewer mains on North River Road are collector sewers (trunk sewers).

Water Boundary Conditions:

Will be provided at request of consultant. Requests must include the location of the service and the expected loads required by the proposed development. Please provide the following and submit Fire Flow Calculation Sheet per FUS method with the request:

- Location of service
- Type of development and amount of required fire flow (per FUS method – include FUS calculation sheet with request)
- Average Daily Demand (l/s)
- Maximum Hourly Demand (l/s)
- Maximum Daily Demand (l/s)
- Water Supply Redundancy – Fire Flow:
  Applicant to ensure that a second service with an inline valve chamber be provided where the average daily demand exceeds 50 m^3 / day (0.5787 l/s per day)

Water services larger than 19 mm require a Water Data Card. Please complete card and submit.

Stormwater Management (Quantity Control):

- Coefficient (C) of runoff determined **as per existing conditions** but in no case more than 0.5.
- TC = To be calculated, minimum 10 minutes
- Any storm events greater than 2 year, up to 100 year, and including 100-year storm event must be detained on site.
- Foundation drains are to be independently connected to sewer main unless being pumped with appropriate back up power, sufficient sized pump and back flow prevention.
- Roof drains are to be connected downstream of any incorporated ICD within the SWM system.

Stormwater Management (Quality Control):

- Rideau Valley Conservation Authority to provide Quality Controls.

Noise Study:

- Noise study required – property fronts a Collector Road (North River Road).

Phase I and Phase II ESA:

- Phase I ESA is required; Phase II ESA may be required depending on the results of the Phase I ESA. Phase I ESA must include an EcoLog ERIS Report.
- Phase I ESA and Phase II ESAs must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04.

Required Studies

- Stormwater Management Report
- Site Servicing Study
- Geotechnical Study
- Phase I ESA
- Phase II ESA (depends on outcome of Phase I)
- Noise Study

Required Plans

- Site Servicing Plan
- Grade Control and Drainage Plan
- Erosion and Sediment Control Plan (Can be combined with Grading Plan)

Relevant information

1. The Servicing Study Guidelines for Development Applications are available at the following address: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#servicing-study-guidelines-development-applications
2. Servicing and site works shall be in accordance with the following documents:
   - ⇨ Ottawa Sewer Design Guidelines (October 2012)
   - ⇨ Ottawa Design Guidelines – Water Distribution (2010)
   - ⇨ Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
   - ⇨ City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012)
   - ⇨ City of Ottawa Environmental Noise Control Guidelines (January 2016)
   - ⇨ City of Ottawa Park and Pathway Development Manual (2012)
   - ⇨ City of Ottawa Accessibility Design Standards (2012)
   - ⇨ Ottawa Standard Tender Documents (latest version)
   - ⇨ Ontario Provincial Standards for Roads & Public Works (2013)

3. Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x.44455).
4. Any proposed work in utility easements requires written consent of easement owner.

APPENDIX C
WATERMAIN CALCULATIONS

McINTOSH PERRY

McINTOSH PERRY

CCO-21-2796 - 949 North River Road - Water Demands

Project:	949 North River Road	
Project No.:	CCO-21-2796	
Designed By:	R.R.R.	
Checked By:	R.D.F.	
Date:	July 19, 2021	
Site Area:	0.17	gross ha
Average Unit	48	1.8 Persons per unit
Total Population	86	Persons
Commercial Area	0.00	m^2
Amenity Space	287.00	m^2

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	*280*	*L/c/d*
Commercial	*2,500*	*L /(1000m ² /d)*
Amenity Space	*2,500*	*L /(1000m ² /d)*
RESIDENCIAL	0.28	L/s
	16.80	L/min
COMMERCIAL	0.01	L/s
	0.50	L/min

MAXIMUM DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	*3.6 x avg. day*	*L/c/d*
Commercial	*1.5 x avg. day*	*L/gross ha/d*
MAXIMUM DAILY DEMAND	1.38	L/s
	83.07	L/min

MAXIMUM HOUR DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	*5.4 x avg. day*	*L/c/d*
Commercial	*1.8 x max. day*	*L/gross ha/d*
MAXIMUM HOUR DEMAND	2.09	L/s
	125.67	L/min

WATER DEMAND DESIGN FLOWS PER UNIT COUNT
CITY OF OTTAWA - WATER DISTRIBUTION GUIDELINES, JULY 2010
FOR POPULATIONS BELOW 501, MOE DESIGN GUIDELINES FOR DRINKING WATER SYSTEMS USED

McINTOSH PERRY

CCO-21-2796 - 949 North River Road - OBC Fire Calculations

Project:	949 North River Road
Project No.:	CCO-21-2796
Designed By:	R.R.R.
Checked By:	R.D.F.
Date:	July 19, 2021

Ontario 2006 Building Code Compendium (Div. B - Part 3)

Water Supply for Fire-Fighting **- Residential**

Building is classified as Group : C and F2 up to 2 Storeys

Building is of combustible construction with fire separations and fire resistance ratings provided in accordance with Subsection 3.2.2., including loadbearing walls, columns and arches. Noncombustible construction may be used in lieu of fire-resistance rating

From Div. B A-3.2.5.7. of the Ontario Building Code - 3. Building On-Site Water Supply:

(a) Q = K x V x Stot

where:

Q = minimum supply of water in litres

K = water supply coefficient from Table 1

V = total building volume in cubic metres

Stot = total of spatial coefficient values from the property line exposures on all sides as obtained from the formula:

Stot = 1.0 + [Sside1+Sside2+Sside3+…etc.]

K	**18**	(from Table 1 pg A-31)
V	**11,142**	(Total building volume in m³.)
Stot	**2.0**	(From figure 1 pg A-32)
Q =	**401,112.00 L**	

→

			From Figure 1 (A-32)
Snorth	6	m	0.4
Seast	8	m	0.2
Ssouth	5	m	0.5
Swest	5	m	0.5

*approximate distances

From Table 2: Required Minimum Water Supply Flow Rate (L/s)

9000 L/min (if Q> 270,000 L)

2378 gpm

McINTOSH PERRY

CCO-21-2796 - 949 North River Road - Fire Underwriters Survey (FUS) Fire Calculations

Project:	949 North River Road
Project No.:	CCO-21-2796
Designed By:	CMK
Checked By:	RDF
Date:	July 19, 2021

From the Fire Underwriters Survey (1999)

From Part II – Guide for Determination of Required Fire Flow Copyright I.S.O.:
Updated per City of Ottawa Technical Bulletin ISTB-2018-02

A. BASE REQUIREMENT (Rounded to the nearest 1000 L/min)

F = 220 x C x √A Where:

F = Required fire flow in liters per minute
C = Coefficient related to the type of construction.
A = The total floor area in square meters (including all storey's, but excluding basements at least 50 percent below grade) in the building being considered.

Construction Type Non-Combustible Construction

C 0.8 **A** **5,400.0** m^2

Caluclated Fire Flow	**12933.3 L/min**
	13000.0 L/min

B. REDUCTION FOR OCCUPANCY TYPE (No Rounding)

From note 2, Page 18 of the Fire Underwriter Survey:

Limited Combustible -15%

Fire Flow	**11050.0 L/min**

C. REDUCTION FOR SPRINKLER TYPE (No Rounding)

Fully Supervised Sprinklered -50%

Reduction	**-5525 L/min**

D. INCREASE FOR EXPOSURE (No Rounding)

	Separation Distance (m)	Cons.of Exposed Wall	Length Exposed Adjacent Wall (m)	Height (Stories)	Length-Height Factor	
Exposure 1	3.1 to 10	Non-Combustible	15	4	60	18%
Exposure 2	3.1 to 10	Non-Combustible	30	3	90	18%
Exposure 3	10.1 to 20	Non-Combustible	30	4	120	10%
Exposure 4	20.1 to 30	Wood frame	10	2	20	14%
					% Increase*	**60%**

Increase*	**6630.0 L/min**

E. Total Fire Flow (Rounded to the Nearest 1000 L/min)

Fire Flow	**12155.0 L/min**
Fire Flow Required**	**12000.0 L/min**

*In accordance with Part II, Section 4, the Increase for separation distance is not to exceed 75%
**In accordance with Section 4 the Fire flow is not to exceed 45,000 L/min or be less than 2,000 L/min

McINTOSH PERRY

CCO-21-2796 - 949 North River Road - CITY OF OTTAWA BOUNDARY CONDITION RESULTS

Project:	949 North River Road
Project No.:	CCO-21-2796
Designed By:	CMK
Checked By:	RDF
Date:	July 19, 2021

Boundary Conditions Unit Conversion

Scenario	Height (m)	Elevation (m)	m H_2O	PSI	kPa
Avg. DD	118.5	58.42	60.1	85.5	589.4
Fire Flow (200 L/s)	89.2	58.42	30.8	43.8	302.0
Peak Hour	109.5	58.42	51.1	72.7	501.1

Hydrant Cover Figure - 949 North River Road


Boundary Conditions for 949 North River Road
ch. North River Rd.
102
203
939
949
152
rue Ontario St.
152
928
959
36
43
10
N
Legend
PRIVATE
PUBLIC
City of Ottawa

From: Robert Freel
Sent: July 27, 2021 3:19 PM
To: Ryan Robineau
Subject: FW: 949 North River Road - Boundary Condition Request
Attachments: 949 North River Road July 2021.pdf

Hi Ryan,

Boundary conditions for North River attached.

Thank you,
Bobby

Robert Freel, P.Eng.
Senior Project Manager, Land Development
T. 613.714.6174 | **C.** 613.915.3815
McINTOSH PERRY
Turning Possibilities Into Reality

From: Fawzi, Mohammed <mohammed.fawzi@ottawa.ca>
Sent: July 27, 2021 3:13 PM
To: Robert Freel <r.freel@mcintoshperry.com>
Subject: RE: 949 North River Road - Boundary Condition Request

Hi Robert,

The following are boundary conditions, HGL, for hydraulic analysis at (zone 1E) assumed to be a dual connection to the 203 mm on Ontario Street (see attached PDF for location).

Minimum HGL: 109.5 m

Maximum HGL: 118.5 m

Max Day + Fire Flow (200 L/s): 89.2 m

The maximum pressure is estimated to be more than 80 psi. A pressure check at completion of construction is recommended to determine if pressure control is required.

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

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

Best Regards,

Mohammed Fawzi, E.I.T.
Project Manager
Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique
Development Review - Central Branch
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 20120, Mohammed.Fawzi@ottawa.ca

From: Fawzi, Mohammed
Sent: July 22, 2021 9:19 AM
To: Robert Freel <r.freel@mcintoshperry.com>
Subject: RE: 949 North River Road - Boundary Condition Request

Hi Robert,

This email is to confirm that your request has been received.

Thank you.

Best Regards,

Mohammed Fawzi, E.I.T.
Project Manager
Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique
Development Review - Central Branch
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 20120, Mohammed.Fawzi@ottawa.ca

From: Robert Freel <r.freel@mcintoshperry.com>
Sent: July 21, 2021 11:34 AM
To: Fawzi, Mohammed <mohammed.fawzi@ottawa.ca>
Subject: 949 North River Road - Boundary Condition Request

Good morning Mohammed,

We would like to request Boundary Conditions for 949 North River Road. The proposed development is a 5-storey apartment building with 48 units and 5,400 m^2 of floor area.

- The estimated fire flow is 12,000 L/min based on the FUS
- Average daily demand: 0.29 l/s.
- Maximum daily demand: 1.38 l/s.
- Maximum hourly daily demand: 2.09 l/s.

Attached is a map showing the proposed connection location along with the calculations prepared for the demands listed above.

If there are any questions, please feel free to contact me.

Thank you,
Bobby

Robert Freel, P.Eng.

Senior Project Manager, Land Development
115 Walgreen Road, Carp, ON K2E 6L5
T. 613.714.6174 | **C.** 613.915.3815
r.freel@mcintoshperry.com | www.mcintoshperry.com

McINTOSH PERRY

Turning Possibilities Into Reality

APPENDIX D
SANITARY CALCULATIONS

McINTOSH PERRY

McINTOSH PERRY

CCO-21-2796 - 949 North River Road - Sanitary Demands

Project:	949 North River Road	
Project No.:	CCO-21-2796	
Designed By:	RRR	
Checked By:	RDF	
Date:	07/19/2021	
Site Area:	0.17	gross ha
Average Unit	48	1.8 Persons per unit
Total Population	86	Persons
Commercial Area	0.00	m^2
Amenity Space	287.00	m^2

EXSTRANEOUS FLOW ALLOWANCES

Infiltration / Inflow	Flow (L/s)
Dry	0.01
Wet	0.05
Total	**0.06**

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS	NUMBER OF UNITS / AREA	Flow (L/s)
Residential	***280***	***L/c/d***	***218***	***0.28***
Industrial - Light**	35,000	L/gross ha/d		0
Industrial - Heavy**	55,000	L/gross ha/d		0
Commercial / Amenity	***2,500***	***L/(1000m² /d)***	***287.00***	***0.01***
Hospital	900	L/(bed/day)		0
Schools	70	L/(Student/d)		0
Trailer Parks no Hook-Ups	340	L/(space/d)		0
Trailer Park with Hook-Ups	800	L/(space/d)		0
Campgrounds	225	L/(campsite/d)		0
Mobile Home Parks	1,000	L/(Space/d)		0
Motels	150	L/(bed-space/d)		0
Hotels	225	L/(bed-space/d)		0
Tourist Commercial	28,000	L/gross ha/d		0
Other Commercial	28,000	L/gross ha/d		0

AVERAGE RESIDENCIAL FLOW	**0.71**	**L/s**
PEAK RESIDENCIAL FLOW	**2.84**	**L/s**
AVERAGE ICI FLOW	**0.01**	**L/s**
PEAK INSTITUTIONAL/COMMERCIAL FLOW	**0.01**	**L/s**
PEAK INDUSTRIAL FLOW **	**0.00**	**L/s**
TOTAL PEAK ICI FLOW	**0.01**	**L/s**

TOTAL SANITARY DEMAND

TOTAL ESTIMATED AVERAGE DRY WEATHER FLOW	**0.73**	**L/s**
TOTAL ESTIMATED PEAK DRY WEATHER FLOW	**2.91**	**L/s**
TOTAL ESTIMATED PEAK WET WEATHER FLOW	**2.97**	**L/s**

** PEAK INDUSTRIAL FLOW PER CITY OF OTTAWA SEWER DESIGN GUIDELINES APPENDIX 4B

SANITARY SEWER DESIGN SHEET

PROJECT: 949 North River Road - 5 Storey Building
LOCATION: Ottawa, Ontario
CLIENT: Gemstone Developments

McINTOSH PERRY

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			FLOW	SEWER DATA						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
STREET	AREA ID	FROM MH	TO MH	UNIT TYPES				AREA	POPULATION		PEAK FACTOR	PEAK FLOW (L/s)	AREA (ha)						PEAK FLOW (L/s)	AREA (ha)		FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	DIA (mm)	SLOPE (%)	VELOCITY (full) (m/s)	AVAILABLE CAPACITY	
				SF	SD	TH	APT	(ha)	IND	CUM			INSTITUTIONAL		COMMERCIAL		INDUSTRIAL			IND	CUM								L/s	(%)
													IND	CUM	IND	CUM	IND	CUM											
		BLD	*Ex. 225mm*				48	0.06	110.4	110.4	4.00	0.15	0.00	0.00	0.03	0.03	0.00	0.00	0.01	0.17	0.17	0.06	0.22	48.39	8.25	200	2.00	1.492	48.17	99.55

Design Parameters:

Residential			ICI Areas			
						Peak Factor
SF	3.4	p/p/u				
TH/SD	2.7	p/p/u	INST	28,000	L/Ha/day	1.5
APT	2.3	p/p/u	COM	28,000	L/Ha/day	1.5
Other	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart

Notes:

1. Mannings coefficient (n) =	0.013	
2. Demand (per capita):	280	L/day
3. Infiltration allowance:	0.33	L/s/Ha
4. Residential Peaking Factor:		
Harmon Formula = 1+(14/(4+P^0.5)*0.8)		
where P = population in thousands		

Designed: RRR

Checked: RDF

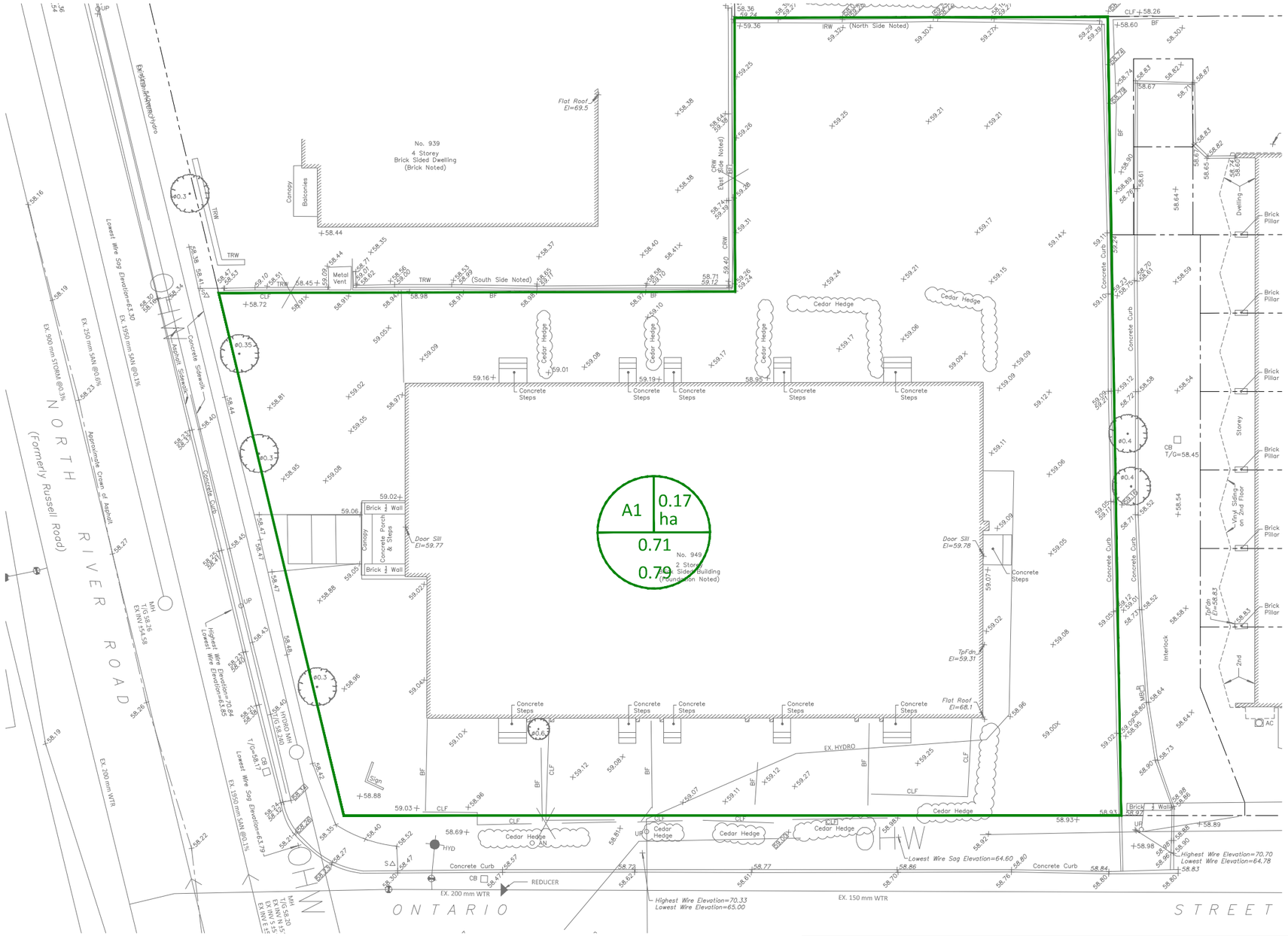
Project No.: CCO-21-2796

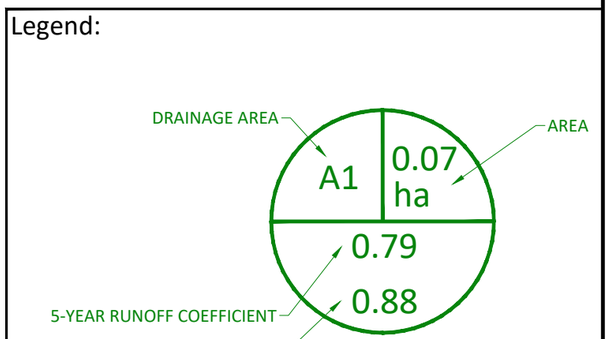
No.	Revision	Date
1.	Issued For Review	2021-09-22

Sheet No: 1 of 1

APPENDIX E
PRE-DEVELOPMENT DRAINAGE PLAN

McINTOSH PERRY





SCALE 1 : 250

0 5 10 15 20 25 Metres

McINTOSH PERRY
115 Walgreen Road, RR3, Carp, ON K0A 1L0
Tel: 613-836-2184 Fax: 613-836-3742
www.mcintoshperry.com

Client: GEMSTONE DEVELOPMENTS
252 ARGYLE STREET OTTAWA, ON K2P 1B9

Project: 5-STOREY RESIDENTIAL BUILDING
949 NORTH RIVER ROAD

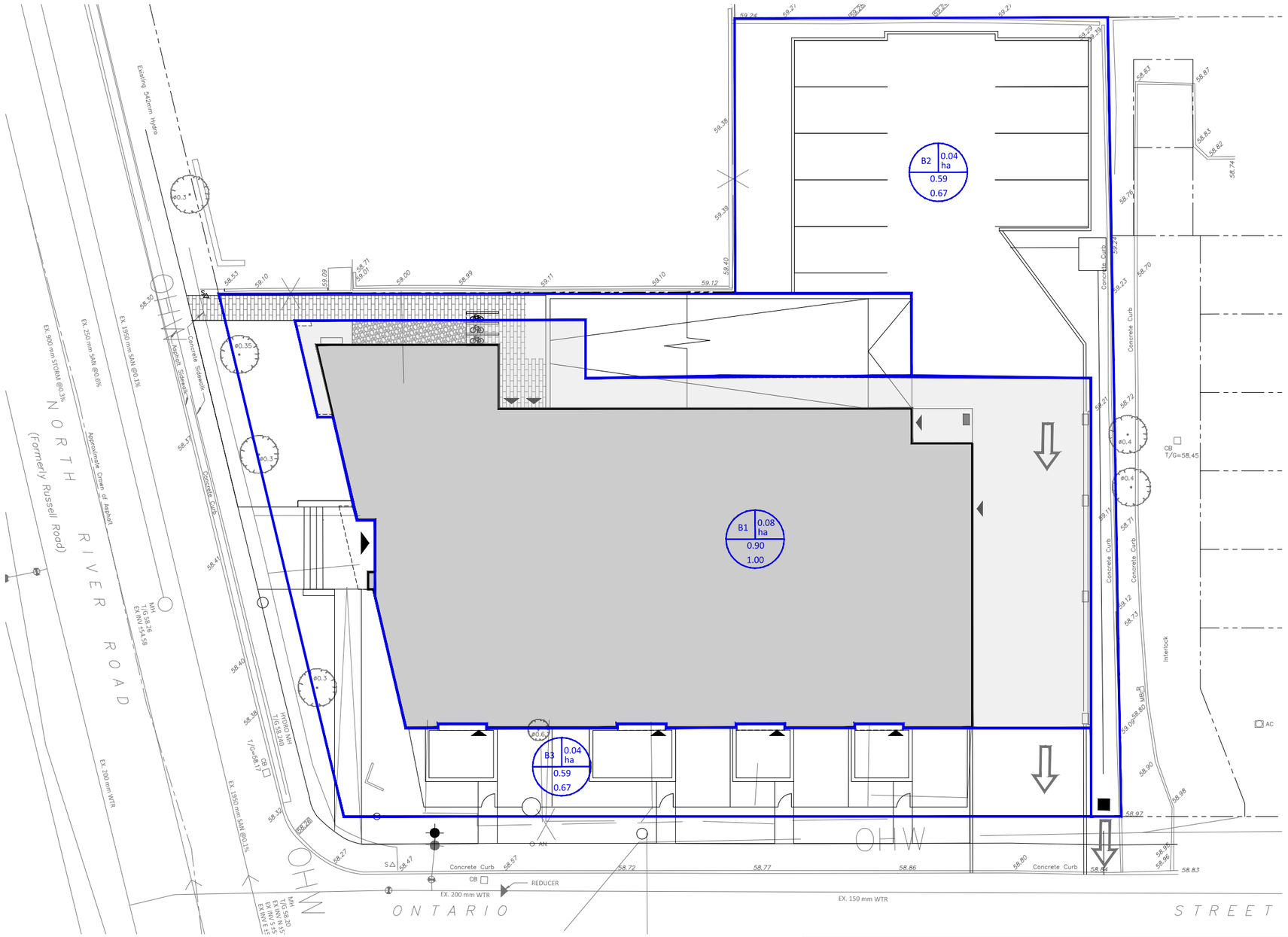
Drawing Title: PRE-DEVELOPMENT DRAINAGE AREA PLAN

Drawn by:	Checked By:				Drawing Number:
R.R.R.	R.D.F.				PRE
Scale: 1:250	Project Number: CCO-21-2796	1	ISSUED FOR REVIEW	SEPT 24, 2021	
		No.	Revisions	Date	

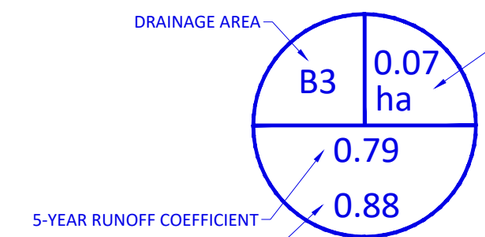
FILENAME:U:\Ottawa\01 Project - Proposals\2021 Jobs\CCO\CCO-21-2796 Gemstone - 949 N River Road\12 - Drawings\CCO-21-2796_Presentation.dwg
LAST SAVED: Tuesday, September 21, 2021 LAST SAVED BY: rrobineau
LAST PLOTTED: Wednesday, September 22, 2021 ETB ELEVATED

APPENDIX F
POST-DEVELOPMENT DRAINAGE PLAN

McINTOSH PERRY



Legend:



SCALE 1 : 250

0 5 10 15 20 25 Metres

N

McINTOSH PERRY
115 Walgreen Road, RR3, Carp, ON K0A 1L0
Tel: 613-836-2184 Fax: 613-836-3742
www.mcintoshperry.com

Client: GEMSTONE DEVELOPMENTS
252 ARGYLE STREET OTTAWA, ON K2P 1B9

Project: 5-STOREY RESIDENTIAL BUILDING
949 NORTH RIVER ROAD

Drawing Title: POST-DEVELOPMENT DRAINAGE AREA PLAN

Drawn by:	Checked By:				Drawing Number:
R.R.R.	R.D.F.				POST
Scale: 1:250	Project Number: CCO-21-2796	1	ISSUED FOR REVIEW	SEPT 24, 2021	
		No.	Revisions	Date	

FILENAME: U:\Ottawa\01 Project - Proposals\2021 Jobs\CCO\CCO-21-2796 Gemstone - 949 N River Road\12 - Drawings\CCO-21-2796_Presentation.dwg
LAST SAVED: Tuesday, September 21, 2021 LAST SAVED BY: rrobineau
LAST PLOTTED: Wednesday, September 22, 2021 CTB FILE USED:

APPENDIX G
STORMWATER MANAGEMENT CALCULATIONS

McINTOSH PERRY

CCO-21-2796 - 949 North River Road - Runoff Calculations

Pre-Development Runoff Coefficient

Drainage Area	Area (ha)	Impervious Area (m^2)	C	Gravel Area (m^2)	C	Pervious Area (m^2)	C	C_{AVG} 2/5-Year	C_{AVG} 100-Year
A1	0.168	1,210.51	0.90	0.00	0.60	464.98	0.20	0.71	0.79

Pre-Development Runoff Calculations

Drainage Area	Area (ha)	C 2/5-Year	C 100-Year	Tc (min)	I (mm/hr)			Q (L/S)		
					2-Year	5-Year	100-Year	2-Year	5-Year	100-Year
A1	0.168	0.71	0.79	10	76.8	104.2	178.6	25.25	34.25	65.86
Total	**0.168**							**25.25**	**34.25**	**65.86**

Post-Development Runoff Coefficient

Drainage Area	Area (ha)	Impervious Area (m^2)	C	Gravel Area (m^2)	C	Pervious Area (m^2)	C	C_{AVG} 2/5-Year	C_{AVG} 100-Year	
B1	0.084	839.80	0.90	0.00	0.60	0.00	0.20	0.90	1.00	Roof
B2	0.041	227.29	0.90	0.00	0.60	180.32	0.20	0.59	0.67	Restricted Parking Lot Area
B3	0.043	241.32	0.90	0.00	0.60	186.76	0.20	0.59	0.67	Unrestricted

Post-Development Runoff Calculations

Drainage Area	Area (ha)	C 2/5-Year	C 100-Year	Tc (min)	I (mm/hr)			Q (L/S)		
					2-Year	5-Year	100-Year	2-Year	5-Year	100-Year
B1	0.084	0.90	1.00	10	76.8	104.2	178.6	16.14	21.89	41.69
B2	0.041	0.59	0.67	10	76.8	104.2	178.6	5.14	6.97	13.52
B3	0.043	0.59	0.67	10	76.8	104.2	178.6	5.43	7.37	14.30
Total	**0.168**							**26.71**	**36.24**	**69.50**

Required Restricted Flow

Drainage Area	Area (ha)	C 5-Year	Tc (min)	I (mm/hr)	I (mm/hr)	Q (L/s)	Q (L/s)
				2-Year	5-Year	2-Year	5-Year
A1	0.168	0.50	10	76.8	104.2	**17.89**	**24.27**

Post-Development Restricted Runoff Calculations

Drainage Area	Unrestricted Flow (L/s)			Restricted Flow (L/S)			Storage Required (m^3)			Storage Provided (m^3)		
	2-Year	5-Year	100-Year	2-Year	5-Year	100-Year	2-Year	5-Year	100-Year	2-Year	5-Year	100-Year
B1	16.14	21.89	41.69	1.60	1.90	3.45	12.88	18.08	34.56	15.75	18.90	34.64
B2	5.14	6.97	13.52	1.50	1.80	3.00	4.14	3.48	7.32	11.56	11.56	11.56
B3	5.43	7.37	14.30	5.43	7.37	14.30						
Total	**26.71**	**36.24**	**69.50**	**8.53**	**11.07**	**20.75**	**17.02**	**21.56**	**41.88**	**27.30**	**30.45**	**46.20**

CCO-21-2796 - 949 North River Road - Runoff Calculations

Storage Requirements for Area B1

2-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	76.8	16.14	1.60	14.54	8.72
20	52.0	10.93	1.60	9.33	11.20
30	40.0	8.41	1.60	6.81	12.26
40	32.9	6.91	1.60	5.31	12.73
50	28.0	5.89	1.60	4.29	12.88
60	24.6	5.16	1.60	3.56	12.82
70	21.9	4.60	1.60	3.00	12.62
80	19.8	4.17	1.60	2.57	12.32
90	18.1	3.81	1.60	2.21	11.95
100	16.7	3.52	1.60	1.92	11.51

Maximum Storage Required 5-Year (m^3) =	12.88

5-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	104.2	21.89	1.90	19.99	12.00
20	70.3	14.76	1.90	12.86	15.43
30	53.9	11.33	1.90	9.43	16.98
40	44.2	9.28	1.90	7.38	17.72
50	37.7	7.91	1.90	6.01	18.03
60	32.9	6.92	1.90	5.02	18.08
70	29.4	6.17	1.90	4.27	17.94
80	26.6	5.58	1.90	3.68	17.67
90	24.3	5.10	1.90	3.20	17.30
100	22.4	4.71	1.90	2.81	16.85

Maximum Storage Required 5-Year (m^3) =	18.08

100-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	178.6	41.69	3.45	38.24	22.94
20	120.0	28.00	3.45	24.55	29.46
30	91.9	21.45	3.45	18.00	32.40
40	75.1	17.54	3.45	14.09	33.82
50	64.0	14.93	3.45	11.48	34.44
60	55.9	13.05	3.45	9.60	34.56
70	49.8	11.62	3.45	8.17	34.33
80	45.0	10.50	3.45	7.05	33.86

Maximum Storage Required 100-Year (m^3) =	34.56

Storage Occupied In Area B1

2-Year Storm Event

Roof Storage			
Location	**Area***	**Depth**	**Volume (m^3)**
Roof	629.85	0.025	15.75
		Total	15.75

Storage Available (m^3) =	**15.75**
Storage Required (m^3) =	**12.88**

5-Year Storm Event

Roof Storage			
Location	**Area***	**Depth**	**Volume (m^3)**
Roof	629.85	0.030	18.90
		Total	18.90

Storage Available (m^3) =	**18.90**
Storage Required (m^3) =	**18.08**

100-Year Storm Event

Roof Storage			
Location	**Area***	**Depth**	**Volume (m^3)**
Roof	629.85	0.055	34.64
		Total	34.64

Storage Available (m^3) =	**34.64**
Storage Required (m^3) =	**34.56**

*Area is 75% of the total roof area

Roof Drain Flow (B1)

Roof Drains Summary			
Type of Control Device	Watts Drianage - Accutrol Weir		
Number of Roof Drians	5		
	2-Year	5-Year	100-Year
Rooftop Storage (m^3)	15.75	18.90	34.64
Storage Depth (m)	0.025	0.030	0.055
Flow (Per Roof Drain) (L/s)	0.32	0.38	0.69
Total Flow (L/s)	1.60	1.90	3.45

Flow Rate Vs. Build-Up (One Weir)	
Depth (mm)	Flow (L/s)
15	0.19
20	0.25
25	0.32
30	0.38
35	0.44
40	0.50
45	0.57
50	0.63
55	0.69

*Roof Drain model to be Accutrol Weirs, See attached sheets

*Roof Drain Flow information taken from Watts Drainage website

CALCULATING ROOF FLOW EXAMPLES

2 roof drains during a 5 year storm
elevation of water = 30mm
Flow leaving 2 roof drains = (2 x 0.36 L/s) = 0.72 L/s

2 roof drains during a 100 year storm
elevation of water = 45mm
Flow leaving 2 roof drains = (2 x 0.54 L/s) = 1.08 L/s

	Roof Drain Flow		
	Flow (l/s)	Storage Depth (mm)	Drains Flow (l/s)
	0.19	15	0.95
	0.25	20	1.25
2-Year	**0.32**	**25**	**1.60**
5-Year	**0.38**	**30**	**1.90**
	0.44	35	2.20
	0.50	40	2.50
	0.57	45	2.85
	0.63	50	3.15
100-Year	**0.69**	**55**	**3.45**
	0.76	60	3.80
	0.82	65	4.10
	0.88	70	4.40
	0.95	75	4.75
	1.01	80	5.05
	1.07	85	5.35
	1.13	90	5.65
	1.20	95	6.00
	1.26	100	6.30
	1.32	105	6.60
	1.39	110	6.95
	1.45	115	7.25
	1.51	120	7.55
	1.58	125	7.90
	1.64	130	8.20
	1.70	135	8.50
	1.76	140	8.80
	1.83	145	9.15
	1.89	150	9.45

Note: The flow leaving through a restricted roof drain is based on flow vs. head information

CCO-21-2796 - 949 North River Road Storage Requirements for Area B2

Storage Requirements for Area B2

5-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	76.8	5.14	0.14	5.00	3.00
12	69.9	4.68	0.14	4.54	3.27
14	64.2	4.30	0.14	4.16	3.49
16	59.5	3.98	0.14	3.84	3.69
18	55.5	3.71	0.14	3.57	3.86
20	52.0	3.48	0.14	3.34	4.01
22	49.0	3.28	0.14	3.14	4.14

Maximum Storage Required 5-Year (m^3) =	4.14

5-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	104.2	6.97	1.80	5.17	3.10
12	94.7	6.33	1.80	4.53	3.26
14	86.9	5.82	1.80	4.02	3.37
16	80.5	5.38	1.80	3.58	3.44
18	75.0	5.02	1.80	3.22	3.47
20	70.3	4.70	1.80	2.90	3.48
22	66.1	4.42	1.80	2.62	3.46

Maximum Storage Required 5-Year (m^3) =	3.48

100-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	178.6	13.52	3.00	10.52	6.31
12	162.1	12.28	3.00	9.28	6.68
14	148.7	11.26	3.00	8.26	6.94
16	137.5	10.42	3.00	7.42	7.12
18	128.1	9.70	3.00	6.70	7.23
20	120.0	9.08	3.00	6.08	7.30
22	112.9	8.55	3.00	5.55	7.32

Maximum Storage Required 100-Year (m^3) =	7.32

Storage Available in Drainage Trench Void Space and Perforated Storm Pipe

Length (m)	Width (m)	Height (m)	Void Fraction	Pipe Diameter (m)
29.67	0.90	1.00	0.40	0.25

$$V = (At-Ap)*Vf*L+Vp$$

V= Storage Available
At = Trench Area Above Pipe Invert
Ap = Pipe Area
Vf = Void Fraction of 25 mm Clear Stone

L= Trench Length

Vp= Volume of Pipe

V = $((0.90*1.00)-(PI(0.25/2)^2)*0.4*29.67+((PI(0.25/2)^2)*29.67)$

2 Year Storage Summary

Storage Available (m^3) =	**11.6**
Storage Required (m^3) =	**4.1**

* Storage Available in Drainage Trench Void Space and Perforated Stc

5 Year Storage Summary

Storage Available (m^3) =	**11.6**
Storage Required (m^3) =	**3.5**

* Storage Available in Drainage Trench Void Space and Perforated Stc

100 Year Storage Summary

Storage Available (m^3) =	**11.6**
Storage Required (m^3) =	**7.3**

* Storage Available in Drainage Trench Void Space and Perforated Stc

Time of Concentration Pre-Development

Drainage Area ID	Sheet Flow Distance (m)	Slope of Land (%)	Tc (min) (5-Year)	Tc (min) (100-Year)
A1	**39**	**0.76**	7	5

Therefore, a Tc of 10 can be used

Tc= (3.26(1.1-c)L^0.5/S^0.33)

c= Blanced Runoff Coefficient

L= Length of drainage area

S= Average slope of watershed

Adjustable Accutrol Weir

Tag: _____

Adjustable Flow Control for Roof Drains

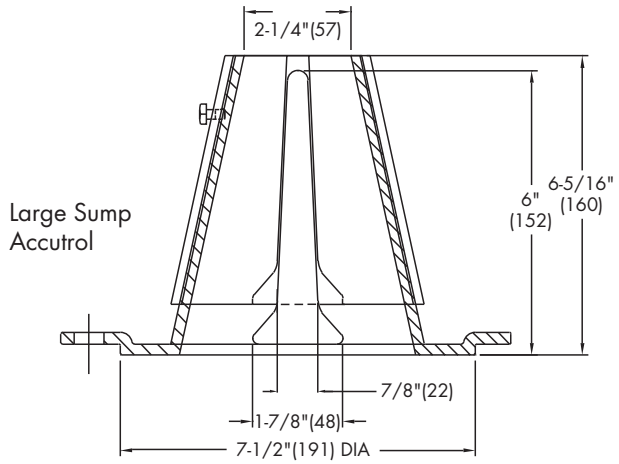
ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)

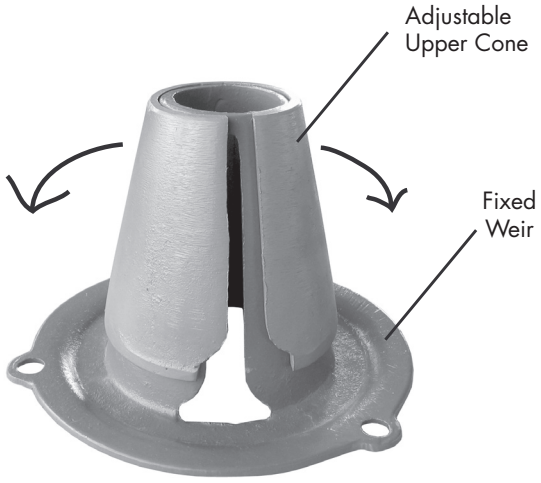
For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the 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

A Watts Water Technologies Company

filterra™
Bioretention Systems

Filterra™ Stormwater Bioretention Filtration System

The Urban Solution for LID

The Filterra™ System

The Filterra System is similar in concept to bioretention in its function and applications but has been optimized for high volume/flow treatment and high pollutant removal. Its small footprint allows it to be used on highly developed sites such as landscaped areas, parking lots and streetscapes. Filterra is exceedingly adaptable and can be used alone or in combination with other BMPs.

Stormwater runoff enters the Filterra System through a curb-inlet opening and flows through a specially designed filter media mixture contained in a landscaped concrete container. The filter media captures and immobilizes pollutants; those pollutants are then decomposed, volatilized and incorporated into the biomass of the Filterra system's micro/macro fauna and flora. Stormwater runoff flows through the media and into an underdrain system at the bottom of the container, where the treated water is discharged.

Features and Benefits

Verified Performance. Multiple third-party field tests confirmed Filterra meets regulatory requirements with verified pollutant removal under TAPE, TARP, and NJCAT testing.

Regulatory Compliance. Third party field testing confirmed that Filterra meets state regulatory requirements for pollutant removal under TAPE and TARP testing.

Aesthetics. Landscaping enhances the appearance of your site making it more attractive while removing pollutants.

Maintenance. Maintenance is simple and safe (no confined space access), and the first year is included with the purchase of every system.

Versatile. Filterra is ideal for both new construction and urban retrofits, as well as:

- **Streetscapes**
- **Parking lots**
- **Highways**
- **Urban settings**
- **Roof drains**

Maintenance. Maintenance is simple and safe (no confined space access), and the first year is included with the purchase of every system.

Design Support. Our engineers can assist you with all aspects of each Filterra application, including flora selection and sizing.[1]

LEED. Obtain up to 12 points for LEED Certification.

A Highly Effective System

Filterra is well-suited for the ultra-urban environment with proven high removal efficiency for many toxic substances such as petroleum and heavy metals.

Filterra™ monitoring unit at a port.

Expected Pollutant Removal

(Ranges Varying with Particle Size, Pollutant Loading and Site Conditions)

TSS Removal	85%
Phosphorus Removal	60% - 70%
Nitrogen Removal	43%
Total Copper Removal	> 58%
Dissolved Copper Removal	46%
Total Zinc Removal	> 66%
Dissolved Zinc Removal	58%
Oil & Grease	> 93%

Information on the pollutant removal efficiency of the filter soil/plant media is based on third party lab and field studies.

Printed on FSC certified paper.

[1] For more details, see the Sizing Table for your project's region.


Maintenance is simple and safe.

filterra™
Bioretention Systems

Filterra™ Stormwater Bioretention Filtration System

The Urban Solution for LID

Design Assistance

Visit **www.imbriumsystems.com** for details and design tools including example layouts, detail drawings, specifications, product design worksheet, and other essential design information.

Ontario Sizing Table

Filterra Size	Max Design Imp Area	
mm	m2	ha
1219 x 1219	350	0.035
1829 x 1524	460	0.046
2438 x 2438	1,440	0.144
3048 x 3048	2.040	0.204

NOTE: Sizing basis is using Toronto rainfall data (Station ID 0100) & continuous simulation, and Filterra's testing infiltration rate.

1. Determine Filterra locations (with effective bypass and appropriate slope < 4%) using example layout details.
2. Determine contributing drainage areas to each Filterra.
3. Choose the corresponding Filterra size from the above Sizing Table. Contact Imbrium for site specific sizing if required.
4. For best results, get us involved early in the design process. Please complete a Product Design Worksheet and include plans for placement and application review.

Proper Placement

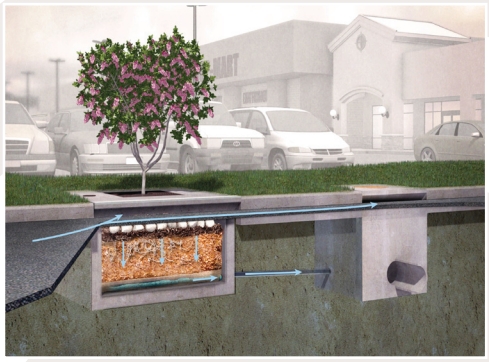
1. Filterra should be placed on grade (not in a sump condition) with a downstream bypass structure to accommodate flows from higher intensity rainfall events.
2. To prevent scour and resuspension of collected pollutants, cross linear flow (left-to-right or right-to-left) into the Filterra throat opening is recommended. "Head-on" flow into the curb inlet is not recommended.

Cold Climate Considerations

Bioretention systems such as Filterra rely on the vegetation to assist in pollutant removal. Winter road clearing efforts can wreak havoc on roadside landscaping and stormwater structures. For the best performance, Imbrium recommends the following:

1. Use salt tolerant plants. Refer to Imbrium's recommended plant list for Filterra systems.
2. Consider using taller species for system visibility and identification during large snow events.
3. Perform maintenance at the end of winter just prior to the growing season to remove mulch contaminated with winter sands and salts. Flush system with water to wash out any remaining salt.

Filterra Placement Example


Filterra System showing curb-inlet opening.

Placement Review

Because we want your project with Filterra to be a great success, we respectfully require that each Filterra project be reviewed by Imbrium's engineering staff. This review is mandatory, as proper placement ensures you of the most efficient and cost effective solution, as well as optimum performance and minimal maintenance.

imbrium®
Imbrium Systems Inc.
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info@imbriumsystems.com | www.imbriumsystems.com/filterra

Volume III: TEMPEST INLET CONTROL DEVICES

Municipal Technical Manual Series

SECOND EDITION

LMF (Low to Medium Flow) ICD

HF (High Flow) ICD

MHF (Medium to High Flow) ICD

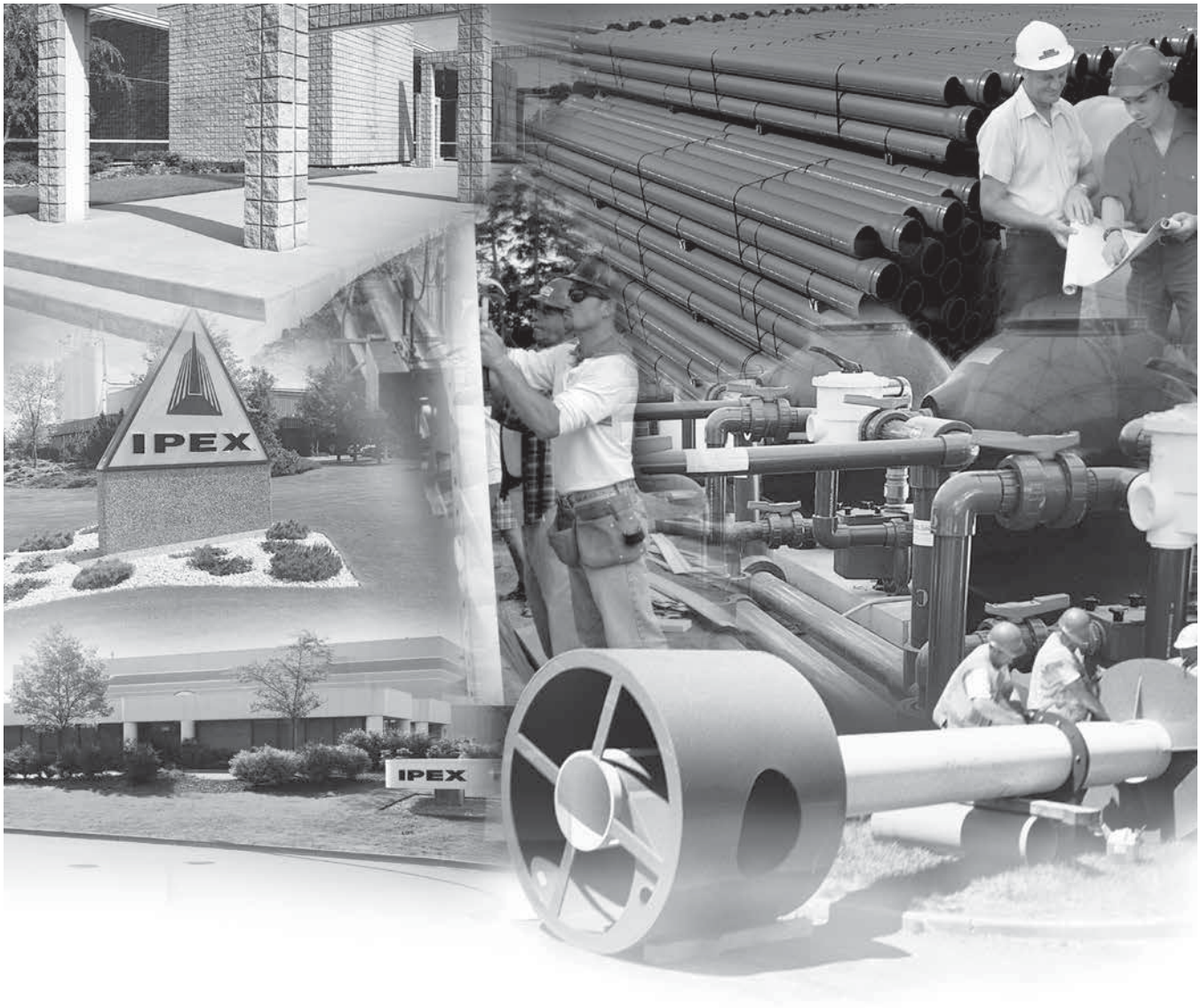
IPEX by aliaxis

IPEX Tempest™ Inlet Control Devices

Municipal Technical Manual Series

Vol. I, 2nd Edition

For information contact: IPEX, Marketing,
1425 North Service Road East, Oakville, Ontario, Canada, L6H 1A7



ABOUT IPEX

At IPEX, we have been manufacturing non-metallic pipe and fittings since 1951. We formulate our own compounds and maintain strict quality control during production. Our products are made available for customers thanks to a network of regional stocking locations throughout North America. We offer a wide variety of systems including complete lines of piping, fittings, valves and custom-fabricated items.

More importantly, we are committed to meeting our customers' needs. As a leader in the plastic piping industry, IPEX continually develops new products, modernizes manufacturing facilities and acquires innovative process technology. In addition, our staff take pride in their work, making available to customers their extensive thermoplastic knowledge and field experience. IPEX personnel are committed to improving the safety, reliability and performance of thermoplastic materials. We are involved in several standards committees and are members of and/or comply with the organizations listed on this page.

For specific details about any IPEX product, contact our customer service department.

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PRODUCT INFORMATION: TEMPEST LOW, MEDIUM FLOW (LMF) ICD

Purpose

To control the amount of storm water runoff entering a sewer system by allowing a specified flow volume out of a catch basin or manhole at a specified head. This approach conserves pipe capacity so that catch basins downstream do not become uncontrollably surcharged, which can lead to basement floods, flash floods and combined sewer overflows.

Product Description

Our LMF ICD is designed to accommodate catch basins or manholes with sewer outlet pipes 6" in diameter and larger. Any storm sewer larger than 12" may require custom modification. However, IPEX can custom build a TEMPEST device to accommodate virtually any storm sewer size.

Available in 14 preset flow curves, the LMF ICD has the ability to provide flow rates: 2lps – 17lps (31gpm – 270gpm)

Product Function

The LMF ICD vortex flow action allows the LMF ICD to provide a narrower flow curve using a larger orifice than a conventional orifice plate ICD, making it less likely to clog. When comparing flows at the same head level, the LMF ICD has the ability to restrict more flow than a conventional ICD during a rain event, preserving greater sewer capacity.

Product Construction

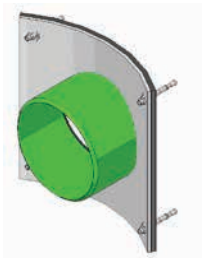
Constructed from durable PVC, the LMF ICD is light weight 8.9 Kg (19.7 lbs).

Product Applications

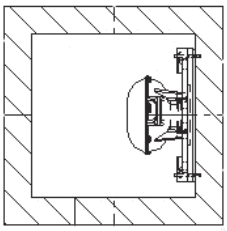
Will accommodate both square and round applications:

Square Application

Round Application



Universal
Mounting Plate



Spigot CB
Wall Plate

Universal
Mounting
Plate Hub
Adapter

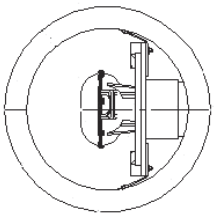


Chart 1: LMF 14 Preset Flow Curves

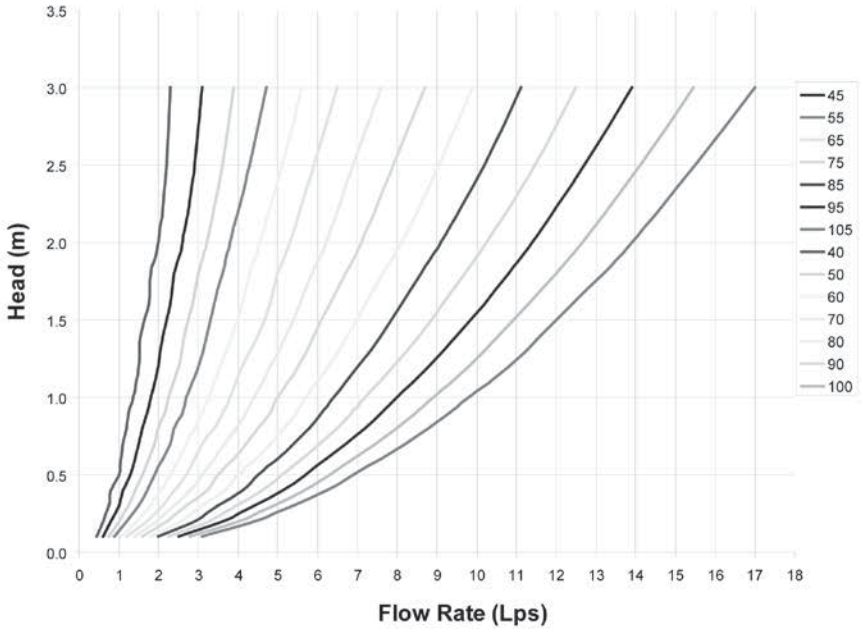
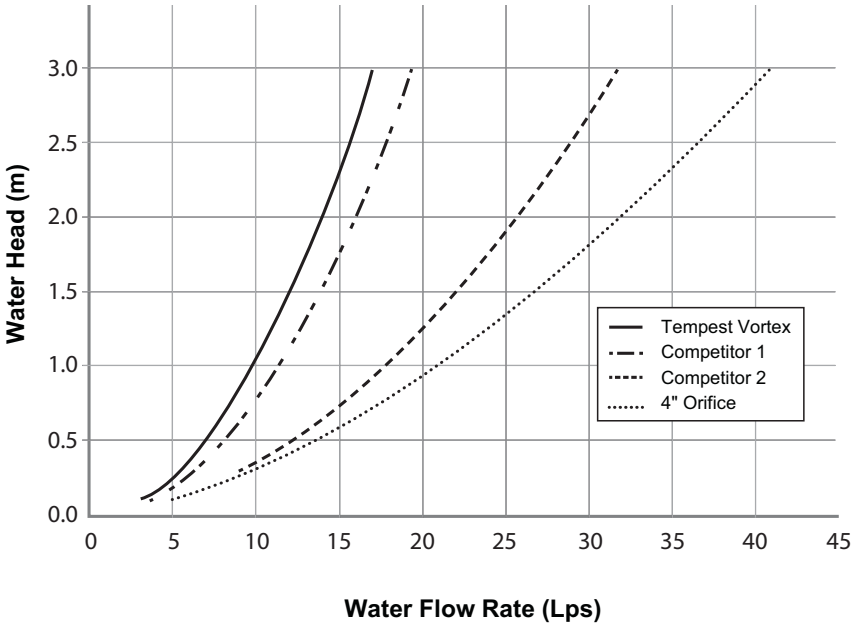


Chart 2: LMF Flow vs. ICD Alternatives



PRODUCT INSTALLATION

Instructions to assemble a TEMPEST LMF ICD into a Square Catch Basin:

STEPS:

1. Materials and tooling verification:
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers, (4) nuts, universal mounting plate, ICD device.
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a minimum of 1-1/2" depth up to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the universal mounting plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From the ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the universal mounting plate and has created a seal.

⚠ WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- Call your IPEX representative for more information or if you have any questions about our products.

Instructions to assemble a TEMPEST LMF ICD into a Round Catch Basin:

STEPS:

1. Materials and tooling verification.
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers and (4) nuts, spigot CB wall plate, universal mounting plate hub adapter, ICD device.
2. Use the spigot catch basin wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a depth between 1-1/2" to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the CB spigot wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the spigot wall plate and the catch basin wall.
6. Apply solvent cement on the hub of the universal mounting plate, hub adapter and the spigot of the CB wall plate, then slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the universal mounting plate hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the mounting plate and has created a seal.

⚠ WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut back the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at ipexna.com.
- Call your IPEX representative for more information or if you have any questions about our products.

NOTE: Do not use or test the products in this manual with compressed air or other gases including air-over-water-boosters

PRODUCT TECHNICAL SPECIFICATION

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook will be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above must not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices will consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's shall have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

PRODUCT INFORMATION: TEMPEST HF & MHF ICD

Product Description

Our HF, HF Sump and MHF ICD's are designed to accommodate catch basins or manholes with sewer outlet pipes 6" in diameter or larger. Any storm sewer larger than 12" may require custom modification. However, IPEX can custom build a TEMPEST device to accommodate virtually any storm sewer size.

Available in 5 preset flow curves, these ICDs have the ability to provide constant flow rates: 9lps (143 gpm) and greater

Product Function

TEMPEST HF (High Flow): designed to manage moderate to higher flows 15 L/s (240 gpm) or greater and prevent the propagation of odour and floatables. With this device, the cross-sectional area of the device is larger than the orifice diameter and has been designed to limit head losses. The HF ICD can also be ordered without flow control when only odour and floatable control is required.

TEMPEST HF (High Flow) Sump: The height of a sewer outlet pipe in a catch basin is not always conveniently located. At times it may be located very close to the catch basin floor, not providing enough sump for one of the other TEMPEST ICDs with universal back plate to be installed. In these applications, the HF Sump is offered. The HF Sump offers the same features and benefits as the HF ICD; however, is designed to raise the outlet in a square or round catch basin structure. When installed, the HF sump is fixed in place and not easily removed. Any required service to the device is performed through a clean-out located in the top of the device which can be often accessed from ground level.

TEMPEST MHF (Medium to High Flow): The MHF plate or plug is designed to control flow rates 9 L/s (143 gpm) or greater. It is not designed to prevent the propagation of odour and floatables.

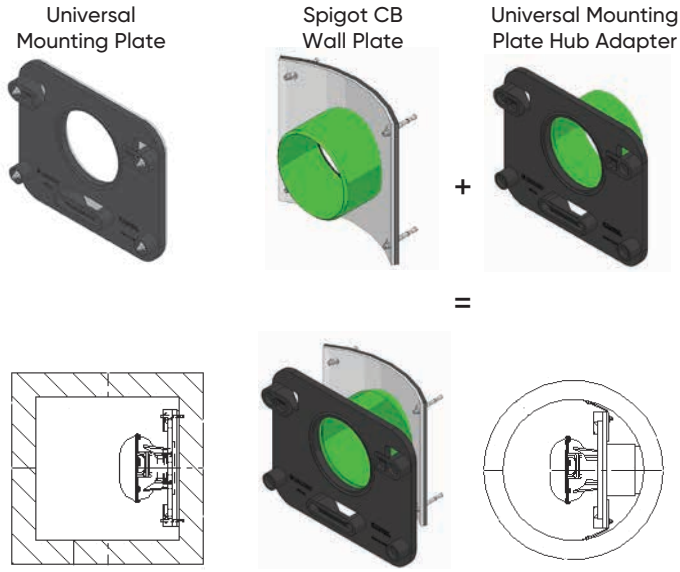
Product Construction

The HF, HF Sump and MHF ICDs are built to be light weight at a maximum weight of 6.8 Kg (14.6 lbs).

Product Applications

The HF and MHF ICD's are available to accommodate both square and round applications:

Square Application **Round Application**



The HF Sump is available to accommodate low to no sump applications in both square and round catch basins:

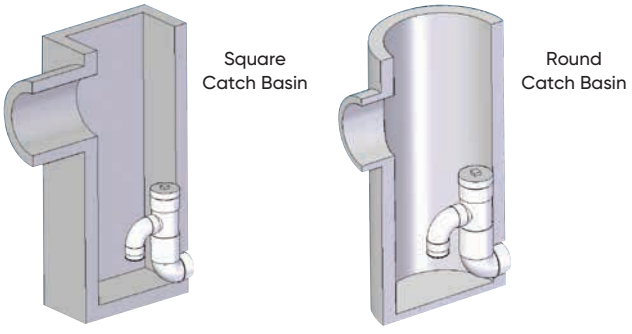
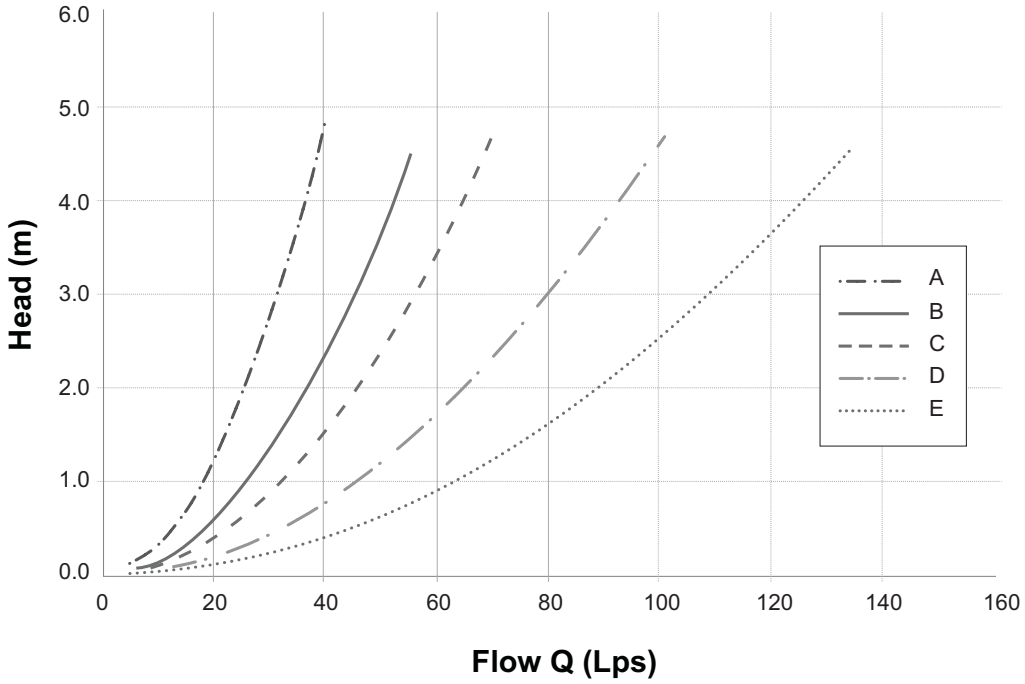


Chart 3: HF & MHF Preset Flow Curves



PRODUCT INSTALLATION

Instructions to assemble a TEMPEST HF or MHF ICD into a Square Catch Basin:

1. Materials and tooling verification:
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers, (4) nuts, universal mounting plate, ICD device
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a minimum of 1-1/2" depth up to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the universal wall mounting plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From the ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the universal wall mounting plate and has created a seal.

⚠ WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- Call your IPEX representative for more information or if you have any questions about our products.

Instructions to assemble a TEMPEST HF or MHF ICD into a Round Catch Basin:

STEPS:

1. Materials and tooling verification.
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level and marker.
   - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers and (4) nuts, spigot CB wall plate, universal mounting plate hub adapter, ICD device.
2. Use the round catch basin spigot adaptor to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a depth between 1-1/2" to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the spigot CB wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the spigot CB wall plate and the catch basin wall.
6. Put solvent cement on the hub of the universal mounting plate, hub adapter and the spigot of the CB wall plate, then slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the wall mounting plate and has created a seal.

⚠ WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.
- Call your IPEX representative for more information or if you have any questions about our products.

NOTE: Do not use or test the products in this manual with compressed air or other gases including air-over-water-boosters

Instructions to assemble a TEMPEST HF Sump into a Square or Round Catch Basin:

STEPS:

1. Materials and tooling verification:
   - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, mastic tape and metal strapping
   - Material: (2) concrete anchor 3/8 x 3-1/2, (2) washers, (2) nuts, HF Sump pieces (2).
2. Apply solvent cement to the spigot end of the top half of the sump. Apply solvent cement to the hub of the bottom half of the sump. Insert the spigot of the top half of the sump into the hub of the bottom half of the sump.
3. Install the 8" spigot of the device into the outlet pipe. Use the mastic tape to seal the device spigot into the outlet pipe. You should use a level to be sure that the fitting is standing at the vertical.
4. Use an impact drill with a 3/8" concrete bit to make a series of 2 holes along each side of the body throat. The depth of the hole should be between 1-1/2" to 2-1/2". Clean the concrete dust from the 2 holes.
5. Install the anchors (2) in the holes by using a hammer. Put the nuts on the top of the anchors to protect the threads when you hit the anchors. Remove the nuts from the ends of the anchors.
6. Cut the metal strapping to length and connect each end of the strapping to the anchors. Screw the nuts in place with a maximum torque of 40 N.m (30 lbf-ft). The device should be completely flush with the catch basin wall.

⚠ WARNING

- **Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.**
- **The solvent cement which is used in this installation is to be approved for PVC.**
- **The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.**
- **Call your IPEX representative for more information or if you have any questions about our products.**

PRODUCT TECHNICAL SPECIFICATION

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control where specified. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook shall be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above shall not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices shall consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's shall have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

NOTES

SALES AND CUSTOMER SERVICE

IPEX USA LLC
Toll Free: (800) 463-9572
ipexna.com

About the IPEX Group of Companies

As leading suppliers of thermoplastic piping systems, the IPEX Group of Companies provides our customers with some of the largest and most comprehensive product lines. All IPEX products are backed by more than 50 years of experience. With state-of-the-art manufacturing facilities and distribution centers across North America, we have established a reputation for product innovation, quality, end-user focus and performance.

Markets served by IPEX group products are:

- Electrical systems
- Telecommunications and utility piping systems
- PVC, CPVC, PP, ABS, PEX, FR-PVDF and PE pipe and fittings (1/4" to 48")
- Industrial process piping systems
- Municipal pressure and gravity piping systems
- Plumbing and mechanical piping systems
- PE Electrofusion systems for gas and water
- Industrial, plumbing and electrical cements
- Irrigation systems

Products manufactured by IPEX Inc. and distributed in the United States by IPEX USA LLC.

IPEX by aliaxis

MNMNTPIP110817U

STORM SEWER DESIGN SHEET

PROJECT: 949 North River Road
LOCATION: Ottawa, Ontario
CLIENT: Gemstone Developments

McINTOSH PERRY

LOCATION				CONTRIBUTING AREA (ha)								RATIONAL DESIGN FLOW											SEWER DATA								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
STREET	AREA ID	FROM MH	TO MH	C-VALUE						INDIV AC	CUMUL AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm)			SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr)	
				0.20	0.60	0.79	0.85	0.87	0.90																DIA	W	H			(L/s)	(%)
	B1	BLDG	Tee						0.08	0.08	0.08	10.00	0.11	10.11	104.19	122.14	178.56	21.89				21.89	87.74	11.92	250			2.00	1.731	65.84	75.05%

Definitions:
Q = 2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820] 100 YEAR

Notes:
1. Mannings coefficient (n) = 0.013

Designed: R.R.R.

Checked: R.D.F.

Project No.: CCO-21-2796

No.	Revision	Date
1.	Issued for review	2021-09-22

Sheet No: 1 of 1

APPENDIX H
CITY OF OTTAWA DESIGN CHECKLIST

McINTOSH PERRY

City of Ottawa

4. Development Servicing Study Checklist

The following section describes the checklist of the required content of servicing studies. It is expected that the proponent will address each one of the following items for the study to be deemed complete and ready for review by City of Ottawa Infrastructure Approvals staff.

The level of required detail in the Servicing Study will increase depending on the type of application. For example, for Official Plan amendments and re-zoning applications, the main issues will be to determine the capacity requirements for the proposed change in land use and confirm this against the existing capacity constraint, and to define the solutions, phasing of works and the financing of works to address the capacity constraint. For subdivisions and site plans, the above will be required with additional detailed information supporting the servicing within the development boundary.

4.1 General Content

Criteria	Location (if applicable)
☐ Executive Summary (for larger reports only).	N/A
☐ Date and revision number of the report.	On Cover
☐ Location map and plan showing municipal address, boundary, and layout of proposed development.	Appendix A
☐ Plan showing the site and location of all existing services.	Site Servicing Plan (C101)
☐ Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	1.1 Purpose 1.2 Site Description 6.0 Stormwater Management
☐ Summary of pre-consultation meetings with City and other approval agencies.	Appendix B
☐ Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	1.1 Purpose 1.2 Site Description 6.0 Stormwater Management
☐ Statement of objectives and servicing criteria.	3.0 Pre-Consultation Summary

☐ Identification of existing and proposed infrastructure available in the immediate area.	N/A
☐ Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	Site Grading, Drainage, Sediment & Erosion Control Plan (C101)
☐ Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	Site Grading, Drainage, Sediment & Erosion Control Plan (C101)
☐ Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	N/A
☐ Proposed phasing of the development, if applicable.	N/A
☐ Reference to geotechnical studies and recommendations concerning servicing.	Section 2.0 Background Studies, Standards and References
☐ All preliminary and formal site plan submissions should have the following information: ○ Metric scale ○ North arrow (including construction North) ○ Key plan ○ Name and contact information of applicant and property owner ○ Property limits including bearings and dimensions ○ Existing and proposed structures and parking areas ○ Easements, road widening and rights-of-way ○ Adjacent street names	Site Grading, Drainage, Sediment & Erosion Control Plan (C101)

4.2 Development Servicing Report: Water

Criteria	Location (if applicable)
☐ Confirm consistency with Master Servicing Study, if available	N/A
☐ Availability of public infrastructure to service proposed development	N/A
☐ Identification of system constraints	N/A
☐ Identify boundary conditions	Appendix C
☐ Confirmation of adequate domestic supply and pressure	N/A
☐ Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Appendix C
☐ Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	N/A
☐ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	N/A
☐ Address reliability requirements such as appropriate location of shut-off valves	N/A
☐ Check on the necessity of a pressure zone boundary modification.	N/A
☐ Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	Appendix C

☐ Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	Site Servicing Plan (C101)
☐ Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A
☐ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Appendix C
☐ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N/A

4.3 Development Servicing Report: Wastewater

Criteria	Location (if applicable)
☐ Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	N/A
☐ Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A
☐ Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A
☐ Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 5.2 Proposed Sanitary Sewer

☐ Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	Section 5.3 Proposed Sanitary Design
☐ Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	N/A
☐ Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 5.2 Proposed Sanitary Sewer
☐ Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A
☐ Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	N/A
☐ Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A
☐ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A
☐ Special considerations such as contamination, corrosive environment etc.	N/A

4.4 Development Servicing Report: Stormwater Checklist

Criteria	Location (if applicable)
☐ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 6.0 Stormwater Sewer Design & Section 7.0 Proposed Stormwater Management
☐ Analysis of available capacity in existing public infrastructure.	N/A
☐ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Pre & Post-Development Plans
☐ Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5-year event (dependent on the receiving sewer design) to 100-year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Section 6.0 Stormwater Sewer Design & Section 7.0 Proposed Stormwater Management
☐ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 6.0 Stormwater Sewer Design & Section 7.0 Proposed Stormwater Management
☐ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.	Section 6.0 Stormwater Sewer Design & Section 7.0 Proposed Stormwater Management
☐ Set-back from private sewage disposal systems.	N/A
☐ Watercourse and hazard lands setbacks.	N/A
☐ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	N/A
☐ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	N/A
☐ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5-year return period) and major events (1:100-year return period).	Appendix G

☐ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	Site Grading, Drainage, Sediment & Erosion Control Plan
☐ Calculate pre-and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Section 7.0 Proposed Stormwater Management Appendix G
☐ Any proposed diversion of drainage catchment areas from one outlet to another.	Section 6.0 Stormwater Sewer Design & Section 7.0 Proposed Stormwater Management
☐ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Section 6.0 Stormwater Sewer Design & Section 7.0 Proposed Stormwater Management
☐ If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	N/A
☐ Identification of potential impacts to receiving watercourses	N/A
☐ Identification of municipal drains and related approval requirements.	N/A
☐ Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 6.0 Stormwater Sewer Design & Section 7.0 Proposed Stormwater Management
☐ 100-year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	Site Grading, Drainage, Sediment & Erosion Control Plan (C101)
☐ Inclusion of hydraulic analysis including hydraulic grade line elevations.	N/A

☐ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 8.0 Sediment & Erosion Control
☐ Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A
☐ Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

4.5 Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

Criteria	Location (if applicable)
☐ Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	N/A
☐ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	N/A
☐ Changes to Municipal Drains.	N/A
☐ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	N/A

4.6 Conclusion Checklist

Criteria	Location (if applicable)
☐ Clearly stated conclusions and recommendations	Section 9.0 Summary Section 10.0 Recommendations
☐ Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	All are stamped
☐ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	All are stamped