Site Servicing and Stormwater Management Report 177-179 Armstrong Street, Ottawa, ON

Client:
MCCORMICK PARK DEVELOPMENTS INC.
P.O. Box 74155 Beechwood Ave
Ottawa, ON, K1M 2H9

Submitted for:
Site Plan Control

Project Name:
177-179 Armstrong Street

Project Number:
OTT-00252997-A0

Prepared By:
EXP
2650 Queensview Drive
Ottawa, ON K2B 8H8
t: +1.613.688.1899
f: +1.613.225.7337

Date Submitted:
April 27, 2020

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f: +1.613.225.7337

Prepared by:

Jason Fitzpatrick, P.Eng.
Project Engineer

Approved by:

Bruce Thomas, P.Eng.
Senior Project Manager

LICENSED PROFESSIONAL ENGINEER
B. M. THOMAS
2020-05-01
PROVINCE OF ONTARIO

Date Submitted:
April 27, 2020

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1 Introduction

1.1 Overview

EXP Services Inc. (EXP) was retained by McCormick Park Developments Inc. to prepare a Site Servicing and Stormwater Management Report for the proposed redevelopment of 177-179 Armstrong Street in support of a Site Plan Application.

The 0.143-hectare site is situated north of the intersection of McCormick Street and Armstrong Street as illustrated in **Figure 1-1** below. The site is inside the Greenbelt and situated in Ward 15 (Kitchissippi). The description of the subject property is noted below:

- Part of Lots 6, Registered Plan 83, in the City of Ottawa, consisting of:
- PIN 040940109 or 177-179 Armstrong Street.
- PIN 04094-0152 or 268 Carruthers Avenue (Part of property taken for proposed development)

The proposed site development will consist of an apartment building comprised of 33 units, consisting of a mix of 1-bedroom, and 2-bedroom, and studio apartments.

This report will discuss the adequacy of the adjacent municipal watermain, sanitary sewers and storm sewers to provide the required water supply, convey the sewage and stormwater flows that will result from the proposed development. This report provides a design brief for submission, along with the engineering drawings, for City approval.

Figure 1-1 - Site Location

2 Existing Conditions

Within the property, there are three (3) existing buildings. The following summarizes the current land use conditions.

- 177 Armstrong Street — Abandoned single home and small business with a large gravel parking area.
- 268 Carruthers Ave — Abandoned single home

The topography of the subject site falls in a southerly direction along Armstrong Street.

3 Existing Infrastructure

The site includes two single homes and a single commercial building that will be removed during the redevelopment of the site.

From review of the sewer and watermain mapping, as-built drawings and Utility Central Registry (UCC) plans, the following summarizes the onsite and adjacent offsite infrastructure:

Within property (177 Armstrong)

- Storm, sanitary and watermain laterals to the property that will be abandoned

On Armstrong Street

- 200mm watermain
- 300mm sanitary sewer
- 300mm storm sewer
- Gas / Bell / Streetlighting/ Hydro

As-built drawings for Armstrong Street were obtained from the City's vault and are included in **Appendix F**.

3.1 Pre-Consultation / Permits / Approvals

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

The proposed site is located within the Rideau Valley Conservation Authority (RVCA) jurisdiction, therefore signoff from the RVCA will be required prior to Site Plan approval. The RVCA has been contacted to confirm the stormwater management quality control requirements. A copy of the correspondence with the RCVA is attached in **Appendix E**.

Generally, an Environmental Compliance Approval (ECA) would be obtained from the Ministry of Environment, Conservation and Parks (MECP), formerly the Ministry of the Environment and Climate Change (MOECC), for any onsite private Sewage Works.

The onsite Sewage Works would generally include the onsite stormwater works such as flow controls, associated stormwater detention, and treatment works. However, an Approval Exemption under Ontario Regulation 525/98 can be applied. Under Section 3 of O'Reg 525/98, Section 53 (1) and (3) do not apply to the alteration, extension, replacement or a change to a stormwater management facility that 1) is designed to service one lot or parcel of land, b) discharges into a storm sewer that is not a combined sewer, c) does not service industrial land or a structure located on industrial land, and finally d) is not located on industrial land.

Based on this exemption, if the parcels noted above are merged into one property parcel, then by completing this the Approval Exemptions under O'Reg 525/98, would be satisfied and not require an ECA. The western portion of the 268 Caurrthers Avenue property would have to be merged with the current property. Prior to City signoff on the infrastructure design a pre-consultation meeting will be held with the local MECP, to confirm that the site will not require an ECA.

In addition, various design guidelines were referred to in preparing the current report including:

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

4 Water Servicing

4.1 Existing Water Servicing

The subject site is within the City of Ottawa 1W pressure zone. The site is currently serviced by the existing 200mm watermain on Armstrong Street. The existing home and commercial building within 177 Armstrong are serviced by laterals that will be blanked during construction.

4.2 Water Servicing Proposal

The proposed development at 177 Armstrong will consist of an apartment building. It shall be 4-storeys high and the apartment and comprised of 33 units. Architectural site plans are provided in **Appendix H.**

Water supply for the apartment building will be provided by a 100mm single copper water service connecting to the existing watermain. Along with the service, a shutoff valve will be installed at the property line. The proposed servicing plan is provided in drawing C200**.**

4.3 Water Servicing Design

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

- Estimated water demands under average day, maximum day and peak hour conditions. As the total population estimate was less than 500, residential peaking factors were based on MECP Table 3-3.
- Estimated the required fire flow (RFF) based on the Fire Underwriters Survey (FUS).
- Obtained hydraulic boundary conditions (HGL) from the City, based on the above water demands and required fire flows.
- Boundary condition data and water demands were used to estimate the pressure at the proposed building, and this was compared to the City's design criteria.

Please refer to **Appendix B** for detailed calculations of the total water demands.

A review of the estimated watermain pressures at the building connection, based on the boundary conditions provided, was completed using a single water service servicing to the building. **Table B-4** in **Appendix B** provides data calculations of anticipated pressures at the building connection based on using a single 25mm copper water service.

Based on results, a single 100mm service would result in a pressure of ±59.0psi at the building. A review of pressures on the top floor was also completed and would result in a pressure of ±43.5 psi to the middle of the third floor.

No pressure reducing measures are required as operating pressures are within 50 psi and 80 psi.

4.4 Water Servicing Design Criteria

Table 4-1 below summarizes the Design Criteria that was used to establish the water demands and the required fire flows, based on the proposed building uses. The design parameters that apply to this project and used for calculations are identified below in **Table 4-1**.

Table 4-1 - Summary of Water Supply Design Criteria

Design Parameter	Value	Applies
Population Density – Single-family Home	3.4 persons/unit	
Population Density – Semi-detached Home	2.7 persons/unit	
Population Density – Townhome or Terrace Flat	1.8 persons/unit	
Population Density – Bachelor Apartment (Studio)	1.4 persons/unit	✓
Population Density – Bachelor + Den Apartment	1.4 persons/unit	
Population Density – One Bedroom Apartment	1.4 persons/unit	✓
Population Density – One Bedroom plus Den Apartment	1.4 persons/unit	
Population Density – Two Bedroom Apartment	2.1 persons/unit	✓
Population Density – Two Bedroom plus Den Apartment	2.1 persons/unit	
Average Day Demands – Residential	350 L/person/day	✓
Average Day Demands – Commercial / Institutional	28,000 L/gross ha/day	
Average Day Demands – Light Industrial / Heavy Industrial	35,000 or 55,000 L/gross ha/day	
Maximum Day Demands – Residential	8.45 x Average Day Demands	✓
Maximum Day Demands – Commercial / Institutional	1.5 x Average Day Demands	
Peak Hour Demands – Residential	12.72 x Average Day Demands	✓
Peak Hour Demands – Commercial / Institutional	2.7 x Average Day Demands	
Fire Flow Requirements Calculation	FUS	✓
Depth of Cover Required	2.4m	✓
Maximum Allowable Pressure	551.6 kPa (80 psi)	✓
Minimum Allowable Pressure	275.8 kPa (40 psi)	✓
Minimum Allowable Pressure during fire flow conditions	137.9 kPa (20 psi)	✓

4.5 Estimated Water Demands

The following **Table 4-2** below summarizes the anticipated water demands for the proposed development based on following:

- The apartment building having 33 units and estimated population of 57.4 persons.

Table 4-2 : Water Demand Summary

Water Demand Conditions	Total Water Demands (L/sec)
Average Day	0.23
Max Day	1.97
Peak Hour	2.96

4.6 Boundary Conditions

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

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

- Minimum HGL = 108.0 m
- Max Day + Fire Flow = 100.0 m
- Maximum HGL = 115.5 m

Based on a ground elevation of approximately 64.0m at the boundary condition location this results in a system water pressure of 41.5m or 59.0psi during peak hour conditions.

4.7 Fire Flow Requirements

Water for fire protection will be available utilizing the proposed fire hydrants located along the adjacent roadways: Carruthers Avenue, Armstrong Street, McCormick Street, and Grant Street. The required fire flows for the proposed buildings were calculated based on typical values as established by the Fire Underwriters Survey 1999 (FUS).

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

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

where:

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

The proceeding **Table 4-3** summarizes the parameters used for estimating the Required Fire Flows (RFF) based on the Fire Underwriters Survey (FUS) and the latest City of Ottawa Technical Bulletins. The RFFs were estimated in accordance with ISTB-2018-02, and based on floor areas provided by the architect, which are illustrates in **Appendix H.**

The following summarizes the parameters used for both proposed buildings.

- Type of Construction Wood Frame
- Occupancy Limited combustible
- Sprinkler Protection None

Table 4-3 - Summary of Design Parameters Used in Calculating Required Fire Flows (RFF) Using FUS

Design Parameter	Value
Coefficient Related to type of Construction C	1.5
Total Floor Area (m2)	2367
Fire Flow prior to reduction (L/min)	16,000
Reduction Due to Occupancy Non-combustible (-25%), Limited Combustible (-15%), Combustible (0%), Free Burning (+15%), Rapid Burning (+25%)	-15%
Reduction due to Sprinkler (Max 50%) Sprinkler Conforming to NFPA 13 (-30%), Standard Water Supply (-10%), Fully Supervised Sprinkler (-10%)	0%
Exposures	+48%
Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNCAL BULLETIN ISTB-2018-02", (yes/no)	No
Total RFF	333

The estimated required fire flows (RFF) based on the FUS methods is: 333 L/sec for the proposed 4-storey apartment building.

4.8 Review of Hydrant Spacing

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

Table 4-4 – Required Fire Flows

Building	Required Fire Flow (L/min)	Available Fireflow Based on Hydrant Spacing as per ISTB-2018-02 (L/min)
177 Armstrong	19,980 (or 333 L/sec)	±22,800

The total available contribution of flow from hydrants was estimated at ±22,800 L/min, whereas the required fire flows (RFF) for each building is 19,980 L/min. Therefore, the available flows from hydrants exceed each building's fire flow requirements as identified in Appendix I of Technical Bulletin ISTB-2018-02. Additional information on the available flows from hydrants is provided in **Table B-3**.

5 Sewage Servicing

5.1 Existing Sewage Conditions

The existing home and commercial building within the property are currently serviced by the existing 300mm sanitary sewer on Armstrong street. Any existing service laterals within the site will be abandoned.

5.2 Proposed Sewage Conditions

It is proposed to provide one single sanitary sewer connection from the subject property to the existing sanitary sewer on Armstrong Street. The sanitary sewer system was designed based on a population flow with an area-based infiltration allowance. A 150mm diameter sanitary sewer is proposed with a minimum 2% slope, having a capacity of 25.2 L/sec based on Manning's Equation under full flow conditions. Based on the OBC, the maximum permitted hydraulic load for a 150mm at 2% is 7,000 fixture units. **Table 5-1** below summarizes the design parameters used.

Table 5-1– Summary of Wastewater Design Criteria / Parameters

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

The estimated peak sanitary flow rate from the proposed property at 179 Armstrong Street is **0.79 L/sec** based on City Design Guidelines. Sewage rates below include a total infiltration allowance of 0.33 L/ha/sec based on the total gross site area.

Table 5-2 – Summary of Anticipated Sewage Rates

Sewage Condition	Sanitary Sewage Flow (L/sec)
Peak Residential	0.74
Infiltration Flow	0.05
Peak Design Flow	0.79

The minimum sewer capacity of the last sewer run on Armstrong Street (with a slope of 0.67%) has a calculated full flow capacity of 79 L/sec. The increase in peak sewage flows up to 0.79 L/sec is minor in comparison to the total capacity of the existing sanitary sewer.

6 Storm Servicing & Stormwater Management

The proposed site is located within the Rideau Valley Conservation Authority (RVCA) jurisdiction, stormwater works are therefore subject to both the Rideau Valley Conservation Authority (RVCA) and City of Ottawa (COO) approval. The RVCA was contacted to discuss the stormwater management quality control requirements.

Correspondence from the RVCA is provided in **Appendix F**, which clarifies that no onsite quality control is required. Similarly, no quality control was noted in the pre-consultation meeting held with the COO, which is also provided in **Appendix F.**

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

- *Coefficient (C) of runoff determined as per existing conditions but in no case more than 0.50.*
- *Time of concentration (Tc) = 20 minutes or can be calculated; not be less than 10 minutes*
- *All storm events greater than 5-year, and up to 100-year, 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.*

6.1 Design Criteria

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

6.2 Minor System Design Criteria

- The storm sewer was sized based on the Rational Method and Manning’s Equation under free flow conditions for the 2-year storm using a 10-minute inlet time.
- Since a detailed site plan was available for the site, including building footprints, calculations of the average runoff coefficients for each drainage area were completed.
- Minimum sewer slopes to be based on minimum velocities for storm sewers of 0.80 m/sec.

6.3 Major System Design Criteria

- The major system has been designed to accommodate on-site detention with sufficient capacity to attenuate the 100-year design storm. On-site storage is calculated based on the 100-year design storm with on-site detention storage provided on the roof and stormwater storage under the entrance way.
- On site storage is provided and calculated for up to the 100-year design storm. There is no surface ponding proposed on the ground surface.
- Overland flow routes are provided.
- The vertical distance from the spill elevation on the street and the ground elevation at the buildings is at least 15cm.
- The emergency overflow spill elevation is at least 30 cm below the lowest building opening.

6.4 Runoff Coefficients

Runoff coefficients used for were based on actual areas taken from CAD. Runoff coefficients for impervious surfaces (roofs, asphalt, and concrete) were taken as 0.90, whereas those for pervious surfaces (grass/landscaping) were taken as 0.20. Average runoff coefficients were calculated for subcatchments (or drainage areas) using the area-weighting routine in PCSWMM. The runoff coefficients for pre-development and post-development catchments are provided in **Appendix D**, with a summary provided in **Table 6-1** below.

Table 6-1 – Summary of Runoff Coefficients

Location	Area (hectares)	Pre-Development Runoff Coefficient, C_{AVG}	Post-Development Runoff Coefficient, C_{AVG}
Entire Site	0.1428	0.59	0.76

6.5 Time of Concentration

A minimum time of concentration of 10-minutes was used for both pre-development and post-development subcatchments. under pre-development conditions the Tc was calculated at 3.8 min, however the minimum value of 10 minutes was used for peak flow conditions.

6.6 Pre-Development Conditions

Under pre-development conditions, stormwater runoff from the 0.1428-hectare site drainage to the rear of the lot. Only a single drainage area for the entire site was considered, discharging out the back end of the site.

Table 6-2 – Summary of Pre-Development Flows

Return Period Storm	Total Peak Flows (L/sec)
2-year	27.1
5-year	36.9
100-year	79.5

6.7 Allowable Release Rate

The allowable release rate of 20.7 L/sec from the proposed site was calculated based on a 5-year storm event at a Tc of 10 min. **Table D-3** provides detailed calculations on the allowable peak flow.

6.8 Proposed Stormwater System

Stormwater runoff from the proposed site will drain from a combination of controlled and uncontrolled areas. As a result of the changes onsite the overall post-development runoff coefficient will change over pre-development conditions. This increase / decrease in runoff is the result of changes due to site development (i.e. additional hard surfaces, roof areas and hard landscaping).

A storm drainage plan is illustrated on **Figure A-2**. A total four (4) subcatchments (or drainage areas) within the development site are shown on this drawing with average runoff coefficients calculated for each drainage area. The stormwater works shall consist of the following elements:

- Flow-control roof drains for the building to have a separate storm lateral connection to municipal system.
- Runoff from surface areas will be collected by area drains and discharge to underground storage (Storm Tech Chambers) located under the entrance way. This in turn discharges to one of the storm laterals noted above.
- Remaining drainage areas along frontage of Armstrong Street to flow uncontrolled to right-of-way.

Table 6-3 – Summary of Post-Development Flows

Return Period Storm	Total Peak Flows (L/sec)	Allowable Peak Flows (L/sec)
2-year	23.7	7.4
5-year	32.2	10.0
100-year	65.2	20.7

To achieve the quantity control requirements and meet the allowable discharge rates as noted in **Section 6.7**, the roof drains will require flow controlled weirs. Based on the roof areas, an estimate of the number of roof drains required was completed. WATTS ACCUTROL weirs were used to determine the total discharge rates from the roof areas based on the number of drains. In addition, the total cumulative prism volumes on the roofs were calculated at a maximum permitted depth of 150mm. Additional information on the estimated 100-year volumes is provided in **Section 6.9**.

6.9 Flow Attenuation

Stormwater flow attenuation will be achieved by utilizing roof storage and stormwater storage under the entrance way. Using the allowable release rates, the Modified Rational Method was used to determine the 2-year, 5-year, and 100-year volumes that will occur for corresponding release rates.

Table D-6 and D-7 provide the storage volumes necessary on the roof and stormwater storage under the entrance way. to attenuate the controlled release rates. **Table D-5** summarizes the combined controlled and uncontrolled flows leaving the subject site. A summary of release rates, storage volume requirements, and provided storage volumes are identified in **Table 6-4** below.

Table 6-4 – Summary of Post-Development Storage

Area No.	Outlet	Release Rate (L/s)			Storage Required (m^3) (MRM)			Storage Provided (m^3)			Control Method
		2-yr	5-yr	100-yr	2-yr	5-yr	100-yr	Roof	Ponding	U/G Chambers	
S01	Armstrong Street	1.4	1.9	4.0							None
S02		2.4	3.3	6.3	6.5	8.7	19.7	19.7			Flow Controlled Roof Drains with Weir (Set at Open Position)
S03		1.9	2.5	5.4	6.5	8.7	18.4		4.2	16.8	ICD (Tempest, LMF60)
S04		1.7	2.3	5.0							None
Totals		7.4	10.0	20.7	13.0	17.4	38.1				

7 Erosion & Sediment Control

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

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

8 Conclusions and Recommendations

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

Water

- A single 50mm watermain service lateral is proposed to the 4-storey apartment building, as the average day demands do not exceed 50 m^3 per day.
- The Required Fire Flow (RFFs) were estimated at **19,980 L/min** (333 L/sec). The total minimum available flows for firefighting purposes, based on the contribution from hydrants, was estimated at **22,800 L/min**.
- Based on hydraulic boundary conditions (HGL) provided by the City of Ottawa, a system pressure of **±59.0 psi** under peak hourly demands is anticipated at the top floor of the proposed building. This exceeds the City's guideline of 20 psi.

Sewage

- Estimated peak sewage flows of **0.79 L/sec** are anticipated. A cursory review of the downstream sanitary sewer system from the site and the Pinecrest Collector indicates minimum pipe capacity of 79 L/sec for a sewer run on Armstrong Street.

Stormwater

- For the stormwater system, the allowable capture rate from the entire site was calculated based on a runoff coefficient of 0.50, time of concentration of 10 minutes for a 5-year storm event. The allowable release rate for the entire site was calculated to be **20.7 L/sec**. Runoff in excess of this will be detained onsite for up to the 100-year storm.
- Two minor surface drainage areas will flow uncontrolled to the right-of-way. The 100-year peak flows from these two areas were accounted for (ie. subtracted) from the total runoff rate to establish the allowable rate.
- In order to meet the allowable release rate, a total retention volume of **±38.1 m^3** metres is required.
- Runoff on the building roofs will be controlled using flow-controlled roof drains. For each roof-drain is equipped with WATTS ACCUTROL weirs and set at the OPEN position are proposed. Each drain having maximum discharge rate of 30 gpm at 150mm depth. A maximum discharge rate of **6.3 L/sec** was established for the 100-year event.
- A total 100-year storage volume requirements on the roof was estimated at **19.7 m^3**, based on the above release rate, using the Modified Rational Method. The volumes available on the roof is **19.7 m^3**, therefore meeting the required volumes.
- Runoff from the surface areas above the area will be collected and detained using underground storm tech chambers located under the entrance way, as well as surface ponding. The volume necessary to detain the 100-year event, is **18.4 m^3**, based on using 50% of the allowable release rate as required by the City of Ottawa. The underground storm tech chambers be sized to hold a minimum volume of approximately **16.8 m^3**, where as the surface ponding will hold up to **4.2 m^3** for a total volume capacity of **21.0 m^3**.

Erosion & Sediment Control

- Erosion and sediment control methods will be used during construction to limit erosion potential.

9 Legal Notification

This report was prepared by EXP Services Inc. for the account of McCormick Park Developments Inc.

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

Appendix A - Figures

Figure A-1 - Pre-Development Drainage Areas

Figure A-2 - Post-Development Drainage Areas

Figure A-3 – Hydrant Location Plan

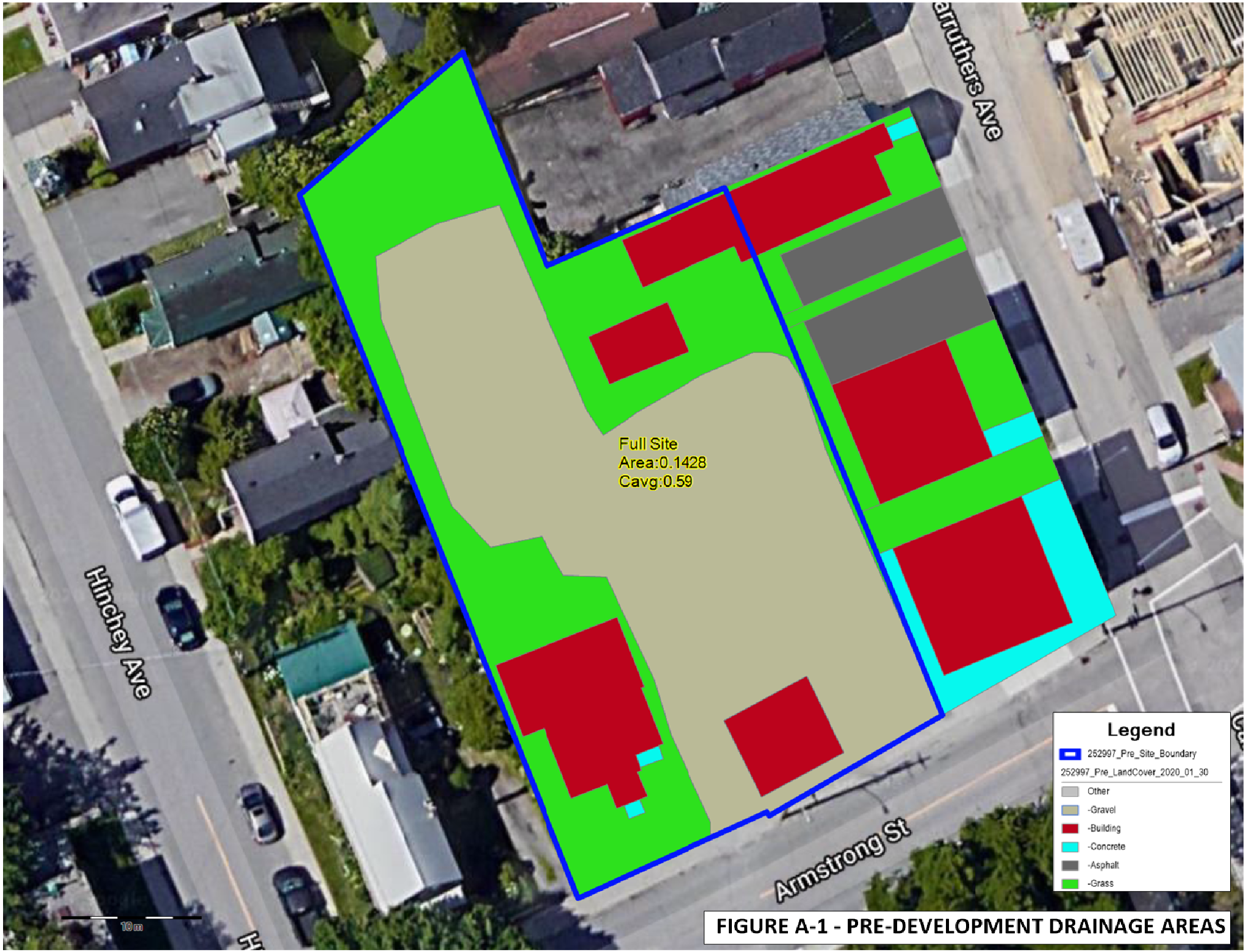
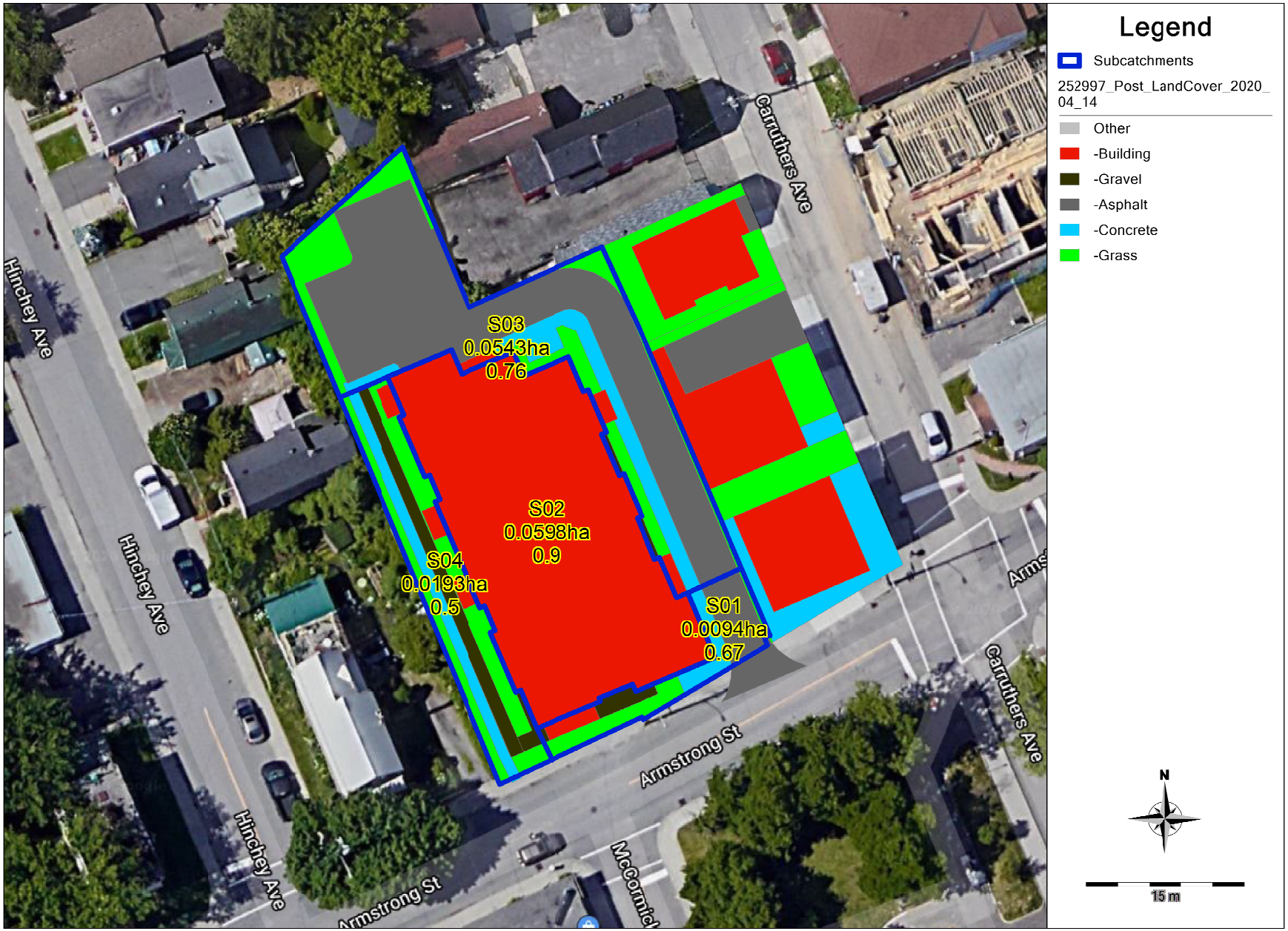


FIGURE A-1 - PRE-DEVELOPMENT DRAINAGE AREAS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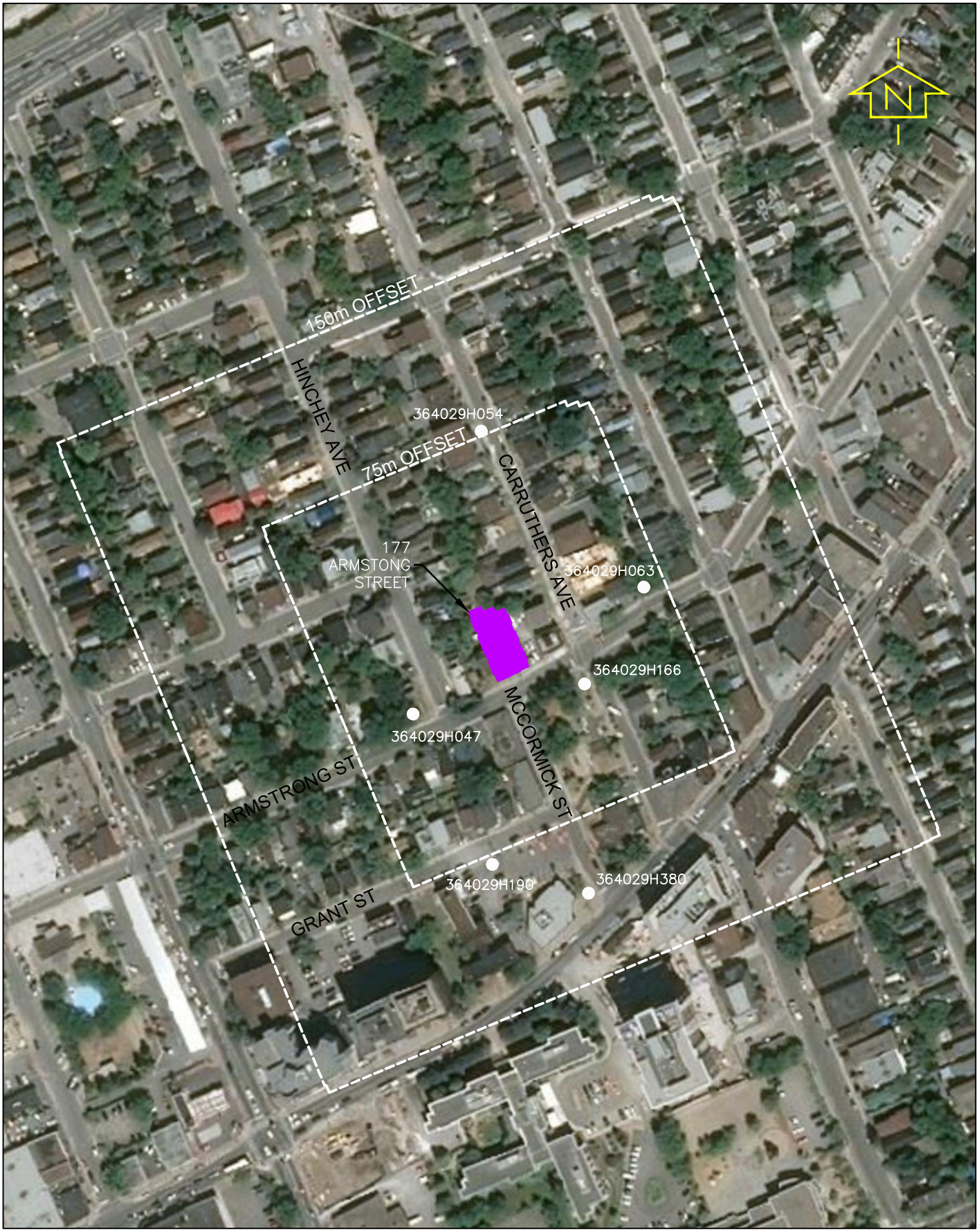

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DESIGN MZG	177–179 ARMSTRONG ST.	SCALE 1:2500
DRAWN MZG	MCCORMICK PARK DEVELOPMENTS INC.	SKETCH NO
DATE JAN 2020	FIRE HYDRANT LOCATIONS	FIG A–3
FILE NO 252997		

Appendix B – Water Servicing Tables

Table B-1 – Water Demand Chart

Table B-2 – Fire Flow Requirements Based on Fire Underwriters Survey (FUS)

Table B-3 – Available Fire Flows Based on Hydrant Spacing

Table B-4 – Estimated Water Pressure at Proposed Building

TABLE B-1: Water Demand Chart

Location: 177-179 Armstrong Street
Project No: OTT-00252997
Designed by: J.Fitzpatrick
Checked By: B. Thomas
Date Revised: April 2020

Water Consumption
Residential = **350** L/cap/day
Commercial = 5.0 L/m^2/day

Population Densities

Single Family	3.4	person/unit
Semi-Detahced	2.7	person/unit
Duplex	2.3	person/unit
Townhome (Row)	2.7	person/unit
Bachelor Apartment	1.4	person/unit
1 Bedroom Apartment	1.4	person/unit
2 Bedroom Apartment	2.1	person/unit
3 Bedroom Apartment	3.1	person/unit
4 Bedroom Apartment	4.1	person/unit
Avg. Apartment	1.8	person/unit

	No. of Residential Units											Residential Demands in (L/sec)					Commercial						Total Demands (L/sec)		
	Singles/Semis/Towns				Apartments								Peaking Factors (x Avg Day)						Peaking Factors (x Avg Day)						
Proposed Buildings	Single Family	Semi-Detached	Duplex	Townhome	Studio	1 Bedroom	2 Bedroom	3 Bedroom	4 Bedroom	Avg Apt.	Total Persons (pop)	Avg. Day Demand (L/day)	Max Day	Peak Hour	Max Day Demand (L/day)	Peak Hour Demand (L/day)	Area (m^2)	Avg Demand (L/day)	Max Day	Peak Hour	Max Day Demand (L/day)	Peak Hour Demand (L/day)	Avg Day (L/s)	Max Day (L/s)	Max Hour (L/s)
Appartment Building					7	10	16				57.4	20,090	8.45	12.72	169,754	255,635							0.233	1.965	2.959
Total =					7	10	16				57.4	20,090			169,754	255,635							0.23	1.96	2.96

PEAKING FACTORS FROM MOECC TABLE 3-3 (Peaking Factors for Water Systems Servicing Fewer Than 500 persons)

Dwelling Units Serviced	Equiv Pop	Night Min Factor	Maximum Day Factor	Peak Hour Factor
10	30	0.10	9.50	14.30
50	150	0.10	4.90	7.40
100	300	0.20	3.60	5.40
150	450	0.30	3.00	4.50
167	500	0.40	2.90	4.30

TABLE B-2
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999
LOCATION: **Apartment Building**

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

F = 220 * C * SQRT(A)

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

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used		2367.0 m²	
	Floor 4 - Amenity		47	100%	47			
	Floor 3		580	100%	580			
	Floor 2		580	100%	580			
	Floor 1		580	100%	580			
	Basement (At least 50% above grade, included)		580	100%	580			
Fire Flow (F)	F = 220 * C * SQRT(A)							16,055
Fire Flow (F)	Rounded to nearest 1,000							**16,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-2,400	13,600
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler	0%	0	13,600
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	13,600
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or N/A	0%	0	13,600
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Lenth-height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1 (west)	6	2	3.1 to 10	Type A	6	2	12	2A	17%	48%	6,528	20,128
	Side 2 (east)	9	2	3.1 to 10	Type A	25	3	75	2C	19%			
	Side 3 (north)	16	3	10.1 to 20	Type A	6	1	6	3A	12%			
	Side 4 (south)	50	6	> 45.1	Type A					0%			

Obtain Required Fire Flow		
	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	**20,000**
	Total Required Fire Flow, L/s =	**333**
	Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNCAL BULLETIN ISTB-2018-02", (yes/no) =	**No**
	Total Required Fire Flow (RFF). If RFF < 167 use RFF (L/sec) =	**333**

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

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

Conditons for Separation

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

TABLE B-3: FIRE FLOW CONTRIBUTIONS BASED ON HYDRANT SPACING

Hydrant #	Location	[1]Distance (m)	[2]Fire Flow Contribution (L/min)	Comment
364029H054	Carruthers Ave	154	0	
364029H063	Armstrong Street	96	3800	
364029H047	Armstrong Street	57	5700	
364029H166	Carruthers Ave	50	5700	
364029H380	McCormick Street	114	3800	
364029H190	Grant Street	117	3800	
Total Fireflow Available in L/min (L/sec) or L/sec			22,800 (380)	
FUS RFF in L/min or L/sec			19,980 (333)	
Meets Requreiment (Yes/No)			Yes	

Notes:

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

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

[3]Straight distance from hydrant ot closest part of building.

TABLE B-4

ESTIMATED WATER PRESSURE AT PROPOSED BUILDING

Description	From	To	Demand (L/sec)	Pipe Length (m)	Pipe Dia (mm)	Dia (m)	Q (m3/sec)	Area (m2)	C	Vel (m/s)	Slope of HGL (m/m)	Head Loss (m)	Elev From (m)	Elev To (m)	*Elev Diff (m)	Pressure From kPa	(psi)	Pressure To kPa	(psi)	Pressure Drop (psi)
Avg Day Conditons																				
Single 100mm watermain	Main	Building	0.23	7 m	100	0.100	0.0002	0.007854	110	0.0293	2.4E-05	0.0002	64.00	66.54	-2.5	431.6	(62.6)	406.7	(59.0)	3.6
Single 50mm watermain	Building	3rd Floor	0.01	10 m	50	0.050	0.0000	0.001963	110	0.0035	1.1E-06	1E-05	66.54	77.44	-10.9	406.7	(59.0)	299.8	(43.5)	15.5
Max Day Conditons																				
Single 100mm watermain	Main	Building	1.96	7 m	100	0.100	0.0020	0.007854	110	0.2496	0.00127	0.0089	64.00	66.54	-2.5	505.2	(73.3)	480.2	(69.6)	3.6
Single 50mm watermain	Building	3rd Floor	0.06	10 m	50	0.050	0.0001	0.001963	110	0.0302	5.7E-05	0.0006	66.54	77.44	-10.9	480.2	(69.6)	373.3	(54.1)	15.5
Peak Hour Conditons																				
Single 100mm watermain	Main	Building	2.96	7 m	100	0.100	0.0030	0.007854	110	0.3769	0.00272	0.019	64.00	66.54	-2.5	431.6	(62.6)	406.5	(59.0)	3.6
Single 50mm watermain	Building	3rd Floor	0.09	10 m	50	0.050	0.0001	0.001963	110	0.0457	0.00012	0.0012	66.54	77.44	-10.9	406.5	(59.0)	299.6	(43.5)	15.5

Water Demand Info

Average Demand =	0.23	L/sec
Max Day Demand =	1.96	L/sec
Peak Hr Deamand =	2.96	L/sec
Fireflow Requriement =	333	L/sec
Max Day Plus FF Demand =	335.0	L/sec

Pipe Lengths

From watermain to building =	7 m
Hazen Williams C Factor for Friction Loss in Pipe, C=	110

Boundary Conditon

	Min HGL	Max HGL	Peak Hr	Max Day + Fireflow	
HGL (m)	108	115.5	108	100.0	(From City of Ottawa)
Approx Ground Elev (m) =	64.0	64.0	64.0	64.0	
Approx Bldg FF Elev (m) =	66.54	66.54	66.54	66.54	
Pressure (m) =	44	51.5	44	36	
Pressure (Pa) =	431,640	505,215	431,640	353,160	
Pressure (psi) =	62.6	73.3	62.6	51.2	

Appendix C – Sanitary Servicing Tables

Table C-1 – Sanitary Sewer Design Sheet

Table C-8: SANITARY SEWER CALCULATION SHEET

LOCATION				RESEDENTIAL AREAS AND POPULAITONS												COMMERCIAL			INDUSTRIAL			INSTITUTIONAL		INFILTRATION			TOTAL FLOW (L/s)	SEWER DATA						
Street	U/S MH	D/S MH	Desc	Area (ha)	NUMBER OF UNITS							POPULATION		Peak Factor	Peak Flow (L/sec)	AREA (m^2)		Peak Flow (L/sec)	AREA (ha)		Peak Factor (per	AREA (Ha)	ACCU AREA (Ha)	AREA (ha)		INFILT FLOW (L/s)		Nom Dia (mm)	Actual Dia (mm)	Slope (%)	Length (m)	Capacity (L/sec)	Q/Q_{CAP} (%)	Full Velocity (m/s)
					Singles	Studio	Semi	1-Bed Apt.	2-Bed Apt.	3-Bed Apt.	4-Bed Apt.	INDIV	ACCU			INDIV	ACCU		INDIV	ACCU				INDIV	ACCU									
Armstong Ave				0.1428		7		10	16			57.4	57.4	4.00	0.744									0.14	0.14	0.047	0.79	150	159.0	2.00	15.0	25.2	3%	1.72
				0.1428		**7**		**10**	**16**			**57.4**												**0.143**									

Residential Avg. Daily Flow, q (L/p/day) = 280
Commercial Avg. Daily Flow (L/m^2/day) = 5.0

Institutianal Avg. Daily Flow (L/s/ha) = 28,000
or L/gross ha/sec = 0.324
Light Industrial Flow (L/gross ha/day) = 35,000
or L/gross ha/sec = 0.40509
Light Industrial Flow (L/gross ha/day) = 55,000
or L/gross ha/sec = 0.637

Commercial Peak Factor = 1.5 (when area >20%)
1.0 (when area <20%)

Institutional Peak Factor = 1.5 (when area >20%)
1.0 (when area <20%)

Residential Correction Factor, K = 0.80
Manning N = 0.013
Peak extraneous flow, I (L/s/ha) = 0.33 (Total I/I)

Peak Population Flow, (L/sec) = P*q*M/86.4
Peak Extraneous Flow, (L/sec) = I*Ac
Residential Peaking Factor, M = 1 + (14/(4+P^0.5)) * K
A_c = Cumulative Area (hectares)
P = Population (thousands)

Sewer Capacity, Qcap (L/sec) = $1/N \; S^{1/2} \; R^{2/3} \; A_c$
(Manning's Equation)

Unti Type	Persons/Unit
Singles	3.4
Studio	1.4
Semi	2.7
1-bed Apt. Unit	1.4
2-bed Apt. Unit	2.1
3-bed Apt. Unit	3.1
4-bed Apt. Unit	4.1

Designed:	Project:
J. Fitzpatrick, P.Eng.	2140 Baseline Road
Checked:	Location:
B. Thomas, P.Eng.	Ottawa, Ontario
File Reference:	Page No:
252997 Sanitary Design Sheet, April 2020.xlsx	**1 of 1**

Appendix D – Stormwater Servicing Tables

Table D-1 – Estimation of Catchment Time of Concentration (Pre-Development Conditions)

Table D-2 – Estimation of Pre-Development Peak Flows

Table D-3 – Estimation of Allowable Peak Flows (Based on Max C=0.50 with Tc=10mins)

Table D-4 – Average Runoff Coefficients for Post-Development

Table D-5 – Summary of Post-Development Peak Flows (Uncontrolled and Controlled)

Table D-6 – Summary of Post-Development Storage

Table D-7 – Storage Volumes for 2-year, 5-year and 100-Year Storms (S2-Roof)

Table D-8 – Storage Volumes for 2-year, 5-year and 100-Year Storms (S3-Surface)

Table D-9 – 2-Year Storm Sewer Calculation Sheet

TABLE D-1: ESTIMATION OF CATCHMENT TIME OF CONCENTRATION (PRE-DEVELOPMENT CONDITIONS)

Catchment No.	Area (ha)	Outlet Location	High Elev (m)	Low Elev (m)	Flow Path Length (m)	Indiv Slope	Avg. C	Time of Conc. Tc	Description
Full Site	0.1428	Armstrong Road	64.9	64.2	58.0	1.3	0.59	3.80	See Note 1
Totals	0.1428								

Notes

1) For Catchments with Runoff Coefficient less than C=0.40, Time of Concentration Based on Federal Aviation Formula (Airport Method), from MTO Drainage Manual Equation 8.16, where: $T_C = 3.26* (1.1-C)* L^{0.5}/ S_W^{0.33}$

2) For Catchments with Runoff Coefficient greater than C=0.40, Time of Concentration Based on Bransby Williams Equation, from MTO Drainage Manual Equation 8.15, where: $T_C = 0.057*L / (S_W^{0.2}*A^{0.1})$

TABLE D-2: ESTIMATION OF PEAK FLOWS (PRE-DEVELOPMENT CONDITIONS) USING CALACUTLED TIME OF CONCENTRATIONS

Catchment No.	Area (ha)	Outlet Location	Time of Conc, Tc (min)	Storm = 2 yr			Storm = 5 yr			Storm = 100 yr		
				I_2 (mm/hr)	Cavg	Q_{2PRE} (L/sec)	I_5 (mm/hr)	Cavg	Q_{5PRE} (L/sec)	I_{100} (mm/hr)	Cavg	Q_{100PRE} (L/sec)
Full Site	0.1428	Armstrong Road	3.80	113.58	0.59	26.6	155.09	0.59	36.3	266.89	0.74	78.1
Totals	0.1428					26.6			36.3			78.1

Notes

1) Intensity, $I = 732.951/(Tc+6.199)^{0.810}$ (2-year, City of 0ttawa)

2) Intensity, $I = 998.071/(Tc+6.035)^{0.814}$ (5-year, City of 0ttawa)

3) Intensity, $I = 1735.688/(Tc+6.014)^{0.820}$ (100-year, City of Ottawa)

4) Cavg for 100-year is increased by 25% to a maximum of 1.0

TABLE D-3: ESTIMATION OF ALLOWABLE PEAK FLOWS (Based on 5 year Pre-Development Rates and Max C=0.50 & Tc=10mins)

Catchment No.	Area (ha)	Outlet Location	Time of Conc, Tc (min)	Storm = 2 yr			Storm = 5 yr		
				I_2 (mm/hr)	Cavg	Q_{ALLOW} (L/sec)	I_5 (mm/hr)	Cavg	Q_{ALLOW} (L/sec)
Full Site	0.1428	Armstrong Road	10.00	76.81	0.50	15.2	104.29	0.50	**20.7**

Notes

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

2) Time of Concentration (Tc) is based on the standard 10 minutes as per City Guidelines. The higher time of 10 minutes was used as it results in lower (more stringent) peak runoff rate used to establish allowable discharge rates

TABLE D-4: AVERAGE RUNOFF COEFFICIENTS (Post-Development)

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

Area No.	Asphalt & Conc Areas (m^2)	A * C_{ASPH}	Roof Areas (m^2)	A * C_{ROOF}	Grassed Areas (m^2)	A * C_{GRASS}	Sum AC	Total Area (m^2)	C_{AVG} (see note)	Comment
S01								94	0.67	Surface Areas
S02								598	0.9	Surface Areas
S03								543	0.76	Surface Areas
S04								193	0.5	Surface Areas
Totals								1,428	0.78	

Notes

1) Cavg derived with area-weighting command in PCSWMM

TABLE D-5: SUMMARY OF POST-DEVELOPMENT PEAK FLOWS (Uncontrolled and Controlled)

Area No	Area (ha)	Time of Conc, Tc (min)	Storm = 2 yr				Storm = 5 yr				Storm = 100 yr				Comments
			C_{AVG}	I_2 (mm/hr)	Q (L/sec)	Q_{CAP} (L/sec)	C_{AVG}	I_5 (mm/hr)	Q (L/sec)	Q_{CAP} (L/sec)	C_{AVG}	I_{100} (mm/hr)	Q (L/sec)	Q_{CAP} (L/sec)	
S01	0.0094	10	0.67	76.81	1.3	1.3	0.67	104.19	1.8	1.8	0.84	178.56	3.9	3.9	
S02	0.0598	10	0.90	76.81	11.5	(2.4)	0.90	104.19	15.6	(3.3)	1.00	178.56	29.7	(6.3)	
S03	0.0543	10	0.76	76.81	8.8	(1.5)	0.76	104.19	12.0	(2.1)	0.95	178.56	25.6	(4.5)	
S04	0.0193	10	0.50	76.81	2.1	2.1	0.50	104.19	2.8	2.8	0.63	178.56	6.0	6.0	
Total =						**(7.4)**				**(10.0)**				**(20.7)**	

Notes

2-yr Storm Intensity, I = 732.951/(Tc+6.199)^0.810 (City of Ottawa)

5-yr Storm Intensity, I = 998.071/(Tc+6.035)^0.814 (City of Ottawa)

100-yr Storm Intensity, I = 1735.688/(Tc+6.014)&^0.820 (City of Ottawa)

Time of Concentration (min), Tc = ***10***

For Flows under column Qcap which are shown in brackets ***(0.0)*** *, denotes flows that are controlled*

TABLE D-6: SUMMARY OF POST DEVELOPMENT STORAGE

Area No.	Area (ha)	Release Rate (L/s)			[1] Storage			Storage Provided (m^3)					Control Method
		2-yr	5-yr	100-yr	2-yr (MRM)	5-yr (MRM)	100-yr (MRM)	Roof	Surface Ponding	UG Chambers	UG CB/MHs	Total	
S01	0.0094	1.3	1.8	3.9									Un-Controlled
S02	0.0598	2.4	3.3	6.3	6.5	8.7	19.7	19.7				19.7	Roof Drains
S03	0.0543	1.5	2.1	4.5	7.4	9.8	20.8		4.2	16.8		21.0	ICD
S04	0.0193	2.1	2.8	6.0									Un-Controlled
Notes		**7.4**	**10.0**	**20.7**	**13.8**	**18.5**	**40.5**						

1) Storage Requried Based on the Modified Rational Method (MRM) for the relase rates noted.

Table D-7- Storage Volumes for 2-year, 5-Year and 100-Year Storms

Area No: **S2 -Roof**

C_{AVG} = 0.90 (2-yr)

C_{AVG} = 0.90 (5-yr)

C_{AVG} = 1.13 (100-yr, Max 1.0)

Time Interval = 2.00 (mins)

Drainage Area = 0.0598 (hectares)

Duration (min)	Release Rate = 2.4 (L/sec); Return Period = 2 (years); IDF Parameters, A = 732.951, B = 0.810, C = 6.199; (I = A/(T_c+C)					Release Rate = 3.3 (L/sec); Return Period = 5 (years); IDF Parameters, A = 998.071, B = 0.814, C = 6.053; (I = A/(T_c+C)					Release Rate = 6.3 (L/sec); Return Period = 100 (years); IDF Parameters, A = 1735.688, B = 0.820, C = 6.014; (I = A/(T_c+C)				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	25.0	2.44	22.6	0.00	230.5	34.5	3.309	31.2	0.00	398.6	74.6	6.300	68.3	0.00
2	133.3	19.9	2.44	17.5	2.10	182.7	27.3	3.309	24.0	2.88	315.0	58.9	6.300	52.6	6.31
4	111.7	16.7	2.44	14.3	3.43	152.5	22.8	3.309	19.5	4.68	262.4	49.1	6.300	42.8	10.27
6	96.6	14.5	2.44	12.0	4.33	131.6	19.7	3.309	16.4	5.90	226.0	42.3	6.300	36.0	12.95
8	85.5	12.8	2.44	10.3	4.97	116.1	17.4	3.309	14.1	6.75	199.2	37.3	6.300	31.0	14.86
10	76.8	11.5	2.44	9.1	5.43	104.2	15.6	3.309	12.3	7.37	178.6	33.4	6.300	27.1	16.26
12	69.9	10.5	2.44	8.0	5.77	94.7	14.2	3.309	10.9	7.82	162.1	30.3	6.300	24.0	17.30
14	64.2	9.6	2.44	7.2	6.02	86.9	13.0	3.309	9.7	8.15	148.7	27.8	6.300	21.5	18.07
16	59.5	8.9	2.44	6.5	6.21	80.5	12.0	3.309	8.7	8.38	137.5	25.7	6.300	19.4	18.65
18	55.5	8.3	2.44	5.9	6.33	75.0	11.2	3.309	7.9	8.54	128.1	24.0	6.300	17.7	19.07
20	52.0	7.8	2.44	5.3	6.42	70.3	10.5	3.309	7.2	8.64	120.0	22.4	6.300	16.1	19.36
22	49.0	7.3	2.44	4.9	6.46	66.1	9.9	3.309	6.6	8.70	112.9	21.1	6.300	14.8	19.55
24	46.4	6.9	2.44	4.5	6.48	62.5	9.4	3.309	6.0	8.71	106.7	20.0	6.300	13.7	19.66
26	44.0	6.6	2.44	4.1	6.47	59.3	8.9	3.309	5.6	8.69	101.2	18.9	6.300	12.6	19.69
28	41.9	6.3	2.44	3.8	6.44	56.5	8.5	3.309	5.1	8.64	96.3	18.0	6.300	11.7	19.67
30	40.0	6.0	2.44	3.6	6.39	53.9	8.1	3.309	4.8	8.57	91.9	17.2	6.300	10.9	19.59
32	38.3	5.7	2.44	3.3	6.33	51.6	7.7	3.309	4.4	8.47	87.9	16.4	6.300	10.1	19.46
34	36.8	5.5	2.44	3.1	6.25	49.5	7.4	3.309	4.1	8.36	84.3	15.8	6.300	9.5	19.30
36	35.4	5.3	2.44	2.9	6.16	47.6	7.1	3.309	3.8	8.23	81.0	15.1	6.300	8.8	19.10
38	34.1	5.1	2.44	2.7	6.06	45.8	6.9	3.309	3.5	8.08	77.9	14.6	6.300	8.3	18.87
40	32.9	4.9	2.44	2.5	5.95	44.2	6.6	3.309	3.3	7.93	75.1	14.1	6.300	7.8	18.61
Max =					**6.48**					**8.71**					**19.69**

Notes

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

2) Rainfall Intensity, $I = A/(Tc+C)^B$

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

4) Storage Rate = Peak Flow - Release Rate

5) Storage = Duration x Storage Rate

6) Maximium Storage = Max Storage Over Duration

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

Table D-8 - Storage Volumes for 2-year, 5-Year and 100-Year Storms

Area No: **S3-Surface**
C_{AVG} = 0.76 (2-yr)
C_{AVG} = 0.76 (5-yr)
C_{AVG} = 0.95 (100-yr, Max 1.0)
Time Interval = 4.00 (mins)
Drainage Area = 0.0543 (hectares)

Duration (min)	Release Rate = 0.8 (L/sec); Return Period = 2 (years); IDF Parameters, A = 732.951, B = 0.810, C = 6.199; (I = A/(T_c+C)					Release Rate = 1.1 (L/sec); Return Period = 5 (years); IDF Parameters, A = 998.071, B = 0.814, C = 6.053; (I = A/(T_c+C)					Release Rate = 2.3 (L/sec); Return Period = 100 (years); IDF Parameters, A = 1735.688, B = 0.820, C = 6.014; (I = A/(T_c+C)				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	19.2	0.77	18.4	0.00	230.5	26.4	1.050	25.4	0.00	398.6	57.2	2.250	54.9	0.00
4	111.7	12.8	0.77	12.0	2.89	152.5	17.5	1.050	16.4	3.95	262.4	37.6	2.250	35.4	8.49
8	85.5	9.8	0.77	9.0	4.33	116.1	13.3	1.050	12.3	5.89	199.2	28.6	2.250	26.3	12.63
12	69.9	8.0	0.77	7.2	5.22	94.7	10.9	1.050	9.8	7.07	162.1	23.3	2.250	21.0	15.12
16	59.5	6.8	0.77	6.1	5.81	80.5	9.2	1.050	8.2	7.85	137.5	19.7	2.250	17.5	16.78
20	52.0	6.0	0.77	5.2	6.23	70.3	8.1	1.050	7.0	8.41	120.0	17.2	2.250	15.0	17.94
24	46.4	5.3	0.77	4.5	6.55	62.5	7.2	1.050	6.1	8.82	106.7	15.3	2.250	13.0	18.79
28	41.9	4.8	0.77	4.0	6.78	56.5	6.5	1.050	5.4	9.12	96.3	13.8	2.250	11.6	19.41
32	38.3	4.4	0.77	3.6	6.96	51.6	5.9	1.050	4.9	9.35	87.9	12.6	2.250	10.4	19.88
36	35.4	4.1	0.77	3.3	7.09	47.6	5.5	1.050	4.4	9.52	81.0	11.6	2.250	9.4	20.22
40	32.9	3.8	0.77	3.0	7.19	44.2	5.1	1.050	4.0	9.64	75.1	10.8	2.250	8.5	20.46
44	30.7	3.5	0.77	2.8	7.26	41.3	4.7	1.050	3.7	9.73	70.2	10.1	2.250	7.8	20.63
48	28.9	3.3	0.77	2.5	7.31	38.8	4.4	1.050	3.4	9.79	65.9	9.4	2.250	7.2	20.73
52	27.3	3.1	0.77	2.4	7.34	36.6	4.2	1.050	3.1	9.82	62.1	8.9	2.250	6.7	20.78
56	25.8	3.0	0.77	2.2	7.36	34.7	4.0	1.050	2.9	9.83	58.8	8.4	2.250	6.2	20.79
60	24.6	2.8	0.77	2.0	7.36	32.9	3.8	1.050	2.7	9.82	55.9	8.0	2.250	5.8	20.76
64	23.4	2.7	0.77	1.9	7.34	31.4	3.6	1.050	2.6	9.80	53.3	7.6	2.250	5.4	20.69
68	22.4	2.6	0.77	1.8	7.32	30.0	3.4	1.050	2.4	9.76	50.9	7.3	2.250	5.0	20.60
72	21.5	2.5	0.77	1.7	7.29	28.8	3.3	1.050	2.2	9.72	48.7	7.0	2.250	4.7	20.48
76	20.6	2.4	0.77	1.6	7.25	27.6	3.2	1.050	2.1	9.66	46.8	6.7	2.250	4.5	20.33
80	19.8	2.3	0.77	1.5	7.20	26.6	3.0	1.050	2.0	9.59	45.0	6.5	2.250	4.2	20.17
Max =					**7.36**					**9.83**					**20.79**

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

TABLE D-9: 2-YEAR STORM SEWER CALCULATION SHEET

Return Period Storm =	**2-year**	(2-year, 5-year, 100-year)
Default Inlet Time=	10	(minutes)
Manning Coefficient =	0.013	(dimensionless)

From Node	To Node	Street	AREA INFO				FLOW (UNRESTRICTED)							SEWER DATA									
			Area No.	Area (ha)	∑ Area (ha)	Average R	Indiv. 2.78*A*R	Accum. 2.78*A*R	Tc (mins)	I (mm/h)	Indiv. Flow	Return Period	Q (L/s)	Dia (mm) Actual	Dia (mm) Nominal	Type	Slope (%)	Length (m)	Capacity, Q_{CAP} (L/sec)	Velocity (m/s) Vf	Velocity (m/s) Va	Time in Pipe, Tt (min)	Hydraulic Ratios Q/Q_{CAP}	Hydraulic Ratios Va/Vf
CBE1	CBT 2		S04	0.0193	0.0193	0.42	0.023	0.023	10.00	76.81	1.73	2-year	1.7	250.0	250	HDPE	0.60	13.59	46.06	0.94	0.29	0.78	0.04	0.31
CBT 2	CB 3				0.019			0.023	10.78	73.94		2-year	1.7	250.0	250	HDPE	0.60	12.28	46.06	0.94	0.29	0.70	0.04	0.31
CB 3	STMH 2				0.019			0.023	11.48	71.55		2-year	1.6	250.0	250	HDPE	0.50	23.10	42.05	0.86	0.27	1.45	0.04	0.31
			S02	0.0598	0.0598	0.90	0.150	0.150	10.00	76.81	11.49	2-year	11.5											
CB 2	U/G CHAMBERS		S03	0.0543	0.114	0.73	0.110	0.260	10.00	76.81	8.46	2-year	20.0	201.2	200	PVC	1.00	4.38	33.31	1.04	0.94	0.08	0.60	0.90
U/G CHAMBERS	CBMH 1				0.114			0.260	10.08	76.51		2-year	19.9	600.0	600	HDPE	0.50	1.50	434.17	1.54	0.48	0.05	0.05	0.31
CBMH1	STMMH 2				0.114			0.260	10.13	76.31		2-year	19.8	251.5	250	PVC	0.50	15.87	42.71	0.86	0.61	0.44	0.46	0.71
STMMH 2	STMMH 1				0.133			0.282	12.93	67.12		2-year	19.0	251.5	250	PVC	0.50	7.31	42.71	0.86	0.61	0.20	0.44	0.71
TOTALS =				**0.13**			**0.282**																	

Definitions:

Q = 2.78*AIR, where

Q = Peak Flow in Litres per second (L/s)

A = Watershed Area (hectares)

I = Rainfall Intensity (mm/h)

R = Runoff Coefficients (dimensionless)

Ottawa Rainfall Intensity Values from Sewer Design Guidelines, SDG002

	a	b	c
2-year	732.951	6.199	0.810
5-year	998.071	6.053	0.814
100-year	1735.688	6.014	0.820

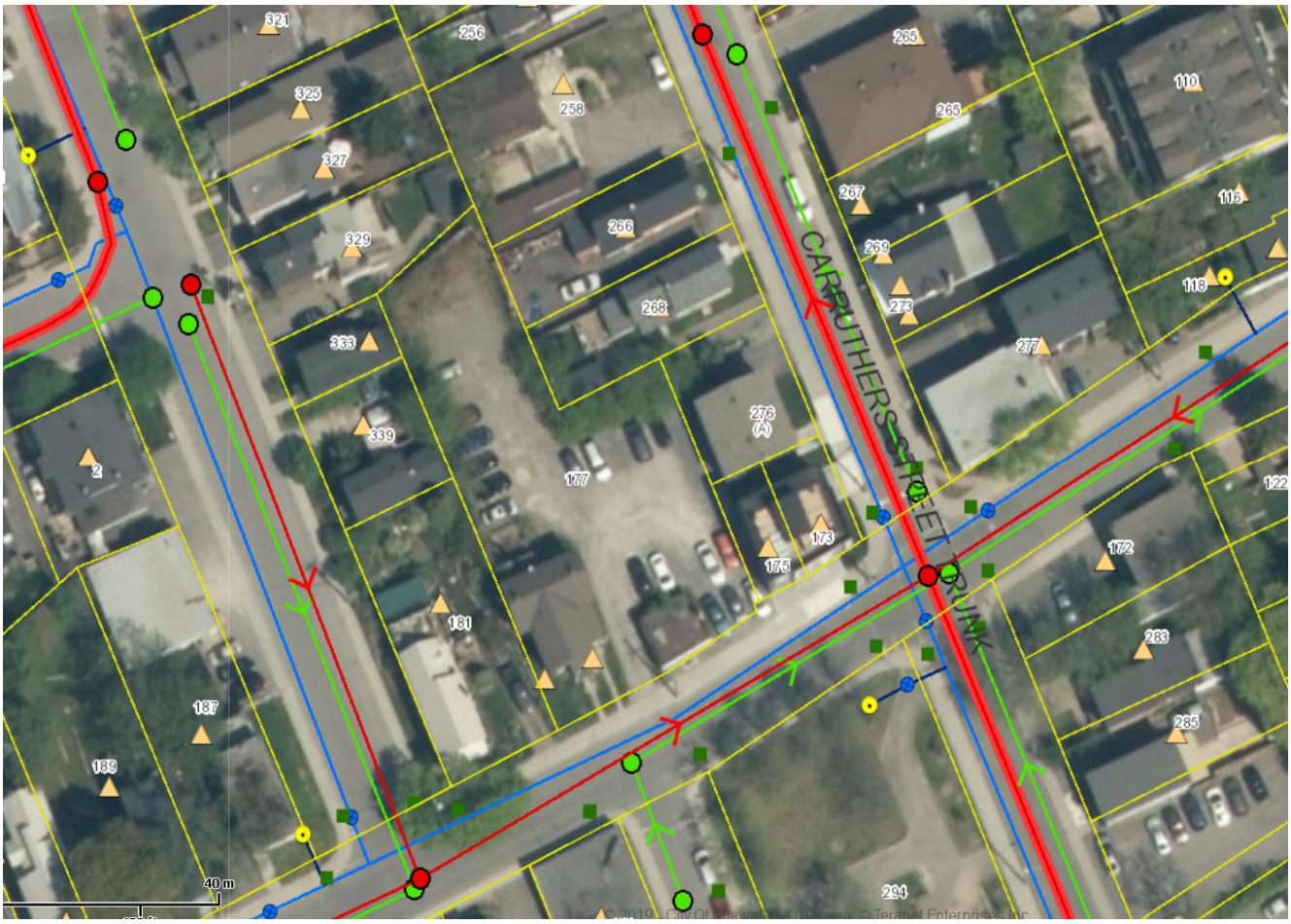
Designed:	Project:	
M.Ghadban, P.Eng.	177 Armstrong Street	
Checked:	Location:	
J. Fitzpatrick, P.Eng.	177 Armstong Street	
Dwg Reference:	File Ref:	Sheet No:
C100 - Site Servicing Plan	**252997 Stormwater - Sewer Design Sheets, April 2020.xlsx**	1 of 1

Appendix E – Consultation / Correspondence

Email on Water System Boundary Conditions

Email Sent to RCVA on Stormwater Management Requirements

Email Received from RCVA on Stormwater Management Requirements



City Services

Armstrong
300mm PVC Stm – 1995
300mm PVC San – 1992
203mm PVC Wtr – 1992
Carruthers
300mm PVC Stm – 1996
1200mm Conc San – 1912
203mm PVC Wtr – 1995

- Suggested service extensions (wtr, san, stm) off Carruthers under proposed drive aisle to provide municipal servicing to all proposed dwellings with the exception of those fronting Armstrong St. Armstrong St townhouses to be serviced off Armstrong. If adequate spacing can be provided (1m setback from foundation - Sewer Connection Bylaw; Lateral Spacing - City Dwg S11.3), it may be possible to service Armstrong fronting townhouses from service extensions. Service extensions will require accompanying MECP ECA applications.

Stormwater Management Criteria

Design – 5 year Storm, C=0.5
Control to 1:100yr storm

Studies Required

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

Plans Required

- Site Servicing Plan
- Plan and Profile's for all services requiring MECP ECA
- Grade Control and Drainage Plan
- Erosion and Sediment Control Plan

Other

- Reinstate any sidewalk/curb that will not be reused
- JUMA's will be required for shared drive aisle

Moe Ghadban

From: Valic, Jessica <jessica.valic@ottawa.ca>
Sent: Wednesday, February 26, 2020 8:53 AM
To: Moe Ghadban
Cc: Bruce Thomas
Subject: RE: Request for Boundary Conditions - 177-179 Armstrong Street
Attachments: 177 Armstrong 268 Carruthers Feb 2020.pdf

Good Morning Moe,

As requested, here are the boundary conditions for this development:

The following are boundary conditions, HGL, for hydraulic analysis at 177 Armstrong & 268 Carruthers (zone 1W) assumed to be connected to the 203mm on Armstrong and 203mm on Carruthers (see attached PDF for location).

Minimum HGL = 108.0m, same at both connections

Maximum HGL = 115.5m, same at both connections

MaxDay + FireFlow (333L/s) = 100.0m, Armstrong connection

MaxDay + FireFlow (83 L/s) = 109.0m, Carruthers connection

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.

Please do not hesitate to contact me with any questions/concerns.

Regards,

Jessica Valic, E.I.T.
Engineering Intern
Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique
Development Review - Central
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 15672
jessica.valic@ottawa.ca

From: Moe Ghadban <Moe.Ghadban@exp.com>
Sent: February 25, 2020 2:52 PM
To: Valic, Jessica <jessica.valic@ottawa.ca>
Cc: Bruce Thomas <Bruce.Thomas@exp.com>
Subject: FW: Request for Boundary Conditions - 177-179 Armstrong Street

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Hi Jessica,

Please see the average day included below:

177 Armstrong (Apartment Building, Boundary Location #1):
Average Day: 0.23 L/sec
Max Day: 2.0 L/sec
Peak Hour: 3.0 L/sec
Fire flow (RFF): 333 L/sec (based on FUS method)
Max Day + FF: 335.0 L/sec.

268 Carruthers Ave (Single Home, Boundary Location #2):
Average Day: 0.01 L/sec
Max Day: 0.1 L/sec
Peak Hour: 0.2 L/sec
Fire flow (RFF): 83 L/sec (based on FUS method)
Max Day + FF: 83.2 L/sec.

Regards,

Moe Ghadban, P.Eng
EXP | Engineering Designer
t : +1.613.688.1899 | m : +1.613.808.4089 | e : moe.ghadban@exp.com

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From: Valic, Jessica <jessica.valic@ottawa.ca>
Sent: Tuesday, February 25, 2020 2:44 PM
To: Moe Ghadban <Moe.Ghadban@exp.com>
Cc: Bruce Thomas <bruce.thomas@exp.com>; Jason Fitzpatrick <jason.fitzpatrick@exp.com>
Subject: RE: Request for Boundary Conditions - 177-179 Armstrong Street

Hi Moe,

Can you please forward me the Average Day Demands for the below as well? This number is required for the boundary conditions.

Please do not hesitate to contact me with any questions/concerns.

Regards,

Jessica Valic, E.I.T.
Engineering Intern
Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique
Development Review - Central
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 15672
jessica.valic@ottawa.ca

From: Moe Ghadban <Moe.Ghadban@exp.com>
Sent: February 20, 2020 3:50 PM
To: Valic, Jessica <jessica.valic@ottawa.ca>
Cc: Bruce Thomas <Bruce.Thomas@exp.com>; Jason Fitzpatrick <jason.fitzpatrick@exp.com>
Subject: RE: Request for Boundary Conditions - 177-179 Armstrong Street

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Hi Jessica,

Thanks for getting back to me. I have attached the location sketch and FF calcs. Please see the Max Day + FF results below:

177 Armstrong (Apartment Building, Boundary Location #1):
Max Day: 2.0 L/sec
Peak Hour: 3.0 L/sec
Fire flow (RFF): 333 L/sec (based on FUS method)
Max Day + FF: 335.0 L/sec.

268 Carruthers Ave (Single Home, Boundary Location #2):
Max Day: 0.1 L/sec
Peak Hour: 0.2 L/sec
Fire flow (RFF): 83 L/sec (based on FUS method)
Max Day + FF: 83.2 L/sec.

Regards,

Moe Ghadban
EXP | Engineering Designer
t : +1.613.688.1899 | m : +1.613.808.4089 | e : moe.ghadban@exp.com

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From: Valic, Jessica <jessica.valic@ottawa.ca>
Sent: Thursday, February 20, 2020 3:44 PM

To: Moe Ghadban <Moe.Ghadban@exp.com>
Cc: Bruce Thomas <bruce.thomas@exp.com>; Jason Fitzpatrick <jason.fitzpatrick@exp.com>
Subject: RE: Request for Boundary Conditions - 177-179 Armstrong Street

Good afternoon Moe,

Apologies, this request didn't reach me until Tuesday. I will forward the conditions upon receipt.

Could you please send me the initial email you sent Steve Gauthier with the location sketch and FF calcs? The email forwarded to me did not contain the attachments and Steve is currently on vacation for a few weeks.

The Project Manager for this application will be assigned when the application is received. In the meantime, feel free to direct any questions about the project to myself.

Please do not hesitate to contact me with any questions/concerns.

Regards,

Jessica Valic, E.I.T.
Engineering Intern
Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique
Development Review - Central
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 15672
jessica.valic@ottawa.ca

From: Moe Ghadban <Moe.Ghadban@exp.com>
Sent: February 18, 2020 4:20 PM
To: Valic, Jessica <jessica.valic@ottawa.ca>
Cc: Bruce Thomas <Bruce.Thomas@exp.com>; Jason Fitzpatrick <jason.fitzpatrick@exp.com>
Subject: RE: Request for Boundary Conditions - 177-179 Armstrong Street

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ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Hi Jessica,

Just following up on when we can expect the boundary conditions. Thank you.

Regards,

Moe Ghadban
EXP | Engineering Designer
t : +1.613.688.1899 | m : +1.613.808.4089 | e : moe.ghadban@exp.com

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From: Gauthier, Steve <Steve.Gauthier@ottawa.ca>
Sent: Tuesday, February 18, 2020 2:52 PM
To: Moe Ghadban <Moe.Ghadban@exp.com>; Valic, Jessica <jessica.valic@ottawa.ca>
Cc: Bruce Thomas <bruce.thomas@exp.com>; Jason Fitzpatrick <jason.fitzpatrick@exp.com>
Subject: RE: Request for Boundary Conditions - 177-179 Armstrong Street

Jessica Valic

From: Moe Ghadban <Moe.Ghadban@exp.com>
Sent: February 18, 2020 11:01 AM
To: Gauthier, Steve <Steve.Gauthier@ottawa.ca>
Cc: Bruce Thomas <Bruce.Thomas@exp.com>; Jason Fitzpatrick <jason.fitzpatrick@exp.com>
Subject: RE: Request for Boundary Conditions - 177-179 Armstrong Street

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ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Hi Steve,

Who is the contact in IAD looking after the boundary conditions request?

Regards,

Moe Ghadban
EXP | Engineering Designer
t : +1.613.688.1899 | m : +1.613.808.4089 | e : moe.ghadban@exp.com

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From: Moe Ghadban
Sent: Friday, February 7, 2020 3:26 PM
To: Steve.Gauthier@ottawa.ca
Cc: Bruce Thomas <bruce.thomas@exp.com>; Jason Fitzpatrick <jason.fitzpatrick@exp.com>
Subject: Request for Boundary Conditions - 177-179 Armstrong Street

Hi Steve,

We are working on a site plan application for 177 Armstrong and 268 Carruthers Ave , and would appreciate if you could arrange for IAD/water Resources to provide hydraulic boundary conditions that we will need for the watermain design. I have attached a sketch of the site and the approximate boundary condition locations.

The pre-consultation meeting minutes did not provide a contact for Infrastructure Approvals/Water Resources. **Could you please forward this email to the appropriate resources**. Thank you.

The following is a summary of the demands and the required fire flows (RFF) we have estimated. We would appreciate the hydraulic boundary conditions based on our estimated water demands and required fire flows as noted below:

177 Armstrong (Apartment Building, Boundary Location #1):
Max Day: 2.0 L/sec
Peak Hour: 3.0 L/sec

Fire flow (RFF): 333 L/sec (based on FUS method)
Max Day + FF: 335.0 L/sec.

268 Carruthers Ave (Single Home, Boundary Location #2):
Max Day: 0.1 L/sec
Peak Hour: 0.2 L/sec
Fire flow (RFF): 83 L/sec (based on FUS method)
Max Day + FF: 83.2 L/sec.

In the event you require confirmation of the above demands and the RFF, I've attached the design tables for reference.

Regards,

Moe Ghadban, P.Eng
EXP | Engineering Designer
t : +1.613.688.1899 | m : +1.613.808.4089 | e : moe.ghadban@exp.com
2650 Queensview Drive
Suite 100
Ottawa, ON K2B 8H6
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'

Moe Ghadban

From: Eric Lalande <eric.lalande@rvca.ca>
Sent: Wednesday, March 4, 2020 12:33 PM
To: Moe Ghadban
Cc: Bruce Thomas; Jason Fitzpatrick
Subject: Re: RVCA - Quality requirements for proposed development - 172 Main Street

Hi Moe,

The RVCA will not require quality control measures for the proposed development. Any opportunities to maximize best management practices are encouraged where possible.

Thank you,

Eric Lalande, MCIP, RPP
Planner, RVCA
613-692-3571 x 1137

Get Outlook for Android

From: Moe Ghadban <Moe.Ghadban@exp.com>
Sent: Wednesday, March 4, 2020 12:25:52 PM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Bruce Thomas <bruce.thomas@exp.com>; Jason Fitzpatrick <jason.fitzpatrick@exp.com>
Subject: RE: RVCA - Quality requirements for proposed development - 172 Main Street

Hi Eric,

Please see the attached site plan. Thank you.

Regards,

Moe Ghadban, P.Eng
EXP | Engineering Designer
t : +1.613.688.1899 | m : +1.613.808.4089 | e : moe.ghadban@exp.com

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keep it green, read from the screen

From: Eric Lalande <eric.lalande@rvca.ca>
Sent: Wednesday, March 4, 2020 12:15 PM
To: Moe Ghadban <Moe.Ghadban@exp.com>
Subject: Re: RVCA - Quality requirements for proposed development - 172 Main Street

Do you have a site plan available for review,

Thanks,

Eric

Get Outlook for Android

From: Moe Ghadban <Moe.Ghadban@exp.com>
Sent: Wednesday, March 4, 2020 12:12:11 PM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Bruce Thomas <bruce.thomas@exp.com>; Jason Fitzpatrick <jason.fitzpatrick@exp.com>
Subject: RVCA - Quality requirements for proposed development - 172 Main Street

Hi Eric,

We are preparing a site servicing and stormwater report for site plan application which consists of a 3-storey apartment unit at 172 Main Street. The first floor will be used as a commercial space, whereas the second and third floor shall be residential (4-2 bedroom units total).

As required by the City, as noted in the pre-consultation meeting, we are emailing the Conservation Authority to provide the water quality requirements for the proposed development.

I'm not sure if it's you who'd review this project, however if you pass this email on to someone else within the RVCA group please CC me on the email. Thank you.

Thank you for your review and input.

Regards,

Moe Ghadban, P.Eng
EXP | Engineering Designer
t : +1.613.688.1899 | m : +1.613.808.4089 | e : moe.ghadban@exp.com
2650 Queensview Drive
Suite 100
Ottawa, ON K2B 8H6
CANADA

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Appendix F – Background Information

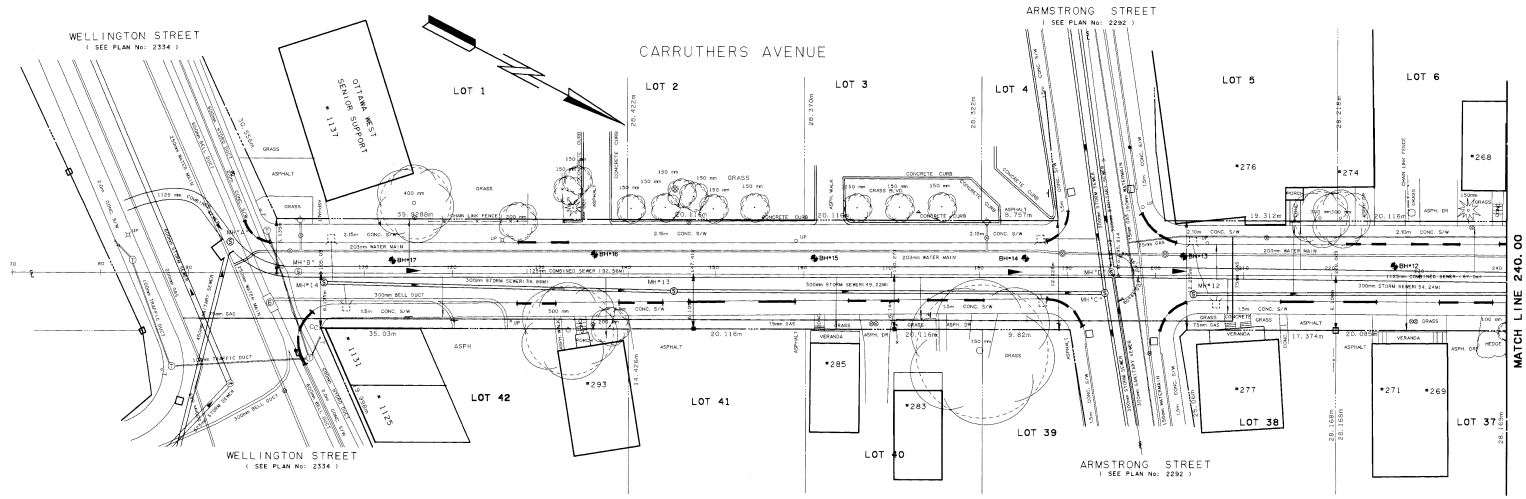
City of Ottawa Vault Drawings (Plan and Profiles)

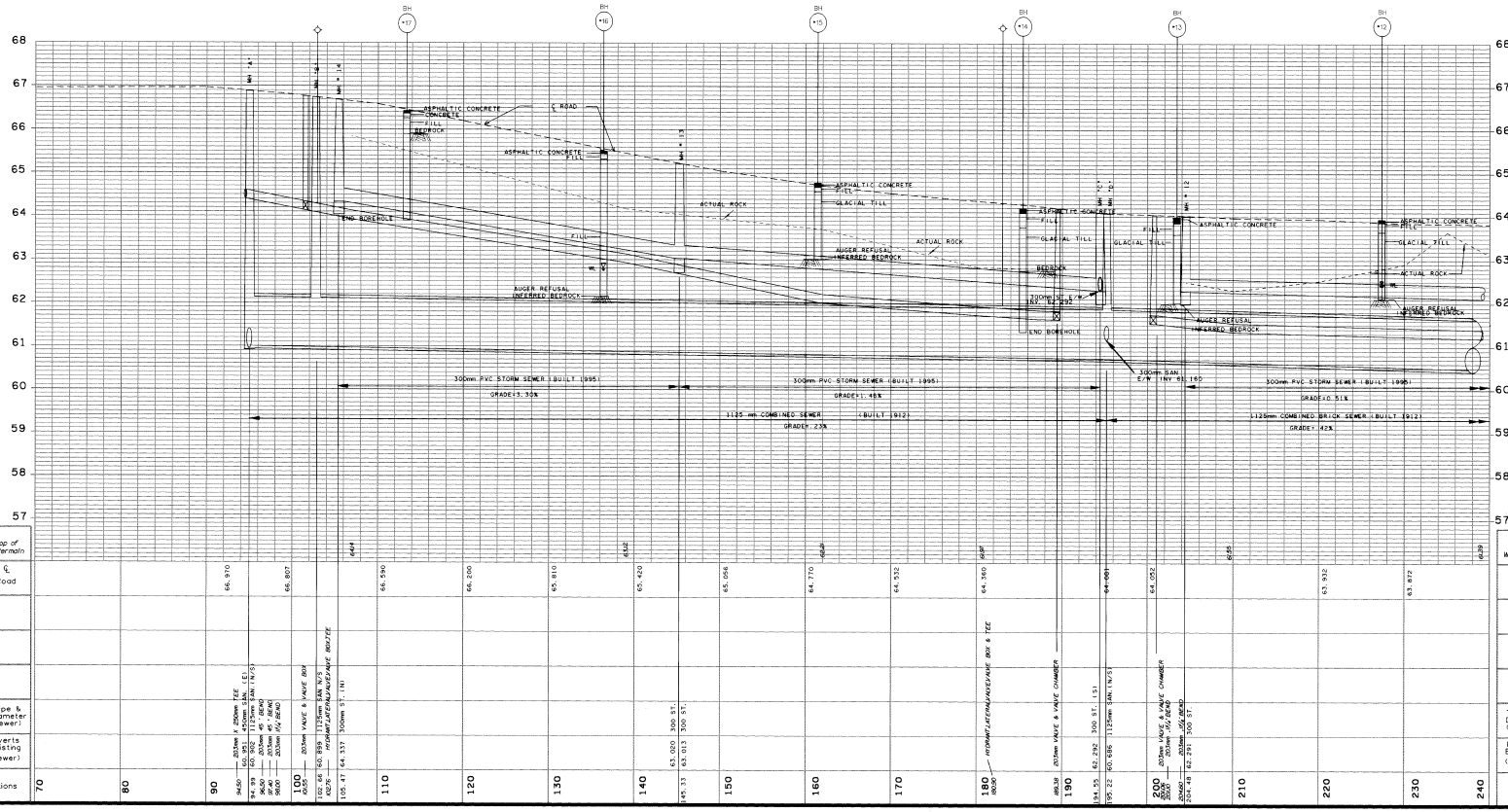
WATTS ACCUTROL Weir for Roof Drains

Tempest-Technical-Manual (page 5 only)

STORMTECH SC-740 CHAMBER Product Sheet

2825 CARRUTHERS AVENUE (3)





Revisions:

No.	Date	Description	Drawn By	Approved By

Design:

Designed By: L.BHATIA	Date: JAN./95	Checked By:	Date:
Survey Detail By: G.BARNEY, T.SCAFFICK	Date: JULY/94	Field Checked By:	Date:
Drafting By: J.FRANCE, D.GREEN	Date: MAR./95	Checked By:	Date:

Chief Design & Const. Eng.
H. PASCOE, P.Eng

Final Measurements:

Construction Type: SEWERS , WATERMAIN , SIDEWALK , ROAD	Inspector: J. FRANCE
Work Commenced: JULY/95	Project Manager: ISHWAR BHATIA
Work Completed: JUNE/96	Field Book #: 5495
Contractor: PEDRO CONS.T	Date: 1995
Drafting Revisions: J. FRANCE	Date: NOV./96 — Checked By: ISHWAR BHATIA

Notes:

- While illustrations and utilities shown are taken from the best available information, they cannot be guaranteed.
- The contractor is requested to check with all utility companies before digging.
- Soil information shown is not guaranteed and contactors are advised to collect additional soils information as deemed necessary
- The actual rock line was recorded during construction of the existing STORM sewer.
- Soil information taken from : J.D. PATERSON ,JAN.16/95
- Reference bench mark : ST. FRANCOIS CHURCH MON.#3606 (ELEV. 67.236)
- Date of television inspection : TAMARACK JAN./91
- This plan supercedes (in whole or in part) plan # 11a
- Registered Plan # : 83
- When reduced, the scale of this drawing is approximately 1:400 horizontally and 1:80 vertically. Do not scale this drawing.
- See additional notes on sheet no. 1

As Built Notes:

- Boreholes prior to construction.
- See typical cross sections for road structure material depths

Watermain Notes:

- All watermain materials and construction methods shall be in accordance with the latest edition of the R.M.O.C. Standard Specifications and Standard Drawings.
- All connections of new watermains to existing watermains and all blankings of existing mains and services shall be performed by R.M.O.C. staff. The Contractor shall provide excavation, backfilling and reinstatement.
- All copper services (19mm to 51mm) shall be installed by R.M.O.C. staff after the watermain has been successfully disinfected
- All new water services shall be installed at 2.4m cover.
- All water services that conflict with sanitary and storm sewers at crossings shall be installed under the sewers unless otherwise directed by the REGIONAL PROJECT MANAGER.
- The proposed watermain shall be insulated at specified locations per R.M.O.C. Specification WSD-23.
- A minimum 2.0m separation is required between all new water services and catchbasins or open structures and shall be insulated per R.M.O.C. Specification WSD-23 as applicable.
- A minimum 2.0m separation is required between all new hydrants and catchbasins or open structures and shall be insulated per R.M.O.C. Specification WSD-23 as applicable.
- The Contractor shall be responsible to determine via excavation the exact location and elevation of the existing watermains as required for all connections , relocations and blanking.

City of Ville d' **Ottawa**

Department Of Engineering And Works
Engineering Branch
Design And Construction Division
111 SUSSEX DRIVE, SUSSEX PAVILION, 7TH FLOOR, OTTAWA, ONTARIO, K1N 5A1

E.M. Robinson	W.R. Cole, P.Eng.
Commissioner	Branch Director

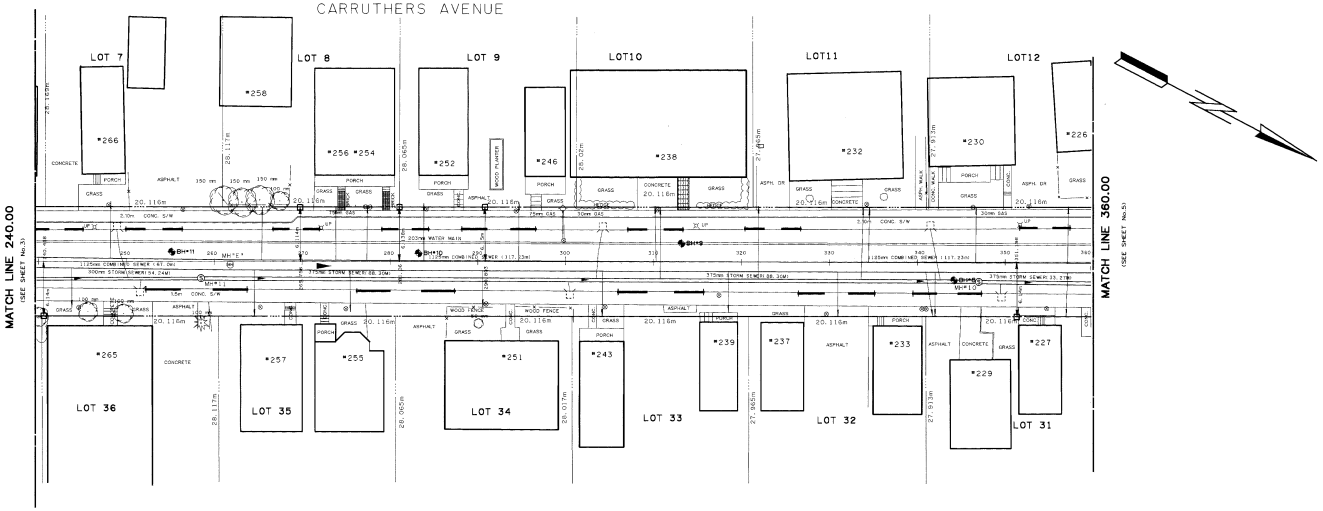
CARRUTHERS AVENUE

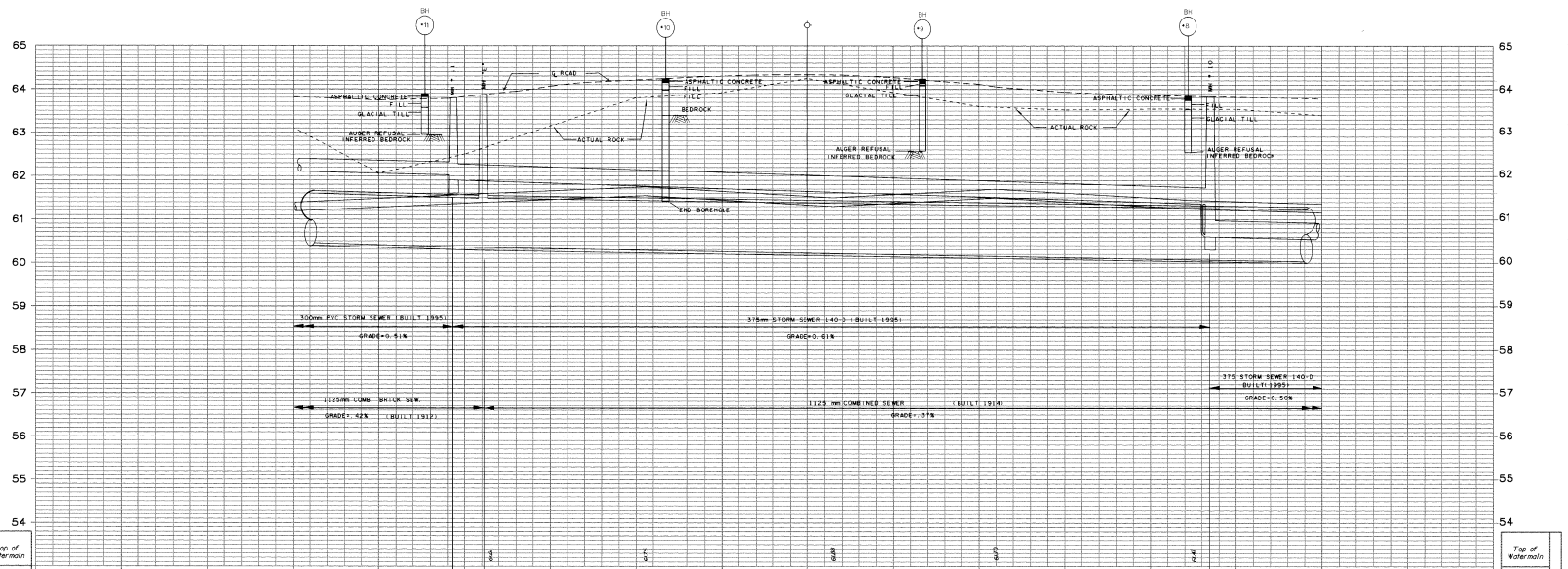
Contract No.	Survey Books	Scales: (See Note)	Plan No.
95C2825	2825	HOR. 1:250 VERT. 1:50	2825 Sheet 3 of 8

C:\DD Filenames\2825s1.dgn

*This drawing was sketched using MicroStation 4.0 (CAD)

2825 CARRUTHERS AVENUE (4)





Stations	240	250	260	270	280	290	300	310	320	330	340	350	360
Top of Watermain													
℄ Road	63.812	63.752	63.817	64.088	64.210	64.310	64.350	64.280	64.116	63.940	63.866	63.826	63.786
Elevations							HYDRANT LAT/ENG/AVENUE BOX & TEE						
Type & Diameter (sewer)		300mm S.T.	375mm S.T.									375mm S.T.	375mm S.T.
Inverts Existing (sewer)		62.013	61.900	60.402							61.568	60.610	
Stations		258.72	260	262.23			289.5				341.00		

1125mm (44in.) (N/S)

Revisions:

No.	Date	Description	Drawn By	Approved By

Design:

Designed By: I. BHATIA	Date: JAN./95	Checked By:	Date:
Survey Detail By: G.BARNETT,S.SCAFFIDI	Date: JUL/94	Field Checked By:	Date:
Drafting By: J. FRANCE, D. GREEN	Date: MAY./95	Checked By:	Date:

Chief Design & Const. Eng.
H. PASCOE, P.Eng

Final Measurements:

Construction Type: SEWERS , WATERMAIN , SIDEWALK , ROAD	Inspector: J. FRANCE
Work Commenced: JUL/95	Project Manager: ISHWAR BHATIA
Work Completed: JUNE/96	Field Book #: 5495
Contractor: PEDRO CONS.T	Date: 1995
Drafting Revisions: J. FRANCE	Date: NOV./96 Checked By: ISHWAR BHATIA

Notes:

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- The contractor is requested to check with allutility companies before digging.
- Soil information shown is not guaranteed and contactors are advised to collect additional soils information as deemed necessary
- The actual rock line was recorded during construction of the existing STORM sewer.
- Soil information taken from : J.D. PATERSON ,JAN.16/95
- Reference bench mark : ST. FRANCOIS CHURCH MON.#3606 (ELEV. 67.236)
- Date of television inspection : TAMARACK JAN./91
- This plan supercedes (in whole or in part) plan # 11a
- Registered Plan # : 83
- When reduced, the scale of this drawing is approximately 1:400 horizontally and 1:80 vertically. Do not scale this drawing.
- See additionalnotes on sheet no. 1

As Built Notes:

- Boreholes prior to construction.
- See typical cross sections for road structure material depths

Watermain Notes:

- All watermain materials and construction methods shall be in accordance with the latest edition of the R.M.O.C. Standard Specifications and Standard Drawings.
- All connections of new watermains to existing watermains and allblankings of existing mains and services shall be performed by R.M.O.C. staff. The Contractor shall provide excavation, backfilling and reinstatement.
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- All new water services shall be installed at 2.4m cover.
- All new water services that conflict with sanitary and storm sewers at crossings shallbe installed under the sewers unless otherwise directed by the REGIONAL PROJECT MANAGER
- The proposed watermain shallbe insulated at specified locations per R.M.O.C. Specification WSD-23.
- A minimum 2.0m separation is required between allnew water services and catchbasins or open structures and shallbe insulated per R.M.O.C. Specification WSD-23 as applicable.
- A minimum 2.0m separation is required between allnew hydrants and catchbasins or open structures and shall be insulated per R.M.O.C. Specification WSD-23 as applicable.

The Contractor shallbe responsible to determine via excavation the exact location and elevation of the existing watermains as required for allconnections , relocations and blanking.

City of Ville d' **Ottawa**

Department Of Engineering And Works
Engineering Branch
Design And Construction Division
111 SUSSEX DRIVE, SUSSEX PAVILION, 7TH FLOOR, OTTAWA, ONTARIO. K1N 5A1

E.M. Robinson, Commissioner	W.R. Cole, P.Eng., Branch Director

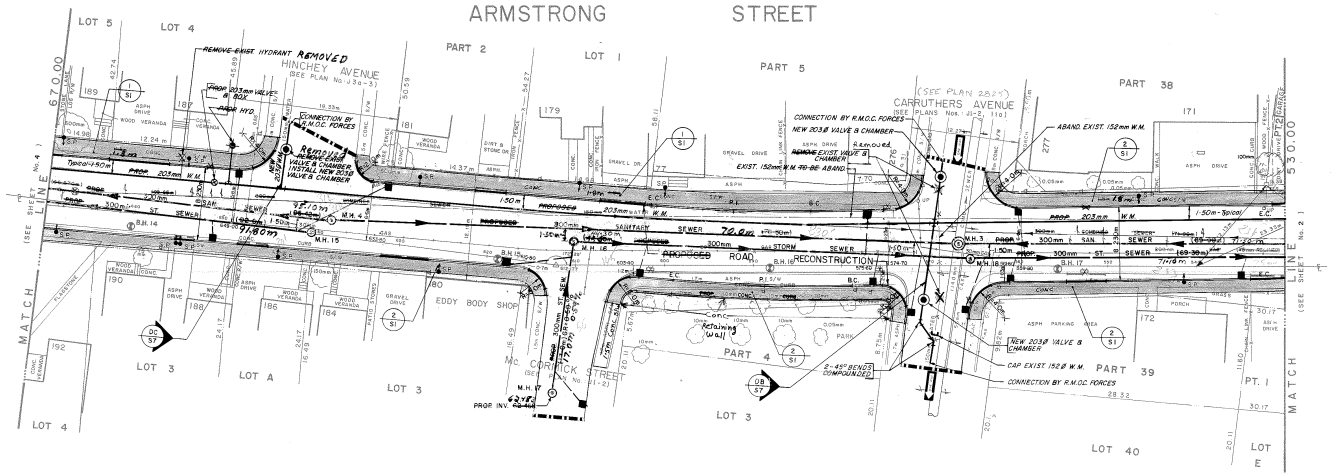
CARRUTHERS AVENUE

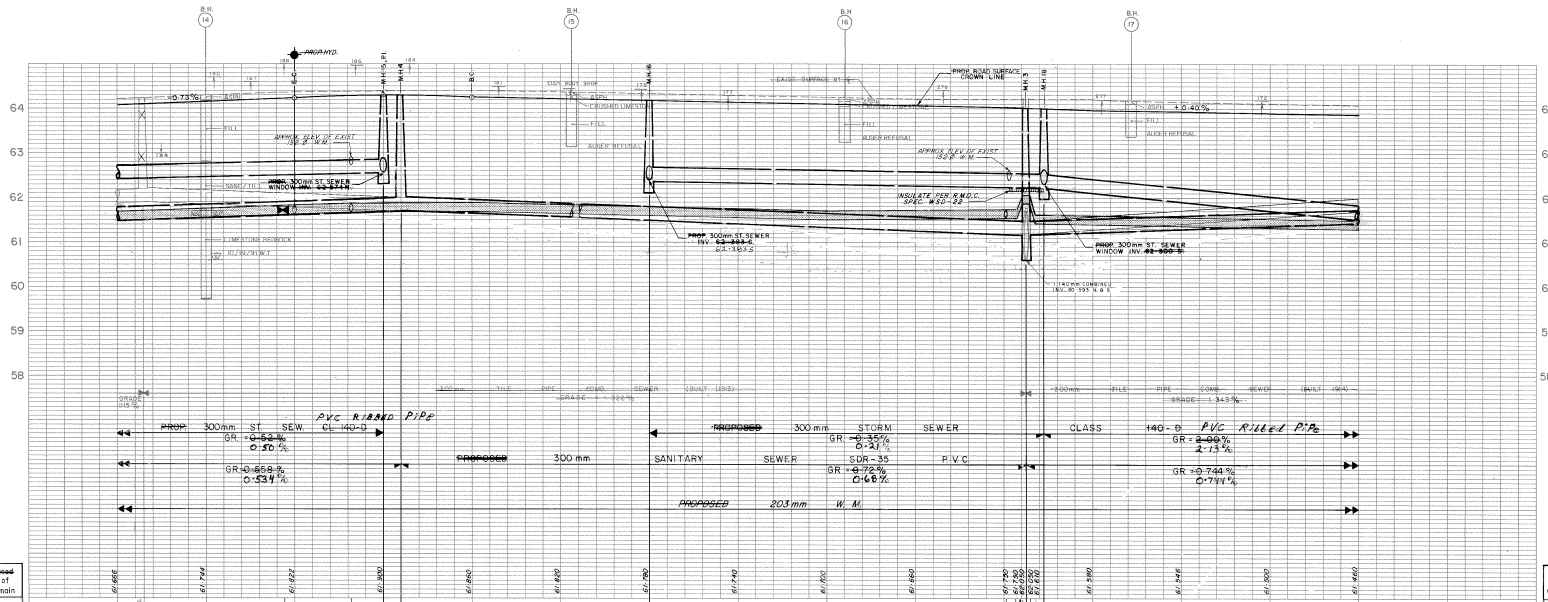
Contract No.	Survey Book#	Scales: (See note)	Plan No.
95C2825	2825	HOR. 1:250 VERT. 1:50	2825 Sheet 4 of 8

CAD Filename: 2825s2.dgn

*This drawing was created using Microstation 4.0 (CAD)

2292 ARMSTRONG STREET (3 of 8)





Elevations	Stations
Proposed Top of Watermain	67000
~~Existing Surface~~	66500
~~Proposed~~ North Gutter	66000
Proposed Road Surface Crown Line	65500
Proposed South Gutter	65000
Type & Diameter (sewer)	64500
Inverts Exist. & Prop. (sewer)	64000
	63500
	63000
	62500
	62000
	61500
	61000
	60500
	60000
	59500
	59000
	58500
	58000
	57500
	57000
	56500
	56000
	55500
	55000
	54500
	54000
	53500
	53000

Revisions:

No.	Date	Description	Drawn By	Appr'd By

Final Measurements:

Contractor Type	Sidewalk	Inspector	A-Peck
Work Commenced	Road sewers Water main	Instructions	A-Cormier
	June 1-92		A-Peck Cormier
Work Completed	Nov 1-92	Field Book #	52 63
Contractor	Lavalin	Date	Sept 15/93
Drafting Revisions	A-Peck	Checked By	Wade Chouthier

Designed By	Date	Structural Check By	Date
D.J. Egan	Nov/91		
Survey Detail By	Date	Checked By	
R. Cormier	Mar/88	R. Cormier	
Drafting By — Base Plan: M. Voss — Jun/89	Date	Checked By	Date
Design Applied By: A. Scaffidi — Dec/91		W.T. Clouthier	March/93

Chief, Design & Const. Eng. | Senior Const. Coord.

LICENSED PROFESSIONAL ENGINEER No. 2493 W. T. CLOUTHIER PROVINCE OF ONTARIO

Notes:

- Utilities shown are taken from best available records. Contractor is requested to check with all utility companies before digging.
- Soil information shown is not guaranteed and contractors are advised to collect additional soils information as deemed necessary.
- Reference bench mark: B.M. 3606, Elev. 67.236
- Proposed storm and sanitary sewers may be constructed in a common trench provided that a minimum horizontal distance of 460mm is maintained between outside barrels of pipe.
- All pipes shall conform to the Canadian Standards Association A257.2(C.S.A) reinforced concrete sewer pipe with approved rubber gaskets.
- A minimum of 460 mm vertical clearance to be maintained between sewers and watermains where practical.
- Borehole soil descriptions are not based on sieve analysis but on visual inspection only, except where otherwise noted.
- Soil Information taken from: Trow Ontario Ltd Dec. 1990
- Date of television inspection: Tamarack Inspection Inc April 91
- This plan supercedes (in whole or in part) plan no: J-1.
- Actual rock line recorded during construction of existing sewer.
- Registered plan no.: 105, 155, 157, 83, 8 43.
- Caution, while illustrations and utilities shown are taken from best available information, they cannot be guaranteed.
- When reduced, the scale of this drawing is approximately 1:400 horizontally and 1:81 vertically. Do not scale this plan.
- See additional notes on sheet no. 1.

Regional Municipality of Ottawa-Carleton Environmental Services Department / Municipalité d'Ottawa-Carleton Services environnementaux

Approved

Date 11/03/93

WATER WORKS

City of Ville d' **Ottawa**

Department Of Engineering And Works

Engineering Branch

Design And Construction Division

1600 SCOTT STREET · OTTAWA, ONTARIO · K1Y 4N7

D.G. Curry P. Eng. Commissioner | W.R. Cole P. Eng. Branch Director

ARMSTRONG STREET

FROM CH. 530.00 TO CH. 670.00

Contract No.:	Survey Books:	Scales:	Plan No:
92C2292	4795, 4961 4828, 4960	HOR. 1:250 VERT. 1:50	2292 Sheet 3 of 8

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

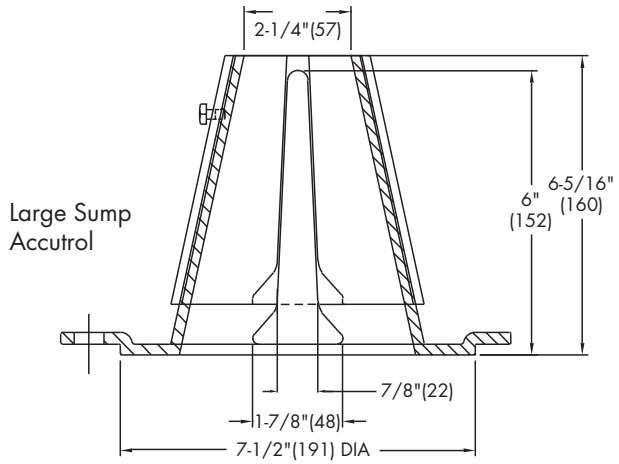
ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)

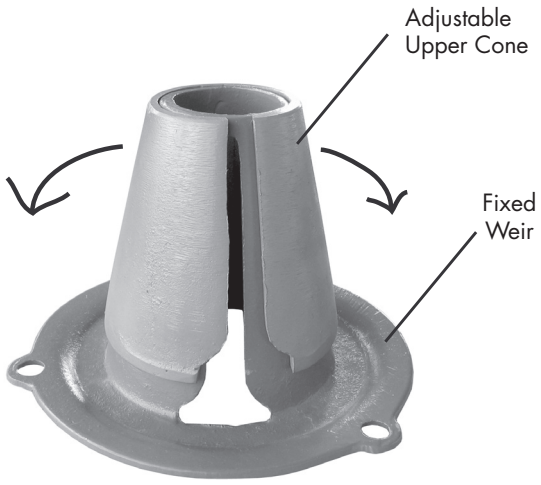
For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the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

EXAMPLE:

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

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





1/2 Weir Opening Exposed Shown Above

TABLE 1. Adjustable Accutrol Flow Rate Settings

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

Job Name _____ Contractor _____

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

Engineer _____ Representative _____

Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold.

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A Watts Water Technologies Company

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Latin America: Tel: (52) 81-1001-8600 • Fax: (52) 81-8000-7091 • Watts.com

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Chart 1: LMF 14 Preset Flow Curves

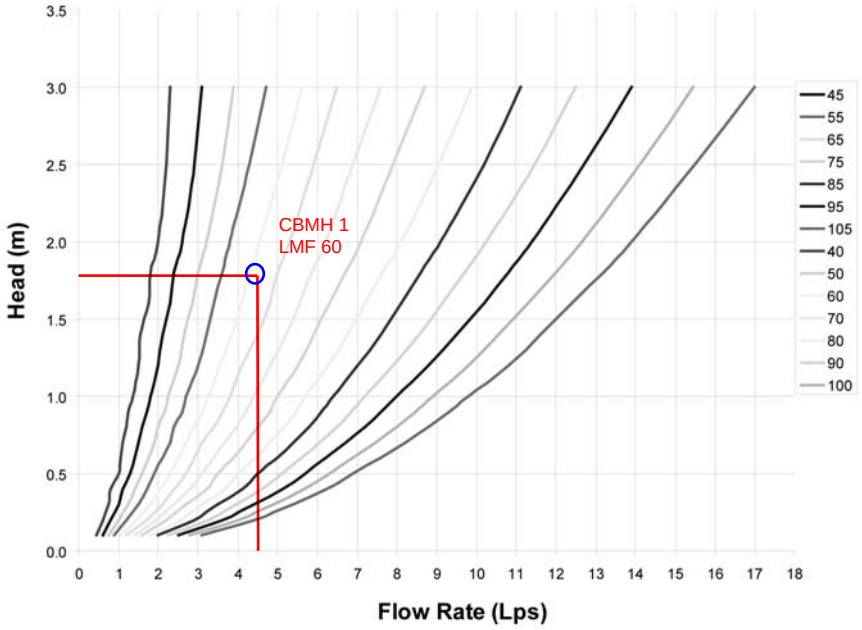
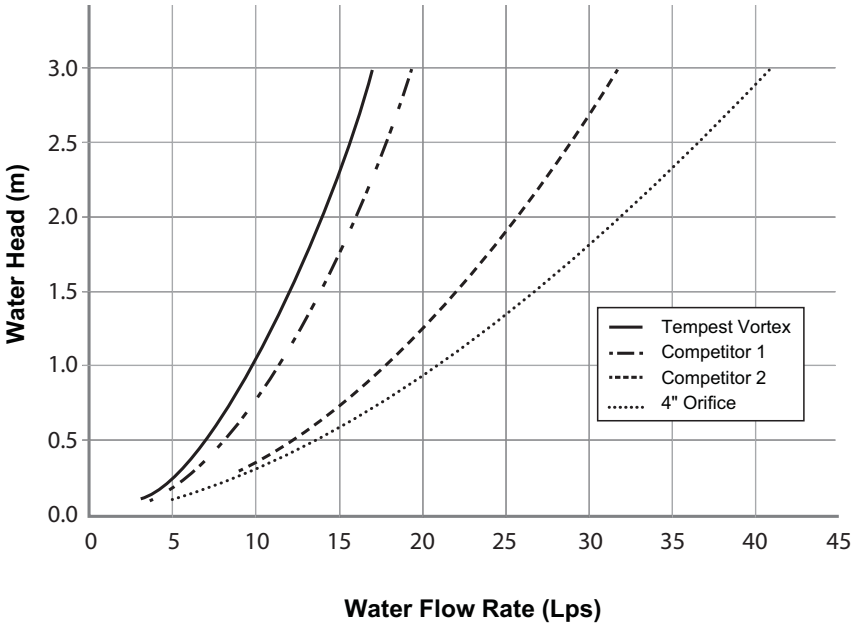


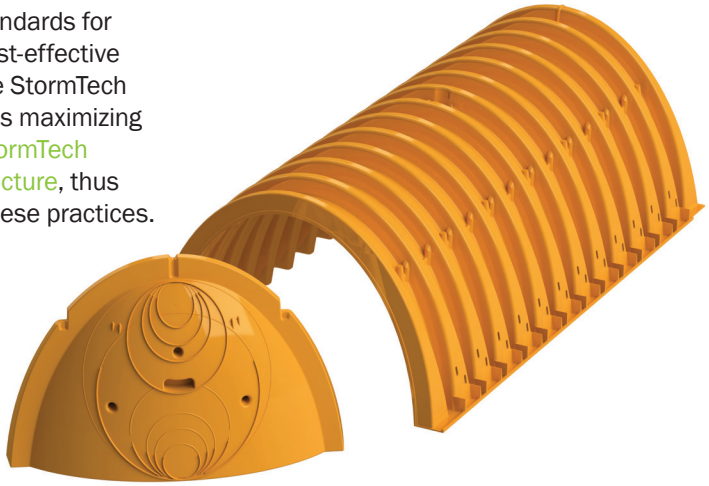
Chart 2: LMF Flow vs. ICD Alternatives



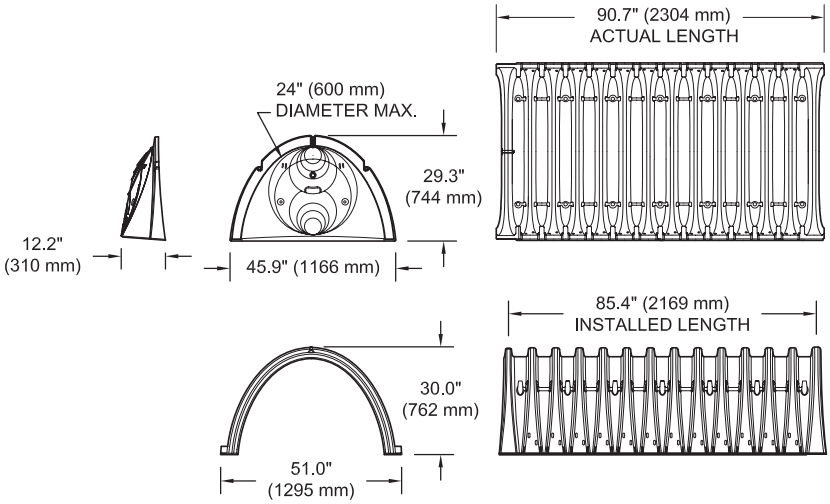
NOTE: Do not use or test the products in this manual with compressed air or other gases including air-over-water-boosters

STORMTECH SC-740 CHAMBER

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.



STORMTECH SC-740 CHAMBER
(not to scale)



Nominal Chamber Specifications

Size (L x W x H)
85.4" x 51" x 30"
2,170 mm x 1,295 mm x 762 mm

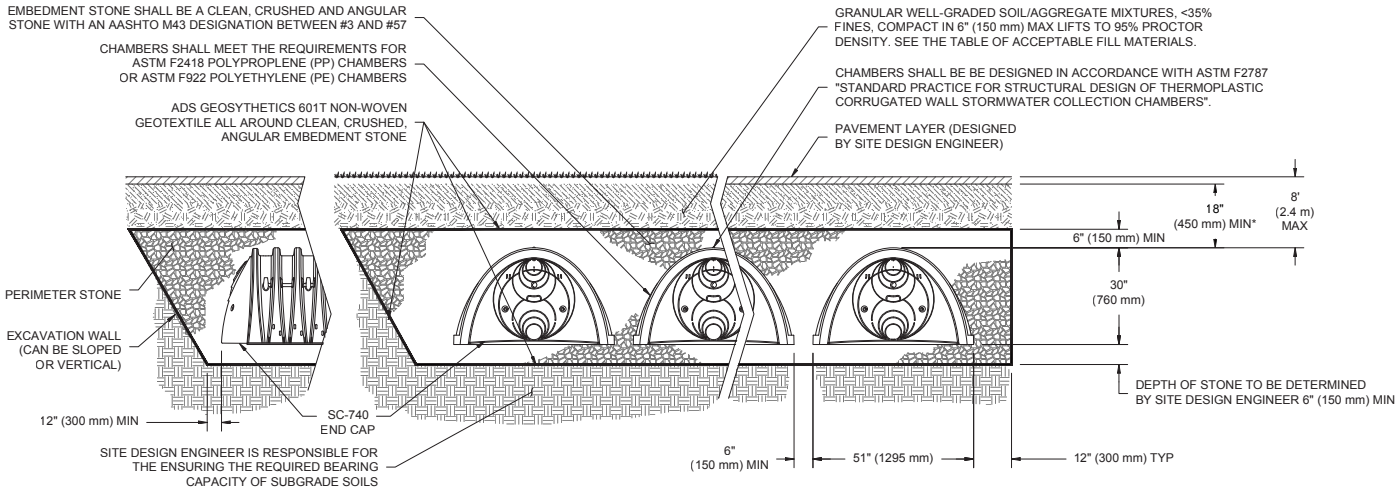
Chamber Storage
45.9 ft³ (1.30 m³)

Min. Installed Storage*
74.9 ft³ (2.12 m³)

Weight
74.0 lbs (33.6 kg)

Shipping
30 chambers/pallet
60 end caps/pallet
12 pallets/truck

*Assumes 6" (150 mm) stone above, below and between chambers and 40% stone porosity.



*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

SC-740 CUMULATIVE STORAGE VOLUMES PER CHAMBER

Assumes 40% Stone Porosity. Calculations are Based Upon a 6" (150 mm) Stone Base Under Chambers.

Depth of Water in System Inches (mm)		Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
42 (1067)		45.90 (1.300)	74.90 (2.121)
41 (1041)		45.90 (1.300)	73.77 (2.089)
40 (1016)	Stone	45.90 (1.300)	72.64 (2.057)
39 (991)	Cover	45.90 (1.300)	71.52 (2.025)
38 (965)		45.90 (1.300)	70.39 (1.993)
37 (940)		45.90 (1.300)	69.26 (1.961)
36 (914)		45.90 (1.300)	68.14 (1.929)
35 (889)		45.85 (1.298)	66.98 (1.897)
34 (864)		45.69 (1.294)	65.75 (1.862)
33 (838)		45.41 (1.286)	64.46 (1.825)
32 (813)		44.81 (1.269)	62.97 (1.783)
31 (787)		44.01 (1.246)	61.36 (1.737)
30 (762)		43.06 (1.219)	59.66 (1.689)
29 (737)		41.98 (1.189)	57.89 (1.639)
28 (711)		40.80 (1.155)	56.05 (1.587)
27 (686)		39.54 (1.120)	54.17 (1.534)
26 (660)		38.18 (1.081)	52.23 (1.479)
25 (635)		36.74 (1.040)	50.23 (1.422)
24 (610)		35.22 (0.977)	48.19 (1.365)
23 (584)		33.64 (0.953)	46.11 (1.306)
22 (559)		31.99 (0.906)	44.00 (1.246)
21 (533)		30.29 (0.858)	1.85 (1.185)
20 (508)		28.54 (0.808)	39.67 (1.123)
19 (483)		26.74 (0.757)	37.47 (1.061)
18 (457)		24.89 (0.705)	35.23 (0.997)
17 (432)		23.00 (0.651)	32.96 (0.939)
16 (406)		21.06 (0.596)	30.68 (0.869)
15 (381)		19.09 (0.541)	28.36 (0.803)
14 (356)		17.08 (0.484)	26.03 (0.737)
13 (330)		15.04 (0.426)	23.68 (0.670)
12 (305)		12.97 (0.367)	21.31 (0.608)
11 (279)		10.87 (0.309)	18.92 (0.535)
10 (254)		8.74 (0.247)	16.51 (0.468)
9 (229)		6.58 (0.186)	14.09 (0.399)
8 (203)		4.41 (0.125)	11.66 (0.330)
7 (178)		2.21 (0.063)	9.21 (0.264)
6 (152)		0 (0)	6.76 (0.191)
5 (127)		0 (0)	5.63 (0.160)
4 (102)	Stone	0 (0)	4.51 (0.128)
3 (76)	Foundation	0 (0)	3.38 (0.096)
2 (51)		0 (0)	2.25 (0.064)
1 (25)		0 (0)	1.13 (0.032)

Note: Add 1.13 ft³ (0.032 m³) of storage for each additional inch (25 mm) of stone foundation.

STORAGE VOLUME PER CHAMBER FT³ (M³)

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Foundation Depth in. (mm)		
		6 (150)	12 (300)	18 (450)
SC-740 Chamber	45.9 (1.3)	74.9 (2.1)	81.7 (2.3)	88.4 (2.5)

Note: Assumes 6" (150 mm) stone above chambers, 6" (150 mm) row spacing and 40% stone porosity.

AMOUNT OF STONE PER CHAMBER

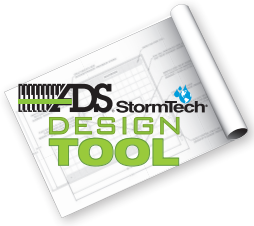
ENGLISH TONS (yds³)	Stone Foundation Depth		
	6"	12"	16"
SC-740	3.8 (2.8)	4.6 (3.3)	5.5 (3.9)
METRIC KILOGRAMS (m³)	**150 mm**	**300 mm**	**450 mm**
SC-740	3,450 (2.1)	4,170 (2.5)	4,490 (3.0)

Note: Assumes 6" (150 mm) of stone above and between chambers.

VOLUME EXCAVATION PER CHAMBER YD³ (M³)

	Stone Foundation Depth		
	6 (150)	12 (300)	18 (450)
SC-740	5.5 (4.2)	6.2 (4.7)	6.8 (5.2)

Note: Assumes 6" (150 mm) of row separation and 18" (450 mm) of cover. The volume of excavation will vary as depth of cover increases.



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Appendix G – Checklist

GENERAL CONTENT		RESPONSE
☐	Executive Summary (for larger reports only).	Not included
☒	Date and revision number of the report.	Date of report provided
☒	Location map and plan showing municipal address, boundary, and layout of proposed development.	Page 1
☒	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.	Section 2 of report
☒	Summary of Pre-consultation Meetings with City and other approval agencies.	In Appendix E
☐	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.	No Master Servicing Studies.
☒	Statement of objectives and servicing criteria.	Section 1 of report
☒	Identification of existing and proposed infrastructure available in the immediate area.	Section 2 & 3 of report
☐	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).	Not applicable
☐	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.	Not applicable
☐	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.	Not applicable
☐	Proposed phasing of the development, if applicable.	Not applicable
☐	Reference to geotechnical studies and recommendations concerning servicing.	Not applicable
☒	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	Functional Report, Civil and Architectural Plans provided all this information.
DEVELOPMENT SERVICING REPORT: WATER		**RESPONSE**
☐	Confirm consistency with Master Servicing Study, if available Availability of public infrastructure to service proposed development Identification of system constraints	Not applicable
☒	Identify boundary conditions	Section 4.6
☒	Confirmation of adequate domestic supply and pressure	Section 4.3
☒	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.	Section 4.7
☒	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.	Section 4.6 & Table B-7 Appendix B
☐	Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	Not applicable
☒	Address reliability requirements such as appropriate location of shut-off valves Check on the necessity of a pressure zone boundary modification.	Section 4.3
☒	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	Section 4.5 & Table B-4, Table B-5, Appendix B
☒	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.	Section 4.2

☐	Description of off-site required feeder mains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	Not applicable
☒	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Table B-1 Appendix B
☐	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	Not applicable
DEVELOPMENT SERVICING REPORT: WASTEWATER		**RESPONSE**
☒	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).	Section 5.1
☐	Confirm consistency with Master Servicing Study and/or justifications for deviations.	Not applicable
☒	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.	Section 5.2
☒	Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 5.2
☐	Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	Not applicable
☒	Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Table C-8 in Appendix C
☒	Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 5.2
☐	Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	Not applicable
☐	Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	Not applicable
☐	Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	Not applicable
☐	Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	Not applicable
☐	Special considerations such as contamination, corrosive environment etc.	Not applicable
DEVELOPMENT SERVICING REPORT: STORMWATER CHECKLIST		**RESPONSE**
☒	Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 6
☐	Analysis of available capacity in existing public infrastructure.	Not applicable
☐	A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Site is too small to be considered
☐	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.	Not Applicable
☐	Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Not Applicable
☒	Description of the stormwater management concept with facility locations and descriptions with references and supporting information.	Section 6.2 & 6.3
☐	Set-back from private sewage disposal systems. Watercourse and hazard lands setbacks.	Not Applicable
☒	Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	Appendix E
☐	Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	Not Applicable
☒	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	Section 6.9 & Table D6-D8 of Appendix D

☐	Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	Not Applicable
☒	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 6.6, 6.8 & Table D-2 & D-5 of Appendix D
☐	Any proposed diversion of drainage catchment areas from one outlet to another.	Not Applicable
☒	Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Section 6.8
☐	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.	Not Applicable
☐	Identification of potential impacts to receiving watercourses Identification of municipal drains and related approval requirements.	Not Applicable
☒	Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 6.9
☒	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 and Erosion and Sediment Plan
☐	Inclusion of hydraulic analysis including hydraulic grade line elevations.	Not Applicable
☒	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 7
☐	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.	Not Applicable – No requirements from Conservation Authority
☐	Identification of fill constraints related to floodplain and geotechnical investigation.	See geotechnical report
☒	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:	Appendix E
☐	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 theAct.	Not Applicable
☐	Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	Not Applicable
☐	Changes to Municipal Drains.	Not Applicable
☐	Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	Not Applicable
CONCLUSION CHECKLIST		**RESPONSE**
☒	Clearly stated conclusions and recommendations	In Section 8
☒	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.	Appendix E
☒	All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	Signed and stamped

Appendix H – Drawings

Site Plan and Renderings (4 pages)

Notes and Legend Sheet, C000

Site Servicing Plan, C100

Site Grading & Erosion and Sediment Control Plan, C200

DRAWING NOTES:

01 PREFINISHED METAL FLASHING (PEWTER)

02 GRAY BRICK: BRAMPTON, PREMIER SIZE, PEWTER LEGATO

03 JAMES HARDIE SIDING (CEDAR)

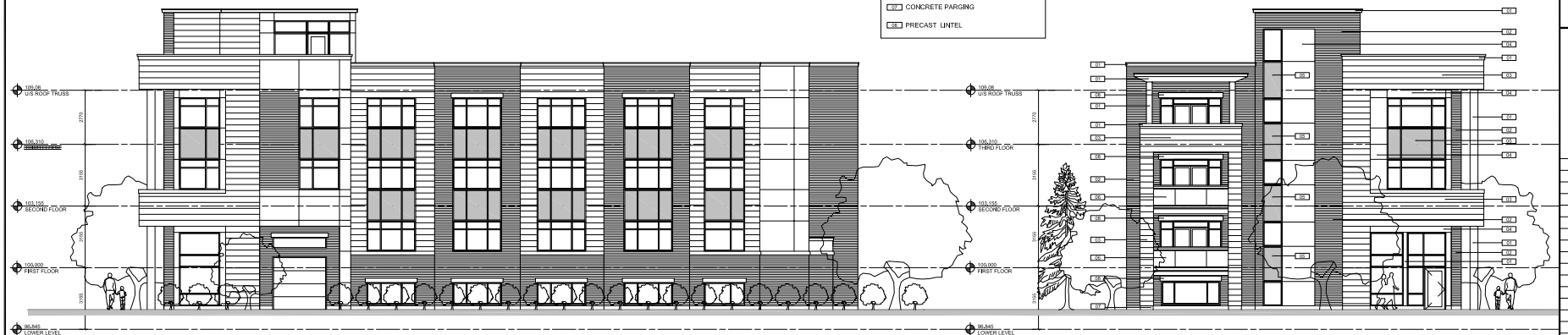
04 HARDIE BOARD PANELS C/W ALUMINUM TRIM PIECES (AGED PEWTER)

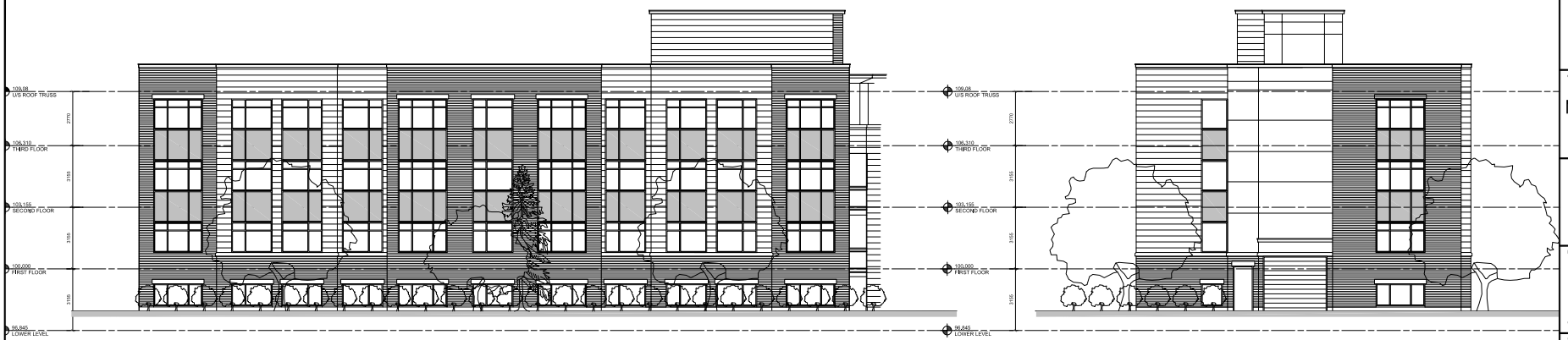
05 HARDIE BOARD ACCENT PANEL C/W ALUMINUM TRIM PIECES (IRON GRAY)

06 PREFINISHED ALUMINUM GUARDRAILS (BLACK) WITH GLASS INSERTS

07 CONCRETE PARGING

08 PRECAST LINTEL





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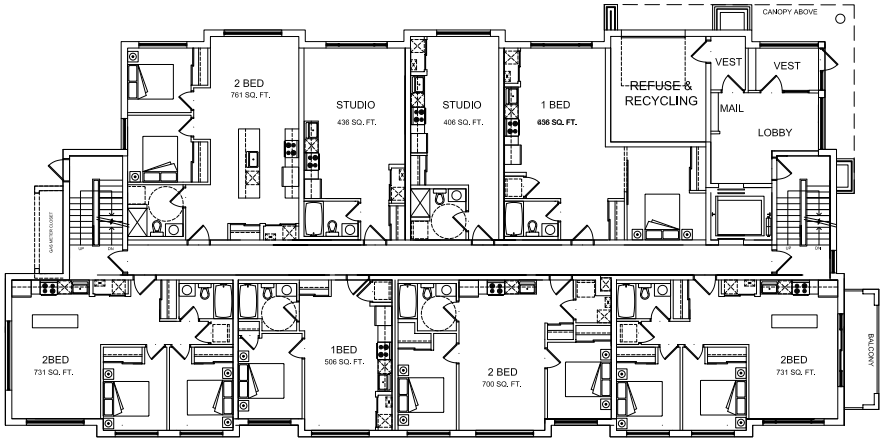
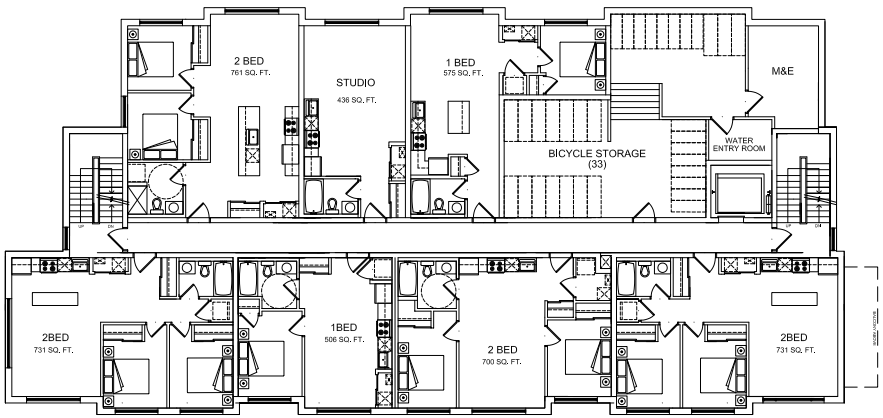


FIRST LEVEL

(2) STUDIO UNITS
(2) ONE BEDROOM UNITS
(4) TWO BEDROOM UNITS



LOWER LEVEL

(1) STUDIO UNITS
(2) ONE BEDROOM UNITS
(4) TWO BEDROOM UNITS

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LOWER & 1RST LEVEL FLOOR PLANS

SCALE: 1:100

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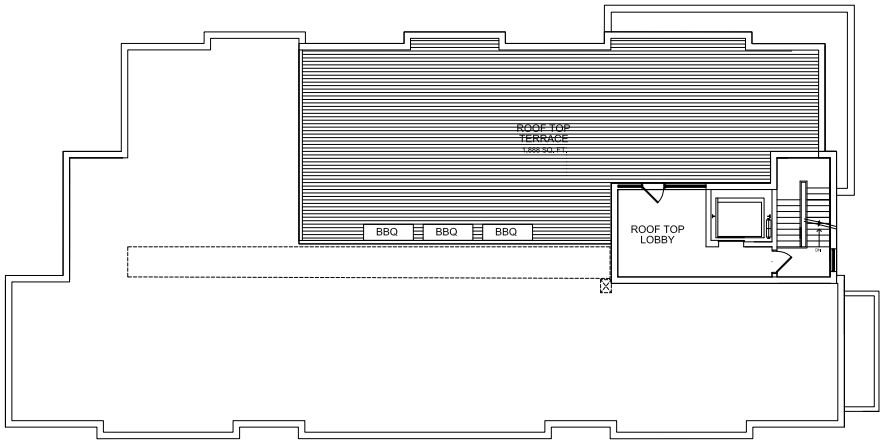
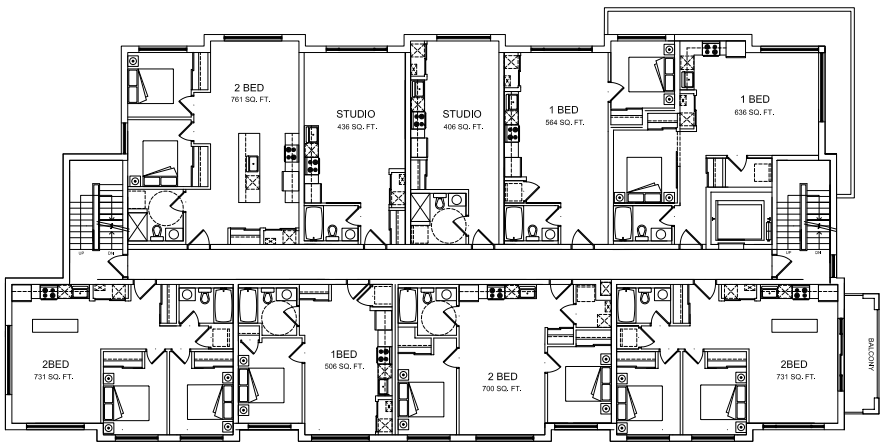


ROOF TERRACE PLAN



2ND & 3RD LEVEL

(2) STUDIO UNITS
(3) ONE BEDROOM UNITS
(4) TWO BEDROOM UNITS

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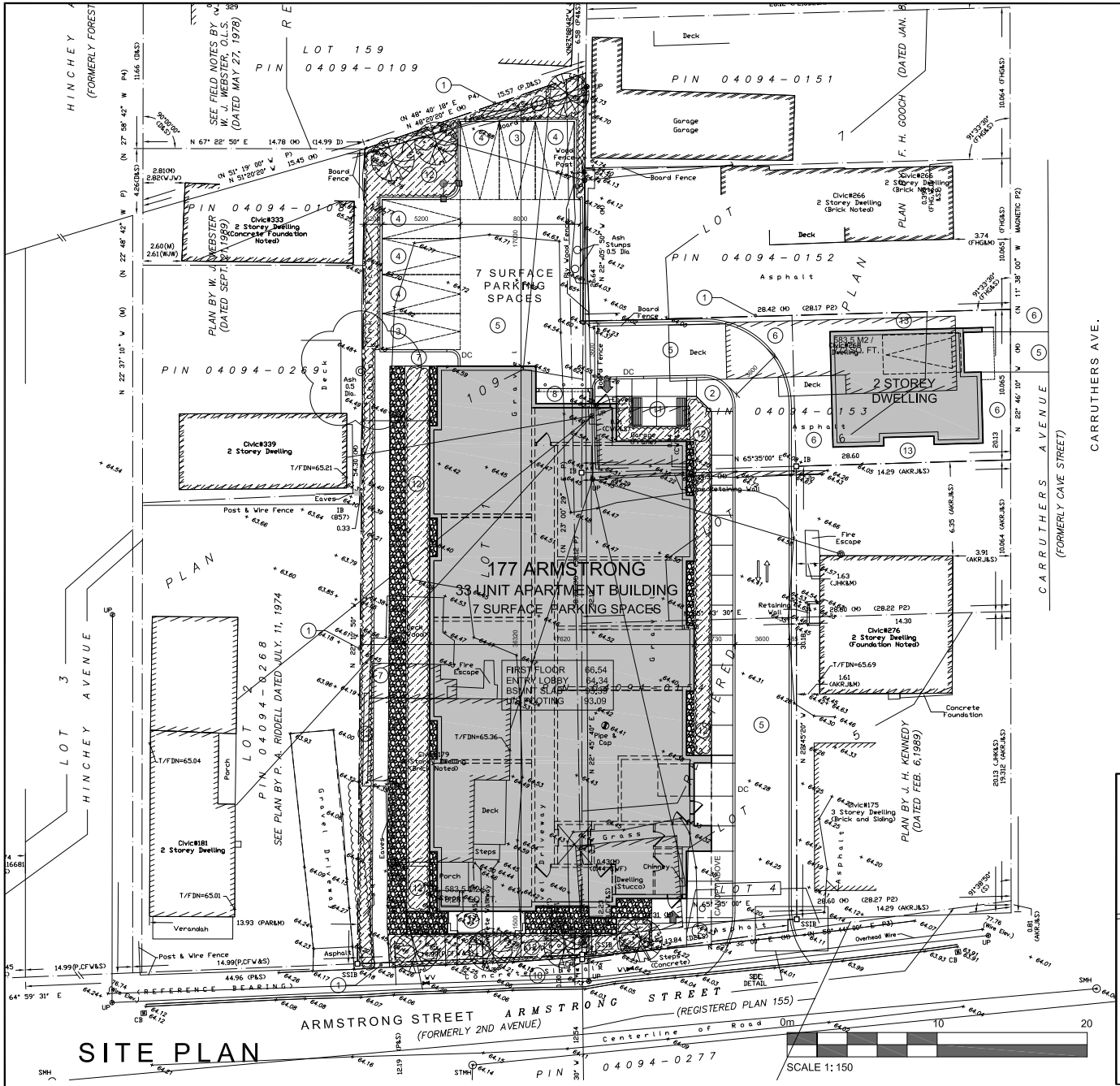


SITE PLAN

DRAWING NOTES:

1. PROPERTY LINE
2. 1500 mm CONCRETE SIDEWALK
3. 2400X5200mm PARKING SPACE
4. 2600X5200mm PARKING SPACE
5. ASPHALT
6. GRASS
7. 1100mm CONCRETE PAVER PATH
8. GAS METER CLOSET
9. BALCONY
10. CONCRETE CITY SIDEWALK
11. BENCHES AND TRASH CAN
12. SOFT LANDSCAPING
13. RIVERWASH STONE ON FILTER CLOTH

SITE PLAN SYMBOLS

- SOFT LANDSCAPING
- RIVERWASH STONE ON FILTER CLOTH
- LIGHT STANDARD
- ENTRANCE LOCATION
- DECIDUOUS TREE
- TWO WAY VEHICLE CIRCULATION

177-179 ARMSTRONG STREET

PROJECT STATISTICS

ZONING	R4H (2249) C
BUILDING HEIGHT	11.0 M
FRONT YARD SETBACK	3.0 M
INTERIOR YARD SETBACK	4.5 M
REAR YARD SETBACK	17.0 M
SITE AREA	1572.71 sq. m. (16,928 sq. ft.)
BUILDING AREA	
33 UNIT APARTMENT BUILDING	563.5 M2 (6280 SQ.FT.)
2 STOREY DETACHED HOUSE	71.72 M2 (772 SQ.FT.)
LOT COVERAGE	41.6%
ASPHALT AREA	362 M2 (3903 SQ.FT.)
LANDSCAPE AREA	555.49 M2 (5979 SQ.FT.)
COMMON AMENITY SPACE AT GRADE	304 SQ.M (3275 SQ.FT.)
ROOF TOP AMENITY SPACE	175 SQ.M (1886 SQ.FT.)

LEGAL DESCRIPTION

PLAN OF LOT 1
REGISTERED PLAN 109
NORTH ARMSTRONG STREET
& PART OF LOTS 4, 5 & 6
REGISTERED PLAN 83
CITY OF OTTAWA
AND
PART OF LOT 6
REGISTERED PLAN 83
CITY OF OTTAWA

PLANNER

Holzman Consultants Inc.
311 Richmond Road, Suite 203
Ottawa, ON K1Z 6X3
Tel: (613) 226.1386
b.holzman@holzmanconsultants.com

CONCEPT DESIGN

URBANDIVA Design Inc.
148 Norgreen Street.
Ottawa Ontario K0M 3M0
Tel: (613) 805-5850

PROJECT DEVELOPER

McCORMICK PARK DEVELOPMENTS
1600 LAPERRIER AVE, SUITE 205
Ottawa Ontario K1M 2H9
Tel: (613) 421-1515

CIVIL ENGINEER

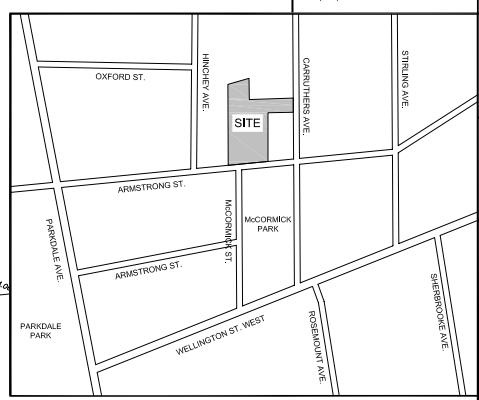
exp Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6
Tel: (613) 688-1899
Fax: (613) 852-8753
bruce.thomas@exp.com

LANDSCAPE ARCHITECT

Gino Aiello
50 Camelot Drive
Nepean, ON K2G5X8
Tel: (613) 852-1343
gino@gjala.com

SURVEYOR

Farley, Smith & Denis Surveying ltd
190 Colonnade Road
Ottawa Ontario K2E7J5
Tel: (613) 727-8226



SITE LOCATION PLAN

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