SERVICING AND STORMWATER MANAGEMENT REPORT – 630 CUMMINGS AVENUE

Project No.: 0CP-16-0679

Prepared for:

Adib Saad, c/o
Liff & Tolot Architects Inc.
1926 Merivale Road, Suite 101
Ottawa, ON
K2G 1E8
REV01: August 14, 2017

McINTOSH PERRY

Executive Summary

Developing a site within the City of Ottawa requires meeting a predefined set of requirements outlined in the City of Ottawa Sewer Design Guidelines (SDG) - 2012 along with meeting the local conservation authority requirements (Rideau Valley Conservation Authority - RVCA) and provincial requirements (Ministry of Environmental and Climate Change – MOECC). Site specific requirements are discussed and outlined in the pre-consultation meeting with the City of Ottawa before the detailed design process is initiated.

This report describes an innovative and cost efficient design solution for the site servicing (water, sanitary, and storm) and stormwater management (SWM) requirements in order to develop this site.

Evaluation of the proposed site plan in addition to a review of the site grading and soil characteristics was completed. Our review identified that roof storage will be utilized to meet the SWM requirements. The proposed sanitary and water services will utilize the existing infrastructure in and around the site to service the development. Therefore, it is our professional opinion that this site located at 630 Cummings Avenue is able to be developed and fully serviced.

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1.0 PROJECT DESCRIPTION

1.1 Purpose

This report will address the servicing (water, sanitary, and storm) and stormwater management requirements associated with the proposed development located at 630 Cummings Avenue within the City of Ottawa.

1.2 Site Description

The property is located at 630 Cummings Avenue. It is described as Part of Lots 13-18, Plan 5R-14833, City of Ottawa, Ontario. The land in question covers approximately 0.16 ha and is located southeast of the intersection of Montreal Road and Cummings Avenue.

The site is currently developed with an existing apartment building and is made up of gravel, asphalt parking and grass areas. The existing apartment building has sanitary and water service. It is unknown whether storm services are present on the site.

The proposed development consists of 107 m² and 144 m² apartment additions to the existing building. Existing parking and drive aisles will remain throughout the site along with landscaping. The existing site accesses for the development will be maintained.

Figure 1: Key Map: 630 Cummings Avenue, Ottawa

2.0 BACKGROUND STUDIES

Background studies that have been completed for the site including a topographical survey of the site and a geotechnical report.

A topographic survey of the site was completed by Farley, Smith & Denis Surveying Ltd. dated October 4, 2016 and can be found under separate cover.

The following report has previously been completed and is available under separate cover:

- Geotechnical Investigation completed by Houle Chevrier Engineering dated May 18, 2016.

3.0 PRE-CONSULTATION SUMMARY

City of Ottawa Staff have been pre-consulted regarding this proposed development in person on November 14, 2016. Specific design parameters to be incorporated within this design include the following:

- Pre-development and post-development flows shall be determined using a calculated time of concentration (Tc) of minimum 10 minutes.
- Control 2, 5 and 100-year post-development flows to the 2-year pre-development flows with a combined C value of 0.50.
- Additional quality control is not required to be provided for this site.

Correspondence with the City can be found in Appendix 'A'.

4.0 EXISTING SERVICES

The existing water and sanitary services to the existing building are able to remain without remediation.

4.1 Cummings Avenue

There is an existing 225 mm diameter sanitary main as well as a 900 mm diameter storm sewer located within Cummings Avenue. There is also a 305 mm diameter watermain within Cummings Avenue.

There are overhead hydro wires in the vicinity of the site. There is an existing gas main within Cummings Avenue.

5.0 SERVICING PLAN

5.1 Proposed Servicing Overview

The overall servicing to the proposed additions will be provided via internal building connections from the existing building. Refer to mechanical plans for details.

5.2 Proposed Water Design

The proposed additions will be serviced via internal connections from the existing building. Refer to mechanical plans.

The required fire protection for the proposed additions and existing building, from the Ontario Building Code (OBC), is 6,300 L/min (See Appendix 'B' for calculation).

The required fire protection from the Fire Underwriters Survey (FUS) is 24,000 L/min (provided for information purposes only).

The water demands for the proposed addition have been calculated as per the Ottawa Design Guidelines – Water Distribution and are as follows: the average and maximum daily demands are 0.23 L/s and 0.58 L/s respectively. The maximum hourly demand was calculated as 1.27 L/s (Refer to Appendix 'B' for flow details). Boundary conditions have been provided by the City of Ottawa and can be found in Appendix 'B'.

Existing lateral locations and sizes were not available at the time of the submission. A hydraulic model will be completed following the receival of this information.

5.3 Proposed Sanitary Design

The proposed additions will be serviced via internal connections. Refer to mechanical plans.

The peak design flow for the proposed additions was determined to be 0.067 L/s, therefore the existing 135 mm diameter lateral has sufficient capacity to convey the flows (See Appendix 'C' for detailed calculations). It is anticipated that there will be no issues with capacity constraints within the proposed lateral or within the existing sanitary main within Cummings Avenue as the amount of flow generated by the addition is negligible.

5.4 Proposed Strom Design (Conveyance and Management)

The north corner of the site will continue to drain towards the existing catch basin located on the property line approximately 10m north of the existing walkway from the front entrance. The east corner of the property will sheet flow towards Cummings Avenue. The entire south west side of the building will continue to flow towards Borthwick Avenue. The proposed additions will provide roof storage for stormwater management. Please see the Site Grading and Drainage Plans for detailed locations of the proposed stormwater infrastructure. The stormwater management design will be further detailed in Section 6.0.

5.5 Site Utilities

All relevant utility companies (telephone - Bell, gas – Enbridge and hydro – Hydro Ottawa, cable - Rogers) will be contacted prior to construction in order to confirm adequate utility servicing for the site. Existing utilities are present along Cummings Avenue. The site connections are anticipated to be fed from the existing utilities currently within the right-of-way.

6.0 PROPOSED STORMWATER MANAGEMENT

6.1 Design Criteria and Methodology

Stormwater management for this site will be maintained through positive drainage away from the buildings and roof storage on the proposed additions. This SWM plan will implement quantity control strategies. Overland flow will continue to be directed towards Cummings and Borthwick Avenue. The quantitative and qualitative properties of the storm runoff for both the pre- and post-development flows are further detailed below.

Stormwater Best Management Practices (SWM BMP's) will be implemented at the "Lot level", "Conveyance" and "End of Pipe" locations. These concepts will be explained further in Section 6.3. To summarize, roof water will be directed to grass surfaces, where possible.

6.2 Runoff Calculations

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

$$Q = 2.78CIA \text{ (L/s)}$$

Where C = Runoff coefficient

I = Rainfall intensity in mm/hr (City of Ottawa IDF curves)

A = Drainage area in hectares

It is recognized that the rational method tends to overestimate runoff rates. As a by-product of using extremely conservative prediction method, any facilities that are sized using these results are expected to function as intended in real world conditions.

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

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

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

As per the pre-consultation meeting with the City of Ottawa the time of concentration (Tc) used for pre-development and post-development flows shall be calculated using a time of concentration (Tc) of 10 minutes. Using FAA method, a Tc of 9.80 was calculated for pre-development conditions. A Tc of 10 minutes was used for pre and post-development conditions.

6.2.1 Pre-Development Drainage

The existing site has been demonstrated as drainage areas A1*, A2, and A3. Drawing CP-16-0679 PRE (Appendix 'D') indicates the limits of these drainage areas.

Table 1: Pre-Development Runoff Summary

Area ID	Drainage Area (ha)	Runoff Coefficient (C) 2 & 5-yr	Runoff Coefficient	2-year Peak Flow (L/s)	5-year Peak Flow (L/s)	100-year Peak Flow (L/s)
A1*	0.13	0.53	0.60	15.07	20.44	39.65
A2	0.02	0.20	0.25	0.66	0.89	1.90
A3	0.01	0.20	0.25	0.49	0.67	1.43
Total	0.16			16.22	22.00	42.99

Note: Area A1 is not located within the area of development and will not be included when calculating the restricted flow for the site. Therefore, only drainage area A2-A3 will be analyzed within the Stormwater Management Calculations.

6.2.2 Post-Development Drainage

The proposed site has been demonstrated as drainage areas B1*, B2, and B3. Drawing CP-16-0679 POST (Appendix 'E') indicates the limits of these drainage areas.

Table 2: Post-Development Runoff Summary

Area ID	Drainage Area (ha)	Runoff Coefficient (C) 2 & 5-yr	Runoff Coefficient	2-year Peak Flow (L/s)	5-year Peak Flow (L/s)	100-year Peak Flow (L/s)
B1*	0.13	0.53	0.60	15.07	20.44	39.65
B2	0.02	0.90	1.00	2.95	4.00	7.62
B3	0.01	0.90	1.00	2.22	3.01	5.73
Total	0.16			20.23	27.45	53.00

Note: Area B1 is not located within the area of development and will not be included when calculating the restricted flow for the site. Therefore, only drainage area B2-B3 will be analyzed within the Stormwater Management Calculations.

6.3 Quantity Control

After discussing the stormwater management criteria for the site with City staff, the total post-development runoff for this site has been restricted to match the 2-year pre-development flow rates with a combined C value of 0.5. (See Appendix 'A' for pre-consultation notes). These values create the following allowable release rates and storage volumes for the development site. Areas A1* and B1* are not included in the following stormwater calculations. The areas are outside of the development area with the exception of the amenity area which will be grass.

Table 3: Allowable Release Rate

Area ID	Drainage Area (ha)	Runoff Coefficient	2-year Peak Flow (L/s)
A2-A3	0.03	0.20	1.15

Reducing site flows will be achieved using roof restriction, and will create the need for onsite storage. Runoff from areas B2-B3 will be restricted as detailed in the table below.

Table 4: Post-Development Restricted Runoff

	Post-Development Unrestricted Flow (l/s)			Post-Development Unrestricted Flow (l/s)		
Area ID	2-yr	5-yr	100-yr	2-yr	5-yr	100-yr
B2	2.95	4.00	7.62	0.42	0.42	0.72
B3	2.22	3.01	5.73	0.36	0.36	0.66
Total	5.17	7.01	13.35	0.78	0.78	1.38

Runoff from Area B2 will be restricted through a single roof drain before discharging into drainage area B1*. The total flow leaving the roof will be 0.42L/s, 0.42 L/s, and 0.72 L/s during the 2 & 5 and 100-year storm events, respectively. This will result in ponding depths of 35 mm for the 2 & 5-year storm events and 60 mm for the 100-year storm event.

Runoff from Area B3 will be restricted through a single roof drain before discharging into drainage area B1*. The total flow leaving the roof will be 0.36 L/s, 0.36 L/s, and 0.66 L/s during the 2 & 5 and 100-year storm events, respectively. This will result in ponding depths of 30 mm for the 2 & 5-year storm event and 55 mm for the 100-year storm event.

All of the storage required for these areas will be located on the proposed roofs, and emergency roof scuppers will be installed to ensure ponding does not exceed the proposed ponding limits. Due to the flow/head relationship of the roof drain, the flow leaving the site during a 100-yr storm event will exceed the 2-year pre-development flow by 0.23 L/s (see Appendix 'F' for calculations).

The following table summarizes the storage requirements and the depth of the water ponding during the 2 & 5 and 100-year storm events to meet the required storage volumes.

Table 5: Storage Summary

	2 & 5-yr Storm Event			100-yr Storm Event		
Area ID	Depth of Ponding (m)	Storage Required (m^3)	Storage Available (m^3)	Depth of Ponding (m)	Storage Required (m^3)	Storage Available (m^3)
B2	0.035	3.1	3.8	0.060	6.0	6.5
B3	0.030	2.2	2.4	0.055	4.2	4.4

6.4 Quality Control

The development of this lot will employ Best Management Practices (BMP's) wherever possible. The intent of implementing stormwater BMP's is to ensure that water quality and quantity concerns are addressed at all stages of development. Lot level BMP's typically include temporary retention of the parking lot runoff, minimizing ground slopes and maximizing landscaped areas. Some of these BMP's cannot be provided for this site due to site constraints and development requirements.

As per the discussions with the RVCA, the site outlet is more than 2000m from Green's Creek therefore no additional on-site quality treatment is required. The combination of the above BMP's and the proposed flow control measures will aid in the thermal protection of the natural environment.

7.0 SEDIMENT EROSION CONTROL

7.1 Temporary Measures

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

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

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

8.0 SUMMARY

- New 107 m^2 and 144 m^2 apartment additions will be constructed on the site located at 630 Cummings Avenue.
- Sanitary and water services to the new additions will be connected internally.
- As discussed with the City of Ottawa staff, the stormwater management design will ensure the post-development flow rates are restricted as much as possible in an effort to meet the 2-year pre-development flow rate calculated with a C value of 0.5.
- Storage for the 2, 5, and 100-year storm events will be provided on the proposed flat roof.

9.0 RECOMMENDATIONS

Based on the information presented in this report, we recommend that City of Ottawa approve this Servicing and Stormwater Management Report, dated August 14, 2017, in support of the proposed building additions on Cummings Avenue.

The sediment and erosion control plan outlined in Section 7.0 and detailed in the Grading and Drainage Plan notes are to be implemented by the contractor.

This report is respectfully being submitted for approval.

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10.0 STATEMENT OF LIMITATIONS

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

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

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

APPENDIX A
CITY OF OTTAWA PRE-CONSULTATION NOTES

McINTOSH PERRY

File No. PC2016-0325

14 Nov 2016

To / Destinataire	**Allison Hamlin, Planner** **Development Review, Urban Outer Core**
From / Expéditeur	**Syd Robertson, Project Manager, Infrastructure Approvals** **Development Review, Urban Outer Core**
Subject / Objet	**Pre-Application Consultation – Servicing Memo** **625 Borthwick Avenue & 630 Cummings Avenue, Ward 13** ***The applicant is proposing a three-storey addition to the north side of the existing apartment at 625 Borthwick Avenue and a three-storey addition to the north and south side of the existing apartment at 630 Cummings Avenue.***

Please note the following information pertaining to engineering design requirements for the above noted site:

1. **Stormwater Management Criteria**
   i. **Quantity Control**

   Q(allowable) to be based on:

   - 2 year storm event
   - IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1967.
   - Predevelopment 'C' or 0.5 (whichever is less)
   - A calculated Time of Concentration (minimum 10 minutes)

   Flows to the storm sewer, in excess of the allowable storm release rate, up to and including the flows from the 100-year storm event, must be detained on site.

   ii. **Quality Control**

   The municipal storm sewer outfalls to the Cote Martin Drain approx. 2.7 km downstream of the subject site. Contact Jocelyn Chandler, Planner, RVCA by phone at 613.692.3571 x1137 or by email at jocelyn.chandler@rvca.ca to confirm if quality treatment of stormwater will be required.

2. **Deep Services (Storm, Sanitary & Water Supply)**
   i. Storm, sanitary and water supply services are available on Borthwick Avenue and Cummings Avenue. Refer to the Municipal Servicing Maps.

ii. To re-use the existing storm and sanitary sewermains /services, they must be adequately sized and CCTV inspected to the satisfaction of the City. The Owner shall be responsible for any spot repairs or replacements as required.

iii. Boundary conditions will be provided by the City to determine if the required fire flows can be achieved. Please provide the following information in the request for boundary conditions:

- Location of service
- Type of development
- Amount of fire flow required ___l/s (Calculation as per the FUS Method).
- Average daily demand: ___ l/s.
- Maximum daily demand: ___l/s.
- Maximum hourly daily demand: ___ l/s.

3. **Phase I & 2 Environmental Site Assessment**

- To be completed in accordance with Ontario Regulation 153/04 (if required).

4. **Servicing Study Guidelines for Development Applications**

- Available at the following address: http://ottawa.ca/en/development-application-review-process-0/servicing-study-guidelines-development-applications

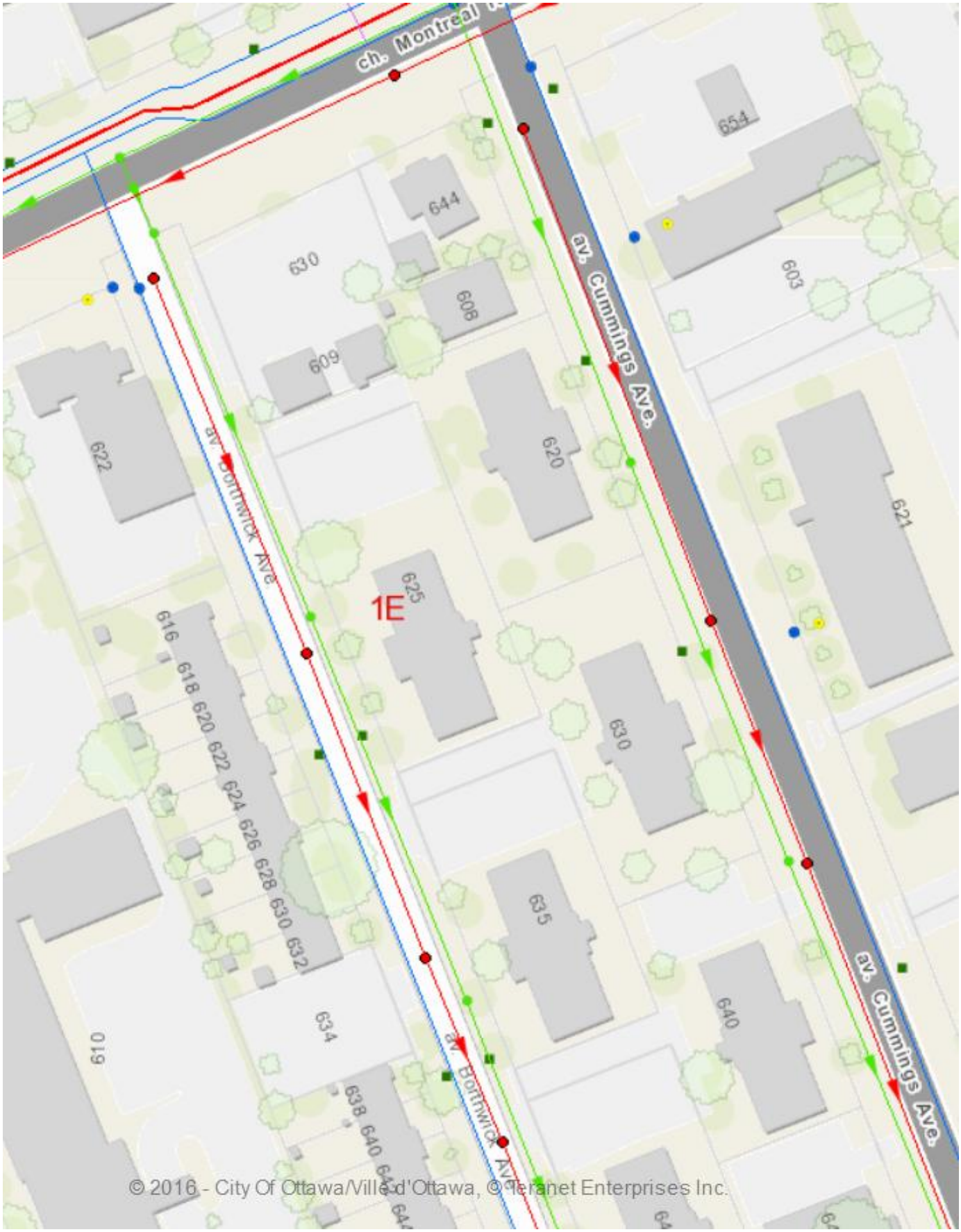
5. **Reference Guidelines and Standards:**

- Ottawa Sewer Design Guidelines (2012)
  - *Also Refer to Technical Bulletin PIEDTB-2016-01*
- Ottawa Design Guidelines – Water Distribution (2010)
  - *Also Refer to Technical Bulletin ISDTB 2012-02 & 2014-02*
- Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
- City of Ottawa Slope Stability Guidelines for Development Applications (2004)
- City of Ottawa Environmental Noise Control Guidelines (2016)
- City of Ottawa Park and Pathway Development Manual (2012)
- City of Ottawa Accessibility Design Standards (2016)
- Ottawa Standard Tender Documents (2016)
- Ontario Provincial Standards for Roads & Public Works (2015)

6. **Record Drawings and Utility Plans**

- Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x.44455).

625 Borthwick Avenue & 630 Cummings Avenue - geoOttawa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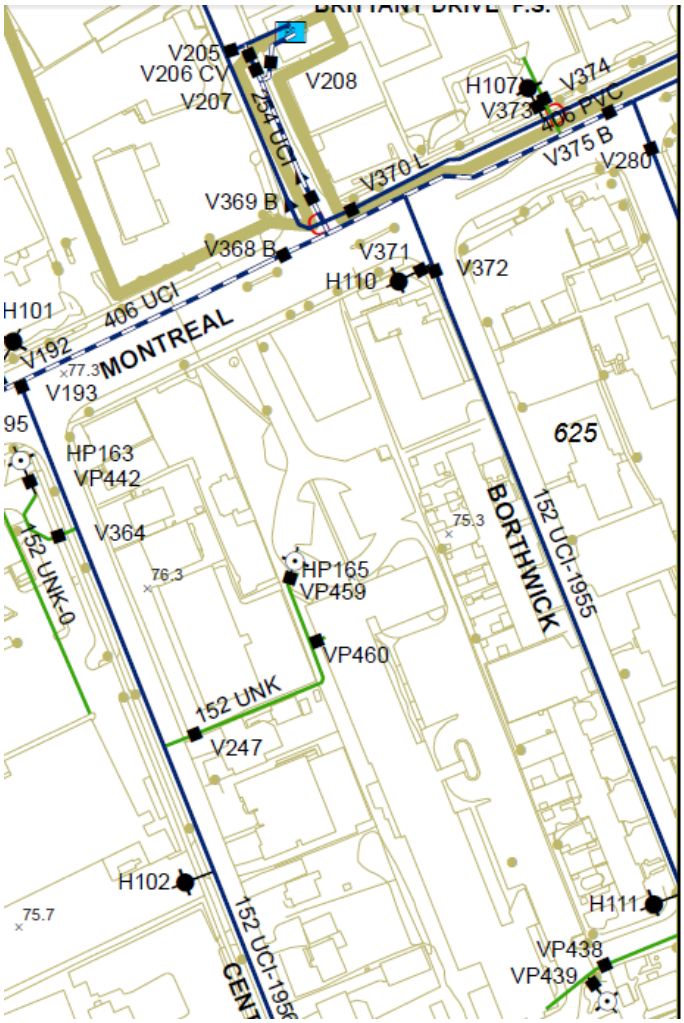
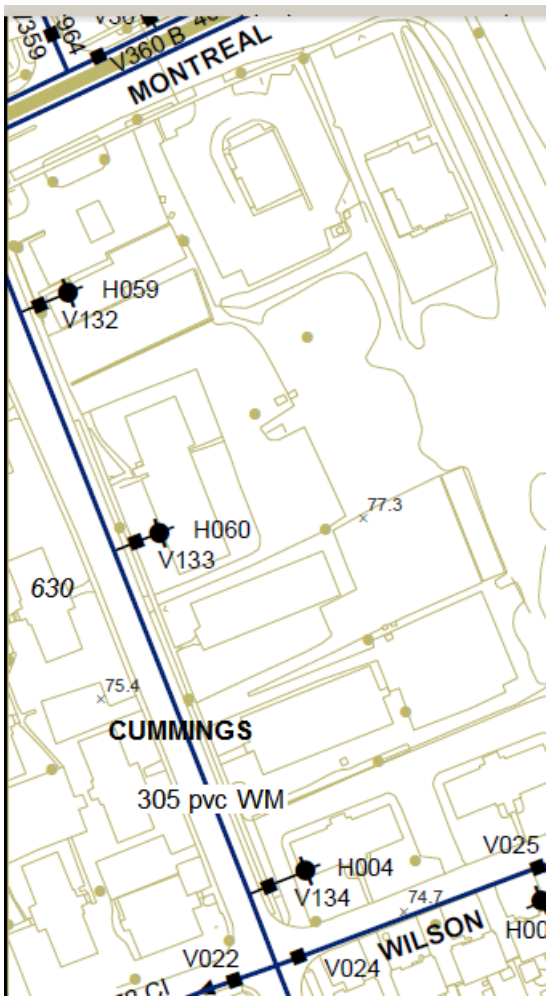
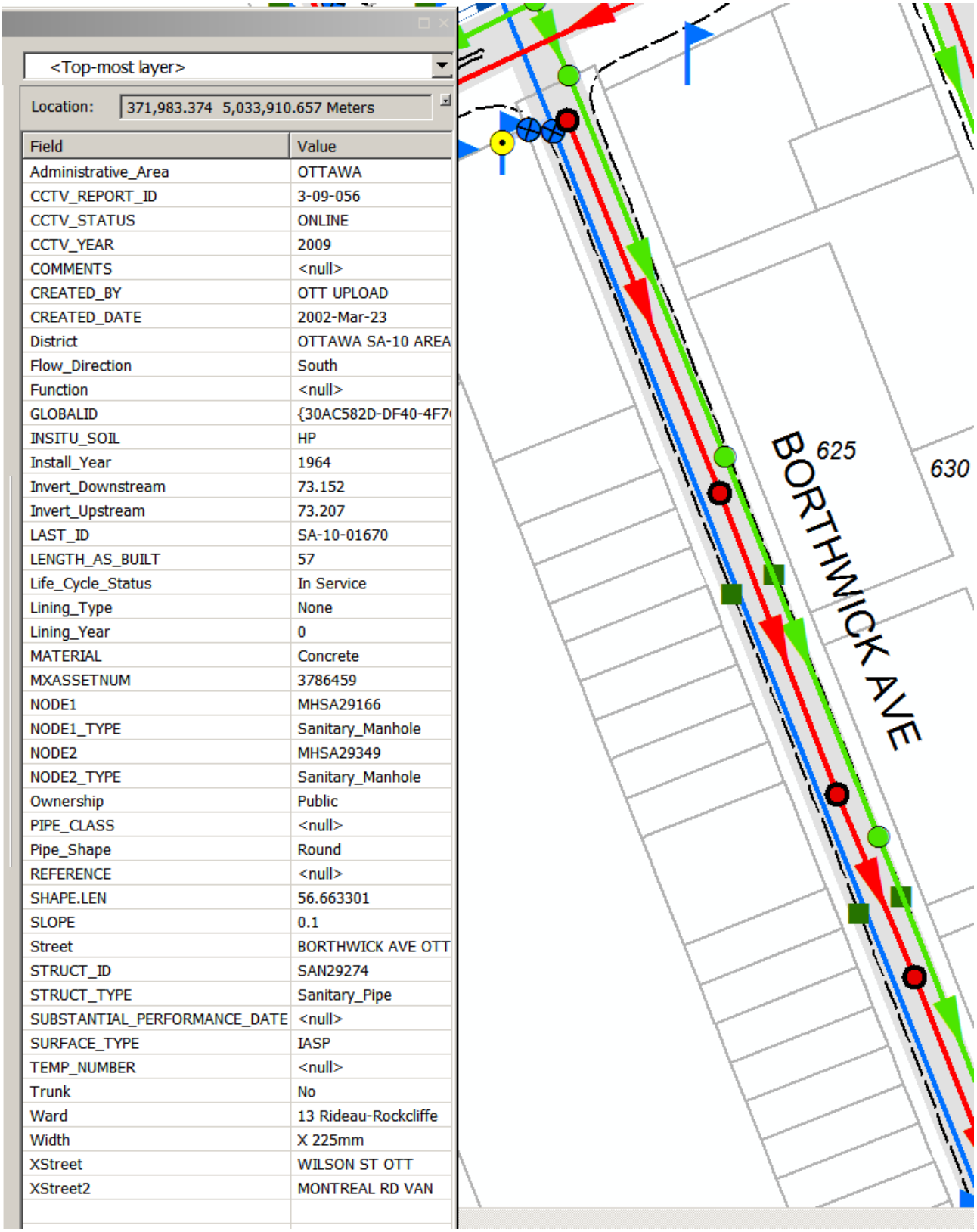
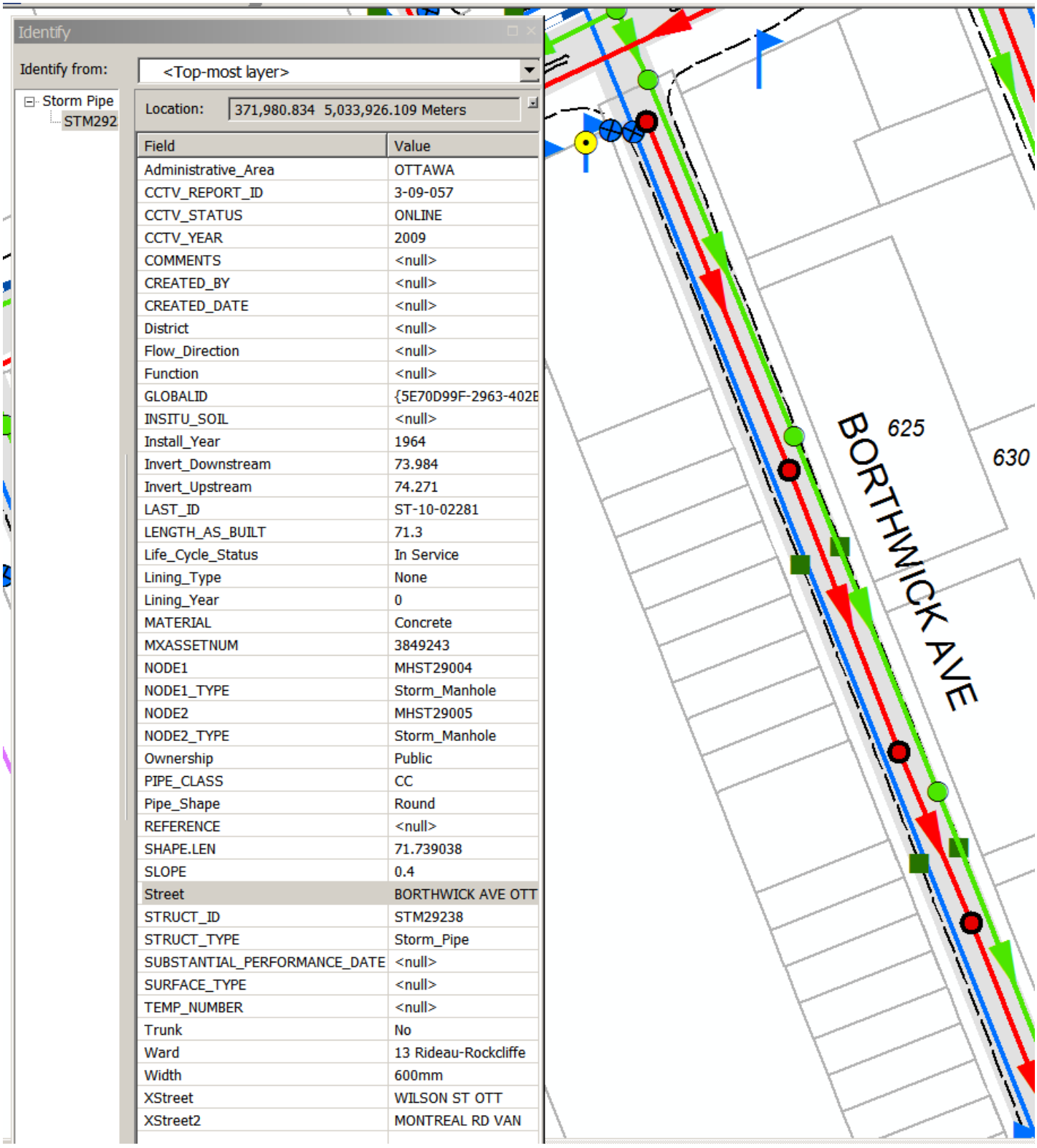




625 Borthwick Avenue & 630 Cummings Avenue – 2016 Water Distribuition



625 Borthwick Avenue – Municipal Services (Sanitary)



625 Borthwick Avenue – Municipal Services (Storm)

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Location: 372,051.531 5,033,922.299 Meters

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Administrative_Area	OTTAWA
CCTV_REPORT_ID	3-09-062
CCTV_STATUS	ONLINE
CCTV_YEAR	2009
COMMENTS	<null>
CREATED_BY	OTT UPLOAD
CREATED_DATE	2002-Mar-23
District	OTTAWA SA-10 AREA
Flow_Direction	South
Function	<null>
GLOBALID	{336747E3-11BB-4C9
INSITU_SOIL	SAND
Install_Year	1958
Invert_Downstream	73.08
Invert_Upstream	74.572
LAST_ID	SA-10-01840
LENGTH_AS_BUILT	45.4
Life_Cycle_Status	In Service
Lining_Type	None
Lining_Year	0
MATERIAL	Concrete
MXASSETNUM	3768144
NODE1	MHSA29208
NODE1_TYPE	Sanitary_Manhole
NODE2	MHSA29209
NODE2_TYPE	Sanitary_Manhole
Ownership	Public
PIPE_CLASS	<null>
Pipe_Shape	Round
REFERENCE	<null>
SHAPE.LEN	45.258939
SLOPE	3.3
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SUBSTANTIAL_PERFORMANCE_DATE	<null>
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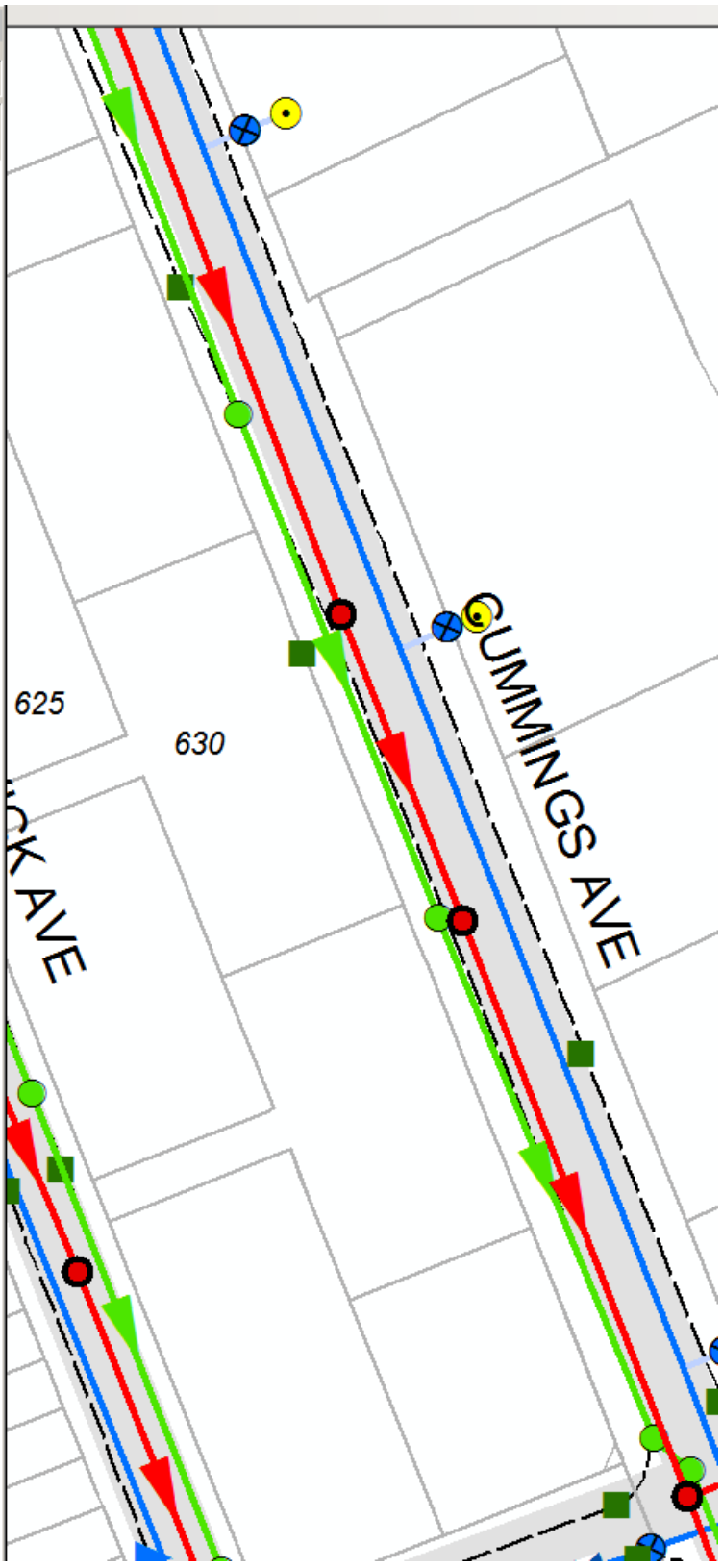
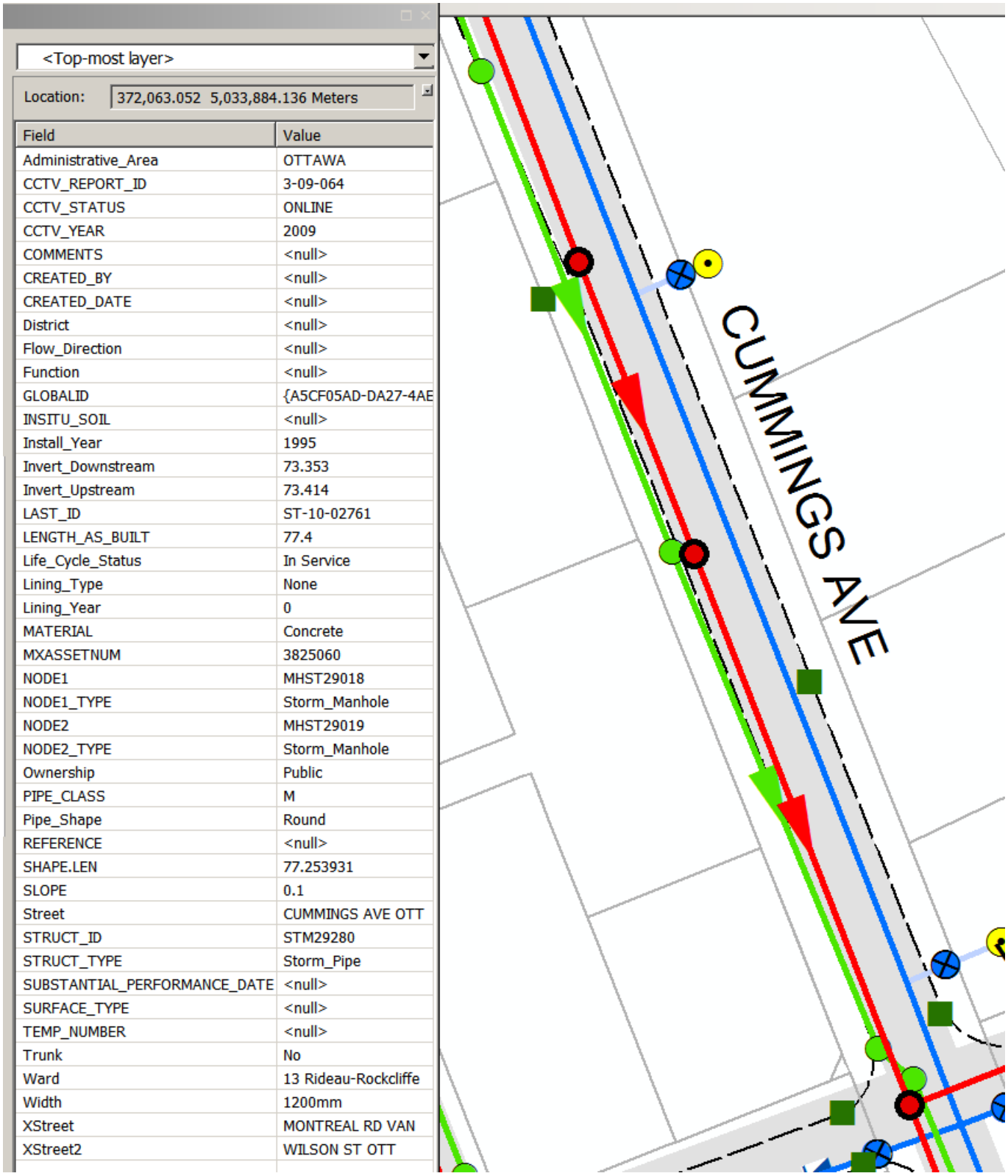
XStreet2	MONTREAL RD VAN



630 Cummings Avenue – Municipal Services (Sanitary)



630 Cummings Avenue – Municipal Services (Storm)

Subject:	Pre-application consultation follow-up email - 625 Borthwick Avenue and 630 Cummings Avenue
From:	Hamlin, Allison (Allison.Hamlin@ottawa.ca)
To:	ltarch@rogers.com;
Cc:	fredrick.vanrooyen@ottawa.ca; christopher.moise@ottawa.ca; Syd.Robertson@ottawa.ca; Wally.Dubyk@ottawa.ca;
Date:	Monday, November 28, 2016 1:31 PM

Thank you for the pre-consultation meeting held on Friday, November 18th regarding 625 Borthwick & 630 Cummings Avenue for three storey additions to the north side of the existing apartment at 625 Borthwick Avenue and to the north and south side of the existing apartment at 630 Cummings Avenue.

The following points were highlighted during the pre consultation and for your consideration in a potential site plan control and minor rezoning application:

Application

- Based on the site plan control by-law (Section 5(2)(b) Site Plan Control is required if the size of the addition exceeds the greater of 55 square metres or 30% of the existing gross floor area to a maximum of 300 square metres. The by-law goes on further to stipulate that the addition of any dwelling units or rooming units is to be undertaken in accordance with clauses 5(3)(a) and (b). Site Plan Control is required if after the alteration the building contains more than three dwelling units. Consequently, site plan control is required.

- Public Consultation for the Site Plan Control application is required for: additions that expand the gross floor area of a building by more than fifty percent, a residential building containing more than five dwelling units or a building that after the addition is more than 350 square metres in gross floor area. With the sum of the two additions to the 630 Cummings property being greater than 50 percent of the existing gfa, public consultation will be required.

Zoning By-law Compliance

- Based on the current concept the following zoning compliance issues have been identified:
  - 630 Cummings Avenue: an interior side yard setback of approximately 1.15m is proposed where a 6m interior side yard setback is required. Based on Endnote 3 in Table 162B of the Zoning By-law (R4 Provisions), in all other circumstances (for any part of a building located within 21 metres of a front lot line: note the front lot line for 630 Cummings Ave is the shortest frontage which is Borthwick, which results in the building to be located greater than 21 metres from the front lot line) the minimum required interior side yard setback is 6m.
  - 630 Cummings Avenue: Based on the new infill II provisions, for any lot with a lot depth greater than 33m, a distance equal to 30% of the lot depth is required. A rear yard setback of approximately 6.134m is proposed where approximately 16.2 rear yard setback is required (based on 54m lot depth).
  - 625 Borthwick: Based on the new infill II provisions, for any lot with a lot depth greater than 25m and up to and including 32m, a distance equal to 28% of the lot depth is required. A rear yard setback of

approximately 7.05m is provided where approximately 7.56 rear yard setback is required (based on 27m lot depth).

o Vehicle parking spaces: Based on the new reduced parking provisions, the site is located under Area X (Schedule 1A of the Zoning By-law). For low-rise apartment buildings in this area 0.5 spaces/dwelling unit are required (no vehicle parking is required for the first 12 dwelling units) and 0.1 spaces/dwellings units for visitors (no visitor parking spaces are required for the first 12 dwelling units). Based on these requirements, 12 total parking spaces would be required for 625 Borthwick Ave and 19 total parking spaces would be required for 630 Cummings Ave.

o Both parking areas: for a parking lot abutting a street regardless of the number of spaces, a 3m landscape buffer is required.

o Amenity Area: It appears that the concept meets the required amount of space under Section 137, however, it stipulates that communal amenity area required for the first eight units must: be located at grade and in the rear yard. Due to the unorthodox lot lines of 630 Cummings Ave, the current concept has the amenity area in the interior side yard.

- You are urged to meet the requirements for the landscape buffer and the visitor parking.
- Based on the complexity, number and nature of the zoning deficiencies identified, it is recommended by planning staff to pursue a minor rezoning application.

Site Plan Control Application

- Manager Approval, Public Consultation

http://ottawa.ca/en/development-application-review-process-0/site-plan-control

Minor Zoning By-law Amendment Application

http://ottawa.ca/en/development-application-review-process-0/zoning-law-amendment

Residential Fourth Density Provisions – See R4N

http://ottawa.ca/en/residents/laws-licenses-and-permits/laws/city-ottawa-zoning-law/r4-residential-fourth-density-zone

Application Fees

http://ottawa.ca/en/city-hall/planning-and-development/how-develop-property/fees

Waste Facilities

- The current non-enclosed bins would be unsatisfactory. Staff would seek either an indoor or enclosed waste facility. Please reference Section 110 of the Zoning By-law for location (if provided within a parking lot).
- To qualify for City pick-up for the residential units, the proposal must meet the City's guidelines regarding waste collection. I will forward the guidelines separately upon request.

Bicycle Parking

- Bicycle parking (Section 111 of the Zoning By-law): 0.5 spaces/dwelling unit. The Department would encourage bicycle parking to be in a safe and accessible location.

Design

- Enhance the pedestrian connection to the parking area – make it clearer to residents.
- Provide windows or work with the material on the east/west additions
- Break up the flat surface if stucco material is used
- Please provide details for any landscaping, benches, etc. provided within the common amenity space.
- Additional street trees should be planted to compensate for private trees being removed at a spacing of approximately 6 to 8 metres apart.

Servicing/Noise

- Please see the attached memo from Syd Robertson.
- A Site Servicing/Stormwater Management Brief will be required.
  - Submit the domestic and fire flow demands ahead of time, so that the Boundary conditions can be determined by the City, and included in the Servicing Brief.
- A Noise Study will be required based on the site being located within 100m of Montreal Road – *to be completed as per the City of Ottawa Environmental Noise Control Guidelines (2016)*

Transportation

- Where the Development Application is expected to generate fewer than 75 vehicles per hour (peak hour, two direction site generated trips) the City would require a Transportation Overview that analyzes the Trip Generation and Non-Auto Modes. The Transportation Overview would facilitate staff review in addressing councillor and public enquiries. Otherwise the trigger points for the type of Transportation Impact Assessment report are as follows; 76 vph-150 vph requires a Transportation Brief, greater than 150 vph requires a Transportation Impact Study.

Cash-in-lieu of Parkland

- The Property Owner shall pay cash-in-lieu of parkland in accordance with the Parkland Dedication By-law of the City of Ottawa, as well as the fee for appraisal services. The monies are to be paid at the time of execution of the Site Plan Agreement. For more information, click here.

General Information

- A list of required plans and studies is attached.
- It is encouraged to pre-consult with the Councillor and neighbours in advance of the application submission. The City Councillor for this area is Tobi Nussbaum.
- You may want to reference information available on the City's website for building permits and development charges as well.

- Please note that these pre-consultation comments are valid for one year. If you submit a development application(s) after this time, you may be required to meet for another pre-consultation meeting and/or the submission requirements may change.

Should you have any questions please do not hesitate to contact me.

Sincerely,

Allison Hamlin, MCIP, RPP

Planner | *Urbaniste*

Development Review, Urban Services | *Examen des projets d'aménagement, Services urbains*

Planning, Infrastructure and Economic Development Department | *Services de la planification, de l'infrastructure et du développement économique*

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* 25477

ottawa.ca/planning / *ottawa.ca/urbanisme*

Attachments

- image001.gif (1.19KB)
- Borthwick Ave_625 - Servicing Memo & Maps.pdf (1.23MB)
- Borthwick Cummings - List of Plans Studies.docx (62.75KB)

APPENDIX B
EXISTING WATERMAIN FLOW AND FIRE PROTECTION CALCULATIONS

McINTOSH PERRY

Charissa Hampel

From: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Sent: August 1, 2017 11:49 AM
To: Charissa Hampel
Cc: Mottalib, Abdul
Subject: FW: 630 cummings
Attachments: 630 Cummings July 2017.pdf

Please see the water boundary conditions as requested.

Thanks,

Abdul Mottalib, P. Eng.

From: ....
Sent: August 01, 2017 9:41 AM
To: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Subject: 630 cummings

The following are boundary conditions, HGL, for hydraulic analysis at 630 Cummings (zone 1E) assumed to be connected to the 305mm on Cummings (see attached PDF for location).

Minimum HGL = 109.8m

Maximum HGL = 118.2m

MaxDay + FireFlow (400 L/s) = 102.0m

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.

From: Scaramozzino, Tracey
Sent: July 26, 2017 3:52 PM
To: 'Curtis Melanson' <c.melanson@mcintoshperry.com>; 'c.hampel@mcintoshperry.com' <c.hampel@mcintoshperry.com>; Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Cc: 'Reid Shepherd' <r.shepherd@holzmanconsultants.com>; Bill Holzman <b.holzman@holzmanconsultants.com>
Subject: 625 Borthwick boundary conditions

Hi Charissa and Curtis;

Abdul Mottalib will be the new project manager for this file.

Regards,

Tracey Scaramozzino, MCIP RPP
Planner
Development Review, Central Branch
Planning, Infrastructure and Economic Development Department
City of Ottawa
110 Laurier Avenue West, Ottawa, ON K1P1J1
613.580.2424 ext 12545, fax: 613-560-6006,
tracey.scaramozzino@ottawa.ca
ottawa.ca/planning / ottawa.ca/urbanisme

From: Hamlin, Allison
Sent: Wednesday, July 26, 2017 3:48 PM
To: Scaramozzino, Tracey <Tracey.Scaramozzino@ottawa.ca>
Subject: FW: Request for boundary conditions

Did you find an engineer?

From: Charissa Hampel [mailto:c.hampel@mcintoshperry.com]
Sent: Wednesday, July 26, 2017 3:09 PM
To: Hamlin, Allison <Allison.Hamlin@ottawa.ca>
Cc: Curtis Melanson <c.melanson@mcintoshperry.com>
Subject: Request for boundary conditions

Good afternoon,

Below are the anticipated water demands for the site so we can obtain the boundary conditions. See attached site plan for reference.

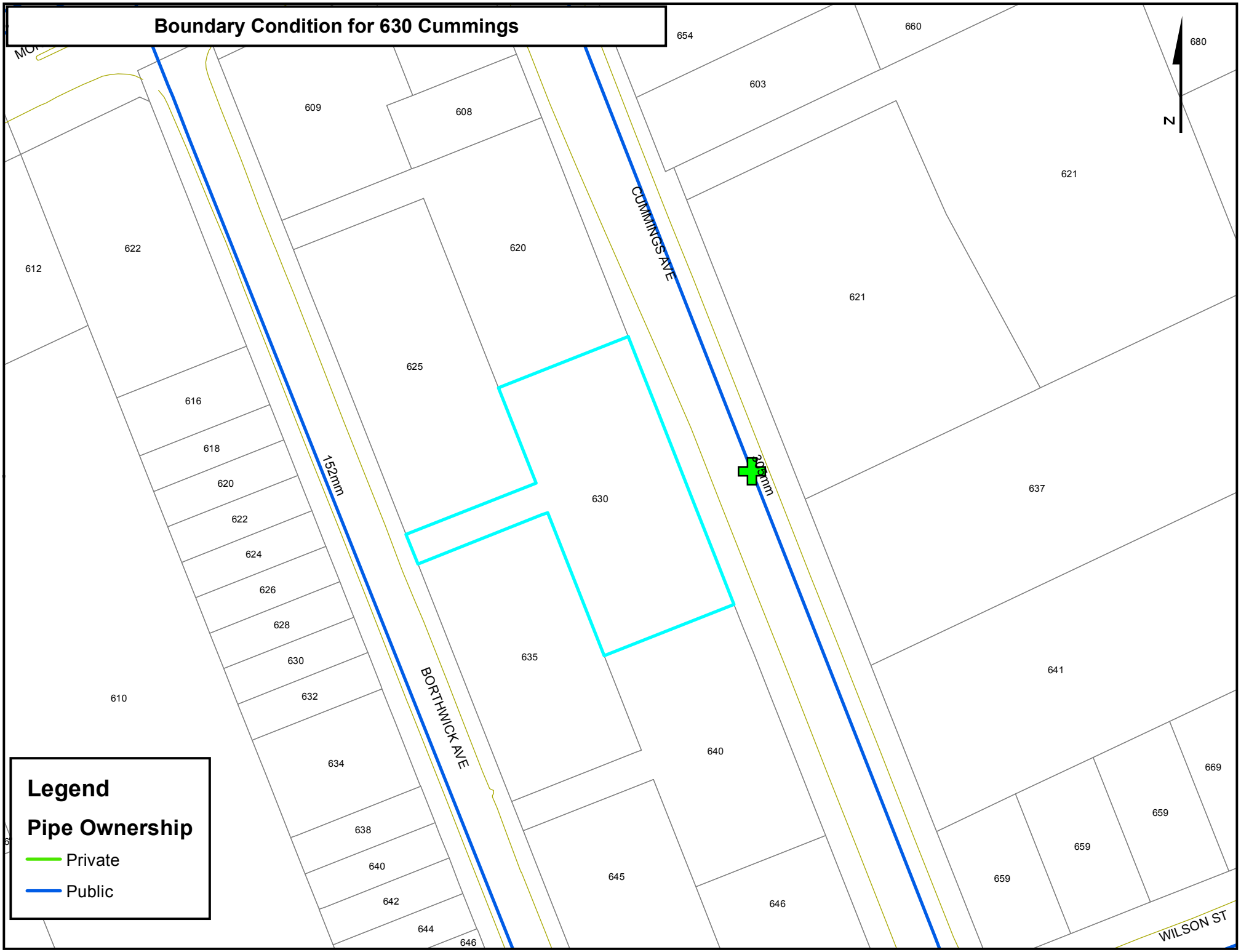
1. Type of development: Proposed Addition to an existing apartment building
2. Location of service: 625 Borthwick Avenue
3. Amount of fire flow required: 20,000 L/min (FUS) (new and existing building)
4. Average daily demand: 0.10 L/s. (addition only)
5. Maximum daily demand: 0.25 L/s. (addition only)
6. Maximum hourly daily demand: 0.56 L/s. (addition only)

1. Type of development: Proposed Additions to an existing apartment building
2. Location of service: 630 Cummings Avenue
3. Amount of fire flow required: 24,000 L/min (FUS) (new and existing building)
4. Average daily demand: 0.23 L/s. (additions only)
5. Maximum daily demand: 0.58 L/s. (additions only)
6. Maximum hourly daily demand: 1.27 L/s. (additions only)

If you have any questions, please feel free to call or email me.

Thank you very much,

Charissa Hampel, EIT
Engineering Intern | Land Development
115 Walgreen Road, RR 3, Carp, ON K0A 1L0
T. 613.836.2184 (2268) | **F.** 613.836.3742 | **C.** 613.791.0505
c.hampel@mcintoshperry.com | www.mcintoshperry.com
McINTOSH PERRY


Boundary Condition for 630 Cummings
654
660
680
603
609
608
621
622
620
612
621
625
616
618
620
622
624
626
628
630
632
634
638
640
642
644
646
630
635
640
645
646
637
641
659
659
659
669
610
152mm
BORTHWICK AVE
CUMMINGS AVE
203mm
WILSON ST
N
Legend
Pipe Ownership
Private
Public

Project:	630 Cummings Avenue
Project No.:	CP-16-0679
Designed By:	CH
Checked By:	CM
Date:	July 28, 2017

Ontario 2012 Building Code Compendium (Div. B - Part 3)

Water Supply for Fire-Fighting - 3 Storey Appartment Addition

Building is classified as Group : C up to 3 storeys (from table 3.2.2.47)
Building is of combustable construction. Floor assemblies are fire separations but with no fire resistance rating. Roof assemblies, mezzanines, load bearing walls, columns and arches do not have a fire resistance rating.

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

(a) Q = K x V x Stot

where:
Q = minimum supply of water in litres
K = water supply coefficient from Table 1
V = total building volume in cubic metres
Stot = total of spatial coefficient values from the property line exposures on all sides as obtained from the formula:
Stot = 1.0 + [Sside1+Sside2+Sside3+...etc.]

K	23	(from Table 1 pg A-31) (Worst case occupancy {E / F2} 'K' value used)
V	5,618	(Total building volume in cu.m.)
Stot	2.0	(From figure 1 pg A-32)
Q =	258,409.60 L	

From Figure 1 (A-32)

Snorth	1.1	m	0.5
Seast	15.2	m	0.0
Ssouth	1.2	m	0.5
Swest	8.4	m	0.05

*approximate distances

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

6300 L/min (if Q >190,000 and ≤270,000 L)
1386 igpm

630 Cummings Avenue - Fire Underwriters Survey (FUS) Fire Calculations

Project:	630 Cummings Avenue
Project No.:	CP-16-0679
Designed By:	CDH
Checked By:	CJM
Date:	July 28, 2017

1. From the Fire Underwriters Survey (1999)

From Part II – Guide for Determination of Required Fire Flow Copyright I.S.O.:

F = 220 x C x √A Where:

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

2. Determine Ground Floor Area

As provided by the Architect:

Floor Area (One Floor) = 691.40 m²
Total Floor Area = 2,074.20 m²

This floor area represents the final build-out of the development; as outlined on the Site Plan drawing.

3. Calculate Required Fire Flow

F = 220 x C x √A

C = 1.50
A = 2,074.20
F = 220.00 X 1.50 X √ 2074.20
F = 15,029.32 L/min.

4. Determine Height in Storeys

From Architectural Drawings:

Number of Storeys = 3.00

5. Determine Increase or Decrease Based on Occupancy

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

Low Hazard - Appartment
No Change

F = 15,029.32 L/min.

6. Determine the Decrease, if any for Sprinkler Protection

From note 3, Page 18 of the Fire Underwriter Survey:

- The flow requirement may be reduced by up to 50% for complete automatic sprinkler protection depending upon adequacy of the system.
- The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards.
- Additional credit of 10% if water supply is standard for both the system and fire department hose lines
- If sprinkler system is fully supervised system, an additional 10% credit is granted
- No Change

F = 15,029.32 L/min.

7. Determine the Total Increase for Exposures

From note 4, Page 18 of the Fire Underwriter Survey:

- Exposure distance to the existing buildings to the north, south, and west of the proposed building is approximately 10.8m, 15.7m, and 17.0m respectfully.
- There are no existing buildings surrounding the remainder of the site that are within 45m.
- Therefore the charge for exposure is 35% of the value obtained in Step 5.
- 15,029.32 L/min + (15,029.32 L/min x 60%)

F = 24,046.91 L/min.

Therefore, after rounding to the nearest 1,000 L/min, the total required fire flow for the development is 24,000 L/min (6340 GPM).

630 Cummings Avenue - Water Demands

Project:	630 Cummings Avenue
Project No.:	CP-16-0679
Designed By:	CH
Checked By:	CM
Date:	July 28, 2017
Site Area:	0.16 gross ha

21 Units
57 Persons

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	*350*	*L/c/d*
Industrial - Light	35,000	L/gross ha/d
Industrial - Heavy	55,000	L/gross ha/d
Shopping Centres	2,500	L/(1000m² /d
Hospital	900	L/(bed/day)
Schools	70	L/(Student/d)
Trailer Parks no Hook-Ups	340	L/(space/d)
Trailer Park with Hook-Ups	800	L/(space/d)
Campgrounds	225	L/(campsite/d)
Mobile Home Parks	1,000	L/(Space/d)
Motels	150	L/(bed-space/d)
Hotels	225	L/(bed-space/d)
Tourist Commercial	28,000	L/gross ha/d
Othe Commercial	28,000	L/gross ha/d
AVERAGE DAILY DEMAND	0.23	L/s

MAXIMUM DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	*2.5 x avg. day*	*L/c/d*
Industrial	1.5 x avg. day	L/gross ha/d
Commercial	1.5 x avg. day	L/gross ha/d
Institutional	1.5 x avg. day	L/gross ha/d
MAXIMUM DAILY DEMAND	0.58	L/s

MAXIMUM HOUR DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	*2.2 x max. day*	*L/c/d*
Industrial	1.8 x max. day	L/gross ha/d
Commercial	1.8 x max. day	L/gross ha/d
Institutional	1.8 x max. day	L/gross ha/d
MAXIMUM HOUR DEMAND	1.27	L/s

WATER DEMAND DESIGN FLOWS PER UNIT COUNT
CITY OF OTTAWA - WATER DISTRIBUTION GUIDELINES, JULY 2010

APPENDIX C
SANITARY SEWER CALCULATIONS

McINTOSH PERRY

McINTOSH PERRY

Project Name: 630 Cummings Avenue
Ottawa, Ontario
CP-16-0679

Re: Sanitary Flow Calculations

---

1. Building Occupancy

   The maximum number of bedroom units in the north and south addition will be 9 and 12 units as per the floors plans.

2. Daily Volume in Litres

   As per the extract of the City of Ottawa Sewer Design Guidelines, Appendix 4-A; Daily Sewage Flow for Dwellings;

   Each Dwelling unit of 1 bedroom

   - = 275 Liters/Dwelling/Day

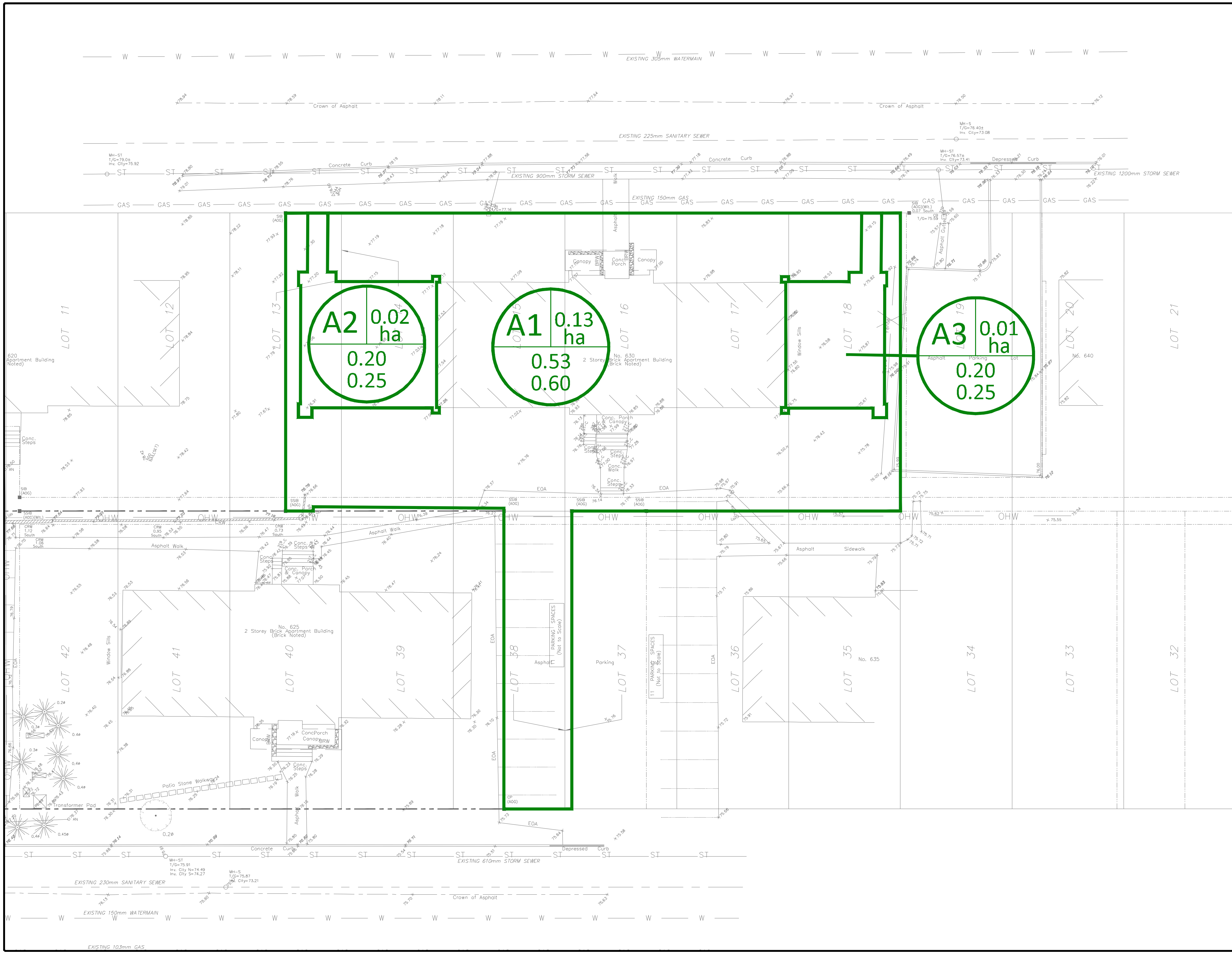
3. Peak Flow (Q/p)

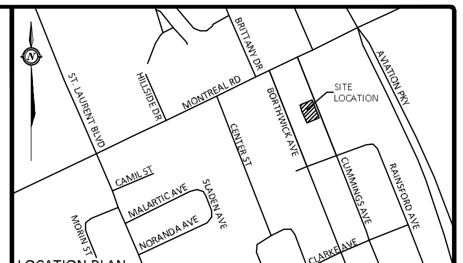
   - $Q_N(p) = F_N \times P_N$ Where:
     F = 275 Litres/Dwelling/Day (as per City of Ottawa Sewer Design Guidelines)
     P = 9 Units (as per floor plans)
   - Therefore, $Q_N(p) = (275) \times (9) =$ 2475 L/Day (0.029 L/sec)
   - $Q_S(p) = F_S \times P_S$ Where:
     F = 275 Litres/Dwelling/Day (as per City of Ottawa Sewer Design Guidelines)
     P = 12 Units (as per floor plans)
   - Therefore, $Q_S(p) = (275) \times (12) =$ 3300 L/Day (0.038 L/sec)
   - $Q_{TOTAL}(p) = Q_N + Q_S$
   - Therefore, $Q_{TOTAL}(p) =$ 5775 L/Day (0.067 L/sec)

The peak flow for the proposed addition will be negligible, therefore it is anticipated that there will be no issues with capacity constraints within the existing sanitary lateral and main within Cummings Avenue.

APPENDIX D
PRE-DEVELOPMENT DRAINAGE PLAN

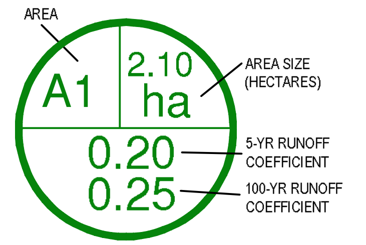
McINTOSH PERRY





LOCATION PLAN

LEGEND



No.	Revision/Issue	Date
1	ISSUED FOR CLIENT REVIEW	JULY 28, 2017

Check and verify all dimensions before proceeding with the work

Do not scale drawings

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

Stamp:

Client:
ADIB SAAD
6039 RIVERCREST DRIVE
ORLEANS, ON K1C 7N4

Project:
630 CUMMINGS AVENUE
APARTMENT ADDITION

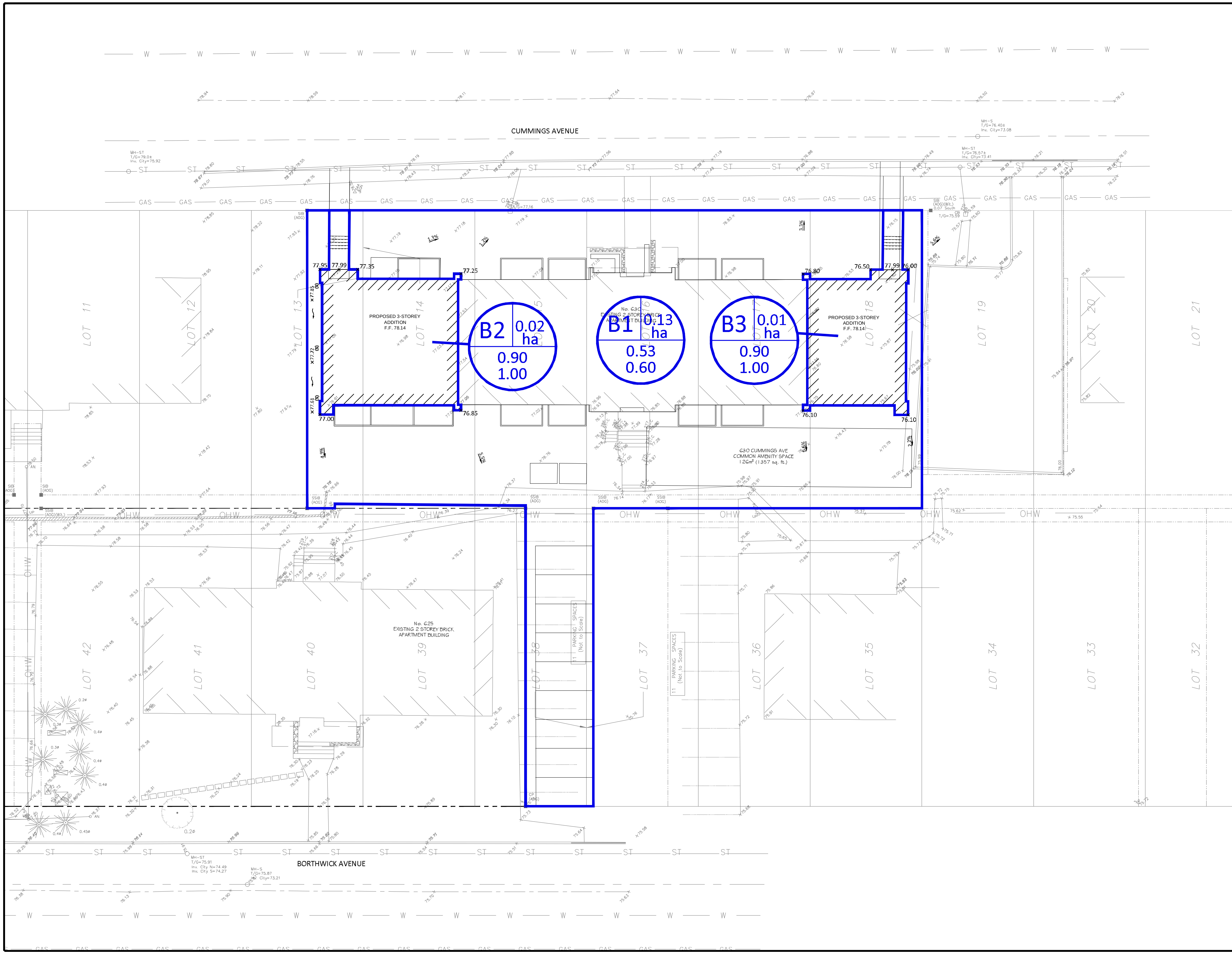
OTTAWA ONTARIO

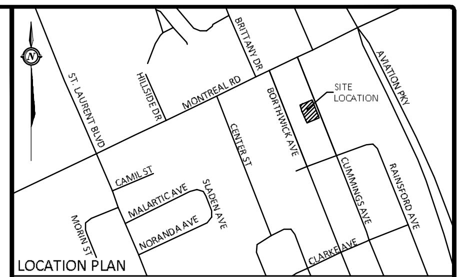
Drawing Title:
PRE-DEVELOPMENT DRAINAGE PLAN

Scale:	N.T.S.	Project Number:	CP-16-0679
Drawn by:	CDH		
Checked By:	RPK	Drawing Number:	
Designed By:	CDH		
Date:	JULY 17, 2017	SHEET 1 of 1	PRE

APPENDIX E
POST-DEVELOPMENT DRAINAGE PLAN

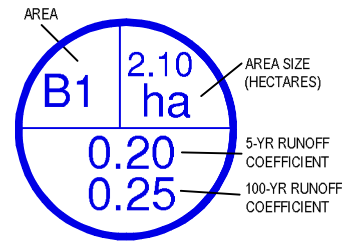
McINTOSH PERRY





LOCATION PLAN

LEGEND



No.	Revision/Issue	Date
1	ISSUED FOR CLIENT REVIEW	JULY 28, 2017

Check and verify all dimensions before proceeding with the work

Do not scale drawings

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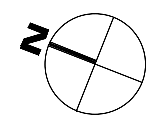

Stamp:

Client:
ADIB SAAD
6039 RIVERCREST DRIVE
ORLEANS, ON K1C 7N4

Project:
630 CUMMINGS AVENUE
APARTMENT ADDITION

OTTAWA ONTARIO

Drawing Title:
POST-DEVELOPMENT DRAINAGE PLAN

Scale:	N.T.S.	Project Number:	CP-16-0679
Drawn by:	CDH		
Checked By:	RPK	Drawing Number:	
Designed By:	CDH		POST
Date:	JULY 17, 2017	SHEET 1 of 1	

APPENDIX F
STORMWATER MANAGEMENT CALCULATIONS

McINTOSH PERRY

FAA METHOD OF CALCULATING Tc

PRE-DEVELOPMENT

FAA equation: $t = G\,(1.1 - c)\,L^{0.5} / (100\,S)^{1/3}$

t= Time of Travel (min)
C= Runoff Coefficient (dimensionless)
Lo= Overland Flow Length (ft)
So= Overland Slope (%)

t = 9.80684

Tc = 9.80684

Tc = 9.81

G=	1.8
C=	0.47
Lo=	98
So=	1.5

AVERAGE PRE-DEVELOPMENT RUNOFF COEFFICIENT CALCULATIONS

Area A1	EXISTING SITE - NON-DEVELOPMENT AREA				
Type	C (5-yr)	C (100-yr)	Area (m²)	Product (5-yr)	Product (100-yr)
ASPHALT	0.90	1.00	215.5	194.0	215.5
BUILDING	0.90	1.00	363.5	327.2	363.5
CONCRETE	0.90	1.00	41.0	36.9	41.0
GRASS	0.20	0.25	711.4	142.3	177.9
Avg C	0.53	0.60			

Area A2	EXISTING SITE - NORTH ADDITION				
Type	C (5-yr)	C (100-yr)	Area (m²)	Product (5-yr)	Product (100-yr)
GRASS	0.20	0.25	153.5	30.7	38.4
Avg C	0.20	0.25			

Area A3	EXISTING SITE - SOUTH ADDITION				
Type	C (5-yr)	C (100-yr)	Area (m²)	Product (5-yr)	Product (100-yr)
GRASS	0.20	0.25	115.4	23.1	28.9
Avg C	0.20	0.25			

AVERAGE POST-DEVELOPMENT RUNOFF COEFFICIENT CALCULATIONS

Area B1	EXISTING SITE - NON-DEVELOPMENT AREA				
Type	C (5-yr)	C (100-yr)	Area (m²)	Product (5-yr)	Product (100-yr)
ASPHALT	0.90	1.00	215.5	194.0	215.5
BUILDING	0.90	1.00	363.5	327.2	363.5
CONCRETE	0.90	1.00	41.0	36.9	41.0
GRASS	0.20	0.25	711.4	142.3	177.9
Avg C	0.53	0.60			

Area B2	NORTH ADDITION				
Type	C (5-yr)	C (100-yr)	Area (m²)	Product (5-yr)	Product (100-yr)
BUILDING	0.90	1.00	144.0	129.6	144.0
CONCRETE	0.90	1.00	9.5	8.6	9.5
Avg C	0.90	1.00			

Area B3	SOUTH ADDITION				
Type	C (5-yr)	C (100-yr)	Area (m²)	Product (5-yr)	Product (100-yr)
BUILDING	0.90	1.00	107.0	96.3	107.0
CONCRETE	0.90	1.00	8.4	7.6	8.4
Avg C	0.90	1.00			

Time of concentration (min.)	2-Year (mm/hr)	5-Year (mm/hr)	100-Year (mm/hr)	
10.00	76.8	104.2	178.6	PRE-DEVELOPMENT
10.00	76.8	104.2	178.6	POST-DEVELOPMENT

PRE-DEVELOPMENT RUNOFF COEFFICIENT CALCULATIONS

Basin	Drainage Area (ha)	Balanced Runoff Coefficient (C) 2 & 5-yr	Balanced Runoff Coefficient (C) 100-yr	2-Year Flow Rate (l/s)	5-Year Flow Rate (l/s)	100-Year Flow Rate (l/s)
A1*	0.13	0.53	0.60	15.07	20.44	39.65
A2	0.02	0.20	0.25	0.66	0.89	1.90
A3	0.01	0.20	0.25	0.49	0.67	1.43
Total	0.16			16.22	22.00	42.99

*NOTE: Area A1 is not located within the area of development and will not be included when calculating the restricted flow for the site. Therefore, only drainage area A2-A3 will be analyzed within the Stormwater Management Calculations.

POST-DEVELOPMENT RUNOFF COEFFICIENT CALCULATIONS

Basin	Drainage Area (ha)	Balanced Runoff Coefficient (C) 2 & 5-yr	Balanced Runoff Coefficient (C) 100-yr	2-Year Flow Rate (l/s)	5-Year Flow Rate (l/s)	100-Year Flow Rate (l/s)
B1*	0.13	0.53	0.60	15.07	20.44	39.65
B2	0.02	0.90	1.00	2.95	4.00	7.62
B3	0.01	0.90	1.00	2.22	3.01	5.73
Total	0.16			20.23	27.45	53.00

*NOTE: Area B1 is not located within the area of development and will not be included when calculating the restricted flow for the site. Therefore, only drainage area B2-B3 will be analyzed within the Stormwater Management Calculations.

REQUIRED RESTRICTED FLOW

Basin	Drainage Area (ha)	Balanced Runoff Coefficient (C) 2 & 5-yr	2-Year Flow Rate (l/s)
A2-A3	0.03	0.20	1.15

ACTUAL STORM WATER RUNOFF FROM SITE (L/s)

Area	Post-Development Unrestricted (l/s)			Post-Development (Restricted) (l/s)			
	2-yr	5-yr	100-yr	2-yr	5-yr	100-yr	
B2	2.95	4.00	7.62	0.42	0.42	0.72	*RESTRICTED*
B3	2.22	3.01	5.73	0.36	0.36	0.66	
Total	5.17	7.01	13.35	0.78	0.78	1.38	

STORAGE REQUIRMENTS FOR AREA B2

2 & 5-YEAR STORM EVENT

Tc	I (mm/hr)	Runoff (l/s) B2	Allowable Outflow (l/s)	Runoff To Be Stored (l/s)	Storage Required (m^3)
10	104.2	4.0	0.42	3.58	2.1
20	70.3	2.7	0.42	2.28	2.7
30	53.9	2.1	0.42	1.65	3.0
40	44.2	1.7	0.42	1.28	3.1
50	37.7	1.4	0.42	1.03	3.1
60	32.9	1.3	0.42	0.84	3.0
70	29.4	1.1	0.42	0.71	3.0
80	26.6	1.0	0.42	0.60	2.9

Maximum Storage Required (m^3) =	3.1

100-YEAR STORM EVENT

Tc	I (mm/hr)	Runoff (l/s) B2	Allowable Outflow (l/s)	Runoff To Be Stored (l/s)	Storage Required (m^3)
10	178.6	7.6	0.72	6.90	4.1
20	120.0	5.1	0.72	4.40	5.3
30	91.9	3.9	0.72	3.20	5.8
40	75.1	3.2	0.72	2.48	6.0
50	64.0	2.7	0.72	2.01	6.0
60	55.9	2.4	0.72	1.67	6.0
70	49.8	2.1	0.72	1.41	5.9
80	45.0	1.9	0.72	1.20	5.8

Maximum Storage Required (m^3) =	6.0

STORAGE OCCUPIED IN AREA B2

5-YEAR STORM EVENT

Other Storage Areas on Site		Water Elev. (m) =		N/A	
Location	T/G	INV. (out)	75% of Area (m^2)	Depth (m)	Volume (m^3)
NORTH ADDITION	N/A	N/A	108.00	0.035	3.8
				Total	3.8

Storage Available (m^3) =	3.8
Storage Required (m^3) =	3.1

100-YEAR STORM EVENT

Other Storage Areas on Site		Water Elev. (m) =		N/A	
Location	T/G	INV. (out)	75% of Area (m^2)	Depth (m)	Volume (m^3)
NORTH ADDITION	N/A	N/A	108.00	0.060	6.5
				Total	6.5

Storage Available (m^3) =	6.5
Storage Required (m^3) =	6.0

STORAGE REQUIRMENTS FOR AREA B3

2 & 5-YEAR STORM EVENT

Tc	I (mm/hr)	Runoff (l/s) B3	Allowable Outflow (l/s)	Runoff To Be Stored (l/s)	Storage Required (m^3)
10	104.2	3.0	0.36	2.6	1.6
20	70.3	2.0	0.36	1.7	2.0
30	53.9	1.6	0.36	1.2	2.2
40	44.2	1.3	0.36	0.9	2.2
50	37.7	1.1	0.36	0.7	2.2
60	32.9	0.9	0.36	0.6	2.1
70	29.4	0.8	0.36	0.5	2.1
80	26.6	0.8	0.36	0.4	2.0

Maximum Storage Required (m^3) =	2.2

100-YEAR STORM EVENT

Tc	I (mm/hr)	Runoff (l/s) B3	Allowable Outflow (l/s)	Runoff To Be Stored (l/s)	Storage Required (m^3)
10	178.6	5.7	0.66	5.1	3.0
20	120.0	3.8	0.66	3.2	3.8
30	91.9	2.9	0.66	2.3	4.1
40	75.1	2.4	0.66	1.7	4.2
50	64.0	2.1	0.66	1.4	4.2
60	55.9	1.8	0.66	1.1	4.1
70	49.8	1.6	0.66	0.9	3.9
80	45.0	1.4	0.66	0.8	3.8

Maximum Storage Required (m^3) =	4.2

STORAGE OCCUPIED IN AREA B3

5-YEAR STORM EVENT

Other Storage Areas on Site		Water Elev. (m) =		N/A	
Location	T/G	INV. (out)	75% of Area (m^2)	Depth (m)	Volume (m^3)
SOUTH ADDITION	N/A	N/A	80.3	0.030	2.4
				Total	2.4

Storage Available (m^3) =	2.4
Storage Required (m^3) =	2.2

100-YEAR STORM EVENT

Other Storage Areas on Site		Water Elev. (m) =		N/A	
Location	T/G	INV. (out)	75% of Area (m^2)	Depth (m)	Volume (m^3)
SOUTH ADDITION	N/A	N/A	80.3	0.055	4.4
				Total	4.4

Storage Available (m^3) =	4.4
Storage Required (m^3) =	4.2

ROOF DRAIN FLOW FOR FLAT ROOF (B2, NORTH ADDITION)

Flow Rate Vs. Build-Up (One Weir)	
Metric	
Depth (mm)	Flow (L/s)
15	0.18
20	0.24
25	0.30
30	0.36
35	0.42
40	0.48
45	0.54
50	0.60
55	0.66
60	0.72

*Roof Drain model to be Accutrol Weirs, See attached sheets
*Roof Drain Flow information taken from Watts Drainage website

CALCULATING ROOF FLOW EXAMPLES

1 roof drain during a 5 year storm
elevation of water = 35mm
Flow leaving 1 roof drain = (1 x 0.42 L/s) = 0.42 L/s

1 roof drain during a 100 year storm
elevation of water = 60mm
Flow leaving 1 roof drain = (1 x 0.72 L/s) = 0.72 L/s

	Roof Drain Flow		
	Flow (l/s)	Storage Depth (mm)	1 Roof Drains Flow (l/s)
	0.18	15	0.18
	0.24	20	0.24
	0.30	25	0.30
	0.36	30	0.36
2 & 5- YR	0.42	35	0.42
	0.48	40	0.48
	0.54	45	0.54
	0.60	50	0.60
	0.66	55	0.66
100-YR	0.72	60	0.72
	0.78	65	0.78
	0.84	70	0.84
	0.90	75	0.90
	0.96	80	0.96
	1.02	85	1.02
	1.08	90	1.08
	1.14	95	1.14
	1.20	100	1.20
	1.26	105	1.26
	1.32	110	1.32
	1.38	115	1.38
	1.44	120	1.44
	1.50	125	1.50
	1.56	130	1.56
	1.62	135	1.62
	1.68	140	1.68
	1.74	145	1.74
	1.80	150	1.80

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

ROOF DRAIN FLOW FOR FLAT ROOF (B3, SOUTH ADDITION)

Flow Rate Vs. Build-Up (One Weir)	
Metric	
Depth (mm)	Flow (L/s)
15	0.18
20	0.24
25	0.30
30	0.36
40	0.48
45	0.54
50	0.60
55	0.66

*Roof Drain model to be Accutrol Weirs, See attached sheets
*Roof Drain Flow information taken from Watts Drainage website

CALCULATING ROOF FLOW

1 roof drain during a 5 year storm
elevation of water = 30mm
Flow leaving 1 roof drain = (1 x 0.36 L/s) = 0.36 L/s

1 roof drain during a 100 year storm
elevation of water = 55mm
Flow leaving 1 roof drain = (1 x 0.55 L/s) = 0.55 L/s

	Roof Drain Flow		
	Flow (l/s)	Storage Depth (mm)	1 Roof Drains Flow (l/s)
	0.18	15	0.18
	0.24	20	0.24
	0.30	25	0.30
2 & 5- YR	0.36	30	0.36
	0.42	35	0.42
	0.48	40	0.48
	0.54	45	0.54
	0.60	50	0.60
100-YR	0.66	55	0.66
	0.72	60	0.72
	0.78	65	0.78
	0.84	70	0.84
	0.90	75	0.90
	0.96	80	0.96
	1.02	85	1.02
	1.08	90	1.08
	1.14	95	1.14
	1.20	100	1.20
	1.26	105	1.26
	1.32	110	1.32
	1.38	115	1.38
	1.44	120	1.44
	1.50	125	1.50
	1.56	130	1.56
	1.62	135	1.62
	1.68	140	1.68
	1.74	145	1.74
	1.80	150	1.80

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