SERVICING AND STORMWATER MANAGEMENT REPORT

Project No.: 0CP-19-0007

Project Name.: 289 Carling Avenue – Mixed Use Office and Apartment Building

Prepared for:

John Howard Society
c/o PBC Development and Construction Management Group Inc.
485 Bank Street, Suite 205
Ottawa, ON
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Prepared by:

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Carp, ON
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Rev 1 – August 16,2019

McINTOSH PERRY

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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 of the property located at 289 Carling Avenue within the City of Ottawa.

1.2 Site Description

The property is located at 289 Carling Avenue. It is described as Lot 10 and Part of Lots 8, 9, and 11 Registered Plan 31326, City of Ottawa, Ontario. The land in question covers approximately 0.12 ha and is located north of the intersection of Carling Avenue and Bell Street South. See Appendix 'A' for Key Plan.

The existing site is currently developed with an asphalt parking lot surrounded by retaining walls and vegetated areas around the perimeter of the property.

The proposed development consists of a six-storey mixed-use office and apartment building with a foundation footprint of approximately 1008.12 m². Parking will be provided underground with upper and lower parking access from Bell Street South.

2.0 BACKGROUND STUDIES

Background studies that have been completed for the site include review of the City of Ottawa as-built drawings, and a topographical survey of the site.

As-built drawings of the existing services within the vicinity of the site were reviewed in order to determine proper servicing and stormwater management schemes for the site.

A topographic survey of the site was completed by Fairhall Moffatt & Woodland Limited, dated August 15, 2018 and can be found under separate cover.

The following reports have been reviewed and are available under separate cover:

- Phase One ESA by DST Consulting Engineers Inc.
- Phase Two ESA by DST Consulting Engineers Inc.
- Geotechnical Investigation by Paterson Group

3.0 PRE-CONSULTATION SUMMARY

City of Ottawa Staff have been pre-consulted regarding the proposed development in person on October 2, 2018. Specific design parameters to be incorporated within this design include the following:

- Pre-development and post-development flows shall each be calculated using a time of concentration (Tc) of 10 minutes.
- Control 5 through 100-year post-development flows to the 5-year pre-development flows, respectively, with a combined C value to a maximum of 0.50.
- Services shall be extended from Carling Avenue as services on Bell Street end north of the property.
- Sanitary and Storm sewers are initially separate, however they ultimately discharge to a combined sewer therefor MECP approval is required.
- Through correspondence with RVCA, it was noted the site has no quality control requirements.

Correspondence can be found in Appendix 'B'.

4.0 EXISTING SERVICES

The following subsections describe the existing services within the Carling Avenue right-of-way and the Bell Street South right-of-way.

4.1 Carling Avenue

Existing services within Carling Avenue ROW west bound lanes:

- 250mm diameter storm sewer

Existing services within Carling Avenue ROW east bound lanes:

- 400mm diameter water main
- 300mm diameter sanitary sewer

Hydro, cable and Bell service locations shall be confirmed by contractor.

The sanitary and storm sewers flow west along Carling Avenue. The sewers both discharge to separate combined sewers near the intersection of Carling Avenue and Lebreton Street South. The sanitary sewer discharges to a 525mm diameter combined sewer and continues south perpendicular to Carling Avenue. The storm sewer discharges to a 250mm diameter combined sewer and continues west down Carling Avenue.

A fire hydrant is present on the south side of Carling Avenue approximately 30.0m from the east corner of the site.

4.2 Bell Street South

Existing services within Bell Street South ROW:

- 200mm diameter watermain
- 300mm diameter combined sewer (ends approximately 25.0m north of site)

Catch basins are present near the existing site entrance as well as across the road. The catch basins are connected to the storm main within Carling Avenue.

A fire hydrant with an unobstructed path of travel is present near the west property corner on Bell Street South.

5.0 SERVICING PLAN

5.1 Proposed Servicing Overview

The overall servicing will be provided via service connections to the mains within Carling Avenue. The water service will be extended from the 400 mm diameter watermain. Similarly, the storm and sanitary services will be connected to the 250 mm diameter and 300 mm diameter mains, respectively. Details pertaining to the final proposed servicing locations have been reviewed and are shown on the proposed Site Servicing Plan included within the submission package.

5.2 Proposed Water Design

A new 50 mm diameter copper water lateral complete with a water valve located at the property line will be connected to the existing 400 mm diameter watermain within Carling Avenue.

The proposed building will be equipped with a sprinkler system. Following Part 3 of the Ontario Building Code (OBC), the required fire protection is 6,300 L/min (See Appendix 'B' for calculation). The required fire protection from the Fire Underwriters Survey (FUS) is 16,5000 L/min (provided for information purposes only).

The water demands for the new building have been calculated as per the Ottawa Design Guidelines – Water Distribution. The demands are as follows: the average and maximum daily demands are 0.27 L/s and 0.63 L/s respectively. The maximum hourly demand was calculated as 1.35 L/s (Refer to Appendix 'B' for flow details).

Boundary conditions have been provided by the City of Ottawa and are available in Appendix 'B'. A model has been undertaken using Bentley's WaterCAD and the results determine that the existing 400 mm watermain within Carling Avenue can adequately service the proposed development. The results are available in Appendix 'B' of this report.

5.3 Proposed Sanitary Design

A new 150 mm diameter gravity sanitary service will be connected to the existing 300 mm diameter sanitary sewer within Carling Avenue. The sanitary service will be complete with a maintenance manhole (SAN MH1A) just inside the property line as per the Ottawa Sewer Design Guidelines (SDG) SD002, October 2012, City of Ottawa, Clause 4.4.4.7 and City of Ottawa Sewer-Use By-Law 2003-514 (14).

The peak design flow for the proposed site was determined to be 0.23 L/s. A 150 mm diameter pipe at a slope of 2.00 percent has a capacity of 22.47 L/s, therefore the proposed 150 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 Carling Avenue as the amount of flow leaving the site is minimal.

5.4 Proposed Storm Design (Conveyance and Management)

Stormwater runoff will be conveyed by way of overland sheet flow which will discharge into the existing infrastructure within Carling Avenue. The roof will provide runoff storage by the use of roof drains before leaving the site. Roof drains will restrict the flow to conform to City requirements.

A new 100 mm diameter storm service will be connected to the existing 250 mm diameter storm main within Carling Avenue. The storm service is provided as an outlet for a foundation drain. The restricted roof stormwater from the roof drains may be connected to the storm service lateral.

From discussions with the City of Ottawa and the Rideau Valley Conservation Authority (RVCA), quantity control will not be provided within the site. Correspondence with the RVCA is available in Appendix 'A'. Further details and calculations pertaining to the quantity and quality of the stormwater management system are provided in Section 6.0.

5.5 Site Utilities

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

5.6 Service Locations

The proposed sanitary, storm, and water services will be placed under the grassed area in the western portion of the property. Hydro, cable, telephone and gas will be primarily placed in a common utility trench connecting to existing infrastructure along Carling Avenue.

Separation distances between the storm, water and sanitary will be maintained as per the Ministry of the Environment requirements.

6.0 PROPOSED STORMWATER MANAGEMENT

6.1 Design Criteria and Methodology

Stormwater management for this site will be maintained through roof storage and positive drainage away from the proposed building. This SWM plan will implement quantity control strategies. The restricted stormwater runoff will be directed to the proposed storm service before reaching the existing storm main within Carling Avenue. Overland flow will be directed towards the Carling Avenue right-of-way. The quantitative properties of the storm runoff for both the pre- and post-development flows are further detailed below. No quality control is required on this site.

Stormwater Best Management Practices (SWM BMP's) will be implemented at the "Lot level", "Conveyance" and "End of Pipe" locations. To summarize, roof water will be directed to grass surfaces.

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:

Table 1: Average Runoff Coefficients (C)

Surface	Avg. C
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 correspondence with City of Ottawa Staff the time of concentration (Tc) used for pre-development and post-development flows shall be 10 minutes.

6.2.1 Pre-Development Drainage

The existing site has been demonstrated as drainage area A1 and A2. Drawing CP-19-0007 PRE (Appendix 'D') indicates the limits of the drainage area. Existing conditions have the overland stormwater runoff flowing from high points located across the northern area of the property and draining south towards Carling Avenue's Right-of-Way (ROW) and the existing catch basins. Table 2 demonstrates the existing flow rates in pre-development conditions.

Table 2: Pre-Development Runoff Summary

Area ID	Drainage Area (ha)	Balanced Runoff Coefficient (C) 5-yr	Balanced Runoff Coefficient (C) 100-yr	5-Year Flow Rate (l/s)	100-Year Flow Rate (l/s)
A1	0.12	0.68	0.76	23.95	46.13
A2	0.01	0.20	0.25	0.30	0.64
Total	**0.13**			**24.25**	**46.77**

(See Appendix 'F' for Calculations)

6.2.2 Post-Development Drainage

The post-development drainage plan was designed to retain runoff generated by a 100-year event onsite. Stormwater exceeding this amount is directed to the northwest corner of the property. The proposed drainage and overland flow directions are indicated on drawing CP-19-0007 POST (Appendix 'E'). Table 3, on the following page, displays the post-development runoff generated by the proposed site.

Table 3: Post-Development Runoff Summary

Area ID	Drainage Area (ha)	Balanced Runoff Coefficient (C) 5-yr	Balanced Runoff Coefficient (C) 100-yr	5-year Flow Rate (L/s)	100-year Flow Rate (L/s)
B1	0.05	0.90	1.00	14.26	27.16
B2	0.02	0.90	1.00	5.29	10.07
B3	0.02	0.90	1.00	5.22	9.94
B4	0.03	0.63	0.71	5.30	10.26
Total	**0.13**			**30.08**	**57.43**

(See Appendix 'F' for Calculations)

Runoff from areas B1-B3 will be restricted through the use of roof drains. The roof restrictions will restrict the 100-yr runoff to the 5-yr pre-development flow rate while accounting for the proposed unrestricted flow from drainage area B4. See Appendix 'F' for calculations. This restriction will be further detailed in Section 6.3.

6.3 Quantity Control

After discussing the stormwater management criteria for the site with City of Ottawa staff, the 5 and 100-year post-development runoff for this site has been restricted to match the 5 and flow rate with a maximum C value of 0.5 (See Appendix 'A' for correspondence). These values create the following allowable release rates and storage volumes for the development site.

Table 4: Allowable Release Rate

Area	Drainage Area (ha)	Balanced Runoff Coefficient (C) 5-yr	Tc (min)	5-Year Flow Rate (L/s)
A1 & A2	0.13	0.50	10	18.40

(See Appendix 'F' for Calculations)

Reducing site flows will be achieved using roof drains and will create the need for roof storage. Runoff from areas B1- B3 will be restricted as detailed in the Table 5 on the following page.

Table 5: Post-Development Restricted Runoff Calculations

Area ID	Post-Development Unrestricted (l/s)		Post-Development (Restricted) (l/s)		
	5-yr	100-yr	5-yr	100-yr	
B1	14.26	27.16	0.72	1.08	RESTRICTED
B2	5.29	10.07	1.80	2.70	RESTRICTED
B3	5.22	9.94	2.40	3.60	RESTRICTED
B4	5.30	10.26	5.30	10.26	UNRESTICTED
Total	**30.08**	**57.43**	**10.22**	**17.64**	

(See Appendix 'F' for Calculations)

Area B1 is the upper level (level 3 to 6) roof area. Runoff from Area B1 will be restricted by two roof drains restricting the flows to 0.72 L/s and 1.08 L/s for the 5-year and 100-year storm events. Area B2 is the southwest portion of the second level roof. Area B2 will be restricted by three roof drains restricting the flows to 1.80 L/s and 2.70 L/s for the 5-year and 100-year storm events. Area B3 is the northeast portion of the second level roof. Area B3 will be restricted by four roof drains restricting the flows to 2.40 L/s and 3.60 L/s for the 5-year and 100-year storm events. Roof drainage areas for the roof areas is depicted on CP-19-0007 – POST plan available within Appendix 'E'. Table 6 below details the required and provided rooftop storage volumes for the development.

Table 6: Rooftop Storage Summary

Area	Depth of ponding (m) for 5-yr storm	5-year required storage (m^3)	5-yr available storage (m^3)	Depth of ponding (m) for 100-yr storm	100-year required storage (m^3)	100-year available storage (m^3)
B1	0.030	9.57	9.85	0.045	14.23	14.77
B2	0.055	6.63	6.70	0.085	10.35	9.90
B3	0.050	5.67	6.01	0.075	8.50	9.01

(See Appendix 'F' for Calculations)

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 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, there are no quality control requirements for the site. Please refer to Appendix 'B' for correspondence with the RVCA and City of Ottawa. The combination of the above BMP's and the proposed flow control measures will aid in the protection of the natural environment.

7.0 SEDIMENT EROSION CONTROL

The site-grading contractor is responsible for ensuring sediment control structures are installed in accordance with the Site Servicing and Sediment & Erosion Control Plan as indicated.

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 and vegetation has been established. 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.

At the discretion of the project manager, municipal staff or conservation authority, additional silt control devices shall be installed at designated locations.

8.0 SUMMARY

- A new 1008.12 m^2 ground floor area six-storey mixed-use office and residential building will be constructed on the site located at 289 Carling Avenue.
- A new 150 mm diameter sanitary service and monitoring manhole will be installed and connected to the existing 300 mm diameter sewer within Carling Avenue.
- A new 50 mm diameter water lateral will be extended from the existing 400 mm diameter main within Carling Avenue.
- A new storm service and manhole will be installed and connected to the existing 250 mm diameter sewer within Carling Avenue.
- As discussed with City of Ottawa staff, the stormwater management design will ensure that the post-development flow rates are restricted to the 5-year pre-development flow rates calculated with a maximum C value of 0.5.
- Storage for the 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 in support of the proposed development located at 289 Carling 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.

Ryan Kennedy, P.Eng.
Practice Area Lead, Land Development
McIntosh Perry Consulting Engineers
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E: r.kennedy@mcintoshperry.com

Charissa Hampel, EIT
Engineering Intern, Land Development
Mcintosh Perry Consulting Engineers
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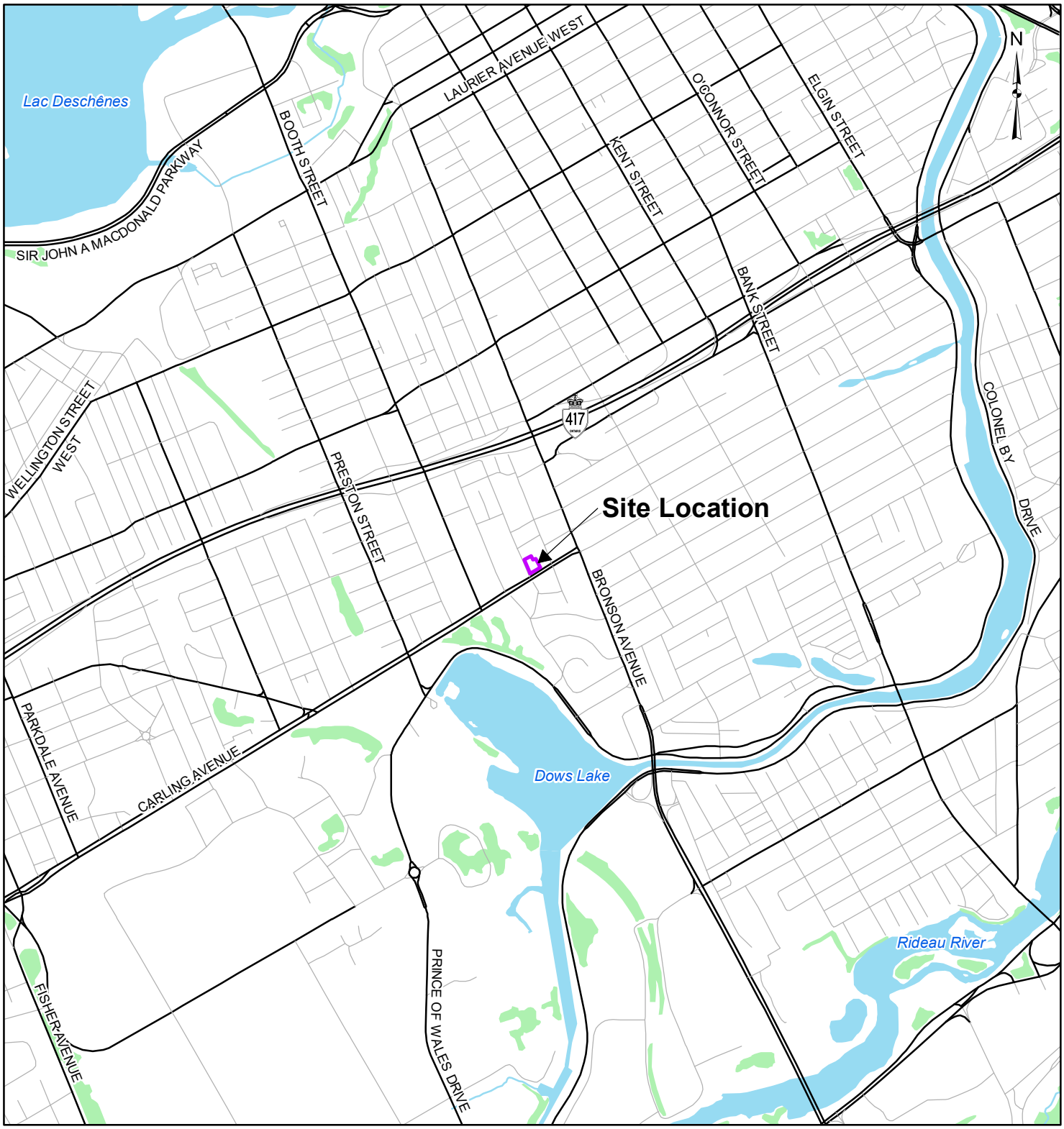
10.0 STATEMENT OF LIMITATIONS

This report was produced for the exclusive use of John Howard Society. 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: KEY PLAN



LEGEND

- Approximate Site Boundary
- Local Road
- Major Road
- Watercourse
- Waterbody
- Wooded Area

REFERENCE

GIS data provided by the Ontario Ministry of Natural Resources and Forestry, 2019.

CLIENT: JOHN HOWARD SOCIETY C/O

PROJECT: NEW MIXED USE OFFICE AND APARTMENT BUILDING

TITLE: SITE LOCATION

McINTOSH PERRY
115 Walgreen Road, RR3, Carp, ON K0A1L0
Tel: 613-836-2184 Fax: 613-836-3742
www.mcintoshperry.com

PROJECT NO: CP-19-0007		FIGURE:
Date	Feb., 05, 2019	1
GIS	LC	
Checked By	CH	

APPENDIX B: CORRESPONDENCE

MINUTES
289 Carling Avenue - Pre-Application Consultation Meeting
Date: Tuesday, October 2, 2018
Time: 1:00 PM – 2:00 PM
Location: 110 Laurier Avenue West, Room 4106E

Present:
Maria Martinez (Project Manager)
Christine MacIntosh (John Howard Society)
Ralph Wiesbrock (KWC Architects)
Andrew Kaster (KWC Architects)
Stefan Krauss (KWC Architects)
Robert Sandercott (City of Ottawa Planning)
Richard Buchanan (City of Ottawa Engineering)
Christopher Moise (City of Ottawa Urban Design)

1.0 Introductions

2.0 Overview of Proposal

3.1	**Overview** • Maria Martinez and Christine MacIntosh provided an overview of the proposal: o The subject property is presently subject to a Request for Proposals for an affordable housing development. Proposals are directed to set a target of 40 to 60 dwelling units within the development. o The John Howard Society (JHS) provides supportive housing for individuals in "transition". o JHS is also proposing to move their offices and support centre to this location, should they win the RFP. These uses, in addition to the parking for the development, would occupy the first three storeys (podium) of the building. o The proposed apartments (40 bachelor and 1-bedroom units) would be located on the fourth to seventh storeys of the proposed building. The majority of the amenity space for these units will be accessible from the fourth storey, including roof decks located on top of the podium. o The services provided by the offices and support centre would be available both to residents of the subject building and residents from other buildings operated by JHS. o With respect to the proposed design of the development, it was noted that accommodation of the	

	required on-site parking for the site has so far been the greatest challenge.	

3.2	**Zoning, Official Plan & Setbacks**
	• AM10 – Arterial Mainstreet Zone, Subzone 10
	  o The following zoning provisions should also be noted:
	  ▪ A minimum amenity area requirement of 6 square metres per dwelling unit is required, at least 50% of which must be communal.
	  ▪ For the residential units, parking is required at a rate of 0.5 spaces per unit and 0.1 visitor spaces per unit, not including the first 12 units.
	  ▪ For the office space, a minimum parking rate of 1 space for every 100 square metres of gross floor area is required.
	  ▪ Bicycle parking is required at a rate of 0.5 spaces per unit.
	  ▪ As per Section 113 of the By-law, one loading space is required for an office use measuring 1000 sq m of total gross floor area or more.	

3.0 Questions

4.1	• How has the expected parking demand factored into the design? o **RESPONSE**: often the units have been geared towards those who don't own vehicles. Often, Minor Variances have been applied for to reduce the minimum parking rate; however, in this instance the applicants would prefer to present a zoning-compliant proposal. It is possible that the clientele in this instance may generate a higher demand for on-site parking than normally expected.	

4.0 Preliminary Comments from City

5.1	**Planning (Robert Sandercott):** • A Site Plan Control application will be required (***Manager Approval, Public Consultation***). • The number of driveway accesses/curb cuts off of Bell Street is a potential concern (i.e. the loading space + both parking accesses), given their proximity to each other. It is preferred to reduce the number of accesses required for this development. o Similarly, the location of and access to the proposed loading space is also a concern.	

	• Consider the function and layout of the amenity space provided for the proposed residential units. Acknowledged that this may change depending on the design and stepbacks of the tower relative to the podium. • ○	

5.2	**Engineering (Richard Buchanan):**
	• A servicing study/brief will be required, in order to confirm if upgrades to the existing servicing are necessary, and to confirm how fire protection/fire flow requirements for the building will be addressed.
	• Servicing from Carling Avenue will be necessary, as services on Bell Street end north of the subject property. It is noted that the services on Carling are located towards the opposite side of the street.
	• While sanitary and storm services are separated, they empty to a combined sewer, and Ministry of Environment approval will be required.
	• Stormwater management – a SWM plan and report will be required.
	  • Stormwater management design is for a 1:5 year storm event with a C factor of 0.5 and a Tc of 10 min, controlled up to the 1:100 year storm event.
	• Carling Avenue is an Arterial Road and therefore a noise study will be required.
	  • Carling Avenue is a transit corridor which is expected to be constructed within 4 to 7 years.	

5.3	**Urban Design (Christopher Moise)** • Consider further articulation between the base/podium and tower above, and pushing the tower section back from the podium. Frontage along Carling appears to have significant mass. • Show more of the surrounding building context and how the proposed design addresses that context. • Amount of and design of parking proposed to be provided is a concern, in particular given that it occupies much of the floors closest to street level.	
5.4	**Transportation (Wally Dubyk) – unable to attend meeting however following comments were provided:** • Applicant will need to complete the TIA (Transporation Impact Assessment) screening form to determine scope of TIA required in support of the application. Link: http://documents.ottawa.ca/sites/documents.ottawa.ca/files/tia_guidelines_en.pdf • Carling Avenue is designated as an Arterial road within the City's Official Plan with a ROW protection limit of 44.5 metres. The ROW protection limit and the offset distance (22.05 metres) are to be dimensioned from the existing centerline of pavement and shown on the drawings. • **ROW interpretation** – Land for a road widening will be taken equally from both sides of a road, measured from the centreline in existence at the time of the widening if required by the City. The centreline is a line	

	running down the middle of a road surface, equidistant from both edges of the pavement. In determining the centreline, paved shoulders, bus lay-bys, auxiliary lanes, turning lanes and other special circumstances are not included in the road surface. • A 5.0 metres x 5.0 metres sight triangle would be required at the intersection of Bell Street and Carling Avenue.	

5.0 Next Steps / Process

7.1	• Staff to follow up with minutes and list of required reports and studies • Should proponents proceed with this project, recommended that another pre-consultation meeting be held once the design is further along in the process.	

From: Eric Lalande <eric.lalande@rvca.ca>
Sent: February 20, 2019 10:44 AM
To: Charissa Hampel
Subject: RE: 289 Carling Avenue - Mixed Use Building

Hi Charissa,

Based on the plans provided, the RVCA will have no Quality control requirements for the proposed mixed use building at 289 Carling Avenue. Best management practices are encouraged where possible.

Please contact me should you have any other questions.

Thanks,

Eric Lalande, MCIP, RPP
Planner, Rideau Valley Conservation Authority
613-692-3571 x1137

From: Charissa Hampel <c.hampel@mcintoshperry.com>
Sent: Wednesday, February 20, 2019 10:31 AM
To: Eric Lalande <eric.lalande@rvca.ca>
Subject: 289 Carling Avenue - Mixed Use Building

Hi Eric,
I am currently working on a development at 289 Carling Ave within the City of Ottawa. The development will consist of a 6 storey mixed use office and apartment building. I have attached a site plan for your reference. Could you please let me know the quality control requirements for the site.

Thanks,

Charissa Hampel, EIT
Engineering Intern
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APPENDIX C: EXISTING WATERMAIN FLOW AND FIRE PROTECTION CALCULATIONS

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CP-19-0007 - 289 Carling Avenue - Water Demands

Project:	289 Carling Avenue		
Project No.:	CP-19-0007		
Designed By:	CDH		
Checked By:	RPK		
Date:	2019/02/05		
Site Area:	0.13	ha	
Office Area	0.12	ha	
Bachlor Apartments	29.00	1.4 Persons per unit	40.6
1-Bedroom Apartments	11.00	1.4 Persons per unit	15.4
		Total	56

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
Other Commercial	28,000	L/gross ha/d
AVERAGE DAILY DEMAND	0.27	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	0.63	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	1.35	L/s

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

115 Walgreen Road, R.R.3. Carp, ON K0A 1L0 | T. 613-836-2184 | F. 613-836-3742
info@mcintoshperry.com | www.mcintoshperry.com

CP-19-0007 - 289 Carling Avenue - OBC Fire Calculations

Project:	289 Carling Avenue
Project No.:	CP-19-0007
Designed By:	CDH
Checked By:	RPK
Date:	2019/02/05

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

Water Supply for Fire-Fighting - Store/Office & Warhouse Building

Building is classified as Groups : C C and D (from table 3.2.2.67)
Building is of noncombustable construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2, including loadbearging walls, columns and arches.

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	16	(from Table 1 pg A-31)
V	15,546	(Total building volume in m³.)
Stot	1.0	(From figure 1 pg A-32)
Q =	248,740.36 L	

			From Figure 1 (A-32)
Snorth	16	m	0.0
Seast	10	m	0.0
Ssouth	35	m	0.0
Swest	-	m	0.0

*approximate distances

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

6300 L/min (if 190,000 > Q > 270,000 L)
1664 gpm

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CP-19-0007 - 289 Carling Avenue - Fire Underwriters Survey (FUS) Fire Calculations

Project:	289 Carling Avenue
Project No.:	CP-19-0007
Designed By:	CDH
Checked By:	RPK
Date:	2019/02/05

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.

A. Determine The Coefficient Related To The Type Of Construction

The building is considered to be of ordinary construction type. Therefore,

C = 1.00

B. Determine Ground Floor Area

As provided by the Architect:

Floor Area = 4,402.87 m²

C. Determine Height in Storeys

From Architectural Drawings:

Number of Storeys = 6.00

D. Calculate Required Fire Flow

F = 220 x C x √A

F = 220.00 X 1.00 X √ 4402.87

F = 14,597.91 L/min.

F = 15,000.00 L/min.

E. Determine Increase or Decrease Based on Occupancy

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

Combustable

0% Charge

Occupancy Decrease = 0.00 L/min.

F = 15,000.00 L/min.

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F. 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
- The building will be sprinklered.
- Therefore the value obtained in Step E is reduced by 30%

Reduction = 15,000.00 L/min. X 30%

Reduction = 4,500.00 L/min.

G. Determine the Total Increase for Exposures

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

- North 16m, East 10m, South 35m
- Therefore the charge for exposure is (15+20+5) 40% of the value obtained in Step E.

= 15,000.00 L/min. X 40%

Increase = 6,000.00 L/min.

H. Determine the Total Fire Demand

- To the answer obtained in E, substract the value obtained in F and add the value obtained in G
- Fire flow should be no less than 2,000L/min. and the maximum value shoul not exceed 45,000L/min.

F = 15,000.00 L/min. - 4,500.00 L/min. + 6,000.00 L/min.
F = 16,500.00 L/min.

Therefore, after rounding to the nearest 1,000 L/min, the total required fire flow for the development is 17000 L/min (4491 GPM).

Average Day

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Hydraulic Grade (m)
J-1 (BLDG)	70.20	16.20	63.28	114.78
J-2	68.80	0.00	65.30	114.80

Peak Hourly

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Hydraulic Grade (m)
J-1 (BLDG)	70.20	81.00	51.68	106.61
J-2	68.80	0.00	54.22	107.00

Max Day + Fire Flow

Label	Is Fire Flow Run Balanced?	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (L/min)	Fire Flow (Available) (L/min)	Pressure (psi)	Elevation (m)	Demand (L/min)	Pressure (Residual Lower Limit) (psi)
H-1	True	True	16,500.00	20,651.93	63.95	71.95	0.00	20.00
J-1 (BLDG)	False	False	16,500.00	(N/A)	66.30	70.20	37.80	20.00
J-2	False	False	16,500.00	(N/A)	68.42	68.80	0.00	20.00

From: Buchanan, Richard <Richard.Buchanan@ottawa.ca>
Sent: February 27, 2019 2:08 PM
To: Charissa Hampel
Subject: FW: Request for Boundary Conditions - 289 Carling Ave
Attachments: 289 Carling Feb 2019.pdf

Hi Charissa

The following are boundary conditions, HGL, for hydraulic analysis at 289 Carling (zone 1W) assumed to be connected to the 406mm on Carling (see attached PDF for location).

Minimum HGL = 107.0m

Maximum HGL = 114.8m

MaxDay + Fireflow (250 L/s) = 106.0m

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.

Richard Buchanan, CET

Project Manager, Development Approvals
Planning, Infrastructure and Economic Development Department
Planning & Growth Management Branch
City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 27801
ottawa.ca/planning / ottawa.ca/urbanisme

From: Charissa Hampel <c.hampel@mcintoshperry.com>
Sent: Friday, February 15, 2019 2:16 PM
To: Buchanan, Richard <Richard.Buchanan@ottawa.ca>
Subject: Request for Boundary Conditions - 289 Carling Ave

Good Afternoon,
Please see below for parameters. Site Plan is attached as well.

1. Type of development: Mix use residential and office building.
2. Location of service: 289 Carling Ave
3. Amount of fire flow required: 15,000 L/min (FUS)
4. Average daily demand: 0.27 L/s.
5. Maximum daily demand: 0.63L/s.
6. Maximum hourly daily demand: 1.35 L/s.

We will also need flow data from hydrants within the vicinity.

Thank you,

Charissa Hampel, EIT
Engineering Intern
115 Walgreen Road, R.R. 3, Carp, ON K0A 1L0
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Boundary Condition for 289 Carling
MCLEAN ST
CLEMOW AVE
BRONSON AVE
CAMBRIDGE ST S
CARLING AVE
BELL ST S
LEBRETON ST S
JACKSON AVE
FREDERICK PL
DOW'S LAKE RD
289
540
530
522
520
514
512
385
360
387
389
391
393
299
601
300
265
350
346
340
736
326
247
770
270
280
774
557
786
788
790
794
567
808
284
286
288
290
292
294
296
304
302
306
102mm
152mm
127mm
203mm
406mm
610mm
N
Legend
Pipe Ownership
Ownership
Private
Public

APPENDIX D: SANITARY SEWER CALCULATIONS

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Project:	CP-19-0007
Designed By:	C.D.H.
Checked By:	R.P.K.
Date:	August 15, 2019

Re: Sanitary Flow Calculations

1. Building Occupancy

The new building will be mixed use with office and apartment space. Occupancies calculated below:

Bachelor Apartments – 29 units x 1.4 persons per unit = 40.6

1-Bedroom Apartments – 11 units x 1.4 persons per unit = 15.4

Office Space – 60 Employees

2. Daily Volume in Litres

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

Single family houses, apartments, Condominiums, cottages, etc.:

- 280 Liters/Person/Day

Office Staff:

- 75 Liters/Person/Day

3. Peak Flow (Q/p)

- $Q_1(p) = F \times P$ Where:
  F = 280 Litres/Person/Day
  P = (40.6 + 15.4) Persons
  Therefore, $Q_1(p)$ = (280) x (56) = 15,680 L/Day (0.181 L/Sec)

- $Q_2(p) = F \times P$ Where:
  F = 75 Litres/Person/Day
  P = 60 Employees
  Therefore, $Q_2(p)$ = (75) x (60) = 4,500 L/Day (0.052 L/Sec)

- Therefore, $Q_{TOTAL}(p) = Q_1(p) + Q_2(p)$ = 20,180 L/Day (0.234 L/s)

APPENDIX E: PRE-DEVELOPMENT DRAINAGE PLAN

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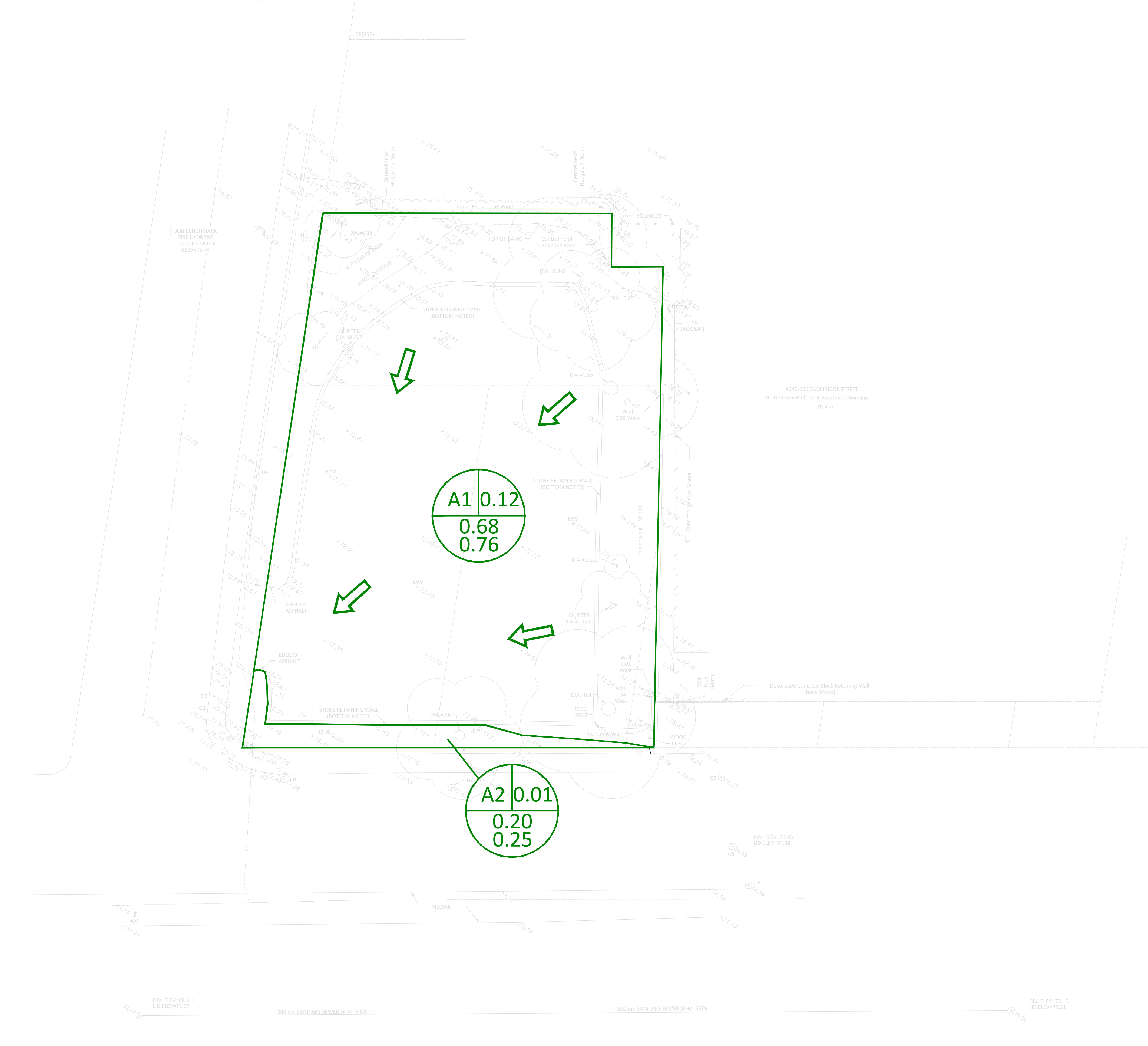

LOCATION PLAN

LEGEND

AREA NAME

AREA (Ha)

A1 0.25 / 0.90 / 1.00

5yr & 100yr COEFFICIENT

OVERLAND DRAINAGE FLOW

FOR REVIEW ONLY
NOT FOR CONSTRUCTION

No.	Revisions	Date
1	ISSUED FOR SITEPLAN CONTROL	AUG. 15, 2019

Check and verify all dimensions before proceeding with the work

Do not scale drawings

SCALE 1 : 500

0 10 20 30 40 50 Metres

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Stamp:

Client:
JOHN HOWARD SOCIETY c/o PBC DEVELOPMENT AND CONSTRUCTION MANAGEMENT GROUP INC.
485 BANK STREET, SUITE 205
OTTAWA, ON K2P 1Z2

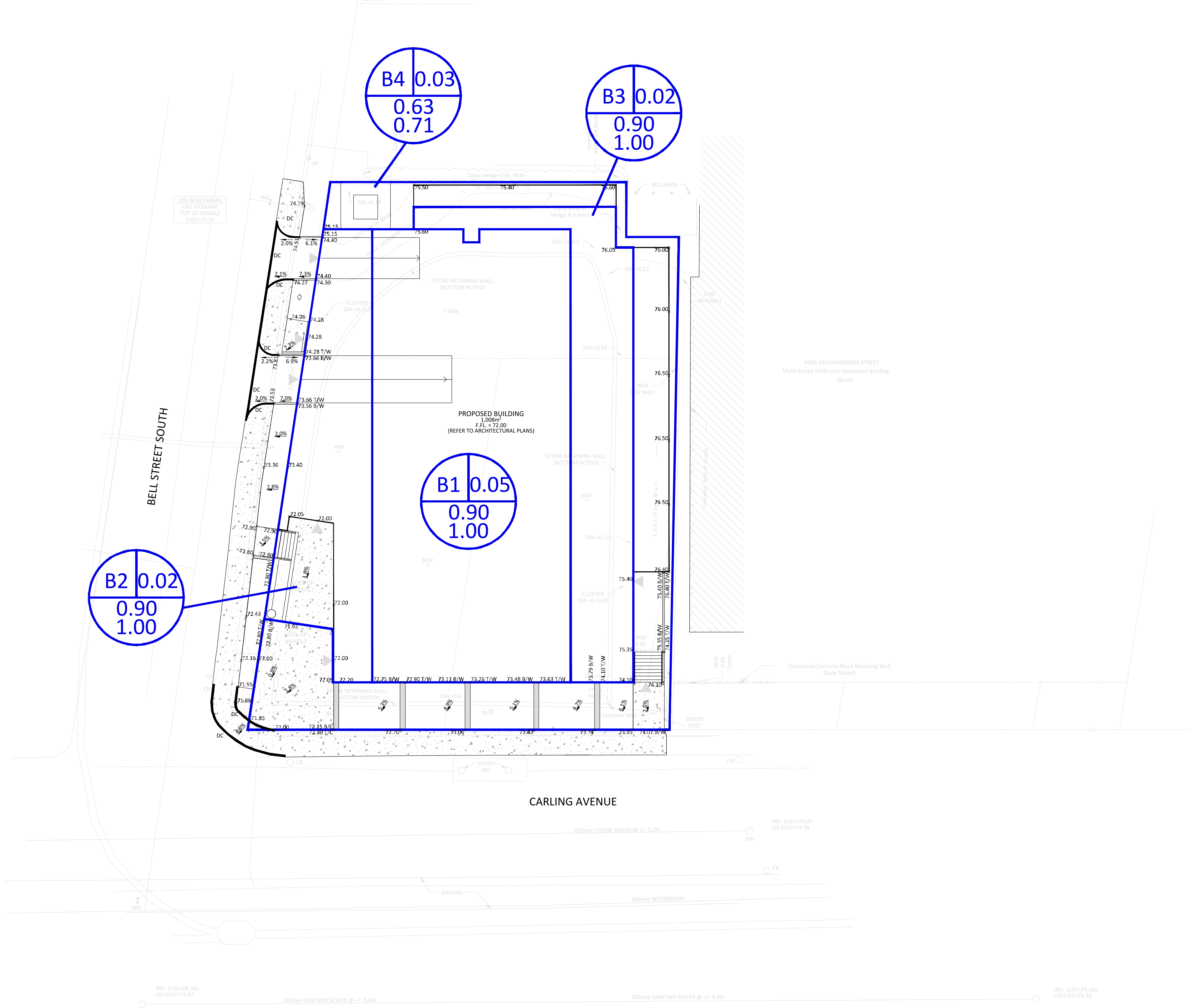
Project:
NEW MIXED USE OFFICE & APARTMENT BUILDING
289 CARLING AVENUE
OTTAWA, ON K1S 4K5

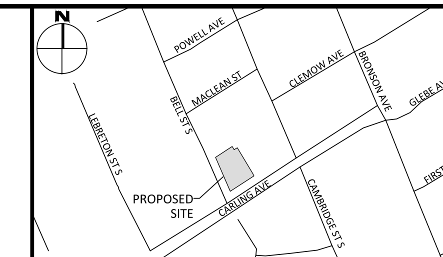
Drawing Title:
PRE-DEVELOPMENT DRAINAGE AREA PLAN

Scale:	N.T.S.	Project Number:	CP-19-0007
Drawn By:	C.D.H.		
Checked By:	R.P.K.	Drawing Number:	PRE
Designed By:	C.D.H.		

APPENDIX F: POST-DEVELOPMENT DRAINAGE PLAN

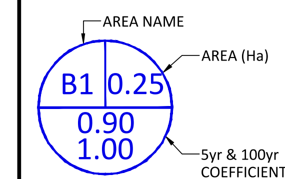
McINTOSH PERRY





LOCATION PLAN

LEGEND



FOR REVIEW ONLY
NOT FOR CONSTRUCTION

No.	Revisions	Date
1	ISSUED FOR SITE PLAN CONTROL	AUG. 15, 2019

Check and verify all dimensions before proceeding with the work

Do not scale drawings

SCALE 1 : 500
0 10 20 30 40 50 Metres

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Stamp:

Client:
JOHN HOWARD SOCIETY c/o PBC DEVELOPMENT AND CONSTRUCTION MANAGEMENT GROUP INC.
485 BANK STREET, SUITE 205
OTTAWA, ON K2P 1Z2

Project:
NEW MIXED USE OFFICE & APARTMENT BUILDING
289 CARLING AVENUE
OTTAWA, ON K1S 4K5

Drawing Title:
POST-DEVELOPMENT DRAINAGE AREA PLAN

Scale:	N.T.S.	Project Number:	CP-19-0007
Drawn By:	C.D.H.		
Checked By:	R.P.K.	Drawing Number:	POST
Designed By:	C.D.H.		

D07-12--XX-XXXX

#XXXXX

APPENDIX G: STORMWATER MANAGEMENT CALCULATIONS

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CP-19-0007 - 289 Carling Ave - Runoff Calculations

Pre-Development Runoff Coefficient

Drainage Area	Area (ha)	Impervious Area (m^2)	C	Gravel Area (m^2)	C	Pervious Area (m^2)	C	C_{AVG} 5-Year	C_{AVG} 100-Year
A1	0.12	832.79	0.90	0.00	0.60	385.99	0.20	0.68	0.76
A2	0.01	0.00	0.90	0.00	0.60	51.75	0.20	0.20	0.25

Pre-Development Runoff Calculations

Drainage Area	Area (ha)	C 5-Year	C 100-Year	Tc (min)	I (mm/hr)		Q (L/s)	
					5-Year	100-Year	5-Year	100-Year
A1	0.12	0.68	0.76	10	104.2	178.6	23.95	46.13
A2	0.01	0.20	0.25	10	104.2	178.6	0.30	0.64
Total	0.13						24.25	46.77

Post-Development Runoff Coefficient

Drainage Area	Area (ha)	Impervious Area (m^2)	C	Gravel Area (m^2)	C	Pervious Area (m^2)	C	C_{AVG} 5-Year	C_{AVG} 100-Year
B1	0.05	547.14	0.90	0.00	0.60	0.00	0.20	0.90	1.00
B2	0.02	202.89	0.90	0.00	0.60	0.00	0.20	0.90	1.00
B3	0.02	200.23	0.90	0.00	0.60	0.00	0.20	0.90	1.00
B4	0.03	177.94	0.90	0.00	0.60	114.80	0.20	0.63	0.71

Post-Development Runoff Calculations

Drainage Area	Area (ha)	C 5-Year	C 100-Year	Tc (min)	I (mm/hr)		Q (L/s)	
					5-Year	100-Year	5-Year	100-Year
B1	0.05	0.90	1.00	10	104.2	178.6	14.26	27.16
B2	0.02	0.90	1.00	10	104.2	178.6	5.29	10.07
B3	0.02	0.90	1.00	10	104.2	178.6	5.22	9.94
B4	0.03	0.63	0.71	10	104.2	178.6	5.30	10.26
Total	0.12						30.08	57.43

Required Restricted Flow

Drainage Area	Area (ha)	C 5-Year	Tc (min)	I (mm/hr)	Q (L/s)
				5-Year	5-Year
A1&A2	0.13	0.50	10	104.2	18.40

Post-Development Restricted Runoff Calculations

Drainage Area	Unrestricted Flow (L/s)		Restricted Flow (L/s)		Storage Required (m^3)		Storage Provided (m^3)		
	5-Year	100-Year	5-Year	100-Year	5-Year	100-Year	5-Year	100-Year	
B1	14.26	27.16	0.72	1.08	9.57	14.23	9.85	14.77	Restricted
B2	5.29	10.07	1.80	2.70	6.63	9.90	6.70	10.35	Restricted
B3	5.22	9.94	2.40	3.60	5.67	8.50	6.01	8.50	Restricted
B4	5.30	10.26	5.30	10.26					Unrestricted
Total	30.08	57.43	10.22	17.64	21.87	32.64	22.55	33.62	

Storage Requirements for Area B1

5-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	76.8	10.51	0.72	9.79	5.88
20	52.0	7.12	0.72	6.40	7.68
30	40.0	5.48	0.72	4.76	8.57
40	32.9	4.50	0.72	3.78	9.07
50	28.0	3.84	0.72	3.12	9.36
60	24.6	3.36	0.72	2.64	9.51
70	21.9	3.00	0.72	2.28	9.57
80	19.8	2.71	0.72	1.99	9.57
90	18.1	2.48	0.72	1.76	9.52
100	16.7	2.29	0.72	1.57	9.43

Maximum Storage Required 2-Year (m^3) =	9.57

100-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	104.2	15.85	1.08	14.77	8.86
20	70.3	10.69	1.08	9.61	11.53
30	53.9	8.20	1.08	7.12	12.82
40	44.2	6.72	1.08	5.64	13.54
50	37.7	5.73	1.08	4.65	13.94
60	32.9	5.01	1.08	3.93	14.15
70	29.4	4.47	1.08	3.39	14.23
80	26.6	4.04	1.08	2.96	14.21

Maximum Storage Required 5-Year (m^3) =	14.23

Storage Occupied In Area B1

5-Year Storm Event

Roof Storage			
Location	Area	Depth	Volume (m^3)
Roof	547.14	0.030	9.85
		Total	9.85

Storage Available (m^3) =	9.85
Storage Required (m^3) =	9.57

100-Year Storm Event

Roof Storage			
Location	Area	Depth	Volume (m^3)
Roof	547.14	0.045	14.77
		Total	14.77

Storage Available (m^3) =	14.77
Storage Required (m^3) =	14.23

Roof Drain Flow (B1)

Roof Drains Summary		
Type of Control Device	Watts Drianage - Accutrol Weir	
Number of Roof Drians	2	
	5-Year	100-Year
Rooftop Storage (m^3)	9.85	14.77
Storage Depth (m)	0.030	0.045
Flow (Per Roof Drain) (L/s)	0.36	0.54
Total Flow (L/s)	0.72	1.08

Flow Rate Vs. Build-Up (One Weir)	
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

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

* Roof Drain Flow information taken from Watts Drainage website

CALCULATING ROOF FLOW EXAMPLES

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

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

	Roof Drain Flow		
	Flow (l/s)	Storage Depth (mm)	Drains Flow (l/s)
	0.18	15	0.36
	0.24	20	0.48
	0.30	25	0.60
5-Year	0.36	30	0.72
	0.42	35	0.84
	0.48	40	0.96
100-Year	0.54	45	1.08
	0.60	50	1.20
	0.66	55	1.32
	0.72	60	1.44
	0.78	65	1.56
	0.84	70	1.68
	0.90	75	1.80
	0.96	80	1.92
	1.02	85	2.04
	1.08	90	2.16
	1.14	95	2.28
	1.20	100	2.40
	1.26	105	2.52
	1.32	110	2.64
	1.38	115	2.76
	1.44	120	2.88
	1.50	125	3.00
	1.56	130	3.12
	1.62	135	3.24
	1.68	140	3.36
	1.74	145	3.48
	1.80	150	3.60

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

Storage Requirements for Area B2

5-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	76.8	10.51	1.80	8.71	5.23
20	52.0	7.12	1.80	5.32	6.39
30	40.0	5.48	1.80	3.68	6.63
40	32.9	4.50	1.80	2.70	6.48
50	28.0	3.84	1.80	2.04	6.12
60	24.6	3.36	1.80	1.56	5.62

Maximum Storage Required 2-Year (m^3) =	6.63

100-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	104.2	15.85	2.70	13.15	7.89
20	70.3	10.69	2.70	7.99	9.58
30	53.9	8.20	2.70	5.50	9.90
40	44.2	6.72	2.70	4.02	9.65
50	37.7	5.73	2.70	3.03	9.08
60	32.9	5.01	2.70	2.31	8.32

Maximum Storage Required 5-Year (m^3) =	9.90

Storage Occupied In Area B2

5-Year Storm Event

Roof Storage			
Location	Area	Depth	Volume (m^3)
Roof	202.89	0.055	6.70
		Total	6.70

Storage Available (m^3) =	6.70
Storage Required (m^3) =	6.63

100-Year Storm Event

Roof Storage			
Location	Area	Depth	Volume (m^3)
Roof	202.89	0.085	10.35
		Total	10.35

Storage Available (m^3) =	10.35
Storage Required (m^3) =	9.90

Roof Drain Flow (B2)

Roof Drains Summary		
Type of Control Device	Watts Drianage - Accutrol Weir	
Number of Roof Drians	3	
	5-Year	100-Year
Rooftop Storage (m^3)	6.70	10.35
Storage Depth (m)	0.055	0.085
Flow (Per Roof Drain) (L/s)	0.66	1.02
Total Flow (L/s)	1.98	3.06

Flow Rate Vs. Build-Up (One Weir)	
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

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

* Roof Drain Flow information taken from Watts Drainage website

CALCULATING ROOF FLOW EXAMPLES

3 roof drains during a 5 year storm
elevation of water = 55mm
Flow leaving 4 roof drains = (3 x 0.66 L/s) = 1.98 L/s

3 roof drains during a 100 year storm
elevation of water = 85mm
Flow leaving 4 roof drains = (3 x 1.02 L/s) = 3.06 L/s

	Roof Drain Flow		
	Flow (l/s)	Storage Depth (mm)	Drains Flow (l/s)
	0.18	15	0.54
	0.24	20	0.72
	0.30	25	0.90
	0.36	30	1.08
	0.42	35	1.26
	0.48	40	1.44
	0.54	45	1.62
	0.60	50	1.80
5-Year	0.66	55	1.98
	0.72	60	2.16
	0.78	65	2.34
	0.84	70	2.52
	0.90	75	2.70
	0.96	80	2.88
100-Year	1.02	85	3.06
	1.08	90	3.24
	1.14	95	3.42
	1.20	100	3.60
	1.26	105	3.78
	1.32	110	3.96
	1.38	115	4.14
	1.44	120	4.32
	1.50	125	4.50
	1.56	130	4.68
	1.62	135	4.86
	1.68	140	5.04
	1.74	145	5.22
	1.80	150	5.40

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

Storage Requirements for Area B3

5-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	76.8	10.51	2.40	8.11	4.87
20	52.0	7.12	2.40	4.72	5.67
30	40.0	5.48	2.40	3.08	5.55
40	32.9	4.50	2.40	2.10	5.04
50	28.0	3.84	2.40	1.44	4.32
60	24.6	3.36	2.40	0.96	3.46

Maximum Storage Required 2-Year (m^3) =	5.67

100-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	104.2	15.85	3.60	12.25	7.35
20	70.3	10.69	3.60	7.09	8.50
30	53.9	8.20	3.60	4.60	8.28
40	44.2	6.72	3.60	3.12	7.49
50	37.7	5.73	3.60	2.13	6.38
60	32.9	5.01	3.60	1.41	5.08

Maximum Storage Required 5-Year (m^3) =	8.50

Storage Occupied In Area B3

5-Year Storm Event

Roof Storage			
Location	Area	Depth	Volume (m^3)
Roof	200.23	0.050	6.01
		Total	6.01

Storage Available (m^3) =	6.01
Storage Required (m^3) =	5.67

100-Year Storm Event

Roof Storage			
Location	Area	Depth	Volume (m^3)
Roof	200.23	0.075	9.01
		Total	9.01

Storage Available (m^3) =	9.01
Storage Required (m^3) =	8.50

Roof Drain Flow (B3)

Roof Drains Summary		
Type of Control Device	Watts Drianage - Accutrol Weir	
Number of Roof Drians	4	
	5-Year	100-Year
Rooftop Storage (m^3)	6.01	9.01
Storage Depth (m)	0.050	0.075
Flow (Per Roof Drain) (L/s)	0.60	0.90
Total Flow (L/s)	2.40	3.60

Flow Rate Vs. Build-Up (One Weir)	
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

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

* Roof Drain Flow information taken from Watts Drainage website

CALCULATING ROOF FLOW EXAMPLES

4 roof drains during a 5 year storm
elevation of water = 50mm
Flow leaving 4 roof drains = (4 x 0.60 L/s) = 2.40 L/s

4 roof drains during a 100 year storm
elevation of water = 75mm
Flow leaving 4 roof drains = (4 x 0.90 L/s) = 3.60 L/s

	Roof Drain Flow		
	Flow (l/s)	Storage Depth (mm)	Drains Flow (l/s)
	0.18	15	0.72
	0.24	20	0.96
	0.30	25	1.20
	0.36	30	1.44
	0.42	35	1.68
	0.48	40	1.92
	0.54	45	2.16
5-Year	0.60	50	2.40
	0.66	55	2.64
	0.72	60	2.88
	0.78	65	3.12
	0.84	70	3.36
100-Year	0.90	75	3.60
	0.96	80	3.84
	1.02	85	4.08
	1.08	90	4.32
	1.14	95	4.56
	1.20	100	4.80
	1.26	105	5.04
	1.32	110	5.28
	1.38	115	5.52
	1.44	120	5.76
	1.50	125	6.00
	1.56	130	6.24
	1.62	135	6.48
	1.68	140	6.72
	1.74	145	6.96
	1.80	150	7.20

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

APPENDIX H: CITY OF OTTAWA DEVELOPMENT SERVICING STUDY CHECKLIST

McINTOSH PERRY

City of Ottawa

4. Development Servicing Study Checklist

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

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

4.1 General Content

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

Identification of existing and proposed infrastructure available in the immediate area.	N/A
Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	Lot Grading, Drainage Plan, Sediment and Erosion Control Plan
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.	Lot Grading, Drainage Plan, Sediment and Erosion Control Plan
Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	N/A
Proposed phasing of the development, if applicable.	N/A
Reference to geotechnical studies and recommendations concerning servicing.	See Geotech
All preliminary and formal site plan submissions should have the following information: o Metric scale o North arrow (including construction North) o Key plan o Name and contact information of applicant and property owner o Property limits including bearings and dimensions o Existing and proposed structures and parking areas o Easements, road widening and rights-of-way o Adjacent street names	Lot Grading, Drainage Plan, Sediment and Erosion Control Plan

4.2 Development Servicing Report: Water

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

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.	N/A
Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A
Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Appendix 'C'
Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N/A

4.3 Development Servicing Report: Wastewater

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

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

4.4 Development Servicing Report: Stormwater Checklist

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

Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	Appendix 'G'
Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	Sediment and Erosion Control Plan
Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	6.0 Stormwater Management, Appendix 'G'
Any proposed diversion of drainage catchment areas from one outlet to another.	6.0 Stormwater Management
Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	6.0 Stormwater Management
If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100 year return period storm event.	Appendix 'B'
Identification of potential impacts to receiving watercourses	N/A
Identification of municipal drains and related approval requirements.	N/A
Descriptions of how the conveyance and storage capacity will be achieved for the development.	6.0 Stormwater Management
100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	Lot Grading, Drainage Plan & sediment Control Plan
Inclusion of hydraulic analysis including hydraulic grade line elevations.	N/A

Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	7.0 Sediment and Erosion Control
Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A
Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

4.5 Approval and Permit Requirements: Checklist

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

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

4.6 Conclusion Checklist

Criteria	Location (if applicable)
Clearly stated conclusions and recommendations	8.0 Summary 9.0 Recommendations
Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	All are stamped
All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	All are stamped