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SERVICING and STORMWATER DESIGN REPORT
65 Acacia Avenue, Ottawa

Prepared For:

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PROJECT #: 170717

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1 INTRODUCTION

This report will address the serviceability of the proposed site, specifically relating to the adequacy of the existing municipal storm sewer, sanitary sewer, and watermains to hydraulically convey the necessary storm runoff, sanitary sewage and water demands that will be placed on the existing system as a result of the proposed development located at 65 Acacia Street Ottawa, Ontario. The report shall also summarize the stormwater management (SWM) design requirements and proposed works that will address stormwater flows arising from the site under post-development conditions and will identify any stormwater servicing concerns and also describe any measures to be taken during construction to minimize erosion and sedimentation.

The site has a total area of 0.05 hectares and is currently occupied by one residential dwelling. It is understood that the owner of the subject property intends to remove the existing building. The property is to contain a 4 storey apartment building with 12 residential units. Parking will be provided at the underground level on the basement floor. Vehicular access to the site is from Acacia Street by means of a main driveway located at the south east corner of the property. Access to the building is provided by entrances at the front and rear of the building. Pedestrian access is proposed along both sides of the driveway by means of permeable paver walkways.

Stormwater management for the site will be designed to attenuate flows to pre-development levels in accordance with City of Ottawa Stormwater management guidelines.

2 STORMWATER DESIGN

2.1 Stormwater Management Design Criteria

Design of the storm sewer system was completed in conformance with the City of Ottawa Design Guidelines. (October 2012). Section 5 “Storm and Combined Sewer Design”.

In accordance with the SWM design criteria provided by the City (see attached email from the City) 100 year post development flow from the proposed development will be restricted to 5 year pre-development flow assuming a maximum pre-development runoff coefficient of C = 0.5.

Rain water from the existing property currently drains from west (rear) to east (front) and is conveyed via overland flow routes to Acacia Avenue. The runoff discharges to the City of Ottawa storm sewer system.

2.1.1 Minor System Design Criteria

The storm sewers have been designed and sized based on the rational formula and the Manning's Equation under free flow conditions for the 5-year storm using a 10-minute inlet time.

2.1.2 Major System Design Criteria

The major system has been designed to accommodate on-site detention with sufficient capacity to attenuate the 100-year design storm. Excess runoff above the 100 year event will flow overland to the east of the site and ultimately into the roadside catch basins along Acacia Ave.

On site storage is provided and calculated for up to the 100-year design storm. Storage is provided on the rooftop, and (east) rear of the property. At the rear of the property storage will be provided on the surface, and in underground pipes and catchbasins. The rooftop has a maximum ponding depth of 150mm. Calculations of the required on-site storage volumes have been provided in Appendix A.

Calculations of the required storage volumes have been prepared based on the Rational Method as identified in Section 8.3.10.3 of the City's Sewer Guidelines. The depth and extent of surface storage will be illustrated on the site servicing and grading plan.

2.2 Stormwater Quantity Control

Peak Flow for runoff quantities for the Pre-Development and Post-Development stages of the project were calculated using the rational method. The rational method is a common and straightforward calculation, which assumes that the entire drainage area is subject to uniformly distributed rainfall. The formula is:

$$Q = \frac{CiA}{360}$$

Where
Q is the Peak runoff measured in ***m^3/s***
C is the Runoff Coefficient, **Dimensionless**
A is the runoff area in ***hectares***
i is the storm intensity measure in ***mm/hr***

All values for intensity, i, for this project were derived from IDF curves provided by the City of Ottawa for data collected at the Ottawa International airport. For this project two return periods were considered, 5 and 100-year events. The formulas for each are:

5-Year Event

$$i = \frac{998.071}{(t_c + 6.053)^{0.814}}$$

100-Year Event

$$i = \frac{1735.071}{(t_c + 6.014)^{0.82}}$$

where t_c is time of concentration

From Appendix 5-D of the City of Ottawa Sewer Design Guidelines, the time of concentration for the site having a slope of 10 to 15 percent and a length of 30 metres would be much less than 10 minutes, therefore the time of concentration was taken as 10 minutes in accordance with City of Ottawa Guidelines for minimum time of concentration.

2.2.1 Pre-development Site Conditions

The site is located south of Rideau Terrace and north of Chapleau Avenue in Ottawa, Ontario. The site has a total area of about 500 square meters which is fully developed. The site is currently occupied by a 1 ½ -story residential building. The residential building has a footprint 110 square metres. The existing building is serviced by an interlocking stone parking surface. All remaining areas are grass at a slope over 7%. It is understood that pre-development conditions will be considered as the lesser of current conditions or conditions resulting in a runoff coefficient of 0.5.

Existing stormwater runoff from the site in general consists of uncontrolled sheet flow. Runoff from approximately the entire site is directed towards the street easterly to catch basins along Acacia Avenue.

2.2.2 Runoff Coefficients

Under pre-development conditions the runoff coefficients for impervious surfaces (roofs, asphalt, and concrete) were taken as 0.90, whereas pervious surfaces (grass) were taken as 0.25.

A 25% increase for the post development 100-year runoff coefficients was used as per City of Ottawa guidelines. Refer to Appendix A for pre-development and post development runoff coefficients.

Based on the existing ground cover the pre-development runoff coefficients were calculated to be 0.25 and 0.31 for the 5 year and 100 year storm events respectively.

2.2.3 Controlled and Uncontrolled Areas

For the purposes of this storm water management design, the site has been divided into uncontrolled and controlled areas as outlined on drawing 170717-POST-CA. The site has two controlled areas. The main roof of the building is in one controlled area (CA1) and the remainder of the roof is in the second controlled area (CA2). The rear of the property is also in the second controlled area (CA2). The side yards and the front yard are defined as one uncontrolled area. Stormwater storage will be provided on the roof of the building in CA1 and CA2. The water from the roof will outlet into CA2 with storage provided by the combination of underground pipes, catch basins/maintenance holes and surface storage in CA2.

Run-off from the roof CA1 will be controlled by two Accutrol Weirs on the roof and directed in CA2. The water going into CA2 will be controlled by an inlet control device installed in the maintenance hole. Runoff from the remaining uncontrolled areas will flow towards Acacia

Avenue. Total storage volumes required resulting from the restriction of flow from the controlled areas are summarized in Appendix A.

2.2.4 Total Allowable Release Rate

The City of Ottawa requires that storm runoff be released in a controlled manner. To control runoff from the site it will be necessary to limit post-development flows for all storm return periods up to the 100-year event using onsite inlet controls. The allowable release rate was determined based on 5 Year predevelopment flows, as per the design criteria provided by the City of Ottawa. Calculations are summarized in Appendix A. The allowable release rate is 5.74 L/s.

2.2.5 Uncontrolled Area Runoff Rates and Allowable Controlled Area Release Rates

The release rate from the controlled area equals the allowable release rate minus the 100 year runoff rate from the uncontrolled portions of the site. A post-development time of concentration of 10 minutes corresponds to a storm intensity of 104.19 mm/hr and 178.56 mm/hr on the 5-year and 100-year storm IDF curves respectively.

The runoff rate from the uncontrolled areas was calculated using the Rational Method.
The uncontrolled runoff for the 100 year design storm event is as follows (calculations are provided in Appendix A):

$$Q = \frac{CiA}{360}$$

Uncontrolled: 0.57 x 178.56 mm/hr x 0.0116 ha = 3.28 L/s

The remaining allowable release rate from the controlled areas of the site during a 100 year storm event is equal to the total allowable release rate from the site less the uncontrolled runoff.

$\mathbf{Q_{controlled\ 100\ YEAR} = Q_{total\ allowable} - Q_{uncontrolled\ 100\ YEAR}}$

The allowable release rate from the property is
5.74 – 3.28 = 2.46 L/s

2.2.6 Post Development Restricted Flow and Storage

In order to meet the stormwater quantity control restriction, the post development runoff rate cannot exceed the 5 year predevelopment runoff rate. Runoff in excess of the allowable release rate will be temporarily stored on the 4th floor roof and on the ground surface as well as in underground pipes, catch basins and maintenance holes and is to be released at the controlled rate following the storm event.

In order to achieve the allowable controlled area storm water release rate, storm water runoff from the roof area of CA1 will be controlled via roof drains designed to achieve a combined maximum release rate of 3.1 L/s. Each roof drain is to be equipped with a weir designed to control flows to 0.032L/s for every 1cm of head. Calculations for Available rooftop storage are summarized in Appendix A. Roof drain specification are provided in Appendix B.

It is understood that all of the roof drains on the building will be directed to one storm drain outlet. Runoff from the roof will be collected by a storm drain pipe specified by the mechanical engineer.

The flow rate from CA2 will be controlled by an inlet control device that is to be installed in CBMH3. This ICD will limit the flow into the municipal system and back up any excess into the underground pipe, and maintenance hole. Additional storage is provided on the ground surface during the 100 year design storm event in catchment CA2. The ICD will continue to release water after the storm event has passed until levels are lowered to pre event conditions. A Hydrovex 50-VHV-1 vertical vortex flow regulator or approved alternative will be used.

The Hydrovex ICD for CA3 should be ordered for the following parameters;

- Model number 50-VHV-1
- Outlet pipe specification: 250mm diameter PVC SDR35
- Discharge: 2.4 L/s
- Upstream Head: 2.2 m
- Manhole Dimensions: 1200 mm diameter

This ICD is selected in order to ensure that the allowable maximum release rate for the 5 and 100 year storm events are not exceeded. Hydrovex selection charts are provided in Appendix B.

The following tables present a summary of the controlled and uncontrolled runoff for each catchment and the required storage resulting from the restriction in flow rate.

Table 1.0 – Summary of Runoff Rates and Storage

Catchment Area ID.	Area	5 – year design Storm			100-year design Storm		
		Release Rate (L/s)	Required Storage (m^3)	Available Storage (m^3)	Release Rate (L/s)	Required Storage (m^3)	Available Storage (m^3)
CA1	0.025	2.9	2.2	7.0	3.9	5.2	7.0
CA2	0.014	2.2	3.8	8.3	2.4	8.3	8.3
UC1	0.012	1.75	N/A	N/A	3.28	N/A	N/A
Total	0.051						

The total allowable runoff rate from the site was 5.74 L/s. The total actual runoff rate from the site is 5.68 L/s during the 100 year storm event which is less than the total allowable runoff rate. The total release rate from the controlled areas is 2.4 L/s.

Refer to Appendix A for a detailed summary of the stormwater management.

2.3 Storm Sewer Design

The on-site storm sewers were designed to be in general conformance with the City of Ottawa Sewer Design Guidelines (October 2012). Specifically, storm sewers were sized using Manning's Equation, assuming a roughness coefficient N = 0.013, to accommodate the runoff from the 5-year storm, under 'open-channel' conditions. The runoff was determined using the rational method and the City of Ottawa IDF curve for a 10-minute time of concentration. Refer to Storm Sewer Design Sheets in Appendix A.

SANITARY SEWER DESIGN

The sanitary service laterals from the proposed development will be connected to the existing 225 mm sanitary sewer along Acacia Avenue.

Sewage discharges will be domestic in type and in compliance with the City of Ottawa Sewer Use By-law. The anticipated peak sanitary flow from the site will be a total of approximately 0.377 L/s.

The sanitary sewage flow for the buildings was calculated based on the City of Ottawa Sewer Design Guidelines (Section 4.4.1.2).

2.4 Design Flows

Residential

Total domestic pop:		
Bachelor units	(0) x 1.4 ppu:	
One Bedroom units	(4) x 1.4 ppu:	5.6
Two Bedroom units	(8) x 2.1 ppu:	16.8
Total:		22.4

$Q_{Domestic}$ = 22.4 x 350 L/person/day x (1/86,400 sec/day) = 0.091 L/sec

$$\text{Peaking Factor} = 1 + \frac{14}{4 + (22.4 / 1000)^{0.5}} = 4.37 \text{*use 4 maximum}$$

$Q_{Peak\ Domestic}$ = 0.091 L/sec x 4.0 = 0.364 L/sec

Infiltration

$Q_{Infiltration}$ = 0. 28 L/ha/sec x 0.0507 ha = 0.014 L/sec

Total Peak Sanitary Flow = 0.363 + 0.014 = 0.377 L/sec

2.5 Sanitary Service Laterals

2.5.1 Sanitary Service Lateral Requirements

The Ontario Building Code specifies minimum pipe size and maximum hydraulic loading for sanitary sewer pipe. OBC 7.4.10.8 (2) states "Horizontal sanitary drainage pipe shall be

designed to carry no more than 65% of its full capacity." The capacity of a 100 mm diameter PVC sanitary sewer lateral at 1% slope is 2.8489 L/sec. The maximum peak sanitary flow from the site is 0.377 L/sec respectively. Since 0.337 L/sec is much less than 0.65 x 2.8489 = 0.1.85L/s, a single sanitary sewer service lateral of 100 mm diameter at a 1% slope will be sufficient. Alternatively:

Table 2.0 Fixture Unit Consideration

Apartment/ Commercial Unit Type	Number of Apartments / Commercial Units	Number of fixture units per apartment / commercial unit	Total number of Fixture Units.
One bedroom	4	10	40
Two bedroom – 2 baths	4	16	64
Two bedroom – 1 bath	4	10	40
Total fixtures			144

From Table 7.4.10.8, the allowable number of fixture units for a 100 mm diameter sanitary service pipe at 1% is 180.

2.5.2 Proposed Sanitary Service Laterals

The existing sewer lateral is to be capped at the property line. The new lateral is to be installed at the location indicated on the Site Servicing drawing 170717 – SER.

3 WATERMAIN DESIGN

It is considered likely that the existing water service lateral and connections are undersized based on the existing 1 ½ story residential dwelling service requirements. The existing water lateral is to be blanked at the watermain. The new lateral is to be installed at the location indicated on the Site Servicing drawing 170717 – SER.

The proposed 50mm diameter water service will be used for the building on 65 Acacia Avenue. The service lateral will be connected to the municipal watermain on Acacia Avenue as indicated on the Site Servicing drawing 170717- SER.

Fire protection will be provided by the existing fire hydrant located on Acacia Street directly in front of the property on the west side of the road.

Fire flow protection requirements were calculated as per the Fire Underwriter's Survey (FUS) Calculations of the fire flow required for the building are provided in Appendix C.

From Appendix C, the maximum fire flow requirement is 5250 L/min or 87.5 L/sec.

3.1 Water Demand

Residential:

Total domestic pop:		
Bachelor units	(0) x 1.4 ppu:	
One Bedroom units	(4) x 1.4 ppu:	5.6
Two Bedroom units	(8) x 2.1 ppu:	16.8
Total:		22.4

Average daily water demand is 22.4 x 350 l/person/day x (1/86,400 sec/day) = 0.091 l/sec
Maximum daily demand is 2.5 x 0.091 l/sec = 0.227 l/sec.
Maximum Hourly demand is = 2.2 x 0.277 l/sec = 0.499 l/sec.

3.2 Boundary Conditions

The water demand due to occupancy together with the fire flow requirements were provided to the City of Ottawa in 2017. These demands consisted of a peak hourly demand of 0.873 L/s and a fire flow demand of 87.5 L/s in order to obtain the boundary conditions for the site. It is assumed that the water services will be connected to the 305 mm water main along Acacia Avenue.

The following are boundary conditions, HGL, for hydraulic analysis were provided in 2017 for the above indicated peak hourly demand and fire flow demand.

Minimum HGL = 109.2
Maximum HGL = 118.2
MaxDay + FireFlow (87.5 L/s) = 112.0m
(Note: Same HGL at each connection point)

The actual proposed peak hourly demand is reduced from 0.873 L/s to 0.499 L/s due to clarification of unit type. The actual proposed fire flow demand remains unchanged at 87.5 L/s.

Since the actual the water demand is decreased due to less occupancy than original demand submitted for boundary conditions, it is expected that the Minimum HGL will be between 118.2 and 109.2 m.

3.3 Water Service Requirements

In accordance with MOE Guidelines, the distribution system shall be sized so that under maximum hourly demand conditions the pressures are not less than 276 kPa (40 psi.)

Where fire flow has been provided; during periods of maximum day and fire flow demand the residual pressure at any point in the distribution system shall not be less than 140 kPa (20 psi.)

Based on City of Ottawa Design Guidelines – Water Distribution a minimum water service size of 50 mm is required based on the proposed occupancy and water demand.

4 EROSION AND SEDIMENT CONTROL

The owner (and/or contractor) agrees to prepare and implement an erosion and sediment control plan at least equal to the stated minimum requirements and to the satisfaction of the City of Ottawa, appropriate to the site conditions, prior to undertaking any site alterations (filling, grading, removal of vegetation, etc.) and during all phases of site preparation and construction in accordance with the current best management practices for erosion and sediment control. It is considered to be the owners and/or contractors responsibility to ensure that the erosion control measures are implemented and maintained.

In order to limit the amount of sediment carried in stormwater runoff from the site during construction, it is recommended to install a silt fence along the inside of the front property line of the site, as shown in Kollaard Associates Inc. Drawing #170717-ESC Erosion & Sediment Control Plan. The silt fence may be polypropylene, nylon, and polyester or ethylene yarn.

If a standard filter fabric is used, it must be backed by a wire fence supported on posts not over 2.0 m apart. Extra strength filter fabric may be used without a wire fence backing if posts are not over 1.0 m apart. Fabric joints should be lapped at least 150 mm (6") and stapled. The bottom edge of the filter fabric should be anchored in a 300 mm (1 ft) deep trench, to prevent flow under the fence. Sections of fence should be cleaned, if blocked with sediment and replaced if torn.

Filter socks should be installed across existing storm manhole and catch basin lids. As well, filter socks should be installed across the proposed catch basin lids immediately after the catch basins are placed. The filter socks should only be removed once the asphaltic concrete and pavers are installed and the site is cleaned.

The exposed landscaped areas of the site should be mulched and seeded with a rapid growing grass mixture or sodded as soon as possible. The proposed granular and asphaltic concrete surfaced areas should be surfaced as soon as possible.

The silt fences should only be removed once the site is stabilized and vegetation is established.

These measures will reduce the amount of sediment carried from the site during storm events that may occur during construction.

5 CONCLUSIONS

This report addresses the adequacy of the existing municipal storm and sanitary sewer system and watermains to service the proposed development of the 4 storey residential building on Acacia Avenue. Based on the analysis provided in this report, the conclusions are as follows:

SWM for the proposed development will be achieved by restricting the 100 year post development flow to the 5 year pre-development flow.

The peak sewage flow rate from the proposed development will be 0.377 L/sec. The existing municipal sanitary sewer should have adequate capacity to accommodate the minimal increase in peak flow. The City has not identified any capacity issues in the existing sanitary sewer system.

The existing municipal watermain along Acacia Ave. will have adequate capacity to service the proposed development for both domestic and fire protection.

During all construction activities, erosion and sedimentation shall be controlled.

We trust that this report provides sufficient information for your present purposes. If you have any questions concerning this report or if we can be of any further assistance to you on this project, please do not hesitate to contact our office.

Sincerely,
Kollaard Associates, Inc.

Steven deWit, P.Eng.

Appendix A: Storm Design Information

- Pre-Development and SWM Summary
- Uncontrolled Runoff Rate and Allowable Release Rate
- Actual Discharge Rate and Storage Volume Requirements
- Storage Volume Provided Roof
- Storage Volume Provided on Ground Surface and Below Grade

- Sewer Design Sheet

APPENDIX A: STORMWATER MANAGEMENT MODEL
PREDEVELOPMENT AND SUMMARY

Client: Simon Saab and Jeffrey Abboud
Job No.: 170710
Location: 65 Acacia Avenue
Date: January 5, 2018

Pre Development Flow

Runoff Coefficient Equation

$C = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{tot}$

Pre Dev run-off Coefficient "C"

			5 Year Event		100 Year Event	
Area	**Surface**	**Ha**	**"C"**	**C_{avg}**	**"C"**	**C_{avg}**
Total	Asphalt/Cement	0.0004	0.90	**0.39**	1.00	**0.46**
0.051	Roof	0.011	0.90		1.00	
	GRASS - w/ slope larger 7%	0.040	0.25		0.31	

Pre Dev.	**C**	**Intensity**	**Area**	**Runoff Rate**
5 Year 2.78CIA=	0.39	104.19	0.051	5.74
		5.7 L/s		

Pre Dev.	**C**	**Intensity**	**Area**	**Runoff Rate**
100 Year 2.78CIA=	0.46	178.56	0.051	11.60
		11.6 L/s		

**Use a 10 minute time of concentration for 5 year

**Use a 10 minute time of concentration

Summary

					5-Year			100-Year		
Sub Area I.D.	Sub Area (ha)	5-Year Cavg	100-Year Cavg	Outlet Location	Release Rate (L/s)	Required Storage (m^3)	Available Storage (m^3)	Release Rate (L/s)	Required Storage (m^3)	Available Storage (m^3)
CA1	0.025	0.90	1.00	SEWER	2.90	2.2	7.0	3.90	5.2	7.0
CA2	0.014	0.51	0.64	SEWER	2.10	3.8	8.3	2.40	7.3	8.3
UC1	0.012	0.52	0.57	STREET	1.75	N/A	NA/	3.28	N/A	NA/
Totals	**0.050**									

Available storage is constidered to be storage below the "overflow" outlet elevation

Equations:

Flow Equation

Q = 2.78 x C x I x A

Where:

C is the runoff coefficient

I is the intensity of rainfall, City of Ottawa IDF

A is the total drainage area

Total Actual Release Rate: **5.68** L/s

Total Allowable Release Rate: **5.74** L/s

APPENDIX A: STORMWATER MANAGEMENT MODEL

UNCONTROLLED RUNOFF RATE AND ALLOWABLE RELEASE RATE

Client: Simon Saab and Jeffrey Abboud
Job No.: 170710
Location: 65 Acacia Avenue
Date: January 5, 2018

Uncontrolled Flow

Runoff Coefficient Equation

$C = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{tot}$

Uncontrolled Area Run-off Coefficient "C" and Runoff Rate

**Use a 10 minute time of concentration

			5 Year Event				100 Year Event			
Area ha	**Surface**	**Ha**	**"C"**	**C_{avg}**	**Intensity** (mm/hr)	**Runoff Rate** (L/s)	**"C"**	**C_{avg}**	**Intensity** (mm/hr)	**Runoff Rate** (L/s)
	Asphalt/Concrete/ Retaining Walls/ Walkways	0.004	0.90	**0.52**	104.19	1.75	1.00	**0.57**	178.56	3.28
	Roof	0.000	0.90				1.00			
	Patio Stone/Semipermeable	0.003	0.60				0.75			
0.01159	Landscape	0.005	0.20				0.25			

Storm Event	Total Allowable Runoff Rate	Total UnCon. Runoff Rate	Allowable Release Rate
	L/s	L/s	L/s
5 year	5.74	1.75	3.99
100 year	5.74	3.28	2.46

Equations:

Flow Equation

Q = 2.78 x C x I x A
Where:
C is the runoff coefficient
I is the intensity of rainfall, City of Ottawa IDF
A is the total drainage area

APPENDIX A: STORMWATER MANAGEMENT MODEL

ACTUAL DISCHARGE RATE AND STORAGE VOLUME REQUIREMENTS

Client: Simon Saab and Jeffrey Abboud
Job No.: 170710
Location: 65 Acacia Avenue
Date: January 5, 2018

**Use a 10 minute time of concentration

Roof Area (CA1)			5 Year Event				100 Year Event			
Area ha	Surface	Ha	"C"	C_{avg}	Intensity (mm/hr)	Runoff Rate (L/s)	"C"	C_{avg}	Intensity (mm/hr)	Runoff Rate (L/s)
	Asphalt/ Concrete	0.000	0.90	**0.90**	104.19	6.44	1.00	**1.00**	178.56	12.27
	Roof	0.025	0.90				1.00			
	Patio Stone/Semipermeable block	0.000	0.60				0.75			
0.02471	Landscape	0.000	0.20				0.25			

Ground (CA2)			5 Year Event				100 Year Event			
Area ha	Surface	Ha	"C"	C_{avg}	Intensity (mm/hr)	Runoff Rate (L/s)	"C"	C_{avg}	Intensity (mm/hr)	Runoff Rate (L/s)
	Asphalt/Concrete	0.002	0.90	**0.51**	104.19	2.07	1.00	**0.59**	178.56	4.10
	Roof	0.003	0.90				1.00			
	Patio Stone/Semipermeable block	0.002	0.60				0.75			
0.01400	Landscape	0.007	0.20				0.25			

Total Allowable Release Rate 5 year 3.99 L/s
100 year 2.46 L/s

Storage Requirements for Roof Area (CA1)

Area = 0.025 hectares
5-year Runoff Coefficient = 0.90 post development
100-year Runoff Coefficient = 1.00 post development

			Release Rate L/s	1	1.5	2	2.5	3	3.5	4
Return Period	**Time (min)**	**Intensity (mm/hr)**	**Flow Q (L/s)**	**Storage Required (m^3)**						
5 Year	10	104.19	6.44	3.3	3.0	2.7	2.4	2.1	1.8	1.5
	20	70.25	4.34	4.0	3.4	2.8	2.2	1.6	1.0	0.4
	30	53.93	3.33	4.2	3.3	2.4	1.5	0.6	-0.3	-1.2
	40	44.18	2.73	4.2	3.0	1.8	0.6	-0.6	-1.8	-3.0
	50	37.65	2.33	4.0	2.5	1.0	-0.5	-2.0	-3.5	-5.0
	60	32.94	2.04	3.7	1.9	0.1	-1.7	-3.5	-5.3	-7.1
	70	29.37	1.82	3.4	1.3	-0.8	-2.9	-5.0	-7.1	-9.2
			Maximum 5 year storage rate	4.2	3.4	2.8	2.4	2.1	1.8	1.5
			Release Rate L/s	1	1.5	2	2.5	3	3.5	4
	10	178.56	12.27	6.8	6.5	6.2	5.9	5.6	5.3	5.0
100 Year	20	119.95	8.24	8.7	8.1	7.5	6.9	6.3	5.7	5.1
	30	91.87	6.31	9.6	8.7	7.8	6.9	6.0	5.1	4.2
	40	75.15	5.16	10.0	8.8	7.6	6.4	5.2	4.0	2.8
	50	63.95	4.39	10.2	8.7	7.2	5.7	4.2	2.7	1.2
	60	55.89	3.84	10.2	8.4	6.6	4.8	3.0	1.2	-0.6
	70	49.79	3.42	10.2	8.1	6.0	3.9	1.8	-0.3	-2.4
	80	44.99	3.09	10.0	7.6	5.2	2.8	0.4	-2.0	-4.4
			Maximum 100 year storage rate	10.2	8.8	7.8	6.9	6.3	5.7	5.1

Storage Requirements for Ground Area (CA2)

Area = 0.014 hectares
5-year Runoff Coefficient = 0.51 post development
100-year Runoff Coefficient = 0.59 post development

			Release Rate L/s			1	1.5	2	2.5	3	3.5	4
Return Period	**Time (min)**	**Intensity (mm/hr)**	**Flow CA3 Q (L/s)**	**Flow CA1&2**	**Total Flow**	**Storage Required (m^3)**						
5 Year	10	104.19	2.07	2.90	4.97	2.4	2.1	1.8	1.5	1.2	0.9	0.6
	20	70.25	1.39	2.80	4.19	3.8	3.2	2.6	2.0	1.4	0.8	0.2
	30	53.93	1.07	2.60	3.67	4.8	3.9	3.0	2.1	1.2	0.3	-0.6
	40	44.18	0.88	2.30	3.18	5.2	4.0	2.8	1.6	0.4	-0.8	-2.0
	50	37.65	0.75	2.10	2.85	5.5	4.0	2.5	1.0	-0.5	-2.0	-3.5
	60	32.94	0.65	1.90	2.55	5.6	3.8	2.0	0.2	-1.6	-3.4	-5.2
	70	29.37	0.58	1.70	2.28	5.4	3.3	1.2	-0.9	-3.0	-5.1	-7.2
			Maximum 5 year storage rate			5.6	4.0	3.0	2.1	1.4	0.9	0.6
			Release Rate L/s			1	1.5	2	2.5	3	3.5	4
	10	178.56	4.10	3.80	7.90	4.1	3.8	3.5	3.2	2.9	2.6	2.3
100 Year	20	119.95	2.75	3.90	6.65	6.8	6.2	5.6	5.0	4.4	3.8	3.2
	30	91.87	2.11	3.70	5.81	8.7	7.8	6.9	6.0	5.1	4.2	3.3
	40	75.15	1.73	3.50	5.23	10.1	8.9	7.7	6.5	5.3	4.1	2.9
	50	63.95	1.47	3.30	4.77	11.3	9.8	8.3	6.8	5.3	3.8	2.3
	60	55.89	1.28	3.10	4.38	12.2	10.4	8.6	6.8	5.0	3.2	1.4
	70	49.79	1.14	2.90	4.04	12.8	10.7	8.6	6.5	4.4	2.3	0.2
			Maximum 100 year storage rate			12.8	10.7	8.6	6.8	5.3	4.2	3.3

Flow CA3 = Flow generated on catchment area CA3 during rainfall event
Flow CA1&2 = Combined Actual flow rate released from the catchments CA1 and CA2
Total Flow = Sum of Flow CA3 plus Flow CA1&2

APPENDIX A: STORMWATER MANAGEMENT MODEL
STORAGE VOLUME PROVIDED ROOF

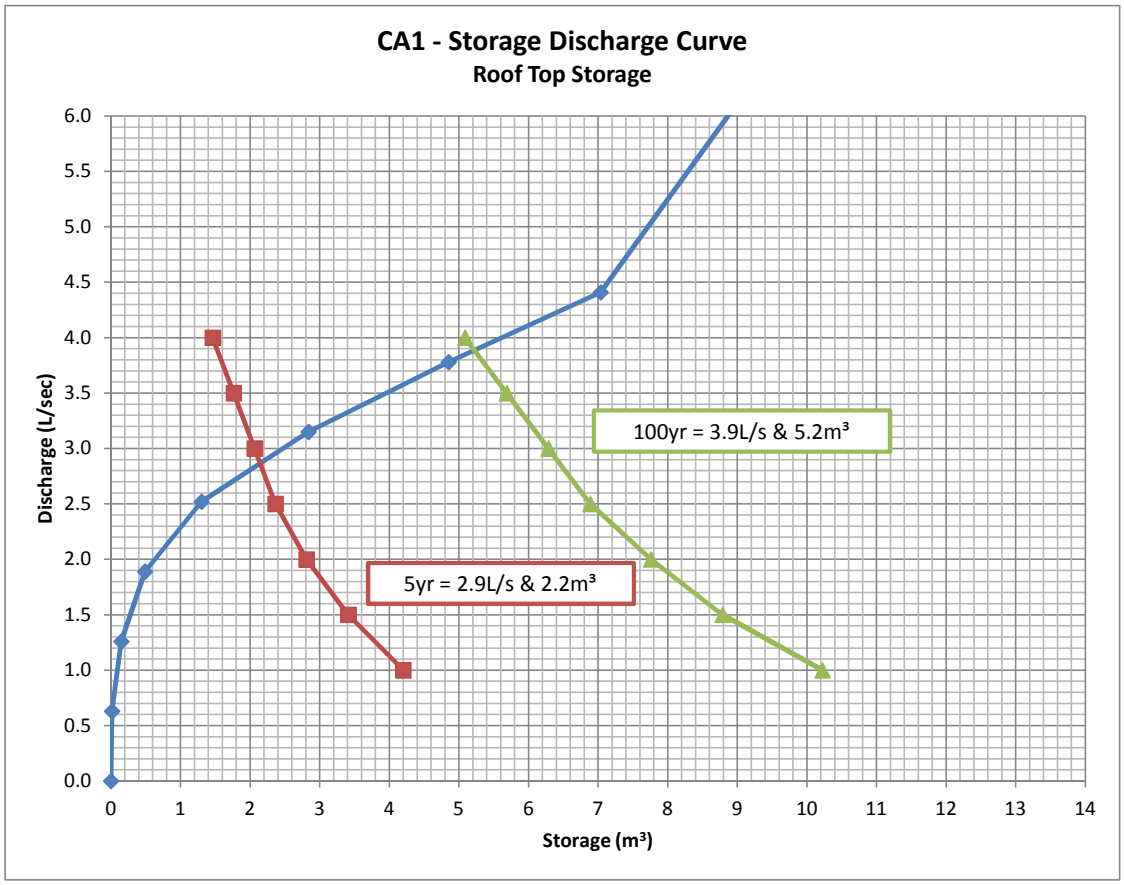
Client: Simon Saab and Jeffrey Abboud
Job No.: 170710
Location: 65 Acacia Avenue
Date: January 5, 2018

Storage Provided for Roof Area (CA1)

Storage Depth (m)	Layer Thickness (m)	Top Layer Area (m²)	Bottom Layer Area (m²)	Incremental Volume (m^3)	Cumulative Storage Volume (m3)	Accutrol Weirs (L/sec)	Overflow Scuppers (L/sec)	Total Outflow (L/sec)
0.15	0.01	218.6	218.6	2.2	24.5	9.5	74	83.3
0.14	0.01	218.6	218.6	2.2	22.3	8.8	60	68.4
0.13	0.01	218.6	218.6	2.2	20.2	8.2	46	54.6
0.12	0.01	218.6	218.6	2.2	18.0	7.6	34	41.9
0.11	0.01	218.6	218.6	2.2	15.8	6.9	24	30.5
0.10	0.01	218.6	218.6	2.2	13.6	6.3	14	20.5
0.09	0.01	218.6	218.6	2.2	11.4	5.7	7	12.3
0.08	0.01	218.6	218.6	2.2	9.2	5.0	1	6.3
0.07	0.01	218.6	218.6	2.2	7.0	4.4	0	4.4
0.06	0.01	218.6	184.6	2.0	4.9	3.8		3.8
0.05	0.01	184.6	124.6	1.5	2.8	3.2		3.2
0.04	0.01	124.6	44.6	0.8	1.3	2.5		2.5
0.03	0.01	44.6	24.6	0.3	0.5	1.9		1.9
0.02	0.01	24.6	4.6	0.1	0.1	1.3		1.3
0.01	0.01	4.6	0.0	0.0	0.0	0.6		0.6
0.00	0.00	0.0	0.0	0.0	0.0	0.0		0.0

Slope on roof	0.005	m/m
Number of Weirs	2	
Number of Slots per Weir	1	
Discharge per slot	0.315	L/sec/cm depth
Total Discharge per Weir per cm depth	0.63	

Maximum Storage required for the 5 year Storm Event	2.2	(m³)
Maximum Storage required for the 100 year Storm Event	5.2	(m³)
Maximum Discharge for the 5 year Storm Event	2.9	L/s
Maximum Discharge for the 100 year Storm Event	3.9	L/s


CA1 - Storage Discharge Curve
Roof Top Storage
Discharge (L/sec)
Storage (m³)
100yr = 3.9L/s & 5.2m³
5yr = 2.9L/s & 2.2m³
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14

APPENDIX A: STORMWATER MANAGEMENT MODEL

STORAGE VOLUME PROVIDED on GROUND SURFACE AND BELOW GRADE

Client: Simon Saab and Jeffrey Abboud
Job No.: 170710
Location: 65 Acacia Avenue
Date: January 5, 2018

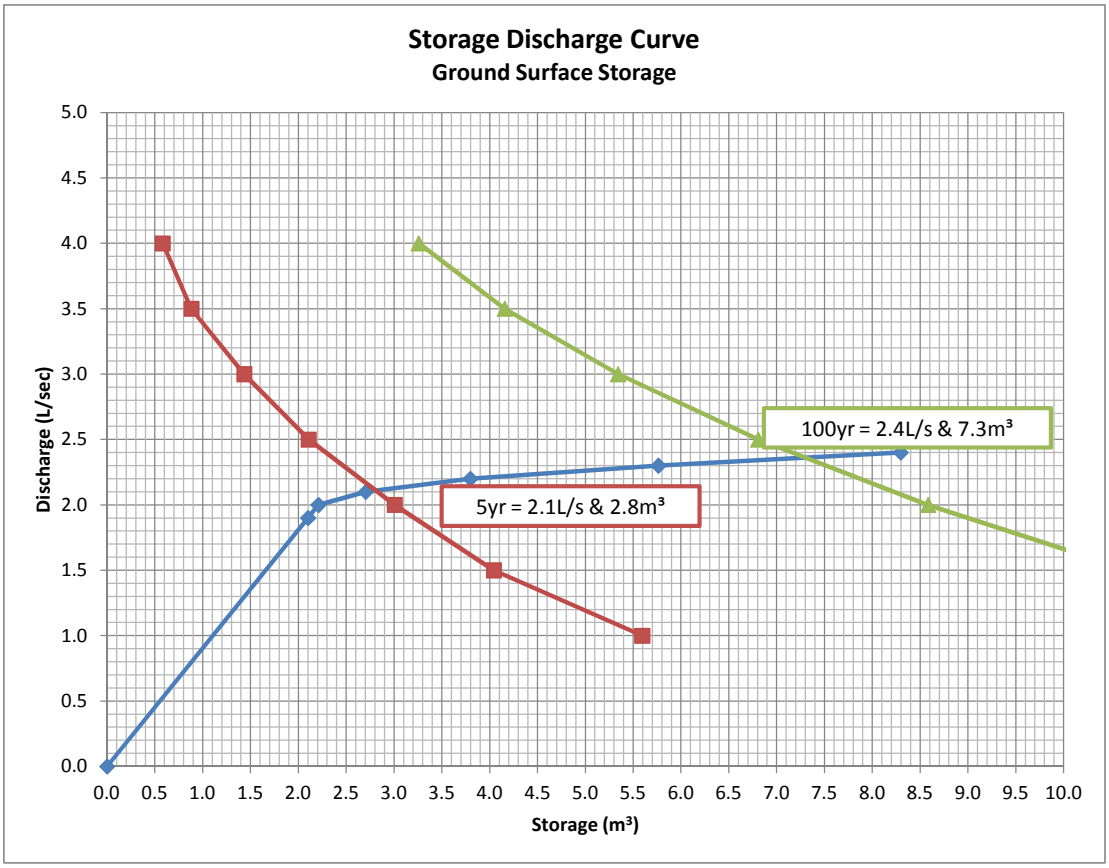
Storage Provided

Storage Elevation (m)	Total Storage Depth (m)	Comment	Incremental Volume (m3)	Cumulative Storage Volume (m3)	Hydrovex Release Rate (L/sec)	Overflow (L/sec)	Total Outflow (L/sec)
70.60	0.15	Surface Storage	2.53	8.30	2.40		2.4
70.57	0.12		1.97	5.76	2.30		2.3
70.54	0.09		1.09	3.80	2.20		2.2
70.51	0.06		0.49	2.70	2.10		2.1
70.48	0.03		0.11	2.21	2.00		2.0
70.45		Underground Storage	0.03	2.10	1.90		1.9
68.35			0.00	0.00	0.00		0.0

HYDROVEX SELECTION INFORMATION

Model No:	50-VHV-1
Oulet pipe Spec:	250 mm PVC SDR 35
Discharge	2.4L/s
Upstream Head:	2.2m
Manhole Diameter	1200 mm
Sump depth:	300 mm

Maximum Storage required for the 5 year Storm Event	3.8	(m^3)
Maximum Storage required for the 100 year Storm Event	7.3	(m^3)
Maximum Discharge for the 5 year Storm Event	2.1	L/s
Maximum Discharge for the 100 year Storm Event	2.4	L/s


Storage Discharge Curve
Ground Surface Storage
Discharge (L/sec)
Storage (m³)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0
100yr = 2.4L/s & 7.3m³
5yr = 2.1L/s & 2.8m³

Water Flow Analysis

Pressure Drop based on assumed minimum initial pressure of 275KPa

Pipe Sections Average Dailly Demand Start	Along	End	Grade Elevation Start m	 End m	Hydraulic Grade line Start m	 End m	 Ps kPa	 Pe kPa	 Q m^3/sec	 V m/sec	 D m	 A m^2
1495 Scott Street	Service	4 storey residential	67.74	81	109.20	109.14	406	276	0.000499	0.2541	0.05	0.001963

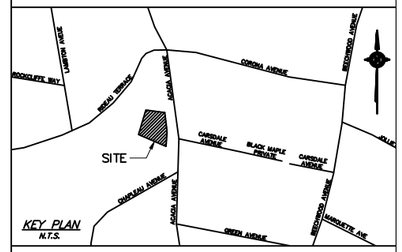
Kollaard Associates
Engineers

PRE-DEVELOPMENT CATCHMENT AREA PLAN

SCALE = 1:200

DRAWING NUMBER:
FIGURE No.

PRE-DEVELOPMENT CATCHMENT AREA PLAN



LEGEND (STORM WATER MANAGEMENT)

- CONTROLLED — CATCHMENT LABEL
- 0.39 / 0.34 — CATCHMENT AREA (HECTARES) / IMPERVIOUS RATIO
- CATCHMENT AREA BOUNDARY
- DIRECTION OF FLOW
- PROPERTY LINE
- TOP OF SLOPE
- CONTROLLED AREA
- UNCONTROLLED AREA
- PRE-DEVELOPMENT DRAINAGE PATTERN
- OVERLAND FLOW ROUTE

REV	BY	DATE	DESCRIPTION
0	XX	2017/MM/DD	DESCRIPTION

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KEMPTVILLE, ONTARIO
KOG 1J0 FAX (613) 258-0475
http://www.kollaard.ca
(613) 860-0923
info@kollaard.ca

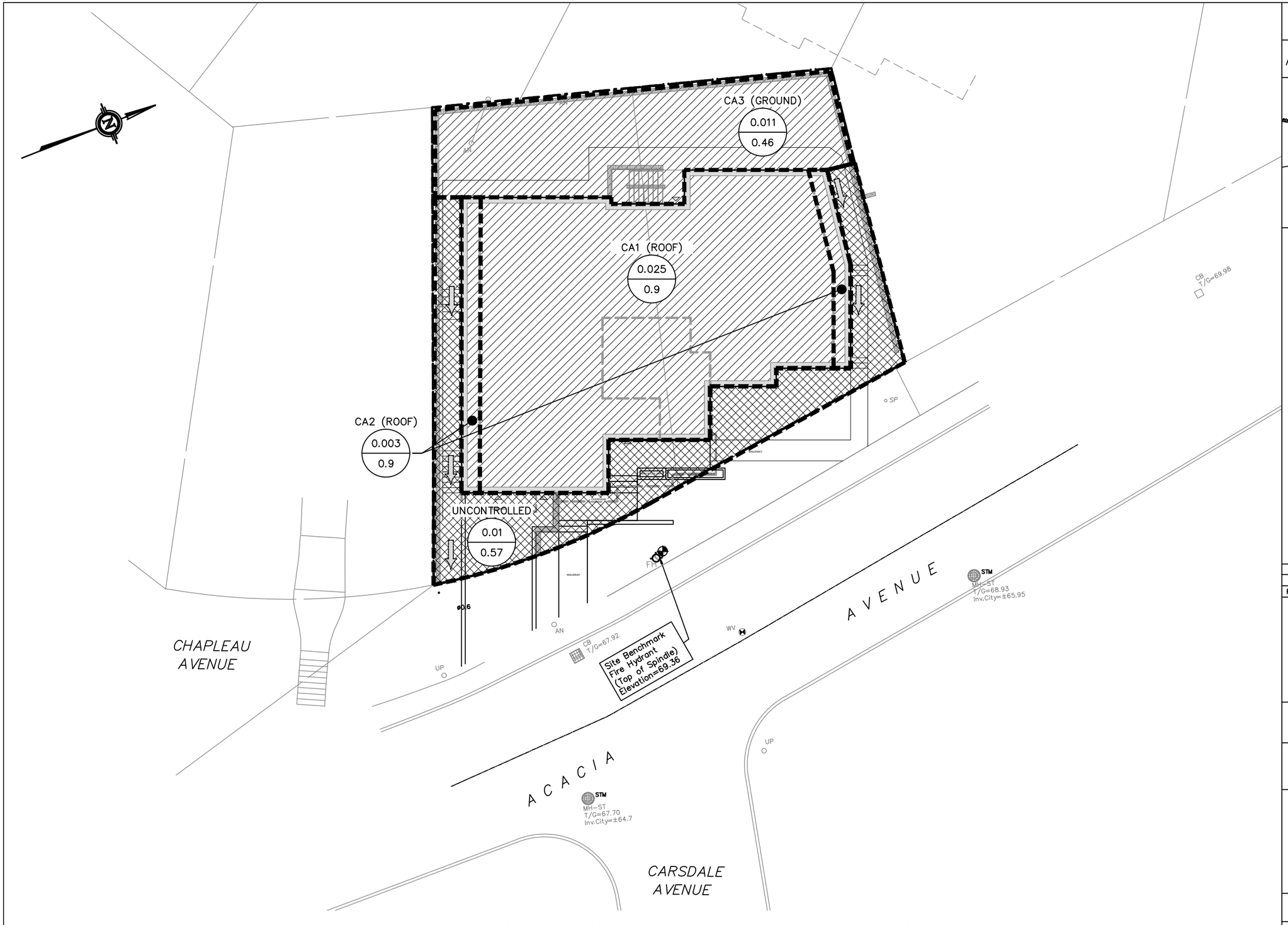
CLIENT:
SIMON SAAB
JEFFREY ABBOUD

PROJECT:
PROPOSED 4 STOREY
LOW RISE APPARTMENT DWELLING

LOCATION:
65 ACACIA AVENUE
OTTAWA, ONTARIO

DESIGNED BY:	DATE:
--	JAN 05, 2018
DRAWN BY:	SCALE:
AVB	1:200

KOLLAARD FILE NUMBER:
170710

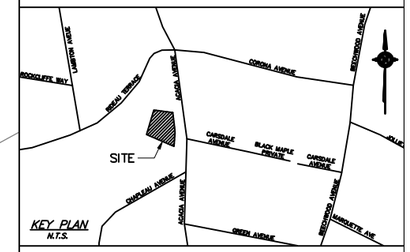


POST-DEVELOPMENT CATCHMENT AREA PLAN

SCALE = 1:200

DRAWING NUMBER:
170717 POST-CA

POST-DEVELOPMENT CATCHMENT AREA PLAN



LEGEND (STORM WATER MANAGEMENT)

CONTROLLED	CATCHMENT LABEL
0.39 / 0.34	CATCHMENT AREA (HECTARES) / IMPERVIOUS RATIO
	CATCHMENT AREA BOUNDARY
	DIRECTION OF FLOW
	PROPERTY LINE
	TOP OF SLOPE
	CONTROLLED AREA
	UNCONTROLLED AREA
	PRE-DEVELOPMENT DRAINAGE PATTERN
	OVERLAND FLOW ROUTE

REV	BY	DATE	DESCRIPTION
0	XX	2017/MM/DD	

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CLIENT:
SIMON SAAB
JEFFREY ABBOUD

PROJECT:
PROPOSED 4 STOREY
LOW RISE APPARTMENT DWELLING

LOCATION:
65 ACACIA AVENUE
OTTAWA, ONTARIO

DESIGNED BY:	DATE:
--	JAN 05, 2018
DRAWN BY:	SCALE:
AVB	1:200

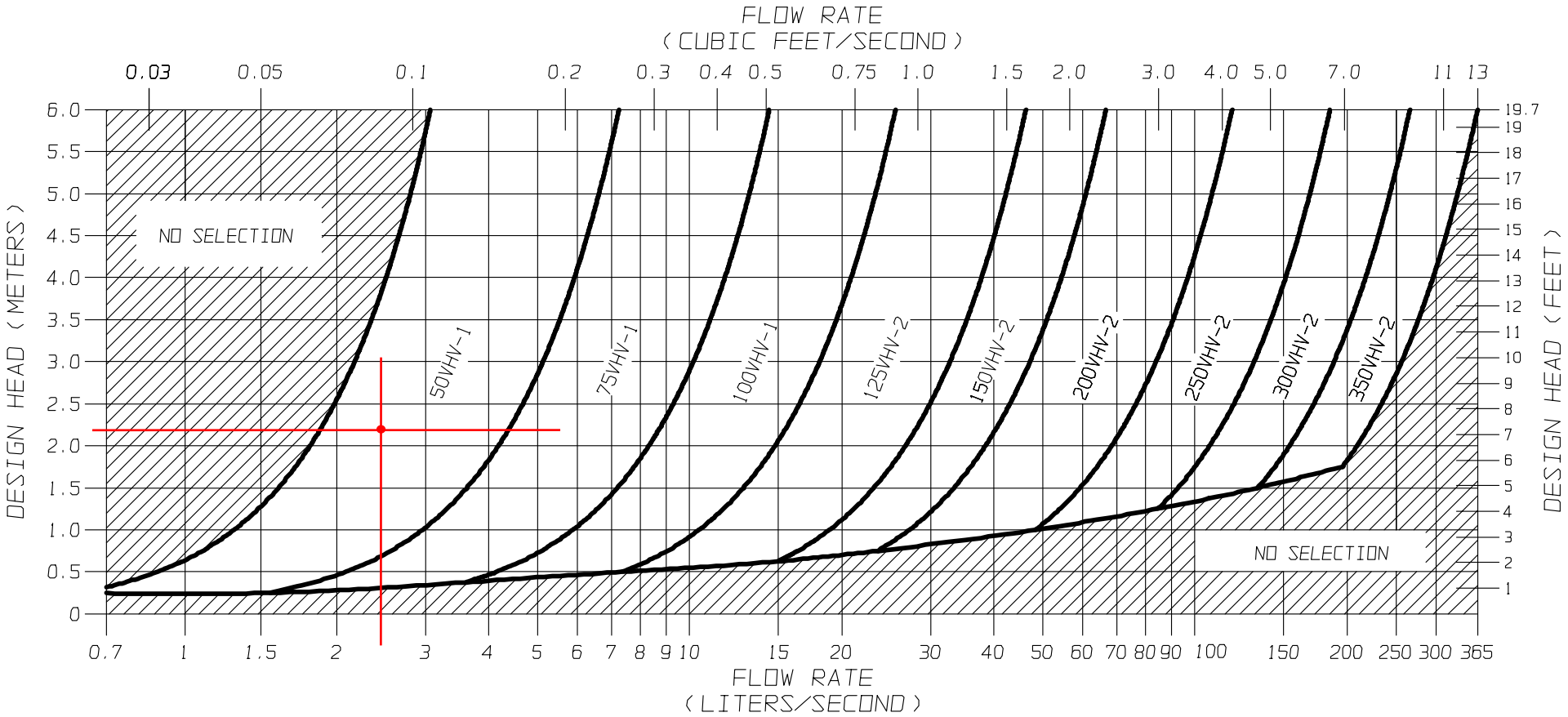
KOLLAARD FILE NUMBER:
170710

Appendix B: Product Information

Hydrovex Information Sheets
Accutrol Weirs Flow Control and Roof Drains Sheets

Hydrovex®

VHV Vertical Vortex Flow Regulator



Flow Rate = 2.4L/s
Design Head = 2.2m

FIGURE 2 - VHV

John Meunier

Accutrol Weirs

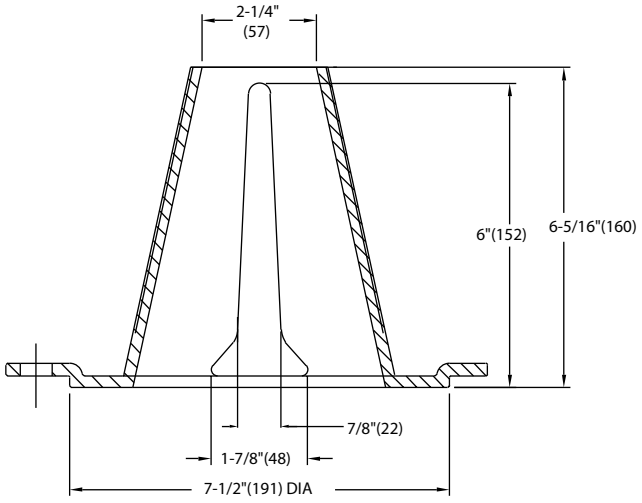
Tag: _____

Flow Control for Roof Drains

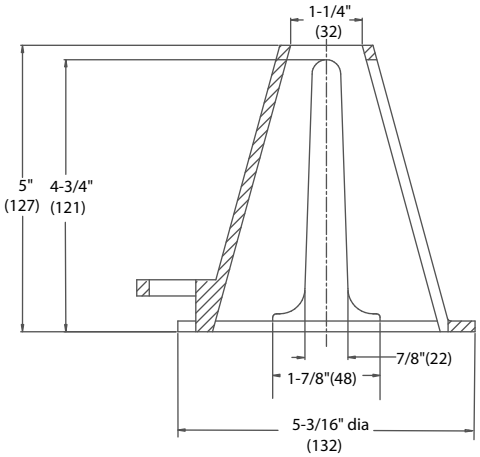
ACCUTROL WEIR FLOW CONTROL

SPECIFICATION: Watts Drainage Products epoxy coated cast iron Accutrol Weir is designed with parabolic openings which limit the flow of rain water off a roof. Each weir slot controls flow to 5 gpm per inch of head to a maximum of 30 gpm at 6" head(for large sump), 25 gpm at 5" head(for small sump) . The Accutrol Weir is secured to the flashing clamp of the roof drain. The Accutrol Weir is available with 1 to 4 slots for the large sump drain and up to 3 slots for the small sump drain.

For Large Sump Roof Drains Specify the "-A" option and number of slots required. (ie. "RD-100-A2" for two slot weir)
For Small Sump Roof Drains Specify the "-A" option and number of slots required. (ie. "RD-200-A1" for one slot weir)



LARGE SUMP ACCUTROL WEIR



SMALL SUMP ACCUTROL WEIR

Job Name _____ Contractor _____

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

Engineer _____ Representative _____

CANADA: 5435 North Service Road, Burlington, ON, L7L 5H7 TEL: 905-332-6718 TOLL-FREE: 1-888-208-8927 Website: www.wattsdrainage.ca

Appendix C: Fire Flow Calculations

Fire Water Storage and Supply Flow Rate Requirements
Boundary Conditions

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Kemptville, Ontario K0G 1J0

Civil • Geotechnical •
Structural • Environmental •
Hydrogeology

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FAX: (613) 258-0475

APPENDIX C: CALCULATION OF FIRE FLOW REQURIEMENTS - 65 Acacia Avenue

Calculation Based on Fire Underwriters Survey, 1999

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

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

where F = required fire flow in litres per minute

A = Fire-Resistive Buildings with 1hr fire rating. Consider only area of the largest floor plus 25 percent of each of the two immedately adjoining floors. Largest floors are floors 1 to 3.
Therefore consider 2nd floor area with 25% of 1st and 25% of 3rd floor areas.

C = coefficient related to the type of construction:

- 1.5 for wood construction (structure essentially combustible)
- 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior)
- 0.8 for noncombustible construction (unprotected metal structural components, masonary or metal walls)
- 0.6 for fire-resistive construction (fully protected frame, floors, roof)

Area of floors 1 - 3 = 276.96 m^2 25% of 1st and 3rd Floors = 138.5 m^2

A = 415.44 m^2 (Fire Resistive Construction)
C = 1.0
F = 4,484 L/min ----------> Rounded to nearest 1000 = **4,000**

2) The value obtained in 1. may be reduced by as much as 25% for occupancies having a low

Non-combustible =	-25%
Limited Combustible =	-15%
Combustible =	0%
Free Burning =	15%
Rapid Burning =	25%

Reduction due to low occupancy hazard = -25% x 4,000 = **= 3,000** L/min

3) The value above my be reduced by up to 50% for automatic sprinlker system

Reduction due to automatic sprinker system = 0% x 3,000 = **3,000**

4) The value obtained in 2. may be increased for structures exposed within 45 metres by the fire

Separation (metres)	Condtion	Charge
0m to 3.0m	1	25%
3.1m to 10.0m	2	20%
10.1m to 20.0m	3	15%
20.1m to 30.0m	4	10%
30.1m to 45.0m	5	5%
45.1m to	6	0%

Exposures	Distance(m)	Condtion		Charge
Side 1	1.5	1	-------->	25%
Side 2	1.3	1	-------->	25%
Front	10.0	2	-------->	20%
Back	4.8	2	-------->	20%
				75%

Increase due to separation = 75% x 3,000 = **2,250** L/min

The fire flow requirement is = **3,000**

Increase due to Separation = 2,250

The Total fire flow requirement is = 5,250

or **87.5** **L/sec**

Subject: Re: FW: Re: 65 Acacia Ave "Service Study Guidelines"
From: Amanda VanBruggen <amanda@kollaard.ca>
Date: 25/10/2017 8:54 AM
To: "Buchanan, Richard" <Richard.Buchanan@ottawa.ca>
CC: Malou Leblanc <malou@kollaard.ca>

Thank you Richard.

Kind Regards,

Amanda Van Bruggen

Kollaard Associates
Engineers

210 Prescott Street, Unit 1
P.O. Box 189
Kemptville, Ontario
K0G 1J0 CANADA
t: 613.860.0923
www.kollaard.ca

On 25/10/2017 8:20 AM, Buchanan, Richard wrote:

> Hi Amanda
>
> The following are boundary conditions, HGL, for hydraulic analysis at 65 Acacia (zone 1E) assumed to be connected to the 305 mm on Acacia Ave (see attached PDF for location).
>
> Minimum HGL = 109.2 m
>
> Maximum HGL = 118.2 m
>
> Max Day + Fire Flow = 112.0 m
>
> These are for current conditions and are based on computer model simulation.
>
> *Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.*
>
> **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:** Amanda VanBruggen [mailto:amanda@kollaard.ca]
> **Sent:** Thursday, October 19, 2017 11:07 AM
> **To:** Buchanan, Richard <Richard.Buchanan@ottawa.ca>
> **Cc:** Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>; Malou Leblanc <malou@kollaard.ca>
> **Subject:** Fwd: Re: 65 Acacia Ave "Service Study Guidelines"

Appendix D: Servicing Guidelines Checklist

4.1 General Content

☒ Executive Summary (for larger reports only).

Comments: *N/A*

☒ Date and revision number of the report.

Comments: *Refer to front page of the report*

☒ Location map and plan showing municipal address, boundary, and layout of proposed development.

Comments: *Refer to drawings170717-SER and 170717-GRD*

☒ Plan showing the site and location of all existing services.

Comments: *Refer to drawing 170717-SER*

☒ 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.

Comments: *Refer to architectural site plan.*

☒ Summary of Pre-consultation Meetings with City and other approval agencies.

Comments: *Yes*

☒ 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.

Comments: *N/A*

☒ Statement of objectives and servicing criteria.

Comments: *Refer to section 1.0 - Introduction*

☒ Identification of existing and proposed infrastructure available in the immediate area.

Comments: *Refer to drawing 170717-SER for location, size and depth.*

☒ 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).

Comments: *N/A*

☒ 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.

Comments: *Refer to grading plan170717-GRD*

☒ 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.

Comments: *N/A*

☒ Proposed phasing of the development, if applicable.

Comments: *N/A*

☒ Reference to geotechnical studies and recommendations concerning servicing.

Comments: *Refer to Geotechnical Report submitted with the site plan Application*

☒ All preliminary and formal site plan submissions should have the following information:

- ☒ Metric scale
- ☒ North arrow (including construction North)
- ☒ Key plan
- ☒ Name and contact information of applicant and property owner
- ☒ Property limits including bearings and dimensions
- ☒ Existing and proposed structures and parking areas
- ☒ Easements, road widening and rights-of-way
- ☒ Adjacent street names

Comments: *Refer to drawing 170717-SER*

4.2 Development Servicing Report: Water

☒ Confirm consistency with Master Servicing Study, if available

Comments: *N/A*

☒ Availability of public infrastructure to service proposed development

Comments: *Refer to Sections 2.4 and Section 3.0 of the servicing and stormwater report.*

☒ Identification of system constraints

Comments: *N/A*

☒ Identify boundary conditions

Comments: *Refer to Appendix C*

☒ Confirmation of adequate domestic supply and pressure

Comments: *Refer to Section 3.0 - Watermain Design.*

☒ 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.

Comments: *Refer to 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.

Comments: *Refer to Appendix A*

☒ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design

Comments: *N/A*

☒ Address reliability requirements such as appropriate location of shut-off valves

Comments: *N/A*

☒ Check on the necessity of a pressure zone boundary modification.

Comments: *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

Comments: *Refer to Section 3.0 - Watermain Design.*

☒ 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.

Comments: *4 storey residential building serviced by 50mm watermain, refer to Drawing 170717-SER.*

☒ 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.

Comments: *N/A*

☒ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.

Comments: *Refer to Section 3.0 - Watermain Design.*

☒ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

Comments: *N/A*

4.3 Development Servicing Report: Wastewater

☒ 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).

Comments: *Refer to Section 2.5 of the servicing and swm report.*

☒ Confirm consistency with Master Servicing Study and/or justifications for deviations.

Comments: *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.

Comments: *Refer to Section 2.5 of the servicing and swm report.*

☒ Description of existing sanitary sewer available for discharge of wastewater from proposed development.

Comments: *Refer to Section 2.5 of the servicing and swm report and drawing 170717-SER.*

☒ 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)

Comments: *Refer to Section 2.5 of the servicing and swm report*

☒ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.

Comments: *N/A*

☒ Special considerations such as contamination, corrosive environment etc.

Comments: *N/A*

4.4 Development Servicing Report: Stormwater

☒ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)

Comments: *Refer to Section 2.0 of the servicing and swm report.*

☒ Analysis of available capacity in existing public infrastructure.

Comments: *Refer to Section 2.2 of the servicing and swm report.*

☒ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.

Comments: *Refer to drawings 170717-PRE-CA, 170717POST-CA and170717-GRD.*

☒ 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.

Comments: *Refer to Section 2.2 of the servicing and swm report.*

☒ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.

Comments: *N/A*

☒ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.

Comments: *Refer to Section 2.2 of the servicing and swm report.*

☒ Set-back from private sewage disposal systems.

Comments: *N/A*

☒ Watercourse and hazard lands setbacks.

Comments: *N/A*

☒ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.

Comments: *RVCA has been notified and will provide feedback.*

☒ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.

Comments: *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).

Comments: *N/A*

☒ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.

Comments: *N/A*

☒ 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.

Comments: *Refer to attached site servicing and swm report.*

☒ Any proposed diversion of drainage catchment areas from one outlet to another.

Comments: *No*

☒ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.

Comments: *Refer to attached site servicing and swm report.*

☒ 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.

Comments: *Quantity control is provided. Refer to attached servicing and swm report report.*

☒ Identification of potential impacts to receiving watercourses

Comments: *None*

☒ Identification of municipal drains and related approval requirements.

Comments: *N/A*

☒ Descriptions of how the conveyance and storage capacity will be achieved for the development.

Comments: *Refer to attached site servicing and swm report.*

☒ 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.

Comments: *N/A*

☒ Inclusion of hydraulic analysis including hydraulic grade line elevations.

Comments: *N/A*

☒ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.

Comments: *Refer to Section 4.0 of the servicing and swm report.*

☒ 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.

Comments: *N/A*

☒ Identification of fill constraints related to floodplain and geotechnical investigation.

Comments: *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:

☒ 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.

Comments: *Not Required.*

☒ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.

Comments: *Not Required.*

☒ Changes to Municipal Drains.

Comments: *N/A*

☒ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

Comments: *N/A*

4.6 Conclusion Checklist

☒ Clearly stated conclusions and recommendations

Comments: *Refer to Section 5.0 of the servicing and swm report.*

☒ 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.

Comments: -

☒ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario

Comments: *Signed and Stamped.*