MMM Group Limited

Site Servicing and Stormwater Management Report – 339 Cumberland Street, Ottawa, ON

Prepared For: EcoCorner Inc.

COMMUNITIES

TRANSPORTATION

BUILDINGS

INFRASTRUCTURE

February 2015 | 1014064

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STANDARD LIMITATIONS

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1.0 INTRODUCTION

MMM Group Ltd. has been retained by EcoCorner Inc. to prepare a site servicing and stormwater management design in support of a zoning by-law amendment for the mixed use development located at 339 Cumberland Street, in the City of Ottawa. The subject site is bounded by York Street to the south, Cumberland Street to the west, and existing buildings to the north and east.

It is understood that the zoning amendment will include provision for additional density by increasing the height restriction to 9-storeys in lieu of the 6-storey limit that is currently in place. This report will provide sufficient detail to demonstrate that the proposed land usage can be supported by the existing municipal water, sanitary and storm services, and that the servicing design conforms to the applicable standards and guidelines.

2.0 SITE DESCRIPTION

The subject site is approximately 0.03 ha in size and is located at the northeast corner of the intersection of Cumberland Street and York Street. Currently, the site is made up of paved parking areas.

Based on the topographic survey plan, the overall topography of the site is relatively flat with parking areas and buildings sloping towards Cumberland Street.

The following municipal services are available within the municipal right of ways of the adjacent streets:

Cumberland Street

- 200 mm watermain, 600 mm storm sewer and 450 mm sanitary sewer.

York Street

- 200 mm watermain, 1200 mm and 1950 x 1300 mm combined sewers, 600 mm sanitary sewer.

The proposed rezoning includes provision for a future 9-storey high mixed-use building with commercial space on the ground floor and residential space above the ground floor. This future building will have a flat roof. The property will propose to have continued pedestrian access from Cumberland Street and York Street.

3.0 WATER DISTRIBUTION AND FIRE FLOW PROTECTION

The subject property lies within the City of Ottawa's 1W pressure zone. The future development will be serviced by a 150 mm diameter service lateral off the existing 200 mm diameter municipal main located on Cumberland Street. The future building will contain a sprinkler system. A new hydrant will not be required

since an existing fire hydrant is located on York Street approximately 40 meters away from the future building main entrance.

Domestic water demands from the development have been determined in accordance with Section 4.28 of the City of Ottawa Water Distribution Guidelines and are summarized below. Detailed calculations of the following are shown in Appendix A:

- Average Day Demand – 0.36 L/s
- Maximum Daily Demand – 1.78 L/s
- Peak Hour Demand - 2.70 L/s

The fire flow demands have been estimated to be 100 L/s based on the Fire Underwriter's Survey. Detailed calculations are shown in Appendix A.

The site has been analyzed as summarized below to ensure all the City of Ottawa minimum criteria for water pressures are met for the two conditions: maximum day with fire flow and peak hour. The analysis was carried out using EPANET based on the boundary conditions provided by the City of Ottawa. The detailed output results are included in the figures found in Appendix A.

The following table summarizes the results of the water model:

3.1.1 SUMMARY OF ALLOWABLE AND RESULTING WATER PRESSURES

Condition	Allowable per City guidelines	EPANET model results
Maximum Day + Fire Flow	140 to 552 kPa	497 to 520.5 kPa
Peak hour	276 to 552 kPa	477.7 kPa

Therefore, in view of the above, the water services designed should be adequate enough to meet both the domestic and firefighting demands of the future development for the two above-mentioned conditions.

Refer to Appendix A for details on the water servicing of the future development.

4.0 SANITARY SERVICING

It is proposed to service the future building by providing a new 150 mm sanitary sewer off the existing 450 mm diameter sanitary sewer on Cumberland Street.

The projected sanitary flows have been estimated according to the City of Ottawa Sewer Design Guidelines – 2012 (see appendix B). The future development will produce a total peak sanitary flow of

1.43 L/s. The estimated flows can be conveyed by the proposed 150 mm service connection. The hydraulic analysis of the pipe demonstrated that the capacity of the 150 mm pipe at 1%, while not under pressure, is 15.2 L/s.

The existing sewer on Cumberland Street is a 450 mm diameter at a slope of 0.488% with a capacity of 199.2 l/s. The future development peak flow will contribute to less than a percent of flow increase with respect to the existing sewer capacity. Correspondence with the City of Ottawa staff did not identify any capacity issues with existing municipal sewers both on Cumberland Street and York Street. Although, the sanitary sewer discharge from the future development on Cumberland Street is greater than the current usage, since the land is vacant, the slight increase in flow is considered negligible. The additional flow, therefore, should not impact the capacity of existing municipal sanitary sewers.

Refer to Appendix B for details on the determination of sanitary flow expected to be generated by the future development.

5.0 STORMWATER CRITERIA

The 100-year post-development flows from the proposed site will be controlled to the 5-year pre-development release rate using a C value of 0.5 and 20 minute time of concentration. This will be achieved using rooftop storage or underground. The rooftop storage system can be designed to accommodate on-site detention with sufficient capacity to attenuate the 100-year design storm using a maximum ponding depth of 150mm.

5.1 Pre-Development Flows

The uncontrolled pre-development flows from the site were determined for the 5-year and 100-year storms (Ottawa Airport) based on the IDF curve equations from the City of Ottawa Sewer Design Guidelines, a pre-development runoff coefficient of 0.50 (C-value) and a Time of Concentration (Tc) of 20 minutes. Using the Rational Method, the pre-development flow from the site was determined to be 3.2 L/s for the 5-year event (refer to Appendix C). The allowable release rate during a 100 year storm event will be limited to 3.2 L/s based on the pre-development flow. The C-value based on the existing conditions of the paved site and was found to be higher; however, a lower C value of 0.5 was used as per correspondence with City staff.

5.2 Post-Development Flows

Post development flows have been calculated using the Rational Method and are based on a Tc equal to 10 minutes. Runoff coefficients for the 100-year storm were increased by 25% to a maximum of 1.0 as per City of Ottawa Guidelines. For 5-year event, runoff coefficient for roof area was taken as 0.90.

The storm drainage areas include the building rooftop and a small area of hard surface outside the

building. Runoff from the roof can either drain to an underground storage tank with controlled discharge or be controlled via roof drain inlet control devices prior to discharging into the existing storm sewer on Cumberland Street. Runoff from areas that are not part of the roof will sheet drain uncontrolled onto Cumberland and York Street.

5.2.1 SUMMARY OF POST DEVELOPMENT FLOWS:

Area No	Area (ha)	C_{5yr}	[1]5-yr Runoff L/sec	C_{100yr}	[1]100-yr Runoff L/sec
ROOF	.0289	0.90	7.5 **(1.3)**	1.00	14.3 **(1.3)**
ASPHALT	.0038	0.90	1.0 **(1.0)**	1.00	1.9 **(1.9)**
Totals	0.0327		8.5 **(2.3)**		16.2 **(3.2)**

[1]**(#.#)** Denotes controlled flow

In summary, the total 5-year and 100-year post-development flows are 8.5 L/sec and 16.2 L/s, respectively. These flows, however, will be restricted to a total of 3.2 L/s for 100-year using either roof drain restriction or underground storage tank with controlled discharge. Since a portion of the site is uncontrolled, the allowable release rate from the storm sewer system (i.e. controlled areas) equals the allowable release rate for the site minus the release rate from the 100-year uncontrolled portion of the site. The total uncontrolled release rate from non-roof area for 100-year storm is 1.9 L/s. Therefore, the allowable release rate from the controlled area for a 100-year storm is 3.2 L/s minus 1.9 L/s. This results in 1.3 L/s from the roof drain(s) or storage tank during a 100-year storm.

Runoff from uncontrolled area(s) will be directed to Cumberland Street, as per pre-development conditions.

5.3 Storage Requirement

The total storage volume required to restrict 100-year post-development flows to allowable 100-year release rate of 3.2 L/s is 11.5 m3. The total storage available based on 150 mm of roof ponding is 14.5 m3, which is more than the required storage. Runoff from the building roof can be restricted via inlet restrictor(s) placed in the rooftop drain(s) or underground storage tank with pump discharge equal to allowable release rate. Although unknown at the time of the rezoning, the details of the chosen option shall be determined by a mechanical Engineer prior to the issuance of a building permit.

5.4 Storm Sewer Design

The storm sewer was designed to be in general conformance with the City of Ottawa Sewer Design Guidelines. Specifically, the storm sewer was sized using Manning's Equation, assuming a roughness

The storm sewer will discharge to the existing storm sewer on Cumberland Street. The post-development release rate will be less than the allowable release rate since the roof will utilize an inlet restrictor or underground storage will be provided. Therefore, the future development under proposed zoning can be accommodated by the existing municipal storm sewer network.

6.0 CONCLUSIONS

The current analysis concludes that the existing municipal infrastructures have sufficient capacity to support the proposed rezoning for a 9-storey future mixed-use development.

7.0 CORPORATE AUTHORIZATION

This document entitled "Site Servicing and Stormwater Report – 339 Cumberland Street, Ottawa, ON" was prepared by MMM Group Limited (MMM) for the account of EcoCorner Inc. The material in it reflects MMM's best judgment in light of the information available to them at the time of preparation. Any use a third party makes of this report, or reliance on or decisions made based on it, are the responsibilities of such third parties. MMM accepts no responsibilities for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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Reviewed by:

Ishaque Jafferjee, P.Eng.

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APPENDIX A – WATERMAIN

WATER DISTRIBUTION - PROPOSED DOMESTIC DEMANDS

Demand Type			
Average Day Demand			
[RES] Residential	=	350	L/c/d
[LIN] Light Industrial	=	35,000	L/gross ha/d
[HIN] Heavy Industrial	=	55,000	L/gross ha/d
[SH]Shopping Centres	=	2,500	
[HOS]Hospitals	=	900	
[SCH]Schools	=	70	
[TN]Trailer Parks no Hook	=	340	
[T]Trailer Parks with Hook	=	800	
[C]Campgrounds	=	225	
[MOB]Mobile Home Parks	=	1000	
[MOT]Motels	=	150	
[HOT]Hotels	=	225	
[TOU]Tourist Commercial	=	28000	
[O]Other Commercial	=	28000	

Maximum Daily Demand:					
[RES] Residential	=	2.5	x	average day	L/c/d
[IND] Industrial	=	1.5	x	average day	L/gross ha/d
[COM] Commercial	=	1.5	x	average day	L/gross ha/d
[INS] Institutional	=	1.5	x	average day	L/gross ha/d

Maximum Hour Demand:					
[RES] Residential	=	2.2	x	maximum day	L/c/d
[IND] Industrial	=	1.8	x	maximum day	L/gross ha/d
[COM] Commercial	=	1.8	x	maximum day	L/gross ha/d
[INS] Institutional	=	1.8	x	maximum day	L/gross ha/d

Future Building							
Demand Type	=	RES			COM		
Average Day Demand	=	350		L/gross ha/day	28,000		L/gross ha/day
Population or Area	**=**	**86.40**		**pers**	**0.02**		**ha**
Average Daily Flow	=	350	x	86.4	28,000	x	0.02
	=	30,240		L/day	560		L/day
	=	**0.35**		**L/s**	**0.01**		**L/s**
Daily Demand Type	=	RES			COM		
Max. Daily Factor	=	5.064			1.5		
Maximum Daily Demand	=	5.064	x	average day	1.5	x	average day
	=	5.064	x	30,240	1.5	x	560
	=	153,135		L/day	840		L/day
	=	**1.77**		**L/s**	**0.01**		**L/s**
Hour Demand Type	=	RES			COM		
Max. Hour Factor	=	7.676		from MOE Guidelines	1.8		
Maximum Hour Demand	=	7.676	x	average day	1.8	x	maximum day
	=	7.676	x	30,240	1.8	x	840
	=	232,122		L/day	1,512		L/day
	=	**2.69**		**L/s**	**0.02**		**L/s**
Total							
Average Daily Flow		0.35		+	0.01	=	**0.36**
Maximum Daily Demand		1.77		+	0.01	=	**1.78**
Maximum Hour Demand		2.69		+	0.02	=	**2.70**

WATER DISTRIBUTION - PROPOSED FIRE FLOW DEMANDS

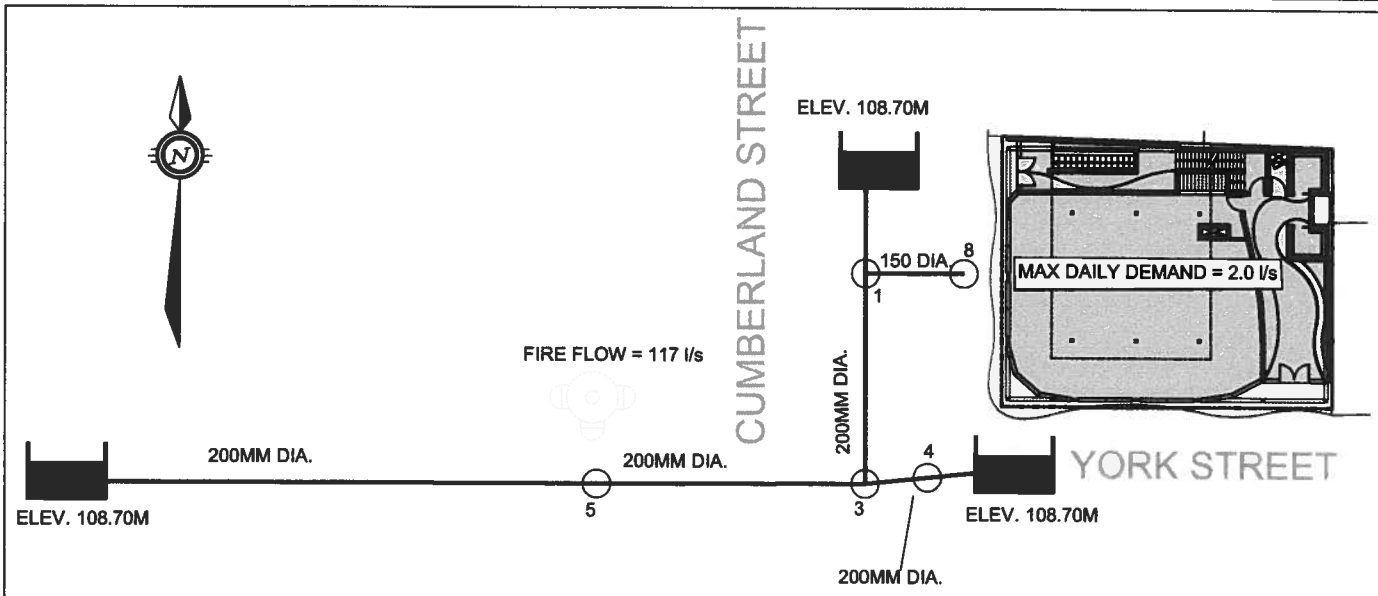
$$F = 220\ C \sqrt{A}$$

Type of Construction Coefficient:		
1.5	=	[W] Wood Frame (all structurally combustible)
1.0	=	[O] Ordinary (brick, masonry wall, combustible floor and interior)
0.8	=	[N] Non-Combustible (unprotected metal structural component, masonry or metal walls)
0.6	=	[F] Fire Resistive (fully protected frame, floors and roof)

Sprinkler Protection:		
-50% (max.)	=	[S] Complete Sprinkler System
-30% (max.)	=	[N] NFPA 13 Conformed
-10% additional (max.)	=	[WSS] If Water Supply Standard for Both System and Fire Lines
-10% additional (max.)	=	[FSS] Fully Supervised System
-20% additional (max.)	=	[WFSS] Combined additional credits

Combustibility:		
-25%	=	[NC] Non-Combustible
-15%	=	[LC] Limited Combustible
0%	=	[C] Combustible
+15%	=	[FB] Free Burning
+25%	=	[RB] Rapid Burning

Future Building			
Type of Constr. Coeff. (C)	=	N	
	=	0.8	
No. of Storeys	=	9	
Avg. Building Floor Area (m^2)	=	200	
Gross Floor Area (m^2)	=	1,800	
**Fire Flow, F (L/min)	=	7,467	
	~	7,000	
Combustibility	=	NC	
	=	-25%	
F	=	5,250	
Sprinkler Protection	=	N	
	=	-30%	
Additional Credit	=	n/a	
	=	0%	
F	=	3,675	
Exposure Distances	:		
North	=	0 m	25%
South	=	38 m	5%
East	=	0 m	25%
West	=	17 m	15%
		Total % =	**70%**
FF Adjustment Factor	=	1.70	
Total Required FF, F	=	3,675 x 1.70	
F	=	6,248 L/min	
	~	6,000	
F	**=**	**100 L/s**	



HYDRAULIC MODEL RESULTS

	ELEV. (M)	DEMAND (L/S)	PRESSURE (KPA)
JUNC. 1	55.6	0	520.5
3	55.8	0	517.7
4	55.6	0	520.1
5	55.6	117	513.8
8	58	2.0	497.0
BOUNDARY	108.7		

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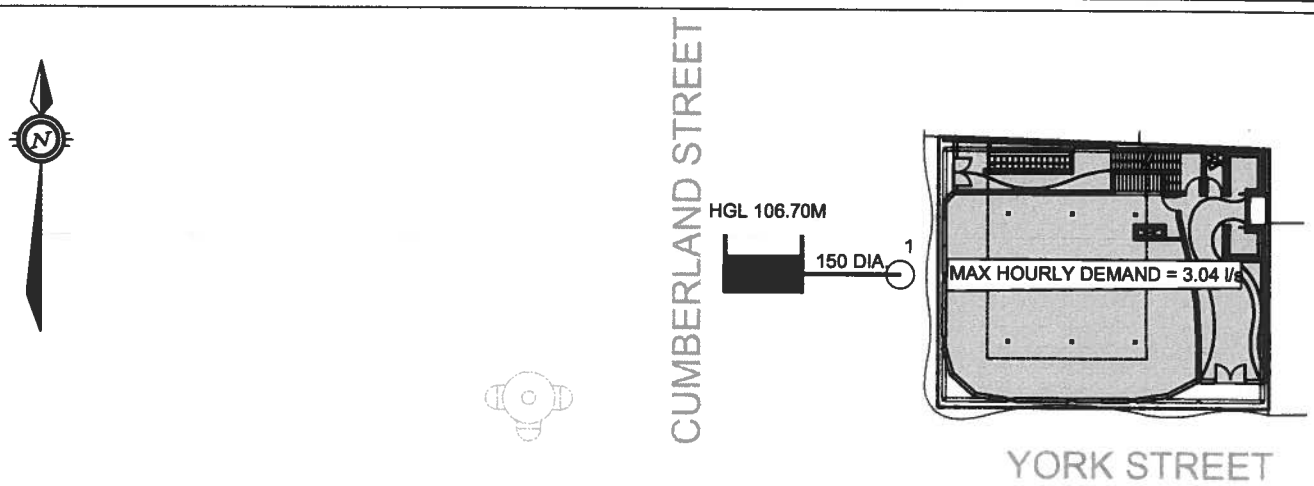
SCALE N.T.S.	CLIENT: ECOCORNER INC.	PROJECT NO. 10-14064-000
DATE 21/10/14	TITLE: 339 CUMBERLAND MAX DAY + FIRE FLOW	FIG 1
DRAWN BY S.BHATIA		



HYDRAULIC MODEL RESULTS

	ELEV. (M)	DEMAND (L/S)	PRESSURE (KPA)
JUNC. 1	58	3.04	477.7
BOUNDARY	106.7		

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SCALE N.T.S.	CLIENT: ECOCORNER INC.	PROJECT NO. 10-14064-000
DATE 21/10/14	TITLE: 339 CUMBERLAND MAX HOURLY	FIG 2
DRAWN BY S.BHATIA		

From: Wu, John <John.Wu@ottawa.ca>
Sent: October-15-14 9:16 AM
To: Shawn Bhatia
Subject: RE: 339 Cumberland St
Attachments: 339 Cumberland Oct 2014.pdf

Here is the result:

The following are boundary conditions, HGL, for hydraulic analysis at 339 Cumberland (zone 1W) assumed to be connected to the 203mm on Cumberland (see attached PDF for location).

Minimum HGL = 106.7m

Maximum HGL = 114.9m

MaxDay (1.94 L/s) + FireFlow (95 L/s) = 108.7m

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.

Thanks.

John

From: Shawn Bhatia [mailto:BhatiaS@mmm.ca]
Sent: Thursday, October 09, 2014 6:10 PM
To: Wu, John
Subject: RE: 339 Cumberland St

Normal day: 0.40 l/s
Max day: 1.94 l/s
Max hour: 2.93 l/s
Fire flow: 95 l/s

Can I get the boundary conditions?

Thanks.

Shawn

From: Wu, John [mailto:John.Wu@ottawa.ca]
Sent: October-02-14 11:01 AM
To: Shawn Bhatia
Subject: RE: 339 Cumberland St

Hi, Shawn:
We need normal day demand, max day demand and max hour demand separated.
And we need fire flow requesting, then, I will send to IMD group to get the boundary condition.
Storm water management , We need restrict post development up to 100 year's storm on site to a C0.5 (20 minutes concentration time) at 5 year's storm.
Sanitary sewer rate, and the capacity on the street will be shown on the servicing report.

John

From: Shawn Bhatia [mailto:BhatiaS@mmm.ca]
Sent: Tuesday, September 30, 2014 4:07 PM
To: Wu, John
Subject: 339 Cumberland St

John,

I am preparing a servicing brief in support of a zoning application for the above-noted site on Cumberland and York. To do this, I need a few answers:

1. Watermain boundary conditions. We have calculated:
    a. Max daily plus fire flow = 100 l/s
    b. Max hourly demand=3 l/s
2. Stormwater release rate and storage. Currently the site is vacant and paved.
    a. 5 year pre-development release rate?
    b. Onsite storage of flow up to 100 year post-development flow?
3. Any other relevant information for the servicing brief

Regards,

Shawn

APPENDIX B – SANITARY

SANITARY SEWAGE - PROPOSED SANITARY FLOWS

Average Wastewater Flows:			
[RES] Residential	=	350	L/c/d
[COM] Commercial	=	50,000	L/gross ha/d
[INS] Institutional	=	50,000	L/gross ha/d
[LIN] Light Industrial	=	35,000	L/gross ha/d
[HIN] Heavy Industrial	=	55,000	L/gross ha/d

Peaking Factors:

[RES] Residential = Harmon Equation

$$P.F. = 1 + \left(\frac{14}{4 + \left(\frac{P}{1000}^{\frac{1}{2}}\right)}\right) * \mathrm{K}$$

where P = population

K = correction factor = 1

[COM] Commercial	=	1.5
[INS] Institutional	=	1.5
[IND] Industrial	=	Per figure in Appendix 4-B

Peak Extraneous Flows:			
Infiltration Allowance	=	0.28	L/s/effective gross ha (for all areas)
Less than 10 ha:			
Foundation Drain Allowance	=	5.0	L/s/gross ha (if necessary for ex. partially separated and combined areas only)
10 ha - 100 ha:			
Foundation Drain Allowance	=	3.0	L/s/gross ha (if necessary for ex. partially separated and combined areas only)
Greater than 100 ha:			
Foundation Drain Allowance	=	2.0	L/s/gross ha (if nec L/gross ha/d

Future Building							
Demand Type	=	RES			COM		
Average Day Demand	=	350		L/gross ha/day	50,000		L/gross ha/day
Population or Area	=	86.4		**pers**	0.02		**ha**
Average Daily Flow	=	350	x	86.4	50,000	x	0.02
	=	30,240		L/day	1,000		L/day
	=	**0.350**		**L/s**	**0.012**		**L/s**
Peaking Factor Type	=	RES			COM		
Peaking Factor	=	4			1.50		
Population	=	86.4					
Peak Daily Flow	=	4	x	average day		x	average day
	=	4	x	30,240		x	1,000
	=	120,960		L/day	1,500		L/day
	=	**1.400**		**L/s**	**0.017**		**L/s**
Infiltration Allowance	=	0.28					
Peak Extraneous Flow	=	0.28	x	lot area			
*	=	0.28	x	0.037			
	=	**0.010**		**L/s**			
Total Peak Design Flow	=	peak daily flows	+	extraneous flow			
	=	1.417	+	0.010			
	=	**1.428**		**L/s**			

APPENDIX C – STORMWATER MANAGEMENT

MMM Group
Storm Water Management Design Sheet

TABLE 1 - PRE DEVELOPMENT AVERAGE RUNOFF COEFFICIENT

Surface Type	Area (ha)	Percent of total Area	C	A X C (ha)
TOTAL	**0.0327**		0.50	0.016
Weighted C =				**0.50**

TABLE 2 - ALLOWABLE RUNOFF

Area Description	Area (ha)	Time of Conc, Tc (min)	Storm = 5 yr			Storm = 100 yr		
			I_5 (mm/hr)	Cavg	Q_5 (L/sec)	I_{100} (mm/hr)	Cavg	Q_{100}(L/sec)
Existing site	0.0327	20	70.25	0.5	**3.2**	119.95	0.5	5.5
Allowable Capture Rate is based on 5-year storm at Tc=20 mins and a C of 0.5								
Q_5 (L/sec) = 2.78 C I A								

5-year Storm $C_{ASPH/ROOF/CONC}$ = 0.90 C_{GRASS} = 0.20 C_{GRAVEL} = 0.70
100-year Storm $C_{ASPH/ROOF/CONC}$ = 1.00 C_{GRASS} = 0.25 C_{GRAVEL} = 0.88
$C_{(100\text{-}yr)}$ for post development flows is increased by 25% to a maximum of 1.00

TABLE 3- POST DEVELOPMENT AVERAGE RUNOFF COEFFICIENTS

Area No.	Asphalt/Roof /Conc Areas (ha)	A * C_{ASPH}	Grassed Areas (ha)	A * C_{GRASS}	Gravel Areas (ha)	A * C_{GRAVEL}	Sum AC	Total Area (ha)	$C_{5\text{-}yr}$	$C_{100\text{-}yr}$
ROOF	0.0289	0.0260	0.0000	0.0000	0	0	0.0260	0.0289	0.90	1.00
ASPH	0.0038	0.0034	0.0000	0.0000	0	0	0.0034	0.0038	0.90	1.00
Total	0.0327		0.0000				0.0294	0.0327		

TABLE 4- POST DEVELOPMENT RUNOFF

Area No	Area (ha)	Storm = 5 yr				Storm = 100 yr			
		I_5 (mm/hr)	C_{AVG}	Q_{UNCONT} (l/s)	Q_{CONT} (l/s)	I_{100} (mm/hr)	C_{AVG}	Q_{UNCONT} (l/s)	Q_{CONT} (l/s)
ROOF	0.0289	104.19	0.90	0.0	7.5	178.56	1.00	**0.0**	**14.3**
ASPH	0.0038	104.19	0.90	1.0	0.0	178.56	1.00	**1.9**	**0.0**
Totals	0.0327			1.0	7.5			**1.9**	**14.3**

Q_{CONT} (l/s) = Q_5 - Sum of $Q_{100\text{-}yr}$ uncontrolled
$I_5 = 998.071 / (Tc + 6.053)^{0.814}$
$I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$
Time of Concentration (min), Tc = 10 mins

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Storm Water Management Design Sheet

TABLE 5 - STORAGE VOLUME REQUIRED (5-YEAR and 100-YEAR STORMS)

ROOF

C_{AVG} = 0.90 (5-year)

C_{AVG} = 1.00 (100-year)

Time Interval = 5 (mins)

Drainage Area = 0.0289 (hectares)

	Release Rate = 1.3 (L/sec) Return Period = 5 (years) IDF Parameters, A = 998.071, B = 0.814 (I = A/(T_c+C)B, C = 6.053					Release Rate = 1.3 (L/sec) Return Period = 100 (years) IDF Parameters, A = 1735.688, B = 0.820 (I = A/(Tc+C)B, C = 6.014				
Time (min)	**Intensity, I (mm/hr)**	**Peak Flow (L/s)**	**Release Rate (L/s)**	**Storage Rate (L/s)**	**Storage Volume (m^3)**	**Intensity, I (mm/hr)**	**Peak Flow (L/s)**	**Release Rate (L/s)**	**Storage Rate (L/s)**	**Storage Volume (m^3)**
0	230.5	16.7	1.3	15.4	0.0	398.6	32.0	1.3	30.7	0.0
5	141.2	10.2	1.3	8.9	2.7	242.7	19.5	1.3	18.2	5.5
10	104.2	7.5	1.3	6.2	3.7	178.6	14.3	1.3	13.0	7.8
15	83.6	6.0	1.3	4.7	4.3	142.9	11.5	1.3	10.2	9.2
20	70.3	5.1	1.3	3.8	4.5	120.0	9.6	1.3	8.3	10.0
25	60.9	4.4	1.3	3.1	4.7	103.8	8.3	1.3	7.0	10.6
30	53.9	3.9	1.3	2.6	4.7	91.9	7.4	1.3	6.1	10.9
35	48.5	3.5	1.3	2.2	4.6	82.6	6.6	1.3	5.3	11.2
40	44.2	3.2	1.3	1.9	4.5	75.1	6.0	1.3	4.7	11.4
45	40.6	2.9	1.3	1.6	4.4	69.1	5.5	1.3	4.2	11.5
50	37.7	2.7	1.3	1.4	4.3	64.0	5.1	1.3	3.8	11.5
55	35.1	2.5	1.3	1.2	4.1	59.6	4.8	1.3	3.5	11.5
60	32.9	2.4	1.3	1.1	3.9	55.9	4.5	1.3	3.2	11.5
65	31.0	2.2	1.3	0.9	3.7	52.6	4.2	1.3	2.9	11.4
70	29.4	2.1	1.3	0.8	3.5	49.8	4.0	1.3	2.7	11.3
75	27.9	2.0	1.3	0.7	3.2	47.3	3.8	1.3	2.5	11.2
80	26.6	1.9	1.3	0.6	3.0	45.0	3.6	1.3	2.3	11.1
85	25.4	1.8	1.3	0.5	2.7	43.0	3.5	1.3	2.2	11.0
90	24.3	1.8	1.3	0.5	2.5	41.1	3.3	1.3	2.0	10.8
95	23.3	1.7	1.3	0.4	2.2	39.4	3.2	1.3	1.9	10.6
100	22.4	1.6	1.3	0.3	1.9	37.9	3.0	1.3	1.7	10.5
105	21.6	1.6	1.3	0.3	1.6	36.5	2.9	1.3	1.6	10.3
110	20.8	1.5	1.3	0.2	1.4	35.2	2.8	1.3	1.5	10.1
115	20.1	1.5	1.3	0.2	1.1	34.0	2.7	1.3	1.4	9.9
120	19.5	1.4	1.3	0.1	0.8	32.9	2.6	1.3	1.3	9.7
Max =					**4.7**					**11.5**

Notes

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

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

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

4) Storage Rate = Peak Flow - Release Rate

5) Storage = Time x Storage Rate

6) Maximum Storage = Max Storage Over Time

From: Wu, John <John.Wu@ottawa.ca>
Sent: October-02-14 11:01 AM
To: Shawn Bhatia
Subject: RE: 339 Cumberland St

Hi, Shawn:
We need normal day demand, max day demand and max hour demand separated.
And we need fire flow requesting, then, I will send to IMD group to get the boundary condition.
Storm water management , We need restrict post development up to 100 year's storm on site to a C0.5 (20 minutes concentration time) at 5 year's storm.
Sanitary sewer rate, and the capacity on the street will be shown on the servicing report.

John

From: Shawn Bhatia [mailto:BhatiaS@mmm.ca]
Sent: Tuesday, September 30, 2014 4:07 PM
To: Wu, John
Subject: 339 Cumberland St

John,

I am preparing a servicing brief in support of a zoning application for the above-noted site on Cumberland and York. To do this, I need a few answers:

1. Watermain boundary conditions. We have calculated:
    a. Max daily plus fire flow = 100 l/s
    b. Max hourly demand=3 l/s
2. Stormwater release rate and storage. Currently the site is vacant and paved.
    a. 5 year pre-development release rate?
    b. Onsite storage of flow up to 100 year post-development flow?
3. Any other relevant information for the servicing brief

Regards,

Shawn