Controlex Realty Management

Stormwater Management and Servicing Report

Type of Document
Issue for Site Plan Approval Building 500 & 600

Project Name
3020 Hawthorne Road

Project Number
OTT-00224388-A0

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Type of Document:
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Project Name:
3020 Hawthorne Road. North Hawthorne Campus

Project Number:
OTT-00224388-A0

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1 Introduction

Exp. Services Inc. was retained by Controlex Realty Management to provide engineering services for the preparation of site grading, servicing and stormwater management report for a light industrial development at 3020 Hawthorne Road.

Development of the site is proceeding in a phased manner. The first phase, completed in 2006, involved the construction of Building 700 (Acklands Grainger). The second phase, built in 2008, included Building 200, and the third phase, built in 2013, included the development of Building 300. The fourth phase, currently proposed, includes the development of Building 500 and 600.

This scope of this report addresses the servicing and stormwater management issues related to the development of Building 500 and 600.

2 Purpose

This report documents the proposed method of servicing the site as well as attenuating the stormwater runoff from the subject site. Items that are addressed include:

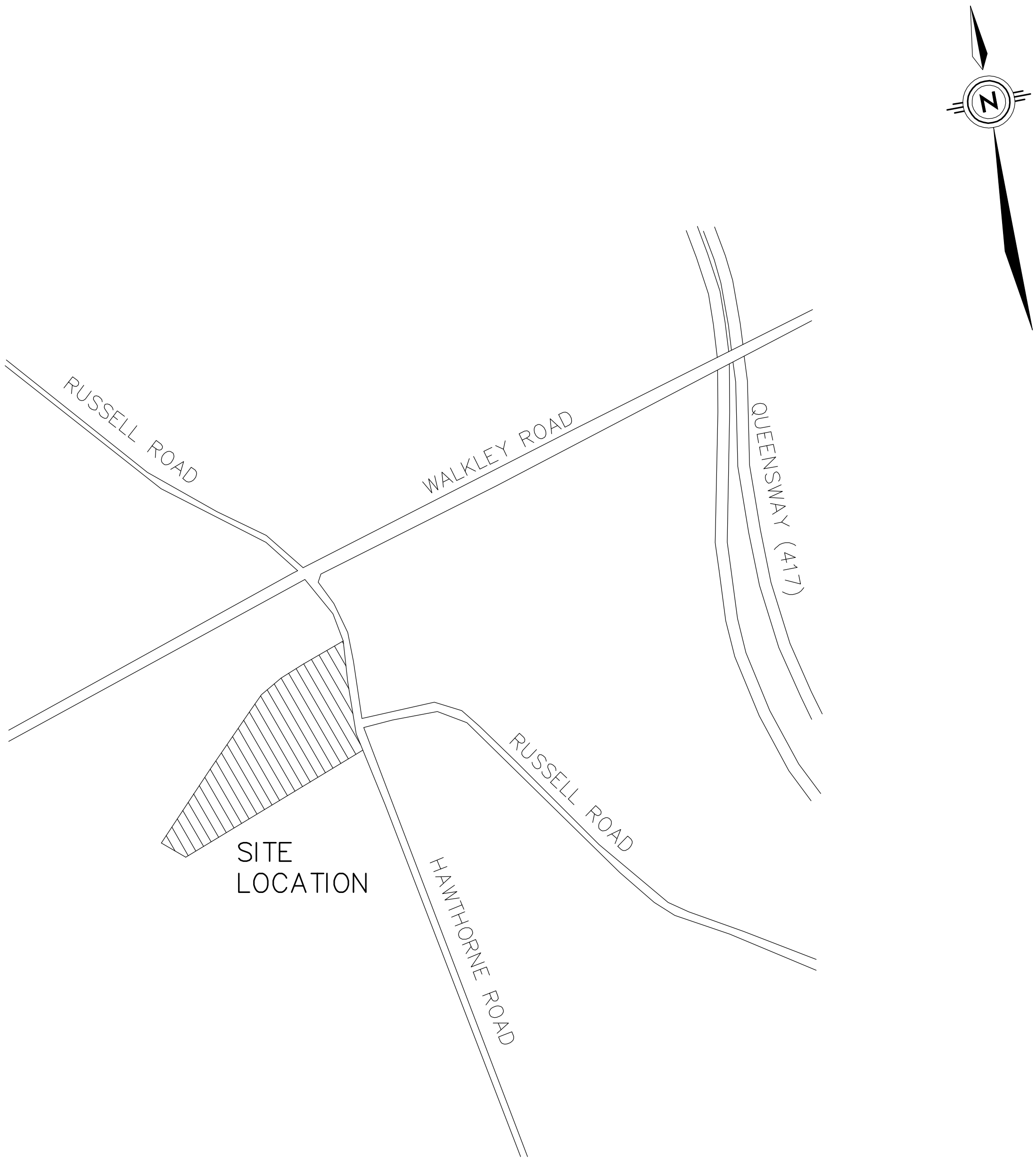
- Determining the size of water and sanitary sewer services and identifying the locations of the connections to existing services.
- Calculating the allowable stormwater release rate, post-development runoff and the corresponding storage volume requirements.
- Determining the locations, sizes and storage volumes of the proposed drainage system components located within the site.

3 Site Overview

The site is 8 hectares in area and is bound by Hawthorne Road to the east, a hydro transmission corridor to the south, the Mather Award Ditch to the west and a railway line to the north. The SWM design will address the quality and quantity control for drainage areas of Buildings 500 and 600. Drainage area of Building 300 has also been included in the current SWM design as the storm water flows from drainage area of Building 300 combine with the flows from Buildings 500 and 600. The total drainage area included for the three buildings is 5.806.

The storm water flows from the railway corridor that was temporarily diverted via a swale crossing the subject site to the Mather Award Drain during the construction of Building 300 will be directed to the Mather Award Drain by constructing a berm along the north property line of the site.

The following Figure 1 is a key map showing the site location.



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date 5/11/2015		
drawn by ML	TITLE: KEY PLAN	FIG 1

4 Watermain Distribution

Building 500 will be serviced by a 203mm diameter service connected to the existing 305mm diameter watermain at the south end of the site. Refer to Site Servicing Plan drawing No. SS1. The existing 205mm stub located at the North East corner of the proposed Building 500 is to be blanked at the 305mm diameter watermain south of the 10m wide sewer easement. Building 600 will be serviced by a 205mm service connection off the existing 205mm water main that currently services Building 200.

Fire Water Demand

Using the Fire Underwriters Survey Criteria Fire Protection Water Supply Guideline from the Office of the Fire Marshall, Ontario, the maximum fire flow requirement for the proposed site was computed to be 80 L/sec (1268 gpm). Fire flow demand was calculated for the largest building (Building 500) assuming that the building is sprinklered with non-combustible construction with limited combustible contents. Refer to Appendix B for fire flow requirement calculations.

Commercial Water Demand

Commercial area = 8 ha

Average daily demand (L/sec):

Commercial Average Demand = 8 ha x 50,000 L/ha/day x (1/86,400) = 4.6 L/sec

Using a peak factor of 1.5, the Maximum Daily Demand yields:

Maximum Commercial Daily Demand = 4.6 x 1.5 = 6.9 L/sec

Using a peak factor of 1.8, the Maximum hourly demand yields:

Maximum Commercial Hourly Demand = 9.4 x 1.8 = 12.5 L/sec

The following boundary conditions were provided by the City of Ottawa (refer to Appendix B):

Minimum HGL = 121.8m

Maximum HGL = 132.7m

Max Day (9.6 L/s) + Fire Flow (80L/s) = 125.0m

Based on the HGL of 125.0m for max day + fire flow, a pressure analysis was performed and a residual pressure of 60.9 psi (420kPa) was estimated at the furthest building (Building 500). from the watermain connection at Hawthorne Rd. Refer to Appendix B for calculation details. The residual water pressure for the two proposed buildings is therefore greater than the minimum requirement of 20psi (140kPa) as per the City of Ottawa Design Guidelines. The existing water supply system will therefore have adequate capacity to meet the domestic and fire demands for the proposed development.

5 Sanitary Sewer Design

An existing 250mm diameter municipal sanitary sewer is located within an easement along the south side of the site and follows the alignment of the once proposed Russell Road extension. This sewer was designed to service these lands and flows westward and connects to a 375mm diameter sewer on the east bank of the Mather Ditch. The 375mm sewer flows north and connects to the 2,700mm diameter South Ottawa Collector located on the north side of the property.

A 200mm sanitary sewer that is connected to the 250mm sanitary was constructed during the construction of Building 300. This sewer will be used to service Buildings 500 and 600 as well. A 200mm sanitary stub to service Building 500 was constructed during the construction of Building 300. Sanitary service for Building 500 will be connected to this stub. It is located on the east side of Building 500. A new service 200mm diameter service lateral off the existing 200mm sanitary will be constructed to service Building 600. It will be located on the west side of Building 600.

The peak sanitary design flow is estimated using the City of Ottawa Sewer Design Guidelines as follows:

The total area being serviced by the existing 200mm sewer is 8 ha.

Design Flow for Commercial Use:	50,000 L/day/ha (0.578 L/s/ha)
Peaking Factor:	1.5
Area:	8 ha
Extraneous Flow:	0.28 L/s/ha
Peak Design Flow:	= (0.578 L/s/ha) (8 ha) (1.5) + (8 ha) (0.28L/s/ha)
	= 9.2 L/s

The 200mm diameter existing sanitary sewer has a minimum 0.5% design slope, providing a capacity of 34 L/s at a full flow velocity of 1.0m/s. Therefore, the design flow can be conveyed by the existing and proposed sewer network.

6 Storm Sewer Design

An existing municipal storm sewer runs parallel to the aforementioned 250 mm diameter sanitary sewer along the south property line. The storm sewer diameter is 600 mm at Hawthorne Road and increases in size along the south limit of the site to be 900 mm at the headwall outlet into the Mather Award Ditch. Storm service for Building 600 will be connected to the existing 375mm storm sewer on the north side of the building. Storm service to Building 500 will be connected to a new storm sewer that will be constructed on the north side of the building.

The on-site storm sewers were designed using the rational method based on a 5-year rainfall event assuming no flow control. Details for storm sewer design can be found on drawing 224388–SWM1 and the storm sewer design sheets Table 502 and 602.

7 Stormwater Management Calculations

7.1 Pre-Development Conditions

The approved SWM design of Building 300 included areas that now forms part of proposed Buildings 500 and 600. Therefore, the SWM design of Buildings 500 and 600 will include Building 300. Total drainage area for these three buildings is 5.695ha. Drainage area for Buildings 300 and 600 is 3.742 ha and for Building 500 it is 1.953ha. Refer to drawing 224388-SWM1 for details.

Drainage Area Building 500:

Total Drainage Area (A):	1.953 hectares
Allowable Runoff coefficient (C):	0.65
5-year Rainfall Intensity	$I_{(5\text{-year, 20 min})}$ = 70.3 mm/hr
Allowable Release Rate	**Q** = 2.78CIA
	Q = 2.78 x 0.65 x 70.3 x 2.021
	Q = 248.1 L/s

Therefore, the allowable release rate for the drainage areas for Building 500 is 248.1 L/s.

Drainage Area Building 300 and 600:

Total Drainage Area(A):	3.895 hectares
Allowable Runoff coefficient (C):	0.65
5-year Rainfall Intensity	$I_{(5\text{-year, 20 min})}$ = 70.3 mm/hr

Allowable Release Rate	**Q** = 2.78CIA
	Q = 2.78 x 0.65 x 70.3 x 3.895
	Q = 494.8 L/s
Drainage sub-area A607 0.11ha area will flow uncontrolled.	
Area of uncontrolled flow (A):	0.11 hectares
Runoff coefficient (C):	0.9
100-year Rainfall Intensity	$\mathbf{I}_{(100\text{-year, 10 min})}$ = 179 mm/hr
Uncontrolled Release Rate	**Q** = 2.78CIA
	Q = 2.78 x 0.9 x 179 x 0.11
	Q = 49.3 L/s

Therefore the allowable release rate from the drainage area of Buildings 300 and 600 will be 445.5 L/s (494.8 L/s – 49.3 L/s).

The total allowable release rate for drainage area of Buildings 300, 500 and 600 will be 693.6L/s.

7.2 Stormwater Management

Stormwater will be controlled and released at a rate less than the allowable release rate for storms up to and including the 100 year storm event. An overland flow route is provided for storms greater than the 100 year return event. Flow control devices will be installed in roof drains and various catchbasins/manholes in order to control stormwater prior to its release from the site.

Storage volume requirements were determined by applying a 5-year and 100-year storm at time steps of 10 minutes until a peak storage volume requirement was attained for each area. The parking lot ponding volumes are determined by applying the pyramid volume equation of one-third of the depth multiplied by the surface area of the pond. Surface ponding depths are limited to 150mm for the 5-year event and 300mm for the 100-year event.

Roof areas are assigned an assumed release rate of 40 L/s/ha, based on past experience. A peak storage volume of 391.7 cubic meters at a 60 minute return time required for Building 500 is equivalent to 41mm averaged over the entire roof. A peak storage volume of 229.8 cubic meters at a 60 minute return time required for Building 600 is equivalent to 41mm averaged over the entire roof.

Stormwater management summary sheets are provided in Table 501 and Table 601, for Buildings 500 and 600 respectively (Appendix A). Detailed calculations for storage volume requirements and storage volumes available are found in Tables 503 to 506 and Tables 603 to 609. Refer to Stormwater Management Plan drawing No.SWM1 for additional information.

The 100 year post-development release rate for the drainage area of Building 500 is 207.7 L/s and is significantly less than the allowable release rate of 248.1 L/s. The 100 year post-development release rate for the drainage area of Building 600 is 350.9 L/s which is significantly less than the allowable release rate of 445.5 L/s. The total 100 year post-development release rate will be restricted to 558.6 L/s.

7.3 Flow Control Device Sizing

Two types of orifice designs are specified for the site. A simple plug-type insert is suitable if the orifice diameter is 75 mm or greater. For lower release rates a more sophisticated orifice design will be employed, such as Hydrovex, to reduce the possibility of clogging often associated with a small orifice. The Hydrovex models are custom-manufactured based on specific head and release rate information. Hydrovex model types were selected based on the manufacturer’s selection charts, while the simple plug-type orifice sizing has been determined per the following example:

Q = C(A)(2gh)0.5

A = Q / (C(2gh)0.5)

πr2 = Q / (C(2gh)0.5)

r = (Q / (π (C(2gh)0.5))0.5

r = $(0.0541 / (\pi (0.6(2*9.81*2.54)^{0.5}))^{0.5}$

r = 0. 064m

diameter = 2r = 2(0.064) = 0.128m = 128mm

Where;

C = 0.6 head loss coefficient for an orifice

Q = 54.1 L/s direct release rate from sub-area to sewer (= 0.0499 cub.m/s)

H = 2.54m head on orifice

(top of grate + ponding depth – pipe invert + pipe radius)

(75.00 + 0.26 – 72.49 - 0.23) = 2.54m

A = Area of orifice

r = radius of orifice

g = acceleration due to gravity

Orifice controls and their locations are shown on the Site Servicing drawing (224388-SS1).

7.4 City Stress Test

As per Technical Bulletin ISDTB-2012-1 issued by the City of Ottawa, it is now a requirement that all drainage systems be stress tested using design storms calculated on the basis of a 20% increase of the City's IDF curves rainfall values. Modifications to the drainage system would be required if severe flooding to properties is identified.

As indicated previously, stormwater is to be stored on site for storms up to and including the 100 year storm event. Therefore, the purpose of the stress test for this type of development is to analyze the overland flow route since it is the outlet for storm events greater than the 100 year event. An increase in 20% of the 100 year storm event will simply follow the proposed overland flow route and spill into the Mather Award Ditch before impacting the buildings. A review of the 100 year ponding elevations, overland flow spill elevations and the elevations of the structures has been completed that shows that the buildings will not be flooded during a major storm event. Refer to the table below.

Table 7.1: FFL vs Spill Elevation

Building #	FFL	Adjacent Spill Elevation
300	76.35	76.00
500	76.10	74.90
600	76.25	76.00

7.5 External Drainage

The previously approved temporary swale conveying the flows from the 0.88 ha external drainage area from the railway corridor will be removed to allow construction of buildings 500 and 600. The temporary swale also conveyed flows from 1.25ha of the subject site within the current proposed phase of development. The 1.25 ha of land that had been flowing uncontrolled to the Mather Award Drain via the temporary swale will now be over controlled by restricting the 100-year post development flow to the 5-year pre-development level. Therefore, the net flow entering the Mather Award Drain will be significantly less than under the pre-development conditions.

A berm shall be constructed along the North Property Line of the proposed development in order to direct flows from the 0.88ha external drainage area towards the Mather Award Drain along the south side swale/ditch of the railway corridor. The swale will convey the flow to the existing outlet of Mather Award Drain previously approved under ECA # 4497-984Q7G. Refer to the External Drainage Area drawing No. EXTRL-DA and typical swale cross sections on the Grading and Drainage Plan drawing No. GR1.

Review of the existing grades along the north property line and south side ditch of the railway corridor indicate a high point of 75.00m between the twin 600mm diameter culverts and the Mather Award Drain. Following the construction of the berm, water in the ditch on the east side of the high point will pond to a maximum elevation of 75.00m before draining to the Mather Award Drain. The existing ditch west of the 75.00m high point has a minimum slope of 0.6% leading to

the Mather Award Drain. Refer to Table 610 and Table 611 in the Appendix for calculations of the external drainage flows and swale capacity. The ditch will have the capacity to convey the 100 year flow of 136.5L/s from the external drainage area. The top of berm elevation of 75.50m at the high point in the ditch will prevent any flow from entering the proposed development. The ditch will only see flows from the external drainage area to the Mather Award Drain during major storm events. Under more frequent storm events the water will simply infiltrate into the ground due to high soil permeability.

Application for an amendment to the previously approved under ECA # 4497-984Q7G for temporary swale will be submitted. ECA for SMW for the development is not required. Correspondence with MOE in this regard is included in Appendix C.

8 Quality Control Measures

8.1 Best Management Practices

In order to follow Best Management Practices for Erosion and Sediment Control the following measures will be employed in the proposed development:

- Geotextile cloth shall be installed between all catch basin covers and frames and sediment shall be removed from geotextile cloth on a regular basis to ensure proper operation.
- A silt fence will be installed as shown on the Erosion and Sediment Control Plan drawing No. ESCP1, to prevent migration of silt.

These erosion and sediment control measures will be implemented during construction. Erosion and Sediment Control measures to be installed and maintained during construction are shown on the Grading Plan (224388-GR1). Filter cloth catches should be inspected daily, and after every rain event to determine maintenance, repair or replacement requirements. Sediments or granular that enter site sewers shall be removed immediately by the contractor. These measures will be implemented prior to the commencement of construction and maintained in good order until vegetation has been established.

8.2 Oil/Grit Separator Unit

The City has indicated that stormwater quality control is required to meet an MOE normal level (70% removal of total suspended solids). Quality control for the drainage area of building 500 (Drainage Areas A501 through A509) will be provided by a new Stormceptor STC 750 unit which will provide the required level of TSS removal. Refer to Appendix A for STC 750 sizing calculations and Stormwater Management Plan (224388-SWM1) for drainage area identification.

Quality control for the existing Building 300 (Drainage Areas A301 through A310) and the proposed Building 600 (Drainage Areas A601 through A606) will be provided by the existing Stormceptor STC 3000. The existing Stormceptor STC 3000 will have adequate capacity to provide the required level of treatment for storm water flows from the drainage areas of the existing Building 300 and the proposed Building 600. Refer to Stormceptor STC 3000 sizing calculations in Appendix A and Stormwater Management Plan (224388-SWM1) for drainage area identification.

9 Conclusion

The development can be adequately serviced with sewer and water from existing infrastructure located adjacent to the site.

The stormwater management measures proposed result in a 100-year release rate of 558.6 L/s which is significantly less than the allowable release rate of 693.6L/s. Quality control of stormwater will be provided by the installation of a new Stormceptor STC 750 unit as well as the existing STC 3000 unit. An overland flow route is provided that will prevent any negative impact on the proposed buildings during storms in excess of the 100-year event. The temporary swale that was approved under ECA # 4497-984Q7G to convey storm water flows towards Mather Award Drain will be removed and a berm will be constructed along the north property line to direct stormwater flows from the external drainage area (railway corridor) towards the Mather Award Drain.

Appendix A–

Tables 501 & 601 – Stormwater Management Summary Sheets

Tables 502 &602 – Storm Sewer Design Sheets

Tables 503 to 506 & 603 to 609 - Storm Storage Volume Tables

Table 610 & 611 External Drainage and Swale Capacity

EXTRNL-DA External Drainage Area Figure

Swale Capacity

Hydrovex Selection Curves

Proposed Stormceptor STC 750 Information

Existing Stormceptor STC 3000 Information

exp Project: 224388 - Building 500 & 600
Location: 3020 Hawthorne
Client: Controlex

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Table 501 Stormwater Management Summary Sheet Drainage Areas Building 500

Sub Area I.D.	Sub Area (ha)	C = 0.2	C = 0.9	Comp. 'C'	Outlet Location	Controlled Release (L/s)	Top of Grate (m)	Ponding Depth (m)	Required 5yr Volume (cu.m)	Required 100yr Volume (cu.m)	Available 5yr volume (cu.m)	Available 100yr volume (cu.m)	Invert or Pan Elev. (m)	Pipe dia (if plug type) (mm)	Head on Orifice (if plug) (m)	Diameter of Orifice (mm)	Hydrovex Model	Head on Hydrovex
A501	0.943		0.943	0.9	BUILDING 500	37.72	N/A	N/A	161.1	391.7	161.1	391.7	N/A	N/A	N/A	N/A	N/A	N/A
A502	0.096		0.096	0.90	CBMH411	40.0	74.60	0.15	53.7	149.6	57.4	323.6	71.85	457	2.67	108	N/A	N/A
A503	0.067		0.067															
A504	0.067		0.067															
A505	0.067		0.067															
A506	0.067		0.067															
A507	0.118		0.118															
A508	0.175		0.175	0.90	CB 413	30.0	73.60	0.30	9.4	34.1	10.2	62.4	71.65	254	2.12	99	N/A	N/A
A509	0.353		0.353	0.90	CB 419	100.0	73.60	0.25	-4.8	45.1	11.3	48.0	71.00	305	2.70	171	N/A	N/A
	1.953	**0.000**	**1.953**		**Release Rate**	**207.7**			**219.4**	**620.6**	**240.0**	**825.7**						
					Allowable Release Rate	**248.1**												

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Table 601 Stormwater Management Summary Sheet Drainage Areas Building 300 and 600

Sub Area I.D.	Sub Area (ha)	C = 0.2	C = 0.9	Comp. 'C'	Outlet Location	Controlled Release (L/s)	Top of Grate (m)	Ponding Depth (m)	Required 5yr Volume (cu.m)	Required 100yr Volume (cu.m)	Available 5yr volume (cu.m)	Available 100yr volume (cu.m)	Invert or Pan Elev. (m)	Pipe dia (if plug type) (mm)	Head on Orifice (if plug) (m)	Diameter of Orifice (mm)	Hydrovex Model	Head on Hydrovex
A301	0.340	0.077	0.263	0.74	STMMH 402	54.2	74.99	0.26	69.2	231.6	69.9	232.0	72.58	457	2.44	128	N/A	N/A
A302	0.109	0.025	0.084															
A303	0.138	0.031	0.107															
A304	0.092	0.020	0.072															
A305	0.092	0.019	0.073															
A306	0.198	0.047	0.151	0.73	CB 44	62.0	74.80	0.20	0.0	16.9	7.1	16.9	73.30	254	1.57	154	N/A	N/A
A307	0.936	0.000	0.936	0.90	BLDG 300	37.6	N/A	N/A	159.6	388.2	159.6	388.2	N/A	N/A	N/A	N/A	N/A	N/A
A308	0.082	0.000	0.082	0.90	CBMH 407	10.0	75.77	0.25	46.8	113.2	46.9	145.5	72.38	381	3.45	51	75VHV-1	3.6
A309	0.080	0.000	0.080															
A310	0.105	0.000	0.105															
A601	0.553	0.000	0.553	0.90	BLDG 600	22.1	N/A	N/A	94.5	229.8	94.5	229.8	N/A	N/A	N/A	N/A	N/A	N/A
A602	0.069	0.000	0.069	0.90	CBMH 416	40.0	74.75	0.15	29.7	89.3	30.0	156.5	72.03	381	2.73	108	N/A	N/A
A603	0.082	0.000	0.082	0.90			74.7	0.25										
A604	0.192	0.000	0.192	0.90			74.65	0.30										
A605	0.518	0.000	0.518	0.90	CBMH415	125.0	74.65	0.30	37.6	180.1	38.6	213.3	72.29	300	2.51	194	N/A	N/A
A606	0.199	0.000	0.199	0.90														
	3.785	**0.219**	**3.566**		**Release Rate**	**350.9**			**437.5**	**1249.1**	**446.7**	**1382.2**						
					Allowable Release Rate	**445.5**												

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Client: Controlex

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Table 502. Storm Sewer Design Sheet Building 500

LOCATION									PROPOSED SEWER							
FROM	TO	R= 0.2	R= 0.9	INDIV 2.78 AR	ACCUM 2.78 AR	TIME OF CONC.	RAINFALL INTENSITY I	PEAK FLOW Q (l/s)	PIPE SIZE (mm)	PIPE SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min.)	EXCESS CAPACITY (l/s)	Q/Qfull
CB 47	MAIN	0.000	0.067	0.17	0.17	10.00	104.19	17.47	201.2	1.00	2.0	33.34	1.05	0.03	15.88	0.52
CB 48	MAIN	0.000	0.067	0.17	0.17	10.00	104.19	17.47	201.2	1.00	2.0	33.34	1.05	0.03	15.88	0.52
CB 49	MAIN	0.000	0.067	0.17	0.17	10.00	104.19	17.47	201.2	1.00	2.0	33.34	1.05	0.03	15.88	0.52
CB 50	MAIN	0.000	0.067	0.17	0.17	10.00	104.19	17.47	201.2	1.00	2.0	33.34	1.05	0.03	15.88	0.52
CBMH 410	CBMH 411	0.000	0.096	0.24	0.91	10.03	104.03	94.74	381.0	0.50	120.0	129.47	1.13	1.76	34.73	0.73
BUILDING 500	MAIN	0.000	0.943	2.36	2.36	10.00	104.19	245.83	381.0	2.00	17.5	258.94	2.27	0.13	13.10	0.95
CBMH 411	MH 412	0.000	0.118	0.30	3.57	11.79	95.58	340.78	457.2	1.50	50.5	364.65	2.22	0.38	23.87	0.93
CBMH 413	MAIN	0.000	0.175	0.44	0.44	10.00	104.19	45.62	254.0	1.00	16.0	62.10	1.22	0.22	16.48	0.73
CBMH419	MAIN	0.000	0.353	0.88	0.88	10.00	104.19	92.02	305.0	1.50	3.0	123.90	1.69	0.03	31.87	0.74
MH412	STMCEPTOR	0.000	0.000	0.00	4.89	12.17	93.96	459.12	533.0	2.00	53.0	633.87	2.84	0.31	174.75	0.72
STMCEPTOR	EX MH 414	0.000	0.000	0.00	4.89	12.49	92.67	452.84	533.0	1.70	3.0	584.40	2.62	0.02	131.56	0.77

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Table 602. Storm Sewer Design Sheet Building 300 and 600

LOCATION									PROPOSED SEWER							
FROM	TO	R= 0.2	R= 0.9	INDIV 2.78 AR	ACCUM 2.78 AR	TIME OF CONC.	RAINFALL INTENSITY I	PEAK FLOW Q (l/s)	PIPE SIZE (mm)	PIPE SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min.)	EXCESS CAPACITY (l/s)	Q/Qfull
CB 41	MAIN	0.025	0.084	0.22	0.22	10.00	104.19	23.35	254.0	1.00	2.0	62.10	1.22	0.03	38.76	0.38
CB 42	MAIN	0.031	0.107	0.28	0.28	10.00	104.19	29.69	254.0	1.00	2.0	62.10	1.22	0.03	32.41	0.48
CB 43	MAIN	0.020	0.072	0.19	0.19	10.00	104.19	19.93	254.0	1.00	3.5	62.10	1.22	0.05	42.17	0.32
CBMH 401	CBMH 402	0.077	0.263	0.70	1.40	10.05	103.94	145.64	381.0	0.80	112.8	163.77	1.43	1.31	18.13	0.89
CBMH 402	STMMH 403	0.019	0.073	0.19	1.59	11.36	97.53	155.49	457.2	0.50	28.4	210.53	1.28	0.37	55.04	0.74
CB 44	STMMH 403	0.047	0.151	0.40	0.40	10.00	104.19	42.09	254.0	5.60	5.5	146.96	2.90	0.03	104.87	0.29
STMMH 403	STMMH 404	0.000	0.000	0.00	2.00	11.73	95.88	191.59	457.2	0.60	44.4	230.62	1.40	0.53	39.04	0.83
BLDG 300	STMMH 404	0.000	0.936	2.34	2.34	10.00	104.19	244.01	381.0	2.00	5.5	258.94	2.27	0.04	14.93	0.94
STMMH 404	STMMH 405	0.000	0.000	0.00	4.34	12.25	93.62	406.33	610.0	0.50	35.3	454.20	1.55	0.38	47.86	0.89
CB 45	CBMH 406	0.000	0.082	0.21	0.21	10.00	104.19	21.38	254.0	2.40	37.7	96.21	1.90	0.33	74.83	0.22
CBMH 406	CBMH 407	0.000	0.080	0.20	0.41	10.33	102.47	41.54	381.0	0.80	44.5	163.77	1.43	0.52	122.23	0.25
CBMH 407	STMMH 405	0.000	0.105	0.26	0.67	10.85	99.92	66.75	381.0	0.80	43.4	163.77	1.43	0.50	97.02	0.41
BLDG 600	MAIN	0.000	0.553	1.38	1.38	10.00	104.19	144.16	381.0	1.00	7.5	183.10	1.60	0.08	38.93	0.79
STMMH 405	STMMH 408	0.000	0.000	0.00	6.39	12.63	92.07	588.52	610.0	0.90	52.3	609.37	2.08	0.42	20.85	0.97
CBMH 418	CBMH415	0.000	0.199	0.50	0.50	10.00	104.19	51.88	254.0	0.80	43.6	55.55	1.10	0.66	3.67	0.93
CBMH415	STMMH 408	0.000	0.518	1.30	1.79	10.66	100.81	180.85	381.0	1.30	34.9	208.76	1.83	0.32	27.91	0.87
CB46	MAIN	0.000	0.080	0.20	0.20	10.00	104.19	20.86	254.0	1.00	5.0	62.10	1.22	0.07	41.25	0.34
CBMH417	CBMH 416	0.000	0.070	0.18	0.38	10.07	103.83	38.97	254.0	0.80	77.0	55.55	1.10	1.17	16.58	0.70
CBMH416	STMMH 408	0.000	0.192	0.48	0.86	11.24	98.07	83.92	305.0	0.80	31.0	90.48	1.24	0.42	6.56	0.93
STMMH 408	STMCEPTOR	0.000	0.000	0.00	9.04	13.05	90.43	817.61	685.0	0.70	4.1	732.15	1.98	0.03	-85.45	1.12
STMCEPTOR	STMMH 409	0.000	0.000	0.00	9.04	13.09	90.30	816.41	685.0	1.50	4.8	1071.76	2.91	0.03	255.35	0.76

exp Project: 224388 - Building 500 & 600
Location: 3020 Hawthorne
Client: Controlex

DATE: December 11 2015
Revised: April 2016
Revised: May 2016

Table 503. Storage Requirements for Area A501 (Building 500)

Area	**0.94**	hectares
5 YR Runoff Coefficient =	**0.90**	post development
100 YR Runoff Coefficient =	**1.00**	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	10	104.19	245.83	37.7	208.1	124.9
	20	70.25	165.75	37.7	128.0	153.6
	30	**53.93**	**127.24**	**37.7**	**89.5**	**161.1**
	40	44.18	104.25	37.7	66.5	159.7
	50	37.65	88.84	37.7	51.1	153.4
100 Year	30	91.87	240.84	37.7	203.1	365.6
	40	75.15	197.00	37.7	159.3	382.3
	50	63.95	167.66	37.7	129.9	389.8
	60	**55.89**	**146.53**	**37.7**	**108.8**	**391.7**
	70	49.79	130.53	37.7	92.8	389.8

Table 504. Storage Requirements for Area A502-A507 (CBMH 411)

Area	**0.48**	hectares
5 YR Runoff Coefficient =	**0.90**	post development
100 YR Runoff Coefficient =	**1.00**	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	10	104.19	125.65	40.0	85.7	51.4
	20	**70.25**	**84.72**	**40.0**	**44.7**	**53.7**
	30	53.93	65.03	40.0	25.0	45.1
	40	44.18	53.28	40.0	13.3	31.9
	50	37.65	45.41	40.0	5.4	16.2
100 Year	10	178.56	239.26	40.0	199.3	119.6
	20	119.95	160.73	40.0	120.7	144.9
	30	**91.87**	**123.10**	**40.0**	**83.1**	**149.6**
	40	75.15	100.69	40.0	60.7	145.7
	50	63.95	85.70	40.0	45.7	137.1

Table 505. Storage Requirements for Area A508 (CB413)

Area	**0.18**	hectares
5 YR Runoff Coefficient =	**0.90**	post development
100 YR Runoff Coefficient =	**1.00**	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	**10**	**104.19**	**45.62**	**30.0**	**15.6**	**9.4**
	20	70.25	30.76	30.0	0.8	0.9
	30	53.93	23.61	30.0	-6.4	-11.5
	40	44.18	19.35	30.0	-10.7	-25.6
	50	37.65	16.49	30.0	-13.5	-40.5
100 Year	**10**	**178.56**	**86.87**	**30.0**	**56.9**	**34.1**
	40	75.15	36.56	30.0	6.6	15.7
	50	63.95	31.11	30.0	1.1	3.3
	60	55.89	27.19	30.0	-2.8	-10.1
	70	49.79	24.22	30.0	-5.8	-24.3

Table 506. Storage Requirements for Area A509 (CBMH 416)

Area	**0.35**	hectares
5 YR Runoff Coefficient =	**0.90**	post development
100 YR Runoff Coefficient =	**1.00**	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	**10**	**104.19**	**92.02**	**100.0**	**-8.0**	**-4.8**
	20	70.25	62.05	100.0	-38.0	-45.5
	30	53.93	47.63	100.0	-52.4	-94.3
	40	44.18	39.02	100.0	-61.0	-146.3
	50	37.65	33.26	100.0	-66.7	-200.2
100 Year	**10**	**178.56**	**175.23**	**100.0**	**75.2**	**45.1**
	20	119.95	117.71	100.0	17.7	21.3
	30	91.87	90.15	100.0	-9.8	-17.7
	40	75.15	73.74	100.0	-26.3	-63.0
	50	63.95	62.76	100.0	-37.2	-111.7

exp Project: 224388 - Building 500 & 600
Location: 3020 Hawthorne
Client: Controlex

DATE: December 11 2015
Revised: April 2016
Revised: May 2016

Table 603. Storage Requirements for Area A301-A305 (CBMH 402)

Area	**0.77**	hectares
5 YR Runoff Coefficient =	**0.74**	post development
100 YR Runoff Coefficient =	**0.93**	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	10	104.19	165.90	54.2	111.7	67.0
	20	**70.25**	**111.86**	**54.2**	**57.7**	**69.2**
	30	53.93	85.87	54.2	31.7	57.0
	40	44.18	70.35	54.2	16.2	38.8
	50	37.65	59.95	54.2	5.8	17.3
100 Year	10	178.56	355.39	54.2	301.2	180.7
	20	119.95	238.74	54.2	184.5	221.4
	30	**91.87**	**182.85**	**54.2**	**128.6**	**231.6**
	40	75.15	149.56	54.2	95.4	228.9
	50	63.95	127.29	54.2	73.1	219.3

Table 604. Storage Requirements for Area A306 (CB 44)

Area	**0.20**	hectares
5 YR Runoff Coefficient =	**0.73**	post development
100 YR Runoff Coefficient =	**0.92**	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	**10**	**104.19**	**42.09**	**62.0**	**-19.9**	**-11.9**
	20	70.25	28.38	62.0	-33.6	-40.3
	30	53.93	21.78	62.0	-40.2	-72.4
	40	44.18	17.85	62.0	-44.2	-106.0
	50	37.65	15.21	62.0	-46.8	-140.4
100 Year	**10**	**178.56**	**90.16**	**62.0**	**28.2**	**16.9**
	20	119.95	60.57	62.0	-1.4	-1.7
	30	91.87	46.39	62.0	-15.6	-28.1
	40	75.15	37.94	62.0	-24.1	-57.7
	50	63.95	32.29	62.0	-29.7	-89.1

Table 605. Storage Requirements for Area A307 (BLDG 300)

Area	**0.94**	hectares
5 YR Runoff Coefficient =	**0.90**	post development
100 YR Runoff Coefficient =	**1.00**	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	10	104.19	244.01	37.6	206.4	123.8
	20	70.25	164.52	37.6	126.9	152.3
	30	**53.93**	**126.29**	**37.6**	**88.7**	**159.6**
	40	44.18	103.47	37.6	65.9	158.1
	50	37.65	88.18	37.6	50.6	151.7
100 Year	30	91.87	239.05	37.6	201.4	362.6
	40	75.15	195.53	37.6	157.9	379.0
	50	63.95	166.41	37.6	128.8	386.4
	60	**55.89**	**145.44**	**37.6**	**107.8**	**388.2**
	70	49.79	129.56	37.6	92.0	386.2

Table 606. Storage Requirements for Area A308-310 (CBMH 407)

Area	**0.27**	hectares
5 YR Runoff Coefficient =	**0.90**	post development
100 YR Runoff Coefficient =	**1.00**	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	30	53.93	36.03	10.0	26.0	46.8
	40	**44.18**	**29.52**	**10.0**	**19.5**	**46.8**
	50	37.65	25.15	10.0	15.2	45.5
	60	32.94	22.01	10.0	12.0	43.2
	70	29.37	19.62	10.0	9.6	40.4
100 Year	**70**	**49.79**	**36.96**	**10.0**	**27.0**	**113.2**
	80	44.99	33.39	10.0	23.4	112.3
	90	41.11	30.52	10.0	20.5	110.8
	100	37.90	28.13	10.0	18.1	108.8
	110	35.20	26.13	10.0	16.1	106.5

Table 607. Storage Requirements for Area A601 (Building)

Area	**0.55**	hectares
5 YR Runoff Coefficient =	**0.90**	post development
100 YR Runoff Coefficient =	**1.00**	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	10	104.19	144.16	22.1	122.1	73.2
	20	70.25	97.20	22.1	75.1	90.1
	30	**53.93**	**74.61**	**22.1**	**52.5**	**94.5**
	40	44.18	61.13	22.1	39.0	93.7
	50	37.65	52.10	22.1	30.0	90.0
100 Year	30	91.87	141.23	22.1	119.1	214.4
	40	75.15	115.52	22.1	93.4	224.2
	50	63.95	98.32	22.1	76.2	228.7
	60	**55.89**	**85.93**	**22.1**	**63.8**	**229.8**
	70	49.79	76.54	22.1	54.4	228.7

Table 608. Storage Requirements for Area A602-A604 (CBMH416)

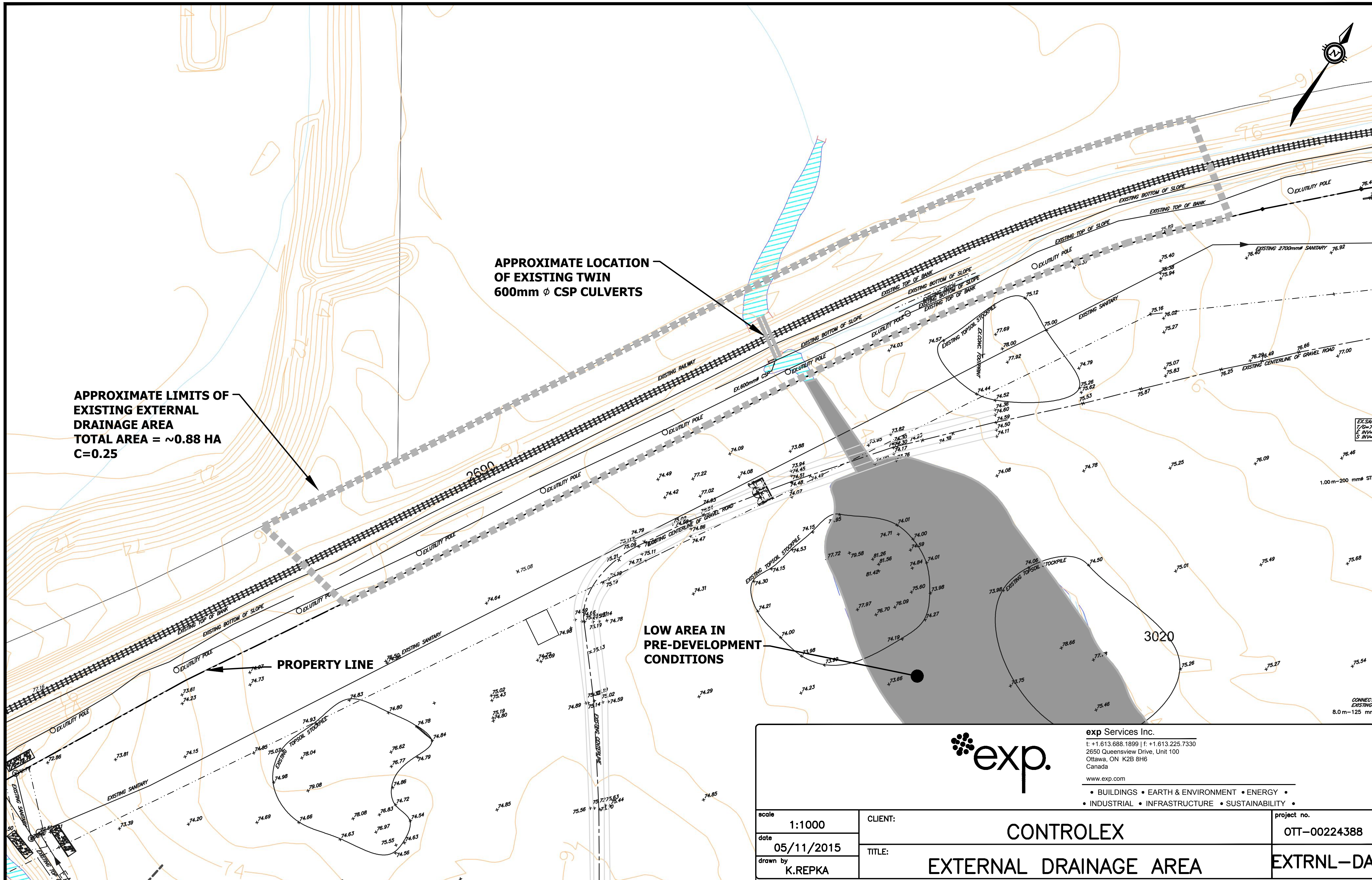
Area	**0.34**	hectares
5 YR Runoff Coefficient =	**0.90**	post development
100 YR Runoff Coefficient =	**1.00**	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	**10**	**104.19**	**89.42**	**40.0**	**49.4**	**29.7**
	20	70.25	60.29	40.0	20.3	24.3
	30	53.93	46.28	40.0	6.3	11.3
	40	44.18	37.92	40.0	-2.1	-5.0
	50	37.65	32.31	40.0	-7.7	-23.1
100 Year	10	178.56	170.26	40.0	130.3	78.2
	20	**119.95**	**114.38**	**40.0**	**74.4**	**89.3**
	30	91.87	87.60	40.0	47.6	85.7
	40	75.15	71.65	40.0	31.7	76.0
	50	63.95	60.98	40.0	21.0	62.9

Table 609. Storage Requirements for Area A605-606 (CBMH 415)

Area	**0.72**	hectares
5 YR Runoff Coefficient =	**0.90**	post development
100 YR Runoff Coefficient =	**1.00**	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Controlled Release	Net Runoff To Be Stored (L/s)	Storage Req'd m3
5 Year	**10**	**104.19**	**187.70**	**125.0**	**62.7**	**37.6**
	20	70.25	126.55	125.0	1.6	1.9
	30	53.93	97.15	125.0	-27.9	-50.1
	40	44.18	79.60	125.0	-45.4	-109.0
	50	37.65	67.83	125.0	-57.2	-171.5
100 Year	10	178.56	357.40	90.0	267.4	160.4
	20	**119.95**	**240.09**	**90.0**	**150.1**	**180.1**
	30	91.87	183.88	90.0	93.9	169.0
	40	75.15	150.41	90.0	60.4	145.0
	50	63.95	128.01	90.0	38.0	114.0



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date: 05/11/2015	TITLE: EXTERNAL DRAINAGE AREA	EXTRNL-DA
drawn by: K.REPKA		

exp Project: 224388 - Building Building 500 & 600
Location: 3020 Hawthorne
Client: Controlex

DATE: APRIL, 2016
Revised: May 2016

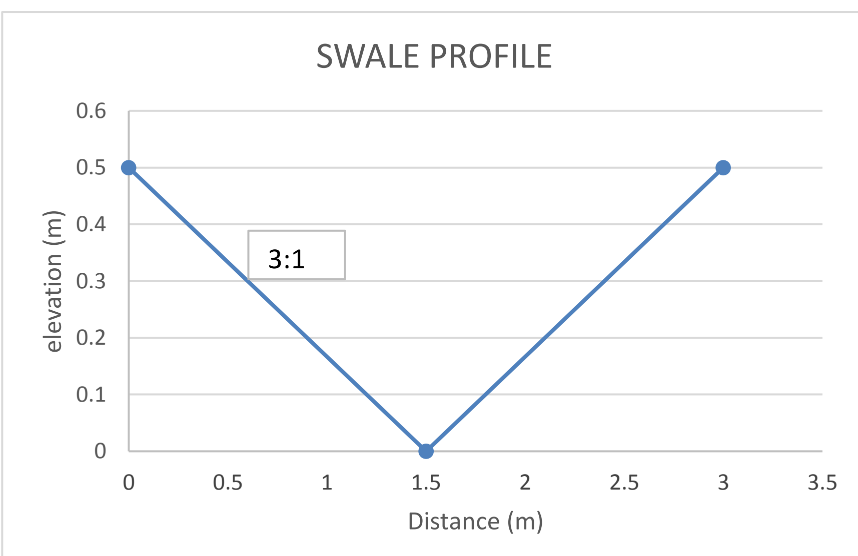
Table 610. External Drainage Flow

Area	**0.88**	hectares
5 YR Runoff Coefficient =	**0.25**	post development
100 YR Runoff Coefficient =	**0.31**	post development

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)
5 Year	10	104.19	63.72
100 Year	10	178.56	136.51

Table 611. PROPOSED SWALE CAPACITY

WATER DEPTH (m)	WETTED PERIMETER (m)	AREA (m^2)	MINIMUM SLOPE (m/m)	Manning n	VELOCITY (m/s)	FLOW (L/s)
0.05	0.316	0.0075	0.006	0.04	0.16	1.199
0.1	0.632	0.03	0.006	0.04	0.25	7.613
0.15	0.949	0.0675	0.006	0.04	0.33	22.444
0.2	1.265	0.12	0.006	0.04	0.40	48.337
0.25	1.581	0.1875	0.006	0.04	0.47	87.640
0.3	1.897	0.27	0.006	0.04	0.53	142.513
0.35	2.214	0.3675	0.006	0.04	0.58	214.971
0.4	2.530	0.48	0.006	0.04	0.64	306.919
0.45	2.846	0.6075	0.006	0.04	0.69	420.176
0.5	3.162	0.75	0.006	0.04	0.74	556.482



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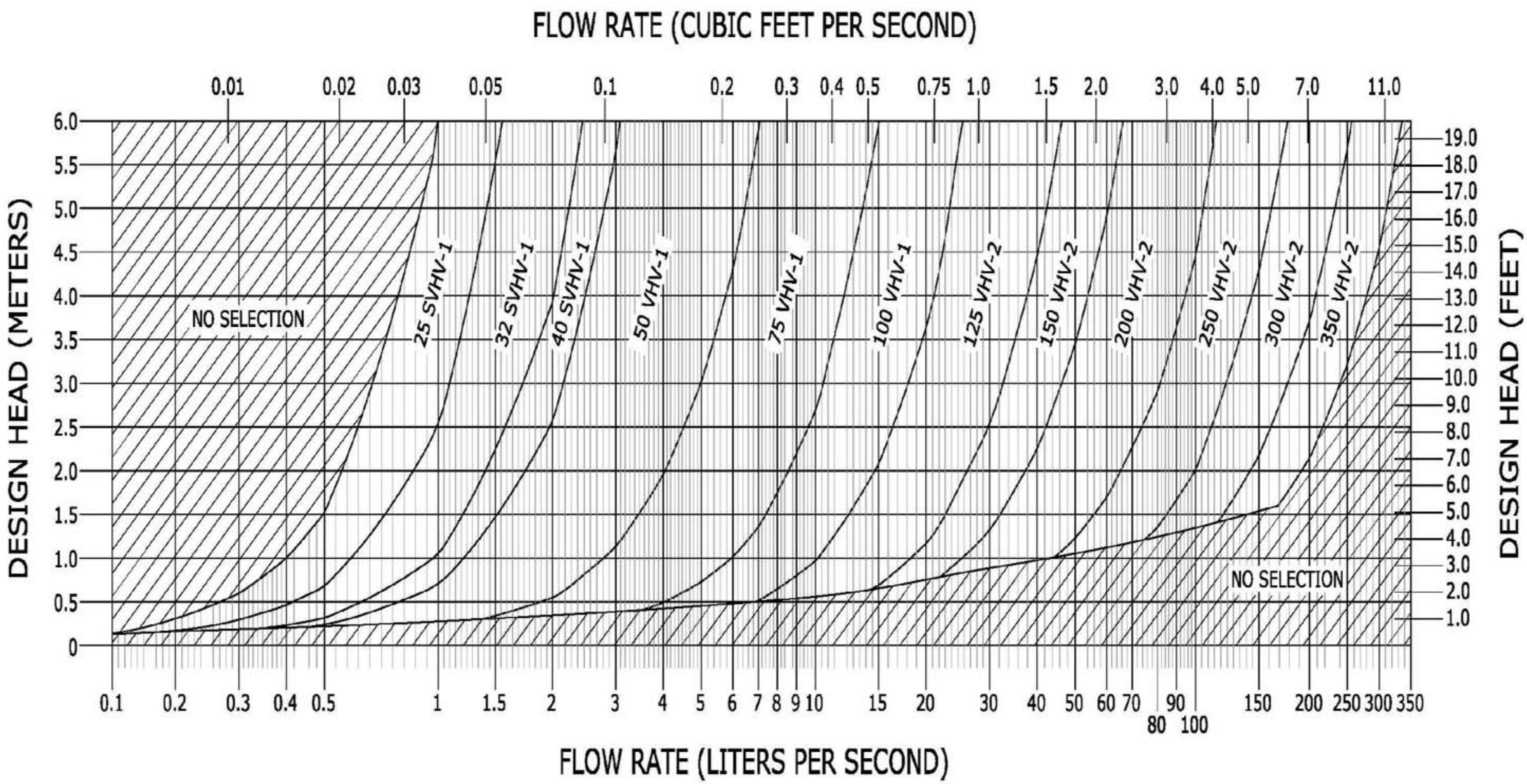


FIGURE 3

JOHN MEUNIER

Stormceptor Sizing Detailed Report
PCSWMM for Stormceptor

Project Information

Date	5/16/2016
Project Name	3020 Hawthorne Rd BLDG 500 600 Phase
Project Number	OTT-00244388
Location	Ottawa

Stormwater Quality Objective

This report outlines how Stormceptor System can achieve a defined water quality objective through the removal of total suspended solids (TSS). Attached to this report is the Stormceptor Sizing Summary.

Stormceptor System Recommendation

The Stormceptor System model STC 2000 achieves the water quality objective removing 73% TSS for a Fine (organics, silts and sand) particle size distribution.

The Stormceptor System

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for all rainfall events, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.

Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Stormceptor is the only oil and sediment separator on the market sized to remove TSS for a wide range of particle sizes, including fine sediments (clays and silts), that are often overlooked in the design of other stormwater treatment devices.

Small storms dominate hydrologic activity, US EPA reports

"*Early efforts in stormwater management focused on flood events ranging from the 2-yr to the 100-yr storm. Increasingly stormwater professionals have come to realize that small storms (i.e. < 1 in. rainfall) dominate watershed hydrologic parameters typically associated with water quality management issues and BMP design. These small storms are responsible for most annual urban runoff and groundwater recharge. Likewise, with the exception of eroded sediment, they are responsible for most pollutant washoff from urban surfaces. Therefore, the small storms are of most concern for the stormwater management objectives of ground water recharge, water quality resource protection and thermal impacts control.*"

"*Most rainfall events are much smaller than design storms used for urban drainage models. In any given area, most frequently recurrent rainfall events are small (less than 1 in. of daily rainfall).*"

"Continuous simulation offers possibilities for designing and managing BMPs on an individual site-by-site basis that are not provided by other widely used simpler analysis methods. Therefore its application and use should be encouraged."

– US EPA Stormwater Best Management Practice Design Guide, Volume 1 – General Considerations, 2004

Design Methodology

Each Stormceptor system is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology from up-to-date local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective.

The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing (summary of analysis presented in Appendix 2):

- Site parameters
- Continuous historical rainfall, including duration, distribution, peaks (Figure 1)
- Interevent periods
- Particle size distribution
- Particle settling velocities (Stokes Law, corrected for drag)
- TSS load (Figure 2)
- Detention time of the system

The Stormceptor System maintains continuous positive TSS removal for all influent flow rates. Figure 3 illustrates the continuous treatment by Stormceptor throughout the full range of storm events analyzed. It is clear that large events do not significantly impact the average annual TSS removal. There is no decline in cumulative TSS removal, indicating scour does not occur as the flow rate increases.

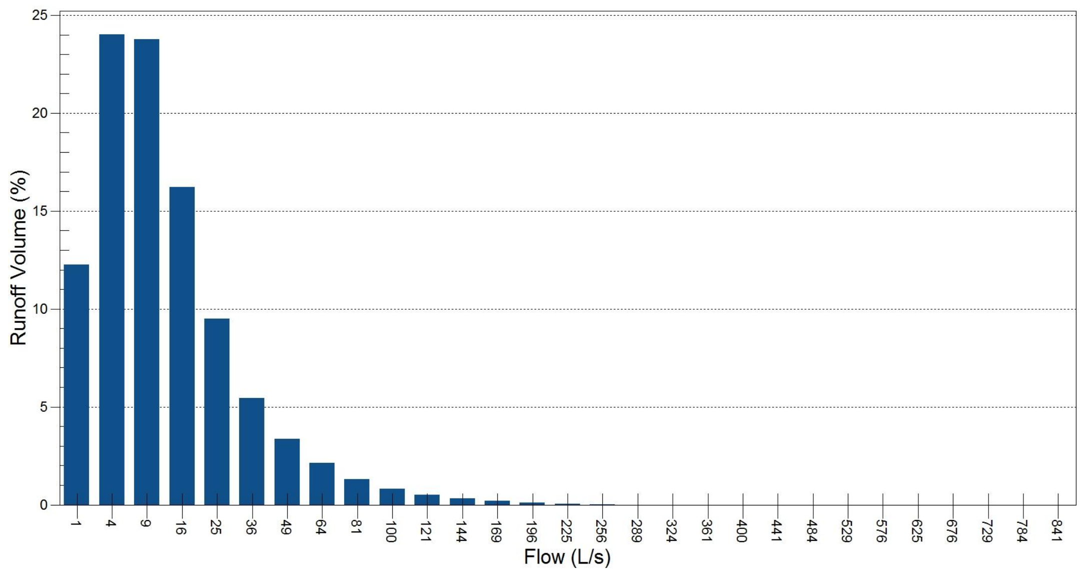


Figure 1. Runoff Volume by Flow Rate for OTTAWA MACDONALD-CARTIER INT'L A – ON 6000, 1967 to 2003 for 2.296 ha, 90% impervious. Small frequent storm events represent the majority of annual rainfall volume. Large infrequent events have little impact on the average annual TSS removal, as they represent a small percentage of the total annual volume of runoff.

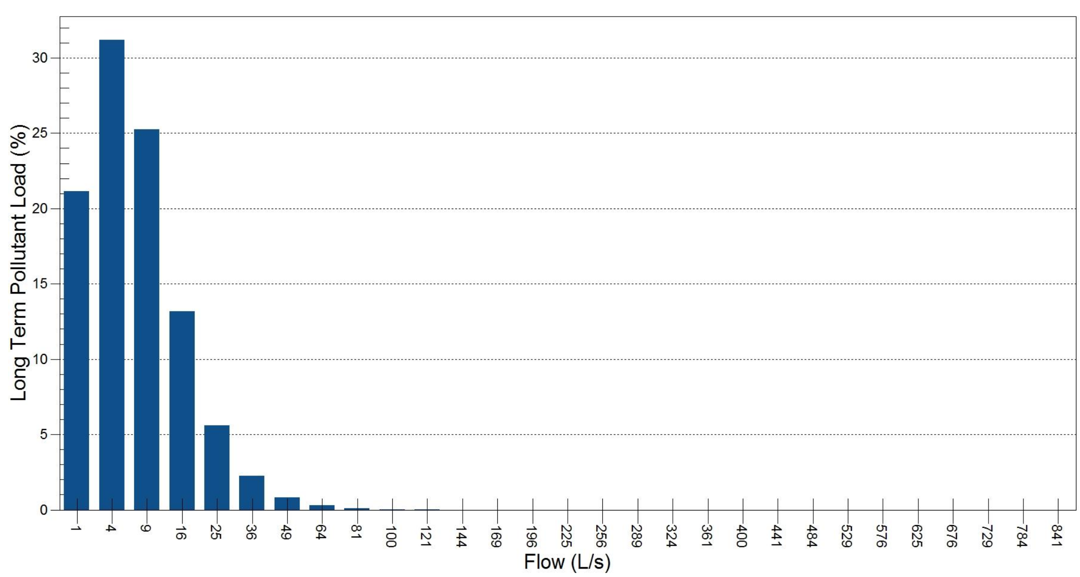
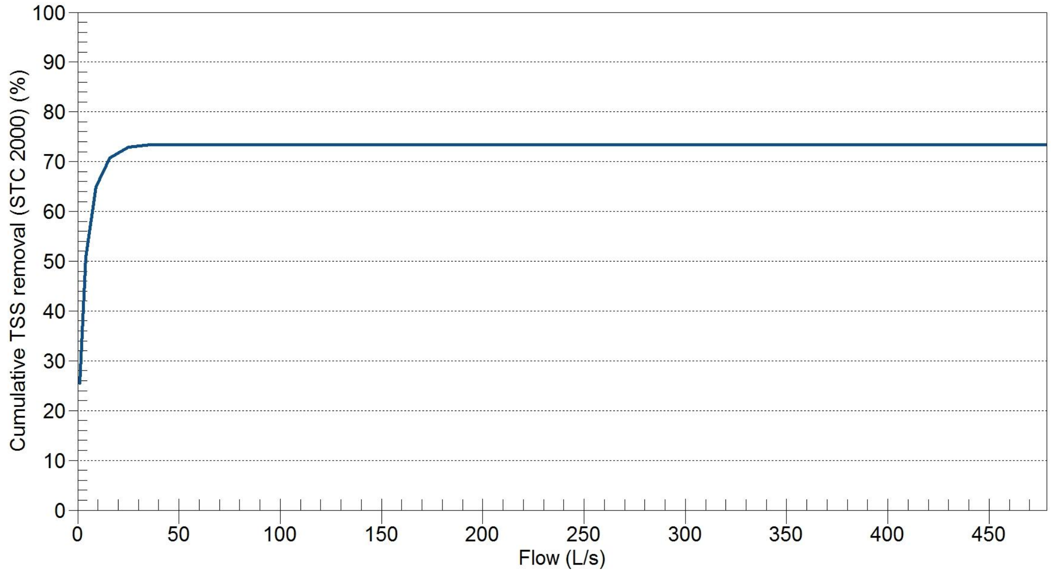


Figure 2. Long Term Pollutant Load by Flow Rate for OTTAWA MACDONALD-CARTIER INT'L A – 6000, 1967 to 2003 for 2.296 ha, 90% impervious. The majority of the annual pollutant load is transported by small frequent storm events. Conversely, large infrequent events carry an insignificant percentage of the total annual pollutant load.



Stormceptor Model	STC 2000	Drainage Area (ha)	2.296
TSS Removal (%)	73	Impervious (%)	90

Figure 3. Cumulative TSS Removal by Flow Rate for OTTAWA MACDONALD-CARTIER INT'L A – 6000, 1967 to 2003. Stormceptor continuously removes TSS throughout the full range of storm events analyzed. Note that large events do not significantly impact the average annual TSS removal. Therefore no decline in cumulative TSS removal indicates scour does not occur as the flow rate increases.

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Appendix 1
Stormceptor Design Summary

Project Information

Date	5/16/2016
Project Name	3020 Hawthorne Rd BLDG 500 600 Phase
Project Number	OTT-00244388
Location	Ottawa

Designer Information

Company	N/A
Contact	N/A

Notes

Existing building 300 and proposed building 600 drainage

Drainage Area

Total Area (ha)	2.296
Imperviousness (%)	90

The Stormceptor System model STC 2000 achieves the water quality objective removing 73% TSS for a Fine (organics, silts and sand) particle size distribution.

Rainfall

Name	OTTAWA MACDONALD-CARTIER INT'L A
State	ON
ID	6000
Years of Records	1967 to 2003
Latitude	45°19'N
Longitude	75°40'W

Water Quality Objective

TSS Removal (%)	70

Upstream Storage

Storage (ha-m)	Discharge (L/s)
0.000	00.000
0.044	350.900
0.125	350.900

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 300	53
STC 750	66
STC 1000	67
STC 1500	67
STC 2000	**73**
STC 3000	74
STC 4000	78
STC 5000	79
STC 6000	81
STC 9000	85
STC 10000	85
STC 14000	87

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Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)								
Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s
20	20	1.3	0.0004					
60	20	1.8	0.0016					
150	20	2.2	0.0108					
400	20	2.65	0.0647					
2000	20	2.65	0.2870					

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor version 1.0
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 300 is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 750 to STC 6000 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 300	STC 750 to STC 6000	STC 9000 to STC 14000
Single inlet pipe	75 mm	25 mm	75 mm
Multiple inlet pipes	75 mm	75 mm	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Imbrium Systems Inc., 1-800-565-4801.

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Appendix 2
Summary of Design Assumptions

SITE DETAILS

Site Drainage Area

Total Area (ha)	2.296	Imperviousness (%)	90

Surface Characteristics

Width (m)	303.0511
Slope (%)	2
Impervious Depression Storage (mm)	0.508
Pervious Depression Storage (mm)	5.08
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (mm/h)	61.98
Min. Infiltration Rate (mm/h)	10.16
Decay Rate (s^{-1})	0.00055
Regeneration Rate (s^{-1})	0.01

Maintenance Frequency

Sediment build-up reduces the storage volume for sedimentation. Frequency of maintenance is assumed for TSS removal calculations.

Maintenance Frequency (months)	12

Evaporation

Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow

Dry Weather Flow (L/s)	No

Upstream Attenuation

Stage-storage and stage-discharge relationship used to model attenuation upstream of the Stormceptor System is identified in the table below.

Storage ha-m	Discharge L/s
0.000	00.000
0.044	350.900
0.125	350.900

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PARTICLE SIZE DISTRIBUTION

Particle Size Distribution

Removing fine particles from runoff ensures the majority of pollutants, such as heavy metals, hydrocarbons, free oils and nutrients are not discharged into natural water resources. The table below identifies the particle size distribution selected to define TSS removal for the design of the Stormceptor System.

Fine (organics, silts and sand)								
Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s
20	20	1.3	0.0004					
60	20	1.8	0.0016					
150	20	2.2	0.0108					
400	20	2.65	0.0647					
2000	20	2.65	0.2870					

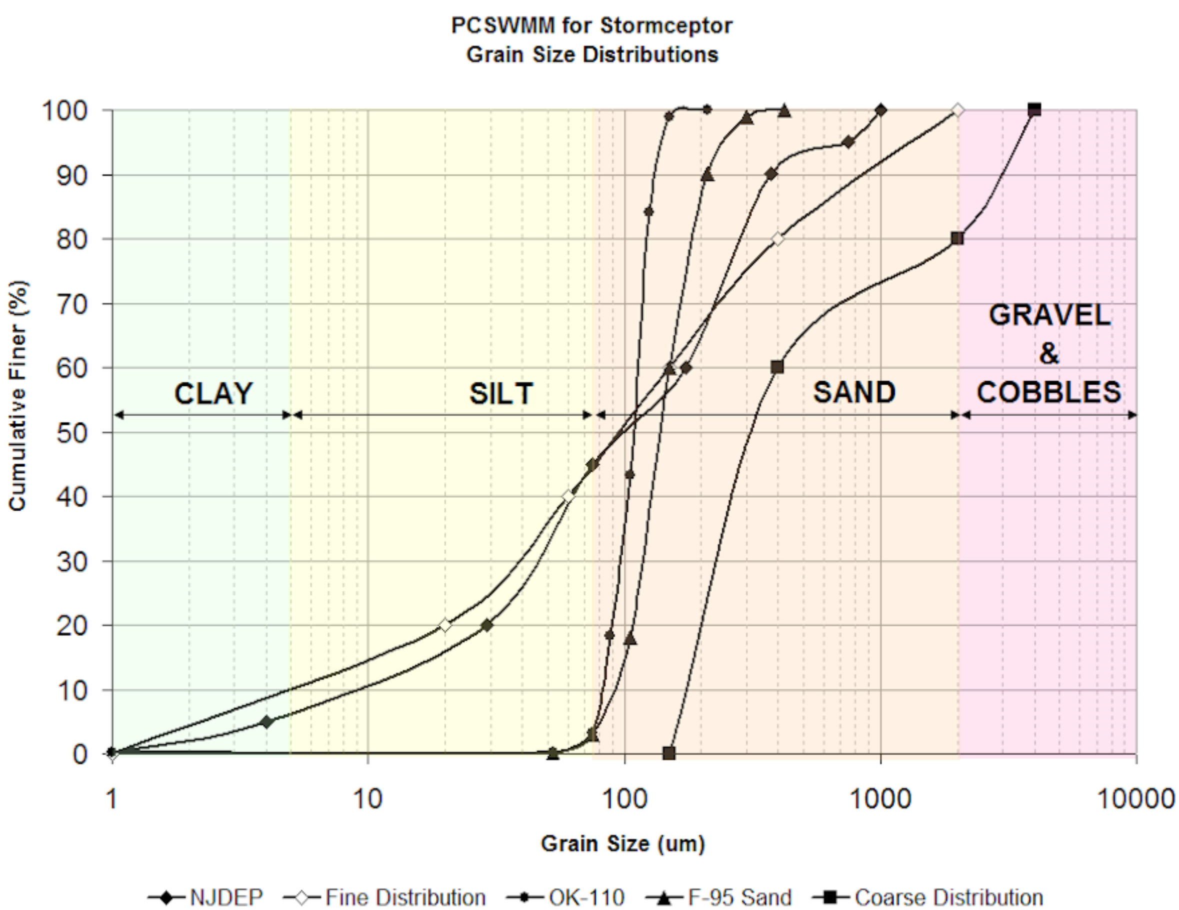

Figure 1. PCSWMM for Stormceptor standard design grain size distributions.

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TSS LOADING

TSS Loading Parameters

TSS Loading Function	Buildup / Washoff

Parameters

Target Event Mean Concentration (EMC) (mg/L)	125
Exponential Buildup Power	0.4
Exponential Washoff Exponential	0.2

HYDROLOGY ANALYSIS

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of the Stormceptor System are based on the average annual removal of TSS for the selected site parameters. The Stormceptor System is engineered to capture fine particles (silts and sands) by focusing on average annual runoff volume ensuring positive removal efficiency is maintained during all rainfall events, while preventing the opportunity for negative removal efficiency (scour).

Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

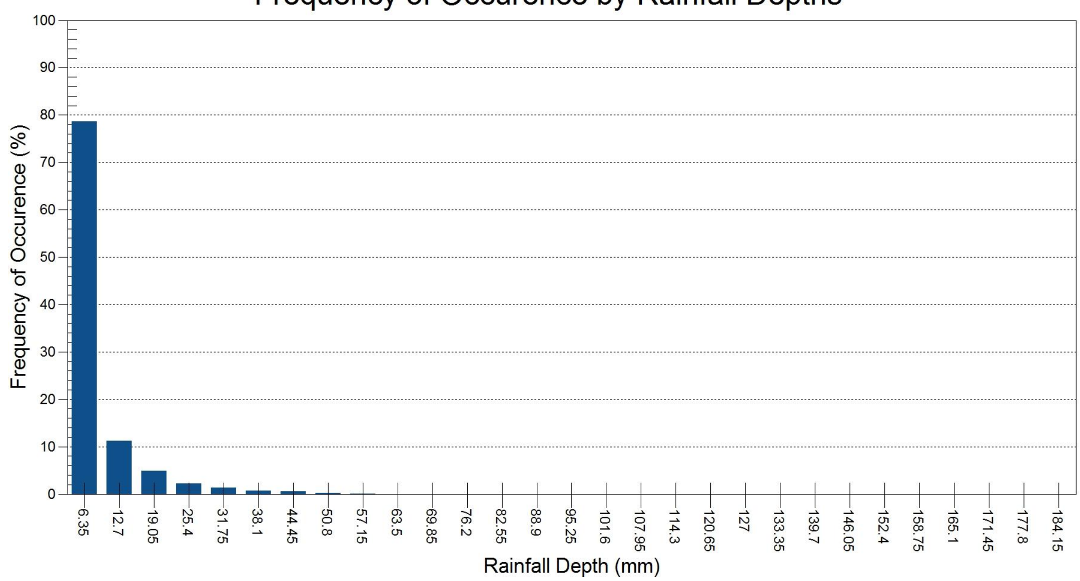
Rainfall Station

Rainfall Station	OTTAWA MACDONALD-CARTIER INT'L A		
Rainfall File Name	ON6000.NDC	Total Number of Events	4537
Latitude	45°19'N	Total Rainfall (mm)	20978.1
Longitude	75°40'W	Average Annual Rainfall (mm)	567.0
Elevation (m)	371	Total Evaporation (mm)	1881.5
Rainfall Period of Record (y)	37	Total Infiltration (mm)	2092.0
Total Rainfall Period (y)	37	Percentage of Rainfall that is Runoff (%)	81.4

Rainfall Event Analysis

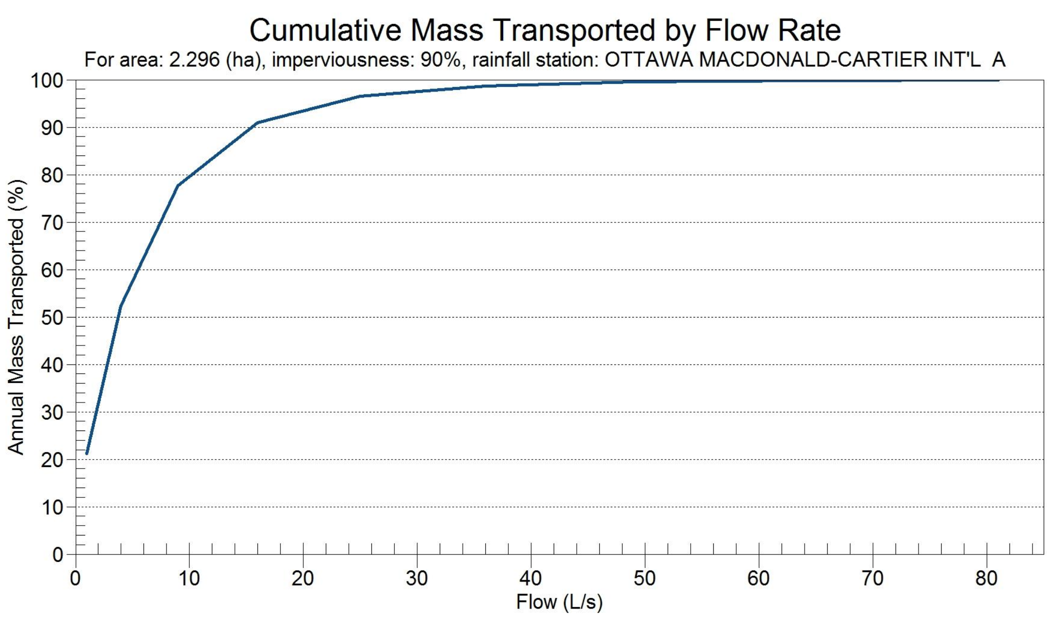
Rainfall Depth mm	No. of Events	Percentage of Total Events %	Total Volume mm	Percentage of Annual Volume %
6.35	3564	78.6	5671	27.0
12.70	508	11.2	4533	21.6
19.05	223	4.9	3434	16.4
25.40	102	2.2	2244	10.7
31.75	60	1.3	1704	8.1
38.10	33	0.7	1145	5.5
44.45	28	0.6	1165	5.6
50.80	9	0.2	416	2.0
57.15	5	0.1	272	1.3
63.50	1	0.0	63	0.3
69.85	1	0.0	64	0.3
76.20	1	0.0	76	0.4
82.55	0	0.0	0	0.0
88.90	1	0.0	84	0.4
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0
107.95	0	0.0	0	0.0
114.30	1	0.0	109	0.5
120.65	0	0.0	0	0.0
127.00	0	0.0	0	0.0
133.35	0	0.0	0	0.0
139.70	0	0.0	0	0.0
146.05	0	0.0	0	0.0
152.40	0	0.0	0	0.0
158.75	0	0.0	0	0.0
165.10	0	0.0	0	0.0
171.45	0	0.0	0	0.0
177.80	0	0.0	0	0.0
184.15	0	0.0	0	0.0
190.50	0	0.0	0	0.0
196.85	0	0.0	0	0.0
203.20	0	0.0	0	0.0
209.55	0	0.0	0	0.0
>209.55	0	0.0	0	0.0

Frequency of Occurence by Rainfall Depths



Pollutograph

Flow Rate L/s	Cumulative Mass %
1	21.2
4	52.4
9	77.7
16	90.9
25	96.5
36	98.7
49	99.5
64	99.8
81	100.0
100	100.0
121	100.0
144	100.0
169	100.0
196	100.0
225	100.0
256	100.0
289	100.0
324	100.0
361	100.0
400	100.0
441	100.0
484	100.0
529	100.0
576	100.0
625	100.0
676	100.0
729	100.0
784	100.0
841	100.0
900	100.0



Stormceptor Sizing Detailed Report

PCSWMM for Stormceptor

Project Information

Date	4/18/2016
Project Name	3020 Hawthorne BLDG 500
Project Number	OTT-00224388
Location	Ottawa

Stormwater Quality Objective

This report outlines how Stormceptor System can achieve a defined water quality objective through the removal of total suspended solids (TSS). Attached to this report is the Stormceptor Sizing Summary.

Stormceptor System Recommendation

The Stormceptor System model STC 750 achieves the water quality objective removing 76% TSS for a Fine (organics, silts and sand) particle size distribution.

The Stormceptor System

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for all rainfall events, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.

Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Stormceptor is the only oil and sediment separator on the market sized to remove TSS for a wide range of particle sizes, including fine sediments (clays and silts), that are often overlooked in the design of other stormwater treatment devices.

Small storms dominate hydrologic activity, US EPA reports

"*Early efforts in stormwater management focused on flood events ranging from the 2-yr to the 100-yr storm. Increasingly stormwater professionals have come to realize that small storms (i.e. < 1 in. rainfall) dominate watershed hydrologic parameters typically associated with water quality management issues and BMP design. These small storms are responsible for most annual urban runoff and groundwater recharge. Likewise, with the exception of eroded sediment, they are responsible for most pollutant washoff from urban surfaces. Therefore, the small storms are of most concern for the stormwater management objectives of ground water recharge, water quality resource protection and thermal impacts control.*"

"*Most rainfall events are much smaller than design storms used for urban drainage models. In any given area, most frequently recurrent rainfall events are small (less than 1 in. of daily rainfall).*"

"Continuous simulation offers possibilities for designing and managing BMPs on an individual site-by-site basis that are not provided by other widely used simpler analysis methods. Therefore its application and use should be encouraged."

– US EPA Stormwater Best Management Practice Design Guide, Volume 1 – General Considerations, 2004

Design Methodology

Each Stormceptor system is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology from up-to-date local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective.

The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing (summary of analysis presented in Appendix 2):

- Site parameters
- Continuous historical rainfall, including duration, distribution, peaks (Figure 1)
- Interevent periods
- Particle size distribution
- Particle settling velocities (Stokes Law, corrected for drag)
- TSS load (Figure 2)
- Detention time of the system

The Stormceptor System maintains continuous positive TSS removal for all influent flow rates. Figure 3 illustrates the continuous treatment by Stormceptor throughout the full range of storm events analyzed. It is clear that large events do not significantly impact the average annual TSS removal. There is no decline in cumulative TSS removal, indicating scour does not occur as the flow rate increases.

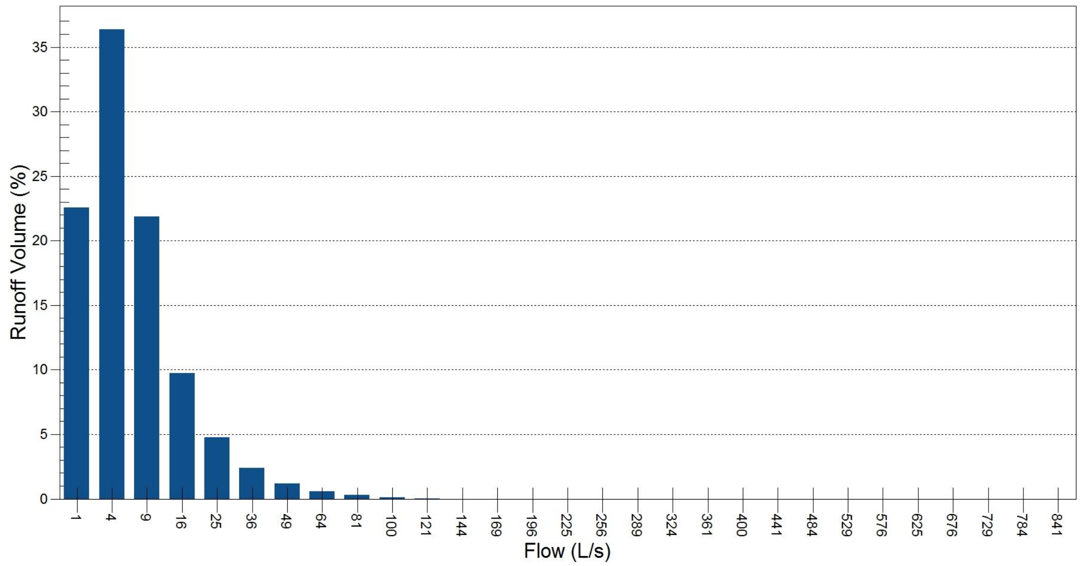


Figure 1. Runoff Volume by Flow Rate for OTTAWA MACDONALD-CARTIER INT'L A – ON 6000, 1967 to 2003 for 1.01 ha, 90% impervious. Small frequent storm events represent the majority of annual rainfall volume. Large infrequent events have little impact on the average annual TSS removal, as they represent a small percentage of the total annual volume of runoff.

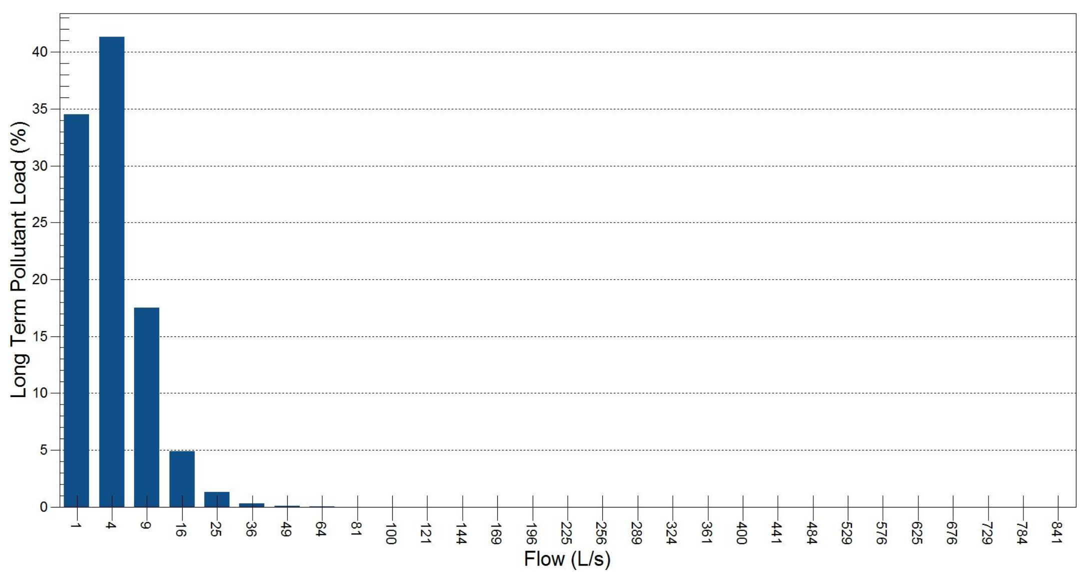
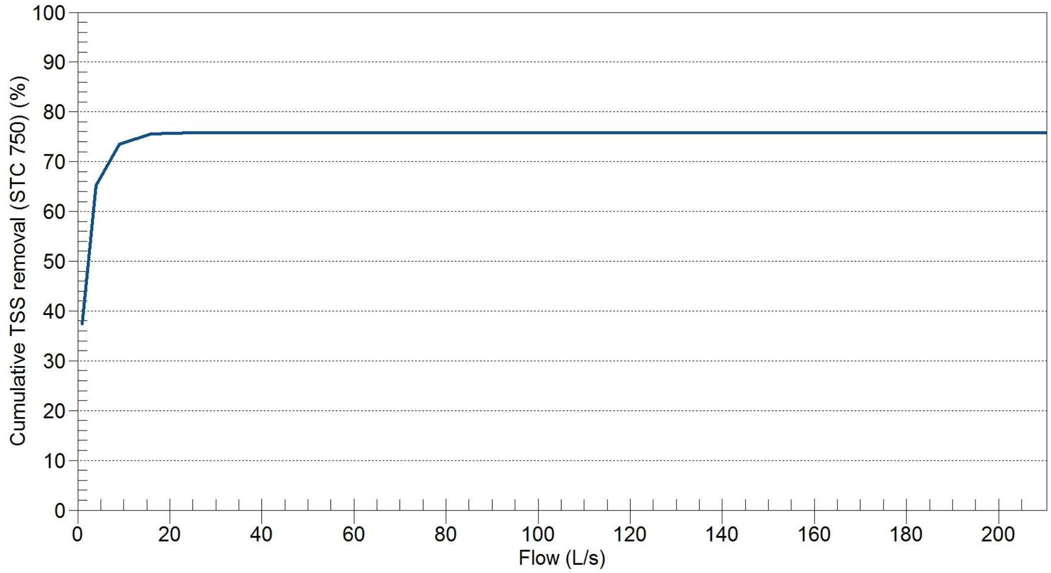


Figure 2. Long Term Pollutant Load by Flow Rate for OTTAWA MACDONALD-CARTIER INT'L A – 6000, 1967 to 2003 for 1.01 ha, 90% impervious. The majority of the annual pollutant load is transported by small frequent storm events. Conversely, large infrequent events carry an insignificant percentage of the total annual pollutant load.



Stormceptor Model	STC 750	Drainage Area (ha)	1.01
TSS Removal (%)	76	Impervious (%)	90

Figure 3. Cumulative TSS Removal by Flow Rate for OTTAWA MACDONALD-CARTIER INT'L A – 6000, 1967 to 2003. Stormceptor continuously removes TSS throughout the full range of storm events analyzed. Note that large events do not significantly impact the average annual TSS removal. Therefore no decline in cumulative TSS removal indicates scour does not occur as the flow rate increases.

Appendix 1
Stormceptor Design Summary

Project Information

Date	4/18/2016
Project Name	3020 Hawthorne BLDG 500
Project Number	OTT-00224388
Location	Ottawa

Designer Information

Company	N/A
Contact	N/A

Notes

BUILDING 500

Drainage Area

Total Area (ha)	1.01
Imperviousness (%)	90

The Stormceptor System model STC 750 achieves the water quality objective removing 76% TSS for a Fine (organics, silts and sand) particle size distribution.

Rainfall

Name	OTTAWA MACDONALD-CARTIER INT'L A
State	ON
ID	6000
Years of Records	1967 to 2003
Latitude	45°19'N
Longitude	75°40'W

Water Quality Objective

TSS Removal (%)	70

Upstream Storage

Storage (ha-m)	Discharge (L/s)
0.000	00.000
0.022	207.700
0.062	207.700

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 300	67
STC 750	**76**
STC 1000	76
STC 1500	77
STC 2000	81
STC 3000	82
STC 4000	85
STC 5000	85
STC 6000	87
STC 9000	90
STC 10000	90
STC 14000	92

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Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)								
Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s
20	20	1.3	0.0004					
60	20	1.8	0.0016					
150	20	2.2	0.0108					
400	20	2.65	0.0647					
2000	20	2.65	0.2870					

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor version 1.0
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 300 is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 750 to STC 6000 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 300	STC 750 to STC 6000	STC 9000 to STC 14000
Single inlet pipe	75 mm	25 mm	75 mm
Multiple inlet pipes	75 mm	75 mm	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Imbrium Systems Inc., 1-800-565-4801.

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Appendix 2
Summary of Design Assumptions

SITE DETAILS

Site Drainage Area

Total Area (ha)	1.01	Imperviousness (%)	90

Surface Characteristics

Width (m)	201
Slope (%)	2
Impervious Depression Storage (mm)	0.508
Pervious Depression Storage (mm)	5.08
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (mm/h)	61.98
Min. Infiltration Rate (mm/h)	10.16
Decay Rate (s^{-1})	0.00055
Regeneration Rate (s^{-1})	0.01

Maintenance Frequency

Sediment build-up reduces the storage volume for sedimentation. Frequency of maintenance is assumed for TSS removal calculations.

Maintenance Frequency (months)	12

Evaporation

Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow

Dry Weather Flow (L/s)	No

Upstream Attenuation

Stage-storage and stage-discharge relationship used to model attenuation upstream of the Stormceptor System is identified in the table below.

Storage ha-m	Discharge L/s
0.000	00.000
0.022	207.700
0.062	207.700

PARTICLE SIZE DISTRIBUTION

Particle Size Distribution

Removing fine particles from runoff ensures the majority of pollutants, such as heavy metals, hydrocarbons, free oils and nutrients are not discharged into natural water resources. The table below identifies the particle size distribution selected to define TSS removal for the design of the Stormceptor System.

Fine (organics, silts and sand)

Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s
20	20	1.3	0.0004					
60	20	1.8	0.0016					
150	20	2.2	0.0108					
400	20	2.65	0.0647					
2000	20	2.65	0.2870					

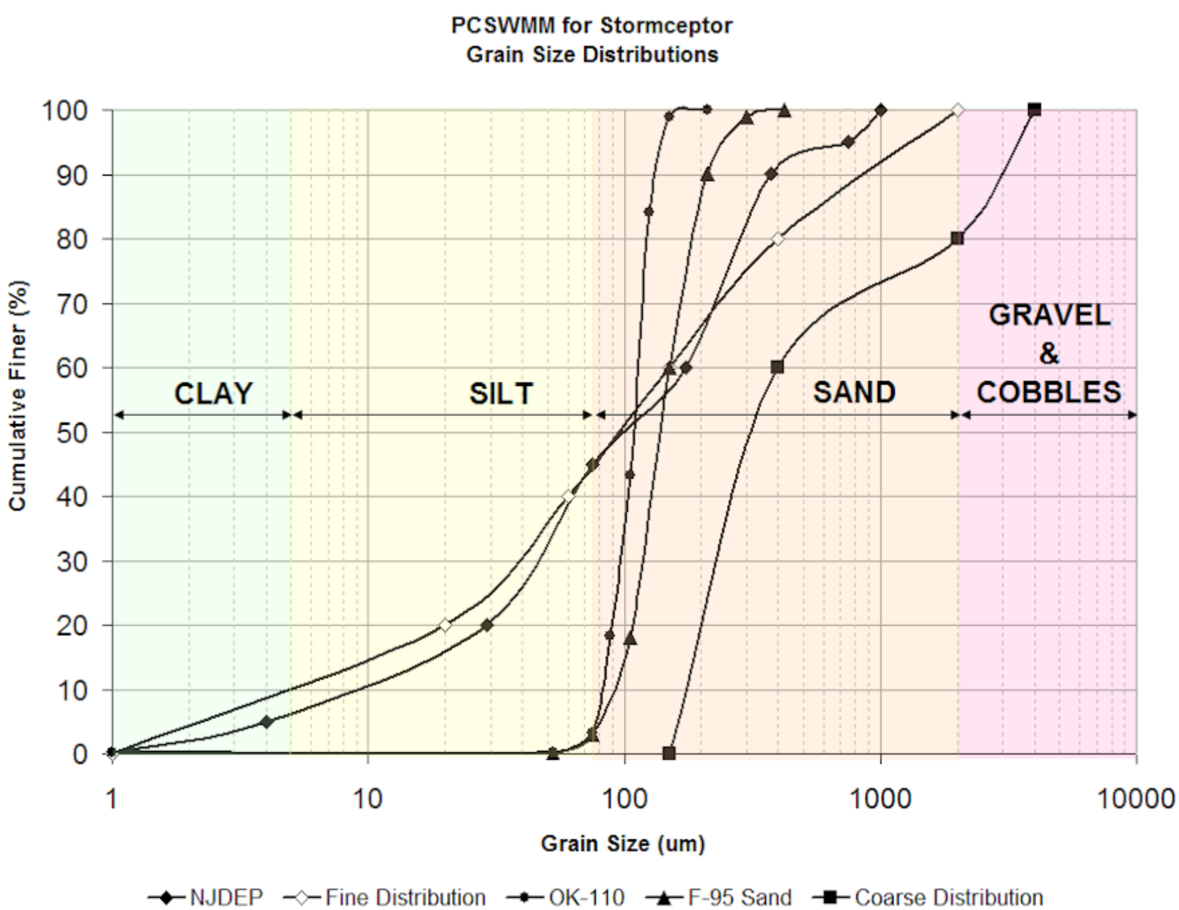

Figure 1. PCSWMM for Stormceptor standard design grain size distributions.

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TSS LOADING

TSS Loading Parameters

TSS Loading Function	Buildup / Washoff

Parameters

Target Event Mean Concentration (EMC) (mg/L)	125
Exponential Buildup Power	0.4
Exponential Washoff Exponential	0.2

HYDROLOGY ANALYSIS

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of the Stormceptor System are based on the average annual removal of TSS for the selected site parameters. The Stormceptor System is engineered to capture fine particles (silts and sands) by focusing on average annual runoff volume ensuring positive removal efficiency is maintained during all rainfall events, while preventing the opportunity for negative removal efficiency (scour).

Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

Rainfall Station	OTTAWA MACDONALD-CARTIER INT'L A		
Rainfall File Name	ON6000.NDC	Total Number of Events	4536
Latitude	45°19'N	Total Rainfall (mm)	20974.3
Longitude	75°40'W	Average Annual Rainfall (mm)	566.9
Elevation (m)	371	Total Evaporation (mm)	1799.5
Rainfall Period of Record (y)	37	Total Infiltration (mm)	2090.3
Total Rainfall Period (y)	37	Percentage of Rainfall that is Runoff (%)	81.9

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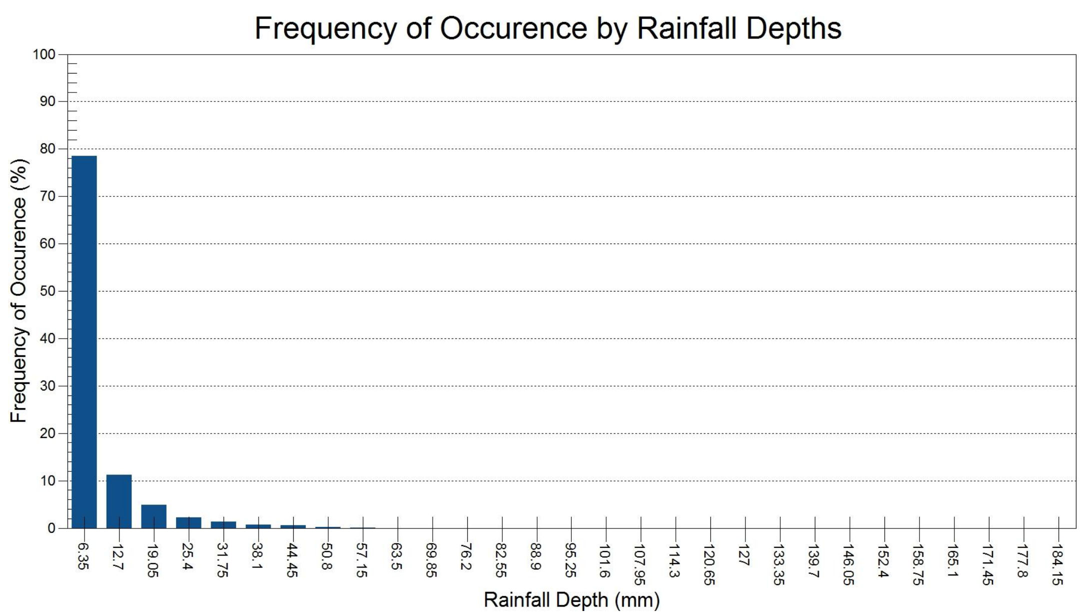
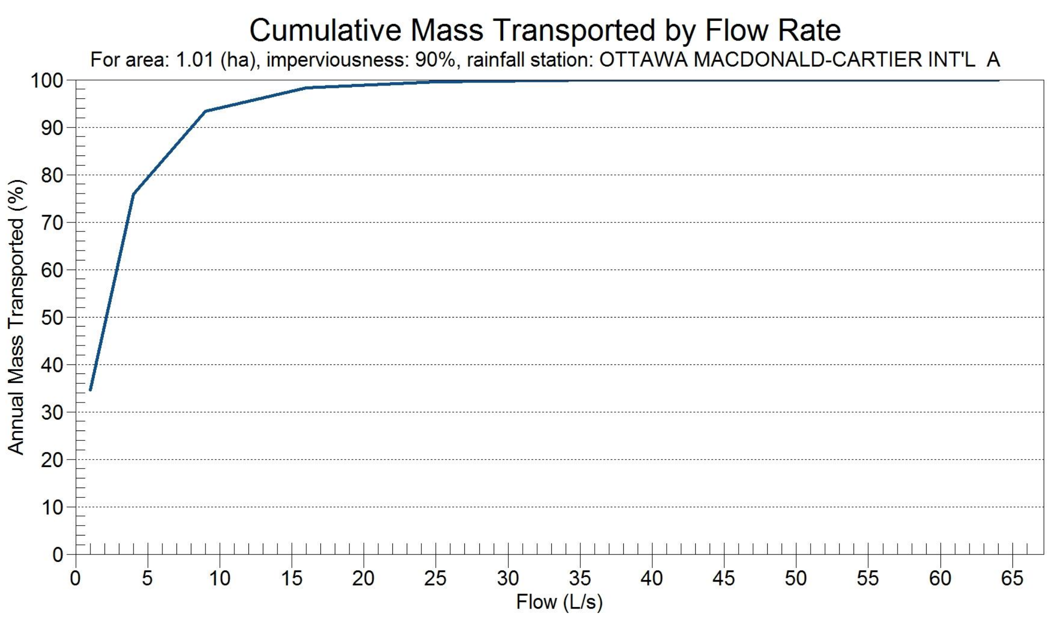
Rainfall Event Analysis

Rainfall Depth mm	No. of Events	Percentage of Total Events %	Total Volume mm	Percentage of Annual Volume %
6.35	3563	78.5	5667	27.0
12.70	508	11.2	4533	21.6
19.05	223	4.9	3434	16.4
25.40	102	2.2	2244	10.7
31.75	60	1.3	1704	8.1
38.10	33	0.7	1145	5.5
44.45	28	0.6	1165	5.6
50.80	9	0.2	416	2.0
57.15	5	0.1	272	1.3
63.50	1	0.0	63	0.3
69.85	1	0.0	64	0.3
76.20	1	0.0	76	0.4
82.55	0	0.0	0	0.0
88.90	1	0.0	84	0.4
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0
107.95	0	0.0	0	0.0
114.30	1	0.0	109	0.5
120.65	0	0.0	0	0.0
127.00	0	0.0	0	0.0
133.35	0	0.0	0	0.0
139.70	0	0.0	0	0.0
146.05	0	0.0	0	0.0
152.40	0	0.0	0	0.0
158.75	0	0.0	0	0.0
165.10	0	0.0	0	0.0
171.45	0	0.0	0	0.0
177.80	0	0.0	0	0.0
184.15	0	0.0	0	0.0
190.50	0	0.0	0	0.0
196.85	0	0.0	0	0.0
203.20	0	0.0	0	0.0
209.55	0	0.0	0	0.0
>209.55	0	0.0	0	0.0



Pollutograph

Flow Rate L/s	Cumulative Mass %
1	34.6
4	75.9
9	93.4
16	98.3
25	99.6
36	99.9
49	100.0
64	100.0
81	100.0
100	100.0
121	100.0
144	100.0
169	100.0
196	100.0
225	100.0
256	100.0
289	100.0
324	100.0
361	100.0
400	100.0
441	100.0
484	100.0
529	100.0
576	100.0
625	100.0
676	100.0
729	100.0
784	100.0
841	100.0
900	100.0



Appendix B–

Email-HGL Boundary Conditions from City of Ottawa

Fire Flow Design Sheet

Pressure Analysis Under Max Day + Fire Flow

Marc Alain Lafleur

From: Robertson, Syd <Syd.Robertson@ottawa.ca>
Sent: Monday, May 16, 2016 1:19 PM
To: Marc Alain Lafleur
Cc: Alam Ansari
Subject: FW: 3020 Hawthorne Rd Water Boundary Conditions
Attachments: Hawthorne Rd_3020 - Boundary Condions Location Plan.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Marc:

The following are boundary conditions, HGL, for hydraulic analysis at 3020 Hawthorne (zone 2C) assumed to be connected to the 406mm on Russell Rd (see attached PDF for location).

Minimum HGL = 121.8m

Maximum HGL = 132.7m

MaxDay (9.6 L/s) + FireFlow (80 L/s) = 125.0m

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.

Syd Robertson, C.E.T.
Project Manager, Infrastructure Approvals
Planning & Growth Management Department
Development Review Services Branch, Urban Services Unit
613-580-2424 ext: 27916

From: Marc Alain Lafleur [mailto:MarcAlain.Lafleur@exp.com]
Sent: May 09, 2016 10:40 AM
To: Robertson, Syd
Cc: Alam Ansari; Sheila Clarke
Subject: 3020 Hawthorne Rd Water Boundary Condition Request

Hi Syd,

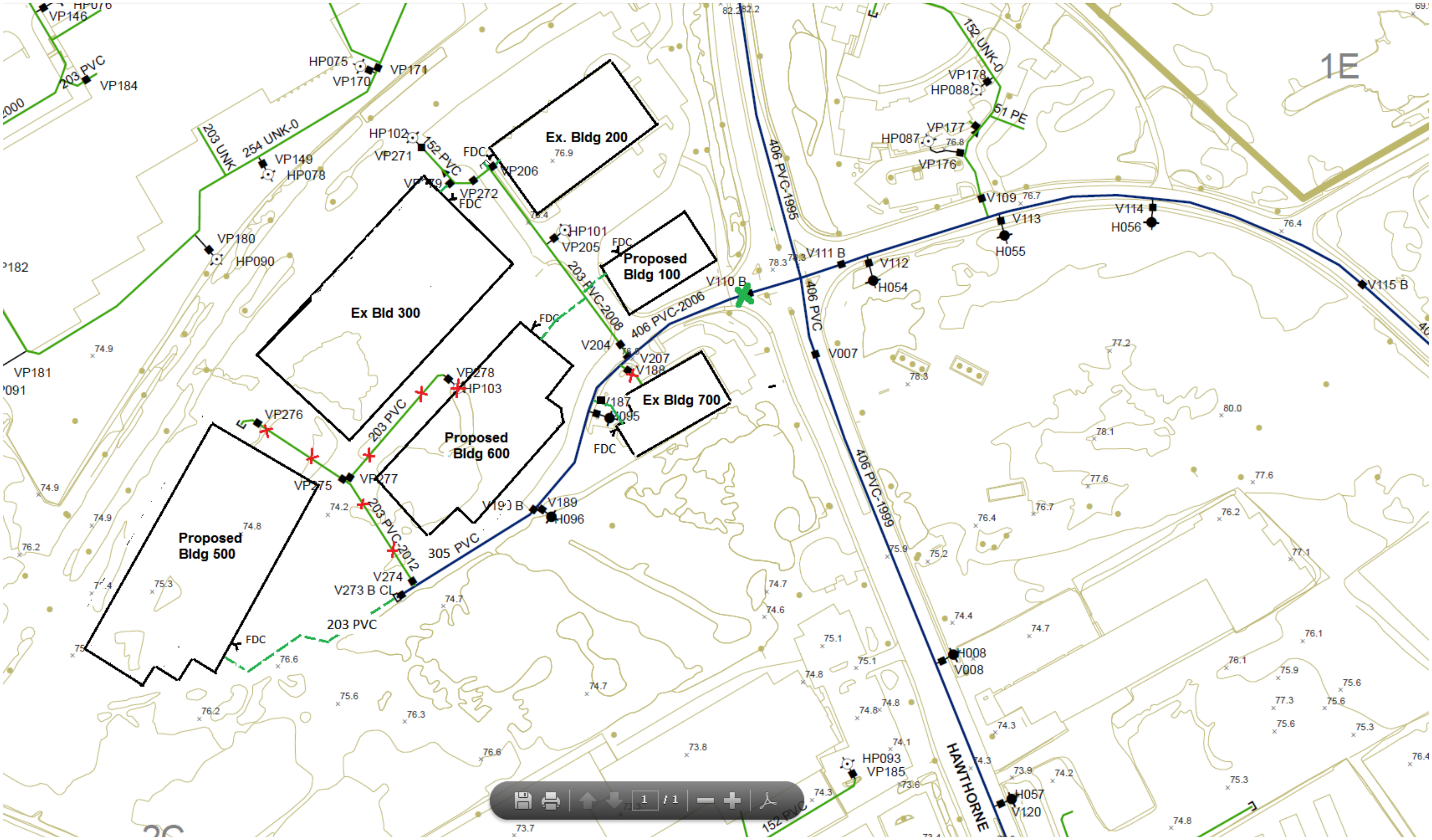
Please Provide updated boundary conditions along 3020 Hawthorne, given the following information:
Commercial Development - Hawthorne Business Park

- Amount of fire flow required: 80L/s
- Average Daily Demand: 4.6 L/s
- Maximum Daily Demand: 9.6 L/sec
- Maximum Hourly Daily Demand: 12.5 L/sec

Thank you,

Marc Alain Lafleur, M.Eng.
Civil Designer, Infrastructure
exp Services Inc.
t: +1.613.688.1899 x3298 **|** e: marcalain.lafleur@exp.com
100-2650 Queensview Drive
Ottawa, ON K2B 8H6
Canada

BOUNDARY CONDITONS FOR 3020 HAWTHORNE ROAD



Fire Flow Design Sheet
3020 Hawthorne
City of Ottawa
Project No. OTT-00224388

Date: 6-May-16

Building Design Assumptions - Non-Sprinklered, Non-Combustible

1. An estimate of the Fire Flow required for a given fire area may be estimated by: $F = 220\,C\sqrt{A}$

F = required fire flow in litres per minute
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, masonry or metal walls)
0.6 for fire-resistive construction (fully protected frame, floors, roof)
A = total floor area in square metres (including all storeys, but excluding basements at least 50% below grade)

A = 9430 m^2
C = 0.8
F = 17091.0 L/min

rounded off to 18,000 L/min (min value of 2000 L/min)

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

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

Reduction due to low occupancy hazard -15% x 18,000 = 15,300 L/min

3. The value obtained in 2. may be reduced by as much as 75% for buildings equipped with automatic sprinkler protection.

Non-combustible c/w Automatic Sprinkler System	-75%
Combustible c/w Automatic Sprinkler System	-50%
No Automatic Sprinkler System	0%

Reduction due to Sprinkler System -75% x 15,300 = 3,825 L/min

4. The value obtained in 3. may be increased for structures exposed within 45 metres by the fire area under consideration.

Separation	Charge
0 to 3 m	25%
3.1 to 10 m	20%
10.1 to 20 m	15%
20.1 to 30 m	10%
30.1 to 45 m	5%

Side 1	50	0%	north side
Side 2	15	15%	east side
Side 3	23	10%	south side
Side 4	50	0%	west side
		25%	(Total shall not exceed 75%)

Increase due to separation 25% x 3,825 = 4,781 L/min

The fire flow requirement is 4,800 L/min
or **80 L/sec**
or 1,268 gpm (us)
or 1,056 gpm (uk)

Based on method described in:
"Water Supply for Public Fire Protection - A Guide to Recommended Practice", 1991
by Fire Underwriters Survey

3020 Hawthorne Rd Building 500 600
Client: Controlex Realty Management
exp Project: Ott-00224388-A0
Date: May, 2016

Pressure check at Building 590 for Max Day + Fireflow
Max day(9.6L/s) + FireFlow(80L/s) HGL= 125.0m

Description	From	To	Flow (L/sec)	Pipe Dia (mm)	Dia (m)	Q (m^3/sec)	Area (m2)	C	Vel (m/s)	Slope of HGL (m/m)	Pipe Length (m)	Frictional Head Loss h_f (m)	Equivalent Pipe Length of Fittings (m)	Minor Loss of Fittings h_b (m)	Total Losses (m) $h_b + h_f$	Start Ground Elev(m)	End Ground Elev (m)	Static Head (m)	Pressure From kPa	(psi)	Pressure To kPa	(psi)	Pressure Drop (psi)
Max Day + Fire Flow	Main	406 to 305 Reducer	89.6	406	0.406	0.0896	0.129461782	125	0.6921	0.0013	181	0.234	24.0	0.031	0.264	78.00	74.90	3.10	460.0	(66.7)	487.8	(70.8)	-4.0
	406 to 305 Reducer	305 to 203 Reducer	89.6	305	0.305	0.0896	0.073061602	125	1.2264	0.0052	82	0.426	11.9	0.062	0.488	74.9	74.95	-0.05	487.8	(70.8)	482.5	(70.0)	0.8
	305 to 203 Reducer	Building 500	89.6	203	0.203	0.0896	0.032365446	125	2.7684	0.0377	125	4.717	14.0	0.529	5.245	75.0	76.1	-1.15	482.5	(70.0)	419.8	(60.9)	9.1

Resistance of Fittings and Valves for 406mm watermain

Fittings	Loss in Equiv. Length in Pipe Diameters	Equiv. Length (metres)	Quantity (each)	Total Equiv. Length (m)
22.5 Degree Elbow	8	3.25	3	9.744
11.25 Degree elbow	4	1.62	1	1.624
Gate Valve Full -Open	13	5.28	1	5.278
Reducer	18	7.31	1	7.308
		Total:	**6**	**23.954**

Resistance of Fittings and Valves for 305mm watermain

Fittings	Loss in Equiv. Length in Pipe Diameters	Equiv. Length (metres)	Quantity (each)	Total Equiv. Length (m)
11.25 Degree elbow	4	1.22	2	2.44
Gate Valve Full -Open	13	3.97	1	3.965
Reducer	18	5.49	1	5.49
		Total:	**4**	**11.895**

Resistance of Fittings and Valves for 203mm watermain

Fittings	Loss in Equiv. Length in Pipe Diameters	Equiv. Length (metres)	Quantity (each)	Total Equiv. Length (m)
22.5 Degree Elbow	8	1.62	1	1.624
45 Degree Elbow	16	3.25	3	9.744
Gate Valve Full -Open	13	2.64	1	2.639
		Total:	**5**	**14.007**

Appendix C-

Email-MOE Ottawa District Office District Engineer, Charles Goulet

Robertson, Syd

From: Goulet, Charles (ENE) [Charles.Goulet@ontario.ca]
Sent: January 8, 2013 2:14 PM
To: Cara Ruddle (cara.ruddle@exp.com)
Cc: Robertson, Syd
Subject: ECA application foe 3020 Hawthorne Road, City of Ottawa
Attachments: 3-0678-93-006.pdf

Good afternoon Cara,

Thanks for your e-mails of December 19, 2012 and January 2, 2013.

This e-mail will document the pre-application consultation process initiated around June of 2012 and concluded on Friday, January 4, 2013, for the sewage works to service Building 300 at 3020 Hawthorne Road.

Some drainage/stormwater reaching the site has been accumulating at the site (northeast of Building 300) because of ever evolving topographical and thus, drainage conditions. The majority of this drainage/stormwater seems to be generated within the contiguous railroad corridor. It is my understanding that the proponent proposes to convey such drainage/stormwater and some surface runoff generated at the 3020 Hawthorne Road property to the Mather Award Drain via a new swale/ditch running parallel to the north boundary of the property of concern. In doing so, a new outlet to the said Drain would need to be established. The Ottawa District Office supports the said approach and does not object to the establishment of the swale/ditch and new outlet to the Mather Award Drain.

It is my understanding that other sewage works have been established over the years however, each and every time a new connection was made between the stormwater management system servicing each development phase and the storm sewer established across the site in the 1990's and discharging to the Mather Award Drain at an outlet location approved pursuant to the attached ECA no. 3-0678-93-006. Furthermore, it is my understanding that all of the buildings have been so far for uses other than industrial land use, as per the definition provided in O. Reg. 525/98 (available at http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_980525_e.htm at the time of writing).

With the context described above, it would be my understanding that the sewage works involved with the management of the drainage/stormwater generated in the railroad corridor would be the only works needing approval under Section 53 of the Ontario Water Resources Act.

You may use this e-mail as a record of pre-application consultation. It would be much appreciated that you include a copy of the comments received from RVCA (Rideau Valley Conservation Authority) and how they were addressed.

Should you have any questions, please feel free to contact me again.

Regards,
Charles Goulet, P. Eng.
District Engineer
MOE Ottawa District Office
2430 Don Reid Drive
Ottawa ON
K1H 1E1

DL 613.521.3450 ext. 246
TF 800.860.2195 ext. 246
F 613.521.5437

and Energy et de l'Énergie

To the Applicant:

The City of Ottawa
1600 Scott Street
Ottawa, Ontario
K1Y 4N7

The Applicant has applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

storm and sanitary sewers and appurtenances to be constructed in Lot 1, Concession 5, Rideau Front, R.P. 5R-250 in the City of Ottawa, as follows:

Storm and Sanitary Sewers

Street	From	To
Street "A"	Hawthorne Rd. Extension	Cul-de-sac
Easement	Street "A" (Cul-de-Sac)	Approx. 185.5m west of Street "A" (Cul-de-Sac)

Storm Sewers

Street "A"	Hawthorne Rd. Extension	Approx. 46.5m east of Hawthorne Rd. Extension

Sanitary Sewers

Street "A"	Hawthorne Rd. Extension	Approx. 39m east of Hawthorne Rd. Extension

including stub sewer connections and building sewers from the main sewer to the street line, all in accordance with Plan No. 2616, revised to March 4, 1993 prepared by UMA Engineering Limited, Consulting Engineers.

The Applicant is hereby notified that this approval is issued subject to the following terms and conditions outlined below:

TERMS AND CONDITIONS

The requirements of this certificate are imposed pursuant to section 53 of the Ontario Water Resources Act. The issuance of this certificate in no way abroages the owner's legal obligations to take all reasonable steps to avoid violating other applicable provisions of this legislation and other legislation and regulations.

The reasons for the imposition of these terms and conditions are as follows:

This Condition is included to emphasize that the issuance of the certificate does not diminish any other statutory and regulatory obligations to which the owner is subject in the construction, maintenance and operation of the works.

The Applicant may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40. provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which the Applicant intends to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the sewage works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary,
Environmental Appeal Board,
112 St. Clair Avenue West,
Suite 502,
Toronto, Ontario.
M4V 1N3

AND

The Director,
Section 53, Ontario Water Resources Act,
Ministry of Environment and Energy,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 22nd *day of* June 1993

W. Gregson, P. Eng.
Director
Section 53
Ontario Water Resources Act

VVA/nr
Attn: -Mr. J.R. Cyr, Clerk, City of Ottawa
cc: -Ms. M.J. Woollam, Clerk, R.M. of Ottawa-Carleton
-Mr. R. Dunn, MOEE, Ottawa District Officer
-Mr. Lance Erion, P. Eng., UMA Engineering Ltd., Consulting Engineers

and Energy et de l'Énergie

APPROVALS BRANCH
3rd Floor
Tel. No. (416) 440-3722
Fax. No. (416) 440-6973

June 22, 1993

The City of Ottawa
1600 Scott Street
Ottawa, Ontario
K1Y 4N7

Dear Mr. Howe:

RE: Certificate of Approval
MOE File No. 3-0678-93-006

Dear Sirs:

Enclosed herewith is the Ministry's Certificate of Approval No. 3-0678-93-006 for the construction of sewers and appurtenances in the City of Ottawa.

In granting final approval, it is our understanding that no final street names have been determined at this time. Please advise us of the final names when they are available in order for us to amend our record.

Copies of this advisory letter and the attached Certificate are being forwarded to the persons indicated.

Yours truly,

W. Gregson, P. Eng.
Manager
Municipal Approvals Section

VVA/nr
Enclosure

Attn: -Mr. J.R. Cyr, Clerk, City of Ottawa
cc: -Ms. M.J. Woollam, Clerk, R.M. of Ottawa-Carleton
-Mr. R. Dunn, MOEE, Ottawa District Officer
-Mr. Lance Erion, P. Eng., UMA Engineering Ltd., Consulting Engineers