Commercial Development,
GTA Dispatch Services,
473 Hesall Circle, Mississauga,
ON

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

prepared for:

Peter Deman

prepared by:

MGM Consulting Inc.
400 Bronte Street South
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File No. 2018-008

May 06, 2019

1. Purpose of Report

MGM Consulting Inc. has been retained by Peter Deman. to prepare a Functional Servicing Report to support a rezoning application for the construction of a parking lot expansion located at 473 Hensall Circle in the City of Mississauga. The overall subject parcel is approximately 0.43 ha currently owned by GTA Dispatch Services. Two existing buildings south of the site were historically part of the subject development area.

The legal description of the subject lands is Part of Lot 12, Concession 1, North of Dundas Street, City of Mississauga, in the Regional Municipality of Peel.

2. Existing Conditions

The overall subject property is approximately 0.43 ha in area and is located on the north side of Hensall Circle. The subject site currently includes an existing building with surrounding asphalt parking and two vehicular entrances access off of Hensall Circle to the east. The west portion of the existing building has a finished floor elevation of 118.55 m. while the east portion has a finished floor elevation of 118.92 m. Abutting developments include residential areas to the west and a commercial area to the south.

Topographically, the site is currently lower than neighboring properties. The existing internal storm system onsite currently captures the internal drainage from the site and from the neighboring properties with storm flows conveyed to the 600mm municipal storm sewer on Hensall Circle via an existing 300mm storm service connection. The existing drainage areas are indicated in **Figure No 1.**

3. Proposed Site Development

The current proposal includes for a paved westerly expansion of the existing parking lot. The two existing buildings are proposed to remain as part of the site redevelopment. The proposed site grading and internal storm sewer system is intended to mitigate existing flooding issue on site while addressing onsite storm water management in accordance with City of Mississauga and Conservation Authority requirements. The vehicular access to the site is proposed to be constructed as per OPSD 350.010.

The proposed drainage areas are indicated in **Figure No 2.**

4. Proposed Site Grading

The proposed site grading will take into consideration the existing topography, perimeter elevations, and be completed as required to provide safe vehicular and pedestrian movements and access within the site, as required to convey storm flows to proposed drainage features (catchbasins and catchbasin manholes), as required to provide sufficient

frost cover on storm servicing, and safely convey major storm flows from the site to the Hensall Circle right of way.

A retaining wall is proposed along the south side of the west portion of the existing building as required to protect the building from flooding during major storm events. The minimum top of wall elevation has been set 300 mm above the maximum ponding elevation within the site as described in Section 5 of this report.

Proposed grading within the site is indicated on the Site Grading Plan, Drawing No. CV-1

5. Stormwater Management

City of Mississauga requirements specific to the subject site are to control post development flows during the 2 and 100-year storm events to at or below 2 year predevelopment peak flow rate with runoff coefficient of 0.5.

5.1 Peak Rate and Quantity Controls

The site was modelled using the Modified Rational Method which is appropriate for small site development analyses. The modified Rational Method generates a triangular hydrograph with the peak of the triangle being the peak flow. Required storage volumes during each time step are then approximated as the difference between the total attenuated flow and the allowable controlled flow times the time difference. The estimated time to concentration used for the subject site is 15 minutes which is consistent with City of Mississauga standards.

Rate controls have been provided with the installation of a 105mm diameter orifice plate installed on the downstream side of control manhole (CBMH5) and upstream of oil/grit separator. The 105mm diameter orifice plate will ontrol the post development flows during the 2 and 100-year storm events to 0.0337 m3/sec and 0.0531 m^3/sec respectively, which are below the allowable 2 year flow rate of 0.0540 m^3/sec by City of Mississauga Design Criteria.

As indicated in the calculations provided in Appendix A, The maximum detention volume required when the 2 year to 100yr post development flow is controlled to the allowable flow is 53.9 m^3 and 160.5 m^3 respectively, which have been provided for within onsite underground storm system and surface ponding. The maximum depth of ponding that will occur is 250 mm within the proposed paved area prior to flowing into Hensall Circle.

During severe storm events when an outlet is blocked, emergency overland flow will occur from the site at an elevation of 118.75 m. through adjacent property (469 Hensall Circle) to the Hensall Circle right of way consistent with the existing overland flow

drainage pattern. The overflow elevation provided is approximately 170 mm below the proposed finished floor elevation of the existing building.

Detailed Stormwater Management Calculations are included in Appendix A.

5.2 Stormwater Quality Controls

The current stormwater quality control objective is to provide an "enhanced" level of treatment which is equivalent to removing 80% of the total suspended solids from the site runoff on an annual loading basis.

Water quality treatment is proposed with the installation of an OSR300 treatment unit, designed to remove an estimated 81% of the total suspended solids (TSS) during 95% of the average annual rainfall events.

Modeling for a proposed OGS treatment unit is included in **Appendix C**. The proposed treatment unit is to be installed downstream of control orifice location.

5.3 Water Balance

Water balance requirements are to retain a minimum of 5mm of water on-site through infiltration, evapotranspiration, or re-use, over the site area. On-site retention of 23.2 m^3 translates to an average of 5.4mm of water over the entire site which satisfies both the erosion control and water balance objectives. Detail water balance calculations are provided in **Appendix A.**

5.4 Erosion & Sediment Control during Construction

In 2006, The Greater Golden Horseshoe Area Conservation Authorities prepared a guideline entitled "Erosion & Sediment Control Guideline for Urban Construction". Based on the guideline, all projects involving the removal of topsoil or site alteration requires an ESC (Erosion and Sediment Control) Plan in place prior to commencing construction. Failure to adhere to the plan could lead to the potential for prosecution under the various pieces of environmental legislation.

The following principles assist in creating an effective ESC Plan.
(Ref. Erosion and Sediment Control Guidelines for Urban Construction)

- Adopt a multi-barrier approach to provide erosion and sediment control through erosion controls first.
- Retain existing ground cover and stabilize exposed soils with vegetation where possible.
- Limit the duration of soil exposure and phase construction where possible.
- Limit the size of disturbed areas by minimizing nonessential clearing and grading.

- Minimize slope length and gradient of disturbed areas.
- Maintain overland sheet flow and avoid concentrated flows.
- Store/stockpile soil away (e.g. greater than 15 meters) from watercourses, drainage features and top of steep slopes.
- Ensure contractors and all involved in the ESC practices are trained in ESC Plan, implementation, inspections, maintenance, and repairs.
- Adjust ESC Plan at construction site to adapt to site features.
- Assess all ESC practices before and after all rainfall and significant snowmelt events.

The guideline stresses that prevention of erosion is the preferred mitigation measure for reducing the potential for sedimentation.

Erosion and sediment control measures can be categorized as Erosion prevention controls and Sediment controls.

Erosion controls include minimizing the reduction in vegetative ground cover or immediate stabilization of disturbed areas by top soiling, seeding, sodding, mulching, erosion control blankets, etc.

Sediment Controls are further broken down into Perimeter Controls, Settling Controls and Filtration Controls. Some major perimeter controls include silt fences, cut-off swales and mud-mats. Settling controls reduce run-off velocity allowing the soil particles to settle out. Settling controls include sediment traps, rock check dams, straw bales and sediment control ponds. Filtration controls are achieved by filtering silt laden water through the use of a filer media such as a geotextile or sand. Filtration controls include storm inlet filter cloths, sediment bags and filter rings.

5.5 Stormwater Credit Assessment

Stormwater Charge Credit Application Guidance Manual by City of Mississauga set out a maximum of 50% credit can be achieved by a property owner or operator. Based on storm water management calculations provided in Appendix A, the post-development flow rate has been controlled to below the predevelopment flow rate, and as such, the full credit of 40% is applicable. Based on the manufacturer's modelling software, the proposed on-site treatment unit will remove an estimated 81% of total suspended solids from development area, and as such, the full credit (10%) for water quality treatment is applicable. Infiltration storage equating to 17.8m^3 has been provided within the proposed infiltration feature, which equates to 5mm over the impervious areas and as such the 5% credit is applicable.

6. Proposed Sanitary Servicing

As per the Region of Peel sanitary servicing requirements, all wastewater mains are to be

designed in accordance with their Design Criteria Manual.

Based on the Region's Std. 2-5-2, Sewage Flows (Excluding Infiltration), the minimum flow for new developments is based on a population of 1000 people and a flow rate of 13.0 L/s.

The infiltration component of the overall flow is 0.2 L/sec/ha.

Based on the above, the maximum sanitary flow generated by the development will be 13.1 L/s.

Sanitary servicing for the site will include a proposed 150 mm sanitary sewer at 1.0% slope, outletting to the existing sanitary sewer manhole on Hensall Circle right of way. The proposed sanitary sewer provides a capacity of 15 L/s, without surcharging.

Detail calculations of wastewater discharge are provided in **Appendix D**

7. Proposed Water Servicing

As per the Region of Peel's water servicing requirements, the proposed development requires a water distribution system designed to meet the greater of the following demands:

a. Maximum Daily Demand plus Fire Flow
b. Maximum Hourly Demand

The Region of Peel Water Demand for ICI developments are as follows:

Unit	Avg. Consumption	Max Day Factor	Peak Hour Factor
L/employee	300	1.4	3.0

The anticipated occupancy load is 48 persons.

The Region of Peel requires that the Fire Flow demand requirement be calculated in accordance with the Water Supply for Public Fire Protection Guidelines by the Fire Underwriters Survey. Given the size of the existing building, adequate fire flow and pressure as required for fire protection is not anticipated to be an issue. A pressure and flow test on the hydrant in close proximity to the subject property will be provided if required

Based on the water demand calculations included in **Appendix B**, the water demand for the site will be governed by Maximum day plus fire flow.

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A 150mm watermain is proposed to service the subject property. The proposed fire hydrant within the site will provide fire protection in accordance with OBC requirements.

Preliminary fire flow calculations are included in **Appendix B**.

8. Conclusions and Recommendations

Based on the preceding analyses, the proposed grading and site servicing will safely convey minor and major storm flows from the site, provide the required on site storage and peak rate controls as required to achieve SWM objectives, provide the required stormwater quality treatment, provide the required domestic water supply and fire protection, and adequate sanitary servicing discharging to the existing 300 mm sanitary sewer on Hensall Circle.

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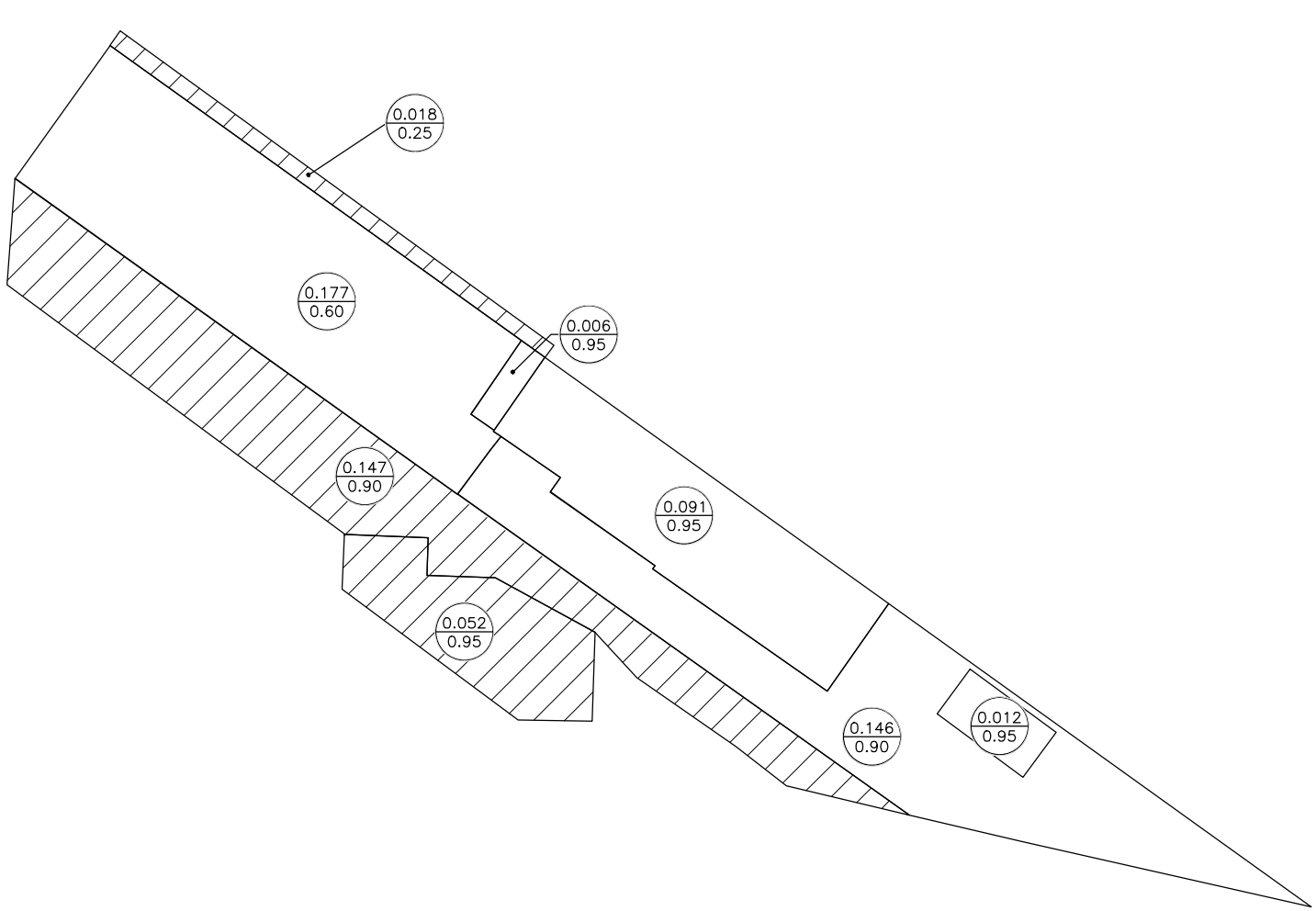
Calvin Dang, B.Eng

M.L.Stairs, P. Eng



MOTOR SERVICES
473 HENSALL CIRCLE, MISSISSAUGA, ON

EXISTING SITE DRAINAGE AREAS

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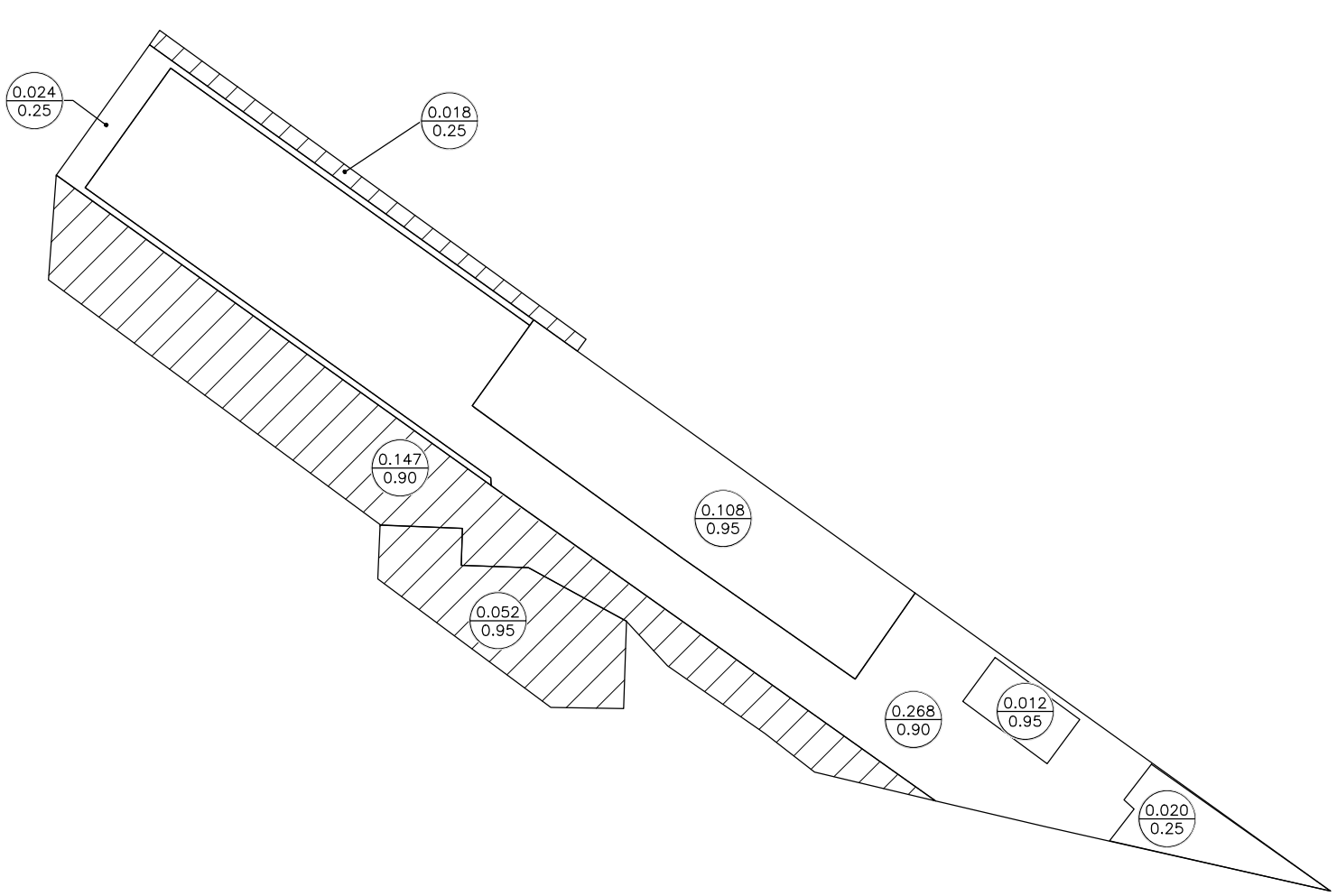
FIGURE #1

DATE: 2019-04-10
SCALE: 1:1000
DWG#2018-008-C2



MOTOR SERVICES
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PROPOSED SITE DRAINAGE AREAS

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FIGURE #2

DATE: 2019-04-10
SCALE: 1:1000
DWG#2018-008-C2

APPENDIX A

STORMWATER MANAGEMENT CALCULATIONS

473 HENSALL CIRCLE, MISSISSAUGA, ON

STORMWATER MANAGEMENT CALCULATIONS

1.0 DRAINAGE CHARACTERISTICS

1.1 Existing Drainage Areas (see Figure No. 1):

		"c"	Area (ha)
Attenuated Areas			
	Asphalt	0.90	0.146
	Gravel	0.60	0.177
	Roof/Concrete	0.95	0.109
External-Attenuated Areas:			
	Landscaped Area	0.25	0.018
	Asphalt	0.90	0.147
	Roof/Concrete	0.95	0.052
	Subtotal Total Area		**0.432**
	Weighted Average "c"		**0.79**
	Subtotal Area +External		**0.649**
	Weighted Average "c"		**0.81**

1.2 Proposed Drainage Areas (see Figure No. 2)

		"c"	Area (ha)
Attenuated Areas:			
	Landscaped Area	0.25	0.044
	Asphalt	0.90	0.268
	Roof/Concrete	0.95	0.120
Unattenuated Areas:			
	Roof/Concrete	0.95	0.000
	Asphalt	0.90	0.000
External-Attenuated Areas:			
	Landscaped Area	0.25	0.018
	Asphalt	0.90	0.147
	Roof/Concrete	0.95	0.052
	Subtotal Total Area		**0.432**
	Weighted Average "c"		**0.85**
	Subtotal Area+External		**0.649**
	Weighted Average "c"		**0.85**

2.0 Allowable Post Development Flows

Peak flows are to be controlled to pre-development flow rates for the 2 to 100 year storm events.
Based on Tc = 15 minutes

Flow "Q" - cIA/360, where c = 0.50 (Runoff Coefficient as per City of Mississauga Design Criteria)

Storm Event	Intensity* (mm/hr)	Allowable Flow (cms)
2 year	59.9	0.0540

* Rainfall intensities are as provided by the City of Mississauga

3.0 On-Site Storage Required

3.1 2 Year Storage Calculation

Rainfall Duration min.	s	2 Year Rainfall Intensity (I) mm/h	Attenuated Flow From Site m^3/s	Unattenuated Flow From Site m^3/s	Controlled Flow From Site* m^3/s	Aprox. Detention Volumes m^3
15	**900**	**59.9**	**0.0919**	**0.0000**	**0.0337**	**52.4**
20	1200	50.2	0.0770	0.0000	0.0337	51.9
25	1500	43.4	0.0666	0.0000	0.0337	49.4
30	1800	38.4	0.0590	0.0000	0.0337	45.5
35	2100	34.6	0.0531	0.0000	0.0337	40.8
40	2400	31.5	0.0484	0.0000	0.0337	35.3

A maximum detention volume required when the 2 year post development flow is controlled to the 2 year predevelopment flow **52.4** **cu.m**

3.2 5 Year Storage Calculation

Rainfall Duration min.	s	5 Year Rainfall Intensity (I) mm/h	Attenuated Flow From Site m^3/s	Unattenuated Flow From Site m^3/s	Controlled Flow From Site* m^3/s	Aprox. Detention Volumes m^3
15	**900**	**80.5**	**0.1235**	**0.0000**	**0.0455**	**70.2**
20	1200	67.4	0.1035	0.0000	0.0455	69.5
25	1500	58.4	0.0896	0.0000	0.0455	66.0
30	1800	51.7	0.0793	0.0000	0.0455	60.8
35	2100	46.5	0.0714	0.0000	0.0455	54.2
40	2400	42.4	0.0651	0.0000	0.0455	46.8

A maximum detention volume required when the 5 year post development flow is controlled to the 5 year predevelopment flow **70.2** **cu.m**

3.3 10 Year Storage Calculation

Rainfall Duration min.	s	10 Year Rainfall Intensity (I) mm/h	Attenuated Flow From Site m^3/s	Unattenuated Flow From Site m^3/s	Controlled Flow From Site* m^3/s	Aprox. Detention Volumes m^3
15	900	99.2	0.1522	0.0000	0.0512	90.9
20	**1200**	**83.1**	**0.1275**	**0.0000**	**0.0512**	**91.5**
25	1500	71.9	0.1103	0.0000	0.0512	88.7
30	1800	63.7	0.0977	0.0000	0.0512	83.7
35	2100	57.3	0.0879	0.0000	0.0512	77.2
40	2400	52.2	0.0801	0.0000	0.0512	69.5
45	2700	48.1	0.0738	0.0000	0.0512	61.0

A maximum detention volume required when the 10 year post development flow is controlled to the 10 year predevelopment flow **91.5** **cu.m**

3.4 25 Year Storage Calculation

Rainfall Duration min.	s	25 Year Rainfall Intensity (I) mm/h	Attenuated Flow From Site m^3/s	Unattenuated Flow From Site m^3/s	Controlled Flow From Site* m^3/s	Aprox. Detention Volumes m^3
15	900	113.9	0.1748	0.0000	0.0521	110.4
20	**1200**	**95.4**	**0.1464**	**0.0000**	**0.0521**	**113.1**
25	1500	82.6	0.1267	0.0000	0.0521	111.9
30	1800	73.1	0.1122	0.0000	0.0521	108.1
35	2100	65.8	0.1010	0.0000	0.0521	102.6

A maximum detention volume required when the 25 year post development flow is controlled to the 25 year predevelopment flow **113.1** **cu.m**

3.5 50 Year Storage Calculation

Rainfall Duration min.	s	50 Year Rainfall Intensity (I) mm/h	Attenuated Flow From Site m^3/s	Unattenuated Flow From Site m^3/s	Controlled Flow From Site* m^3/s	Aprox. Detention Volumes m^3
15	900	127.1	0.1951	0.0000	0.0526	128.2
20	1200	106.6	0.1635	0.0000	0.0526	133.1
25	**1500**	**92.3**	**0.1416**	**0.0000**	**0.0526**	**133.5**
30	1800	81.7	0.1254	0.0000	0.0526	131.1
35	2100	73.6	0.1129	0.0000	0.0526	126.7

A maximum detention volume required when the 50 year post development flow is controlled to the 50 year predevelopment flow **133.5** **cu.m**

3.6 100 Year Storage Calculation

Rainfall Duration min.	s	100 Year Rainfall Intensity (I) mm/h	Attenuated Flow From Site m^3/s	Unattenuated Flow From Site m^3/s	Controlled Flow From Site* m^3/s	Aprox. Detention Volumes m^3
15	900	140.7	0.2159	0.0000	0.0531	146.5
20	1200	118.1	0.1813	0.0000	0.0531	153.8
25	**1500**	**102.4**	**0.1571**	**0.0000**	**0.0531**	**156.1**
30	1800	90.8	0.1393	0.0000	0.0531	155.2
35	2100	81.8	0.1255	0.0000	0.0531	152.0
40	2400	74.6	0.1144	0.0000	0.0531	147.3

A maximum detention volume required when the 100 year post development flow is controlled to the 100 year predevelopment flow **156.1** **cu.m.**

4.0 Orifice Calculation

A 105mm orifice plate is proposed on the downstream side of CBMH5 to control post development flows:

Orifice Equation: Q = CA*(2gh)^1/2

Orifice diameter =	105	mm.
A = cross sectional area of orifice =	0.00866	sq,m.
g = gravitational acceleration	9.81	m/sec^2
c = entrance loss coefficient	0.82	
Orif. plate invert elev =	115.85	
Orif. plate centreline elev =	115.90	m.

4.1 Two Year Controlled Flow Calculations

2 Year Ponding Elev. 117.05
head = "h" = 1.148
Controlled Flow "Q" = 0.0337
and the total flow from the site during the 2 year storm event (attenuated + unattenuated) = 0.0337 cms

4.2 Five Year Controlled Flow Calculations

5 Year Ponding Elev. 118.00
head = "h" = 2.098
Controlled Flow "Q" = 0.0455
and the total flow from the site during the 5 year storm event (attenuated + unattenuated) = 0.0455 cms

4.3 Ten Year Controlled Flow Calculations

10 Year Ponding Elev. 118.55
head = "h" = 2.648
Controlled Flow "Q" = 0.0512
and the total flow from the site during the 10 year storm event (attenuated + unattenuated) = 0.0512 cms

4.4 Twenty Five Year Controlled Flow Calculations

25 Year Ponding Elev. 118.65
head = "h" = 2.748
Controlled Flow "Q" = 0.0521
and the total flow from the site during the 25 year storm event (attenuated + unattenuated) = 0.0521 cms

4.5 Fifty Year Controlled Flow Calculations

50 Year Ponding Elev. 118.70
head = "h" = 2.798
Controlled Flow "Q" = 0.0526
and the total flow from the site during the 50 year storm event (attenuated + unattenuated) = 0.0526 cms

4.6 One Hundred Year Controlled Flow Calculations

100 Year Ponding Elev. 118.75
head = "h" = 2.848
Controlled Flow "Q" = 0.0531
and the total flow from the site during the 100 year storm event (attenuated + unattenuated) = 0.0531 cms

5.0 On-site Storage Provided

5.1 Storm Sewer Storage

The detention volume available within the storm sewer pipes is as follows:

From	To	Size	Length	Vol. (cu.m.)	
CB1	CBMH2	450	21.6	3.4	
CBMH2	MH3	450	13.5	2.1	
OGS1	CBMH4	600	30.9	8.7	
CBMH4	CBMH5	600	40.9	11.6	
Structure(CB)		600	1.9	1.1	
Structure(MH)		1200	9.6	10.8	
Total Sewer Storage				**37.9**	**cu.m**

5.2 Undergrround Storage Volume

Undergrround Storage is proposed with a series of stormtech chambers, as follows:

Stormtech Chamber Model - MC 3500
Maximum length = 14.5 m
Maximum width = 4.7 m
Number of chambers = 11
Total volume in chamber = **60** **cu.m**

5.3 Maximum Surface Ponding Storage

LOCATION	GRATE ELEVATION	PONDING ELEVATION	PONDING DEPTH	PONDING AREA m^2	VOLUME m^3
CB1	118.51	118.75	0.24	160	12.8
CBMH2	118.50	118.75	0.25	322	26.8
CBMH4	118.50	118.75	0.25	243	20.3
CBMH5	118.58	118.75	0.17	166	9.4

Total 100 Year Surface Ponding **69.3** **cu.m**

Total 2, 5 & 10 year site storage in pipe and surface ponding= **97.9** **cu.m**
Total 100 year site storage in pipe and surface ponding= **167.2** **cu.m**

9.0 Water Balance Calculation

The required water balance volume over site area =			**21.6**	**cu.m**
The water balance provided is as follows:				
	Area (m^2)	Initial Abstraction (mm)	Volume (m^3)	
Water balance provided within asphalt and roof	3880	1	3.88	m^3
Water balance provided within soft landscaping	440	5	2.2	m^3
Water balance provided under Inflitration Trench				
Infiltration Pit Dimension = 11.0x4.0x1.0	m			
	Length (m)	Width (m)	Storage (cu.m.)	
1.0 m depth clear stone	11	4	17.6	
150mm Pipe Storage	10.4		0.18	
Provided Storage in infiltration pit=			17.8	m^3
Total Storage			23.9	m^3
Equivalent depth over the site area =			**5.5**	mm.

MGM CONSULTING Inc.
STORM SEWER DESIGN SHEET

MOTOR SERVICING REZONING
473 HENSALL CIRCLE, MISSISSAUGA

By: Chenchen Shi
Date: June 13, 2018

Location				Areas		A * C			Rainfall		Flow	Sewer Design					
Manhole from		Manhole to		Area ha	Cumulative Area ha	Coefficient C	Incremental A * C	Cumulative A * C	Time min	Intensity I 10 mm/hr.	Q cms	Pipe Size mm.	Slope %	Max. Flow Q max cms	Max Velocity V max m./sec.	Length m.	Time in Section min.
CB1		CBMH2		0.164	0.164	0.78	0.128	0.128	10.0	124.8	0.044	450	0.5	0.202	1.27	21.6	0.28
CBMH2		MH3		0.129	0.293	0.82	0.105	0.234	10.3	122.9	0.080	450	0.5	0.202	1.27	13.5	0.18
MH3		CBMH4			0.293			0.234	10.5	121.8	0.079	600	0.5	0.435	1.54	30.9	0.33
CBMH4		CBMH5		0.180	0.473	0.93	0.168	0.401	10.8	119.7	0.134	600	0.5	0.435	1.54	40.9	0.44
CBMH5		OGS		0.149	0.622	0.91	0.135	0.536	11.2	117.1	0.175	300	0.5	0.068	0.97	4.1	0.07
OGS		MH6			Control down to 0.0455 cms by 105mm orifice plate							300	0.5	0.068	0.97	3.2	0.06
MH6		EX. MH										300	0.5	0.068	0.97	11.6	0.20

n= 0.013

APPENDIX B

FIRE FLOW & WATER DEMAND CALCULATION

473 HENSALL CIR, Mississauga- Fire Flow Calculation

The FUS requires that a minimum water supply source 'F' be provided at 140 kPa
The min flow 'F' can be calculated as such:

$F=220C\sqrt{A}$
where:
F- Required fire flow in L/min
C- Coefficient related to construction
A- Total area in sq.m

C = 1 (Ordinary Construction)

For non-combustible construction, the area shall be a total of all floors (excluding basements at least 50 percent below grade) in the building being considered.

A = 1030 sq.m

Therefore,

F= 7060.59 L/min
= 7000.00 L/min (rounded to nearest 1000)

Modified Flow

F'=F*(1-f1)*(1-f2+f3)

where:
f1- Occupancy factor reduction
High hazard occupancy, f1 = 25%

f2- Sprinkler protection factor reduction
Based on fully automated sprinkler system, maximum reduction = 0%

where:
f3- Exposure factor addition
Exposure factor is not to exceed 75%
Separation between subject building and other structures, and associated charges are as follows:

	Distance (m)	Charge
North Side	Parking Lot	0%
South Side	Road	0%
East Side	Railway	0%

West Side	Building 13m	15%
Total		**15%**

The total increase for exposures is 15%

The resulting required minimum modified flow, F' = **10062.5** l/min

Therefore a minimum flow of approximately **10000** L/min must be available at the nearest hydrant with a minimum pressure of 140 kPa.

Note: This fireflow calculation has been prepared as a guide only. Confirmation should be obtained from a Fire Protection professional for confirmation

473 Hensall Circle- Mississauga

WATER CONNECTION

Connection Point – Hydrant at Southwest side of the building				
Pressure Zone of Connection Point- Pressure Zone				
	Office (SP)			
Total equivalent population to be serviced	48	persons	1.1 persons/100m2	
Total Lands to be Serviced (ha)	0.432			
Hydrant Flow Test Location				
	Hydrant Flow Test Location			
		Pressure (kPa)	Time	
Minimum water pressure		N/A		
Maximum water pressure		N/A		

	Water Demands			
	Demand type	Demand (units)		
No.		Use 1	Use 2	Total
1	Average day flow (l/s)	0.17	0	0.17
2	Maximum day flow (l/s)	0.23	0	0.23
3	Peak hour flow (l/s)	0.50	0	0.50
4	Fire Flow (l/s)	166.67	0	166.67
Analysis				
5	Maximum day plus fire flow			166.90
6	Peak hour flow			0.50
7	Maximum demand flow			166.90

Note: Fire flow calculated based on current proposed building on the site.

WASTEWATER CONNECTION				Total
Connection point -		Hensall Circle		
Total equivalent population to be serviced		48 persons		48 persons
Total Lands to be serviced		0.432ha		0.432ha
New development under 1000 population		13.0L/s		
Infiltration	0.2 L/sec/ha	0.086 L/s		
8	Wastewater sewer effluent	13.1 L/s		13.1 L/s

APPENDIX C

TREATMENT UNIT SIZING REPORT

Detailed Stormceptor Sizing Report – 473 Hensall Cir

Project Information & Location			
Project Name	473 Hensall Cir	**Project Number**	2018-008
City	Mississauga	**State/ Province**	Ontario
Country	Canada	**Date**	5/24/2018
Designer Information		**EOR Information (optional)**	
Name	CHENCHEN SHI	**Name**	
Company	MGM CONSULTING INC.	**Company**	
Phone #	905-567-8678	**Phone #**	
Email	cshi@mgm.on.ca	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	
Recommended Stormceptor Model	OSR 300
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	80
PSD	OK-110
Rainfall Station	TORONTO CENTRAL

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
OSR Model	**% TSS Removal Provided**
OSR 300	80
OSR 750	88
OSR 2000	92
OSR 4000	95
OSR 6000	96
OSR 9000	97
OSR 14000	98
StormceptorMAX	Custom

Stormceptor
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 each rainfall event, 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.

Design Methodology
Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using 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. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:
• Site parameters
• Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
• Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
• TSS load
• Detention time of the system

Hydrology Analysis
PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing 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			
State/Province	Ontario	**Total Number of Rainfall Events**	3329
Rainfall Station Name	TORONTO CENTRAL	**Total Rainfall (mm)**	13189.2
Station ID #	0100	**Average Annual Rainfall (mm)**	732.7
Coordinates	43°40'N, 79°20'W	**Total Evaporation (mm)**	1096.5
Elevation (ft)	328	**Total Infiltration (mm)**	2099.4
Years of Rainfall Data	18	**Total Rainfall that is Runoff (mm)**	9993.3

Notes
• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules. • Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed. • For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area	
Total Area (ha)	0.432
Imperviousness %	84.0

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Design Details	
Stormceptor Inlet Invert Elev (m)	
Stormceptor Outlet Invert Elev (m)	
Stormceptor Rim Elev (m)	
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

OK-110		
Particle Diameter (microns)	Distribution %	Specific Gravity
1.0	0.0	2.65
53.0	3.0	2.65
75.0	15.0	2.65
88.0	25.0	2.65
106.0	41.0	2.65
125.0	15.0	2.65
150.0	1.0	2.65
212.0	0.0	2.65

Site Name	

Site Details

Drainage Area

Total Area (ha)	0.432
Imperviousness %	84.0

Surface Characteristics

Width (m)	131.00
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

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (mm/hr)	61.98
Min. Infiltration Rate (mm/hr)	10.16
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow

Dry Weather Flow (lps)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	

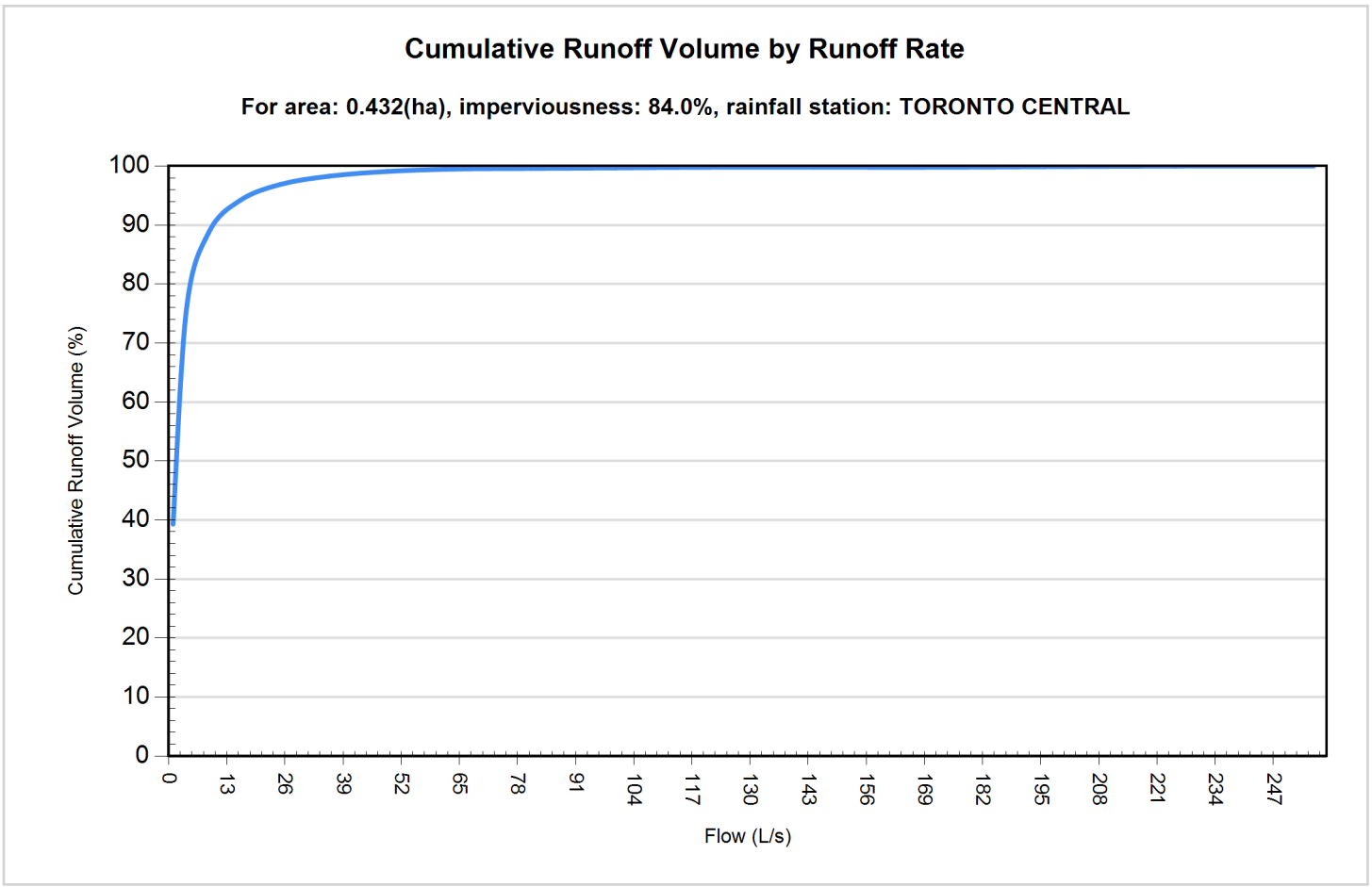
Buildup/Wash-off Parameters

Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

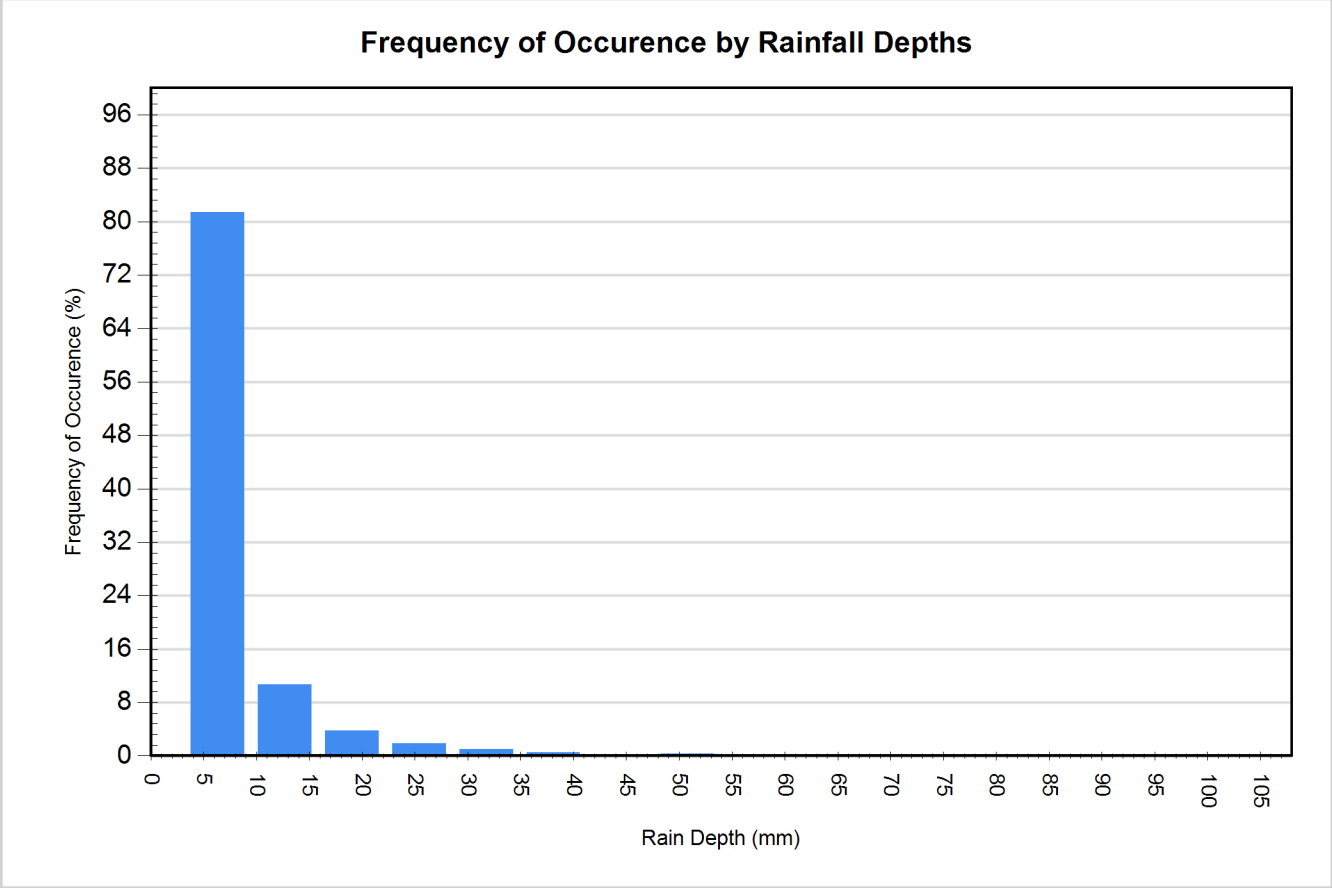
TSS Availability Parameters

Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	**Runoff Volume (m³)**	**Volume Over (m³)**	**Cumulative Runoff Volume (%)**
1	17093	26425	39.3
4	32997	10520	75.8
9	38658	4859	88.8
16	40978	2538	94.2
25	42159	1357	96.9
36	42787	729	98.3
49	43123	393	99.1
64	43290	226	99.5
81	43343	173	99.6
100	43377	139	99.7
121	43407	109	99.8
144	43428	88	99.8
169	43450	66	99.8
196	43475	41	99.9
225	43501	15	100.0
256	43516	0	100.0



Rainfall Event Analysis				
Rainfall Depth (mm)	No. of Events	Percentage of Total Events (%)	Total Volume (mm)	Percentage of Annual Volume (%)
6.35	2711	81.4	3900	29.6
12.70	356	10.7	3266	24.8
19.05	127	3.8	1991	15.1
25.40	62	1.9	1346	10.2
31.75	32	1.0	905	6.9
38.10	16	0.5	541	4.1
44.45	8	0.2	334	2.5
50.80	11	0.3	519	3.9
57.15	2	0.1	106	0.8
63.50	2	0.1	120	0.9
69.85	0	0.0	0	0.0
76.20	0	0.0	0	0.0
82.55	1	0.0	77	0.6
88.90	1	0.0	85	0.6
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0



For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

APPENDIX D

SANITARY FLOW CALCULATIONS

PROJECT: 473 Hensall Circle
CONSULTANT MGM Consulting Inc.

REGIONAL MUNICIPALITY OF PEEL
SANITARY SEWER DESIGN CHART

SHEET No. 1 OF 1
PROJECT NO. 2018-008 n = 0.013
DESIGNED CS DATE 10-Jun-18

LOCATION	FROM MH	TO MH	AREA (ha)	DENSITY (ppha)	POPULATION	CUM. AREA (ha)	CUM. POP.	SEWAGE FLOW (m3/s)	INFILT. FLOW (m3/s)	FOUNDATION DRAINS (m3/s)	TOTAL FLOW (m3/s)	LENGTH (m)	PIPE DIA. (m)	GRADIENT (%)	CAPACITY (m3/s)	VELOCITY (m/s)	DROP IN LOWER MH
473 Hensall Circle			0.43	50	22	0.43	22	0.013	0.0001	0.000	0.0131		0.150	1.00	0.015	0.862	

NOTE: SEWAGE FLOWS FOR LIGHT INDUSTRIAL AND LIGHT COMMERCIAL SHALL BE BASED ON 75 ppha and 50 pphs RESPECTIVELY