PANORAMA WELLNESS CENTRE
3280 PALLADIUM DRIVE
KANATA, ON
SITE SERVICING STUDY

For:	Govan Brown & Associates 31-200 Thurston Drive Ottawa, Ontario
By:	H.S.P. Consultants Inc. 5715 Warner Drive Long Sault, ON K0C 1P0
HSP Project No.:	10113
Date:	March 10th, 2020

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1.0 Introduction

1.1 Scope

HSP was retained Govan Brown & Associates to design necessary plans, specifications and documents pertaining to the site servicing for the proposed development located at 3280 Palladium Drive, Kanata, Ontario. This study forms part of the Site Plan Application for the above-mentioned development. The scope identified herein is based off of expected occupancy of the first floor. When the second floor occupancy is determined, it should be noted that the site servicing study be re-assessed base on the new tenant loading.

1.2 Site

The site is described as Block 2 of Registered Plan 4M-1627, Geographic Township of Huntley, City of Ottawa, on the north side of Upper Canada Street as shown on the topographic survey prepared by Stantec Inc. The subject lot has an area of 0.4856 hectares.

1.3 Previous Studies

The design of the site servicing of this development has been completed in accordance with the following reports:

- Kanata West Master Serving Study, June 2006
- Amendment to Kanata West Business Park Stormwater Management Report and Pond 6 East Design Brief, Revision 2, July 2016

1.4 Accompanying Reports

This design brief is to be accompanied by the following supplemental reports:

- Storm Water Management Report
  Completed by: HSP Consultants Inc
  Date: March 2020

- Geotechnical Report
  Completed by: Paterson Group
  Date: January 2019

2.0 Water Servicing

The current zoning for the development is Industrial, however the proposed use translates more into a Commercial/Institutional space and as such Table 3-2 of the MOE Drinking Water Design Guidelines may be used. As per Clause 3.4.3 of the MOE Guidelines, an allowance of 28m^3/(ha*d) will be used if no records are available. As such, the development will be designed for 28m^3/(ha*d) of drinking water. Given the area of our site, the flow rate for domestic water is 40L/s. The flow rate required for the full sprinkler system may be found in Appendix B. This calculation indicates a required flow rate of 83L/s. Therefore, the total required flow for the development is 123L/s.

There are proposed three AA hydrants within 75m of 3280 Palladium drive. As per Technical Bulletin ISTB-2018-02, these hydrants produce 5,700L/min, providing a total of 17,100 L/min, which is above the 7,380 L/min requirement for the development.

The proposed watermain on Upper Canada Drive is a 200mmø PVC CL150DR located on the north side of the street. The required service size for the development is a 150mmø service. The service will be installed with a W3 Chamber, as per city standards.

3.0 Wastewater Servicing

As shown on Drawing SP1, Revision A in Appendix A, theproposed sanitary sewer runs parallel to Upper Canada Street. The proposed sanitary sewer main begins at Sanitary Manhole 160A and flows easterly along Upper Canada at 0.7%. The PVC SDR35 sanitary sewer has a diameter of 250mm.

The proposed site has an area of 0.4856 hectares. In accordance with the City of Ottawa's Sewer Design Guidelines, the proposed flow has been calculated in accordance to Appendix 4A. Given the proposed use of a Medical Office, the sanitary design flow is calculated as follows:

Table 3.1: Sanitary Design Flow Calculations

No. of Doctors:	3	275 Litres/Day/Person
No. of Office Staff:	9	75 Litres/Day/Person
No. of Patients:	100	25 Litres/Day/Person
Total Flow:	4000	Litres/Day
Total Flow:	2.78	Litres/Second

Based on ICI Sewer Design Tables (Appendix C), the design parameter for the subdivision is 35,000 Litres/Hectare/Day for Industrial zoning. Given the site area, this translates to a maximum flow of 8237 Litres/hectare/day.

As such, the development falls well within the designed flow for the subdivision.

4.0 Site Storm Water Management

HSP created drawings SP1 to SP4 (Appendix A) to design the storm water management system for the proposed site. These drawings also depict the general features of the site, parking, structures and landscaping.

The private right-of-way south of the property will have new mains installed prior to the completion of this project. Upper Canada Street is proposed to have a new 675mmø concrete storm sewer installed at a slope of 0.7%. This proposed sewer will be the discharge point for the development.

The design of the storm water management system is completed in accordance with the Ontario Ministry of Environment "Storm Water Management Planning and Design Manual", City of Ottawa, and Conservation Authority requirements.

4.1 Design Intent

At the time of the design, a topographic survey was completed. The lot corner elevations are to remain at existing elevations. The main principle of the site storm sewer management is to contain all storm water on the site and limit its flow leaving the site to a "pre-development" state prior to entering the storm sewer mains and providing storage for any excess water.

4.2 Design Parameters

The following is a list of the design parameters used in determining the storm water flows for the site and corresponding sewer pipe sizes. The design calculations are provided in Appendix D.

4.2.1 Pre-Development Flow

- Proposed site has an area of 0.4856 hectares;
- "Pre-Development" runoff limit was established by HSP from pre-development conditions of the site.
- Rainfall Intensity as per IDF Table for "Carleton Place, Ontario";
- Time of Concentration of 5 minutes;
- 2 & 100-year design storms.

A predevelopment flow limit of 30.4 L/s (2 year) & 67.5 L/s (100 year) are imposed for the proposed development. These are the flow rates used to limit the future runoff flowrate and to determine storage requirements.

4.2.2 Catch basin Sub-Areas

The catch basins are used to collect the storm water from its associated area. The amount of impervious area is determined for each area. Catch basin subareas can be seen on Drawing SP3 in Appendix A. All impervious surfaces (roofs, roadways, etc.) are associated with a run-off coefficient of 0.90. All pervious surfaces (e.g. grass) are associated with a run-off coefficient of 0.20 for the design storm events. With this information, and in accordance with the Modified Rational Method, a hydrograph is prepared for the detention areas. This hydrograph provides the storage requirement for the area under consideration. As per City of Ottawa requirements, to calculate the required above ground storage, the outlet flow rate has been halved. Given the overall anticipated design flows for the site, the total generated post development flow is 113.5 L/s (2 year) & 252.1 L/s (100 year), which are both greater than the pre-development flows. As such, quantity control measures are required.

4.2.2.1 Catch Basin CB100 (Storm Line 1)

Catch Basin CB100 is located at the north east side of the property. This catch basin drains a total of 366m^2, with 65m^2 of that total constituting pervious area. The total flow rate for this area, according to the Modified Rational Method, is 8.9 L/s (2-Year) and 19.7 L/s (100-Year). This Catch basin will flow into CBMH101 unrestricted with a 13m 200mmø PVC SDR35 storm sewer sloped at 1.0%.

4.2.2.2 Catch Basin CB108 (Storm Line 2)

Catch Basin CB108 is located at the north of the property. This catch basin drains a total of 131m^2, with 116m^2 of that total constituting pervious area. The total flow rate for this area, according to the Modified Rational Method, is 1.1 L/s (2-Year) and 2.5 L/s (100-Year). This Catch basin will flow into CBMH101 unrestricted with a 14m 150mmø PVC SDR35 storm sewer sloped at 1.0%.

4.2.2.3 Catch Basin Man Hole CBMH101 (Storm Line 3)

Catch Basin Man-Hole CBMH100 is located at the north east side of the property. This catch basin drains a total of 846m^2, with 213m^2 of that total constituting pervious area. The total flow rate for this area, according to the Modified Rational Method, is 19.1 L/s (2-Year) and 42.5 L/s (100-Year). This Catch basin will flow into the CB102 unrestricted with a 200mmø PVC SDR35 storm sewer sloped at 1.0%.

4.2.2.4 Catch Basin CB103 (Storm Line 4)

Catch Basin CB103 is located at the east of the property. This catch basin drains a total of 330m^2, with 32m^2 of that total constituting pervious area. The total flow rate for this area, according to the Modified Rational Method, is 8.6 L/s (2-Year) and 19.1 L/s (100-Year). This Catch basin will flow into CB102 unrestricted with a 13m 200mmø PVC SDR35 storm sewer sloped at 1.0%.

4.2.2.5 Catch Basin CB102(Storm Line 5)

Catch Basin CB102 is located at the middle of the property. This catch basin drains a total of 1,494m^2, with 245m^2 of that total constituting pervious area. The total flow rate for this area, according to the Modified Rational Method, is 36.7 L/s (2-Year) and 81.5 L/s (100-Year). This Catch basin will flow into CB102 unrestricted with a 17m 300mmø PVC SDR35 storm sewer sloped at 1.0%.

4.2.2.6 Catch Basin CB105 (Storm Line 6)

Catch Basin CB105 is located at the east of the property. This catch basin drains a total of 330m^2, with 32m^2 of that total constituting pervious area. The total flow rate for this area, according to the Modified Rational Method, is 8.6 L/s (2-Year) and 19.1 L/s (100-Year). This Catch basin will flow into CB104 unrestricted with a 13m 200mmø PVC SDR35 storm sewer sloped at 1.0%.

4.2.2.7 Catch Basin CB104 (Storm Line 7)

Catch Basin CB104 is located in the middle of the property. This catch basin drains a total of 2262m^2, with 405m^2 of that total constituting pervious area. The total flow rate for this area, according to the Modified Rational Method, is 54.8 L/s (2-Year) and 121.7L/s (100-Year). This Catch basin will flow into CB106 unrestricted with a 17m 300mmø PVC SDR35 storm sewer sloped at 1.0%.

4.2.2.8 Roof Drains (Storm Line 8)

Refer to mechanical drawings for roof drain system. Below grade, the roof drains will be drained by a 300mmø PVC SDR35 storm sewer sloped at 1.0%. The total flow rate for this area, according to the Modified Rational Method, is 30.6 L/s (2-Year) and 68L/s (100-Year).

4.2.2.9 Catch Basin CB106 (Storm Line 9)

Catch Basin CB106 is located in the middle of the property. This catch basin drains a total of 3658m^2, with 405m^2 of that total constituting pervious area. The total flow rate for this area, according to the Modified Rational Method, is 94.1 L/s (2-Year) and 209L/s (100-Year). This Catch basin will flow into CB107 unrestricted with a 13m 400mmø PVC SDR35 storm sewer sloped at 1.5%.

4.2.2.10 Catch Basin CB107 (Storm Line 10)

Catch Basin CB107 is located in the middle of the property. This catch basin drains a total of 3991m^2, with 438m^2 of that total constituting pervious area. The total flow rate for this area, according to the Modified Rational Method, is 102.7 L/s (2-Year) and 228.2L/s (100-Year). This Catch basin will flow into MH100 unrestricted with a 9m 400mmø PVC SDR35 storm sewer sloped at 2.0%.

4.2.2.11 Catch Basin CB109 (Storm Line 11)

Catch Basin CB109 is located in the west of the property. This catch basin drains a total of 419m^2, with 109m^2 of that total constituting pervious area. The total flow rate for this area, according to the Modified Rational Method, is 9.4 L/s (2-Year) and 20.9L/s (100-Year). This Catch basin will flow into CB110 unrestricted with a 28m 200mmø PVC SDR35 storm sewer sloped at 1.0%.

4.2.2.12 Catch Basin CB110 (Storm Line 12)

Catch Basin CB110 is located in the west of the property. This catch basin drains a total of 713m^2, with 342m^2 of that total constituting pervious area. The total flow rate for this area, according to the Modified Rational Method, is 12.6 L/s (2-Year) and 27.9L/s (100-Year). This Catch basin will flow into MH300 unrestricted with a 13m 200mmø PVC SDR35 storm sewer sloped at 1.0%.

4.2.2.13 Man Hole MH300 (Storm Line 13)

Man Hole MH300 is located in the south-west of the property. This catch basin drains a total of 713m^2, with 342m^2 of that total constituting pervious area. The total flow rate for this area, according to the Modified Rational Method, is 12.6 L/s (2-Year) and 27.9L/s (100-Year). This Catch basin will flow into MH300 unrestricted with a 13m 200mmø PVC SDR35 storm sewer sloped at 1.0%.

4.2.2.14 Catch Basin Man Hole CBMH400 (Storm Line 14)

Catch Basin Man Hole CBMH400 is located in the south of the property. This catch basin drains a total of 884m^2, with 458m^2 of that total constituting pervious area. The total flow rate for this area, according to the Modified Rational Method, is 14.9 L/s (2-Year) and 33.0L/s (100-Year). This Catch basin will flow into MH100 unrestricted with a 13m 200mmø PVC SDR35 storm sewer sloped at 1.0%.

4.2.2.15 Man Hole MH100 (Storm Line 15)

Man Hole MH100 is located in the south of the property. This manhole forms the discharge point for all controlled flow on the property and is the only structure with a restricted flow. This catch basin drains a total of 4766m^2, with 992m^2 of that total constituting pervious area. The total unrestricted flow rate for this area, according to the Modified Rational Method, is 112.4 L/s (2-Year) and 249.8L/s (100-Year). The flow will be restricted with a Hydrovex 250 VHV-2, designed for 65L/s and 1.5m of head. The restricted flow rates will be 29L/s (2-Year) and 65.2 L/s (100-Year).

4.2.3 Storage Requirements

The City of Ottawa requires a 50% flow reduction to design for storage while using the Modified Rational Method. As such the storage calculations found in Appendix D have a reduced flow rate, and thus increasing the storage requirement. The underground storage system has been designed by Cultec. The design calculations and drawings for this system will be provided once available. The system has been designed to store the 100-year storm event, for a total of 76m^3.

4.2.4 Storm Water Quality

To provide a minimum of 80% removal of total suspended solids (TSS) for the site, a device needs to be installed. Given the relative flows for the site, a Stormcepter® unit has been selected. MH100 will discharge to an inline device, namely STC750 (MH200) will be installed to treat the site. The units are to be installed and maintained as per the manufacturer's recommendations. The Stormceptor design report may be found in Appendix E.

4.2.5 Other flows

There is an uncontrolled flow on the south side of the property, of 1.04L/s (2-year) and 2.32L/s (100 year). These uncontrolled flows were subtracted from the predevelopment flow rates to establish the allowed release rate from the controlled areas.

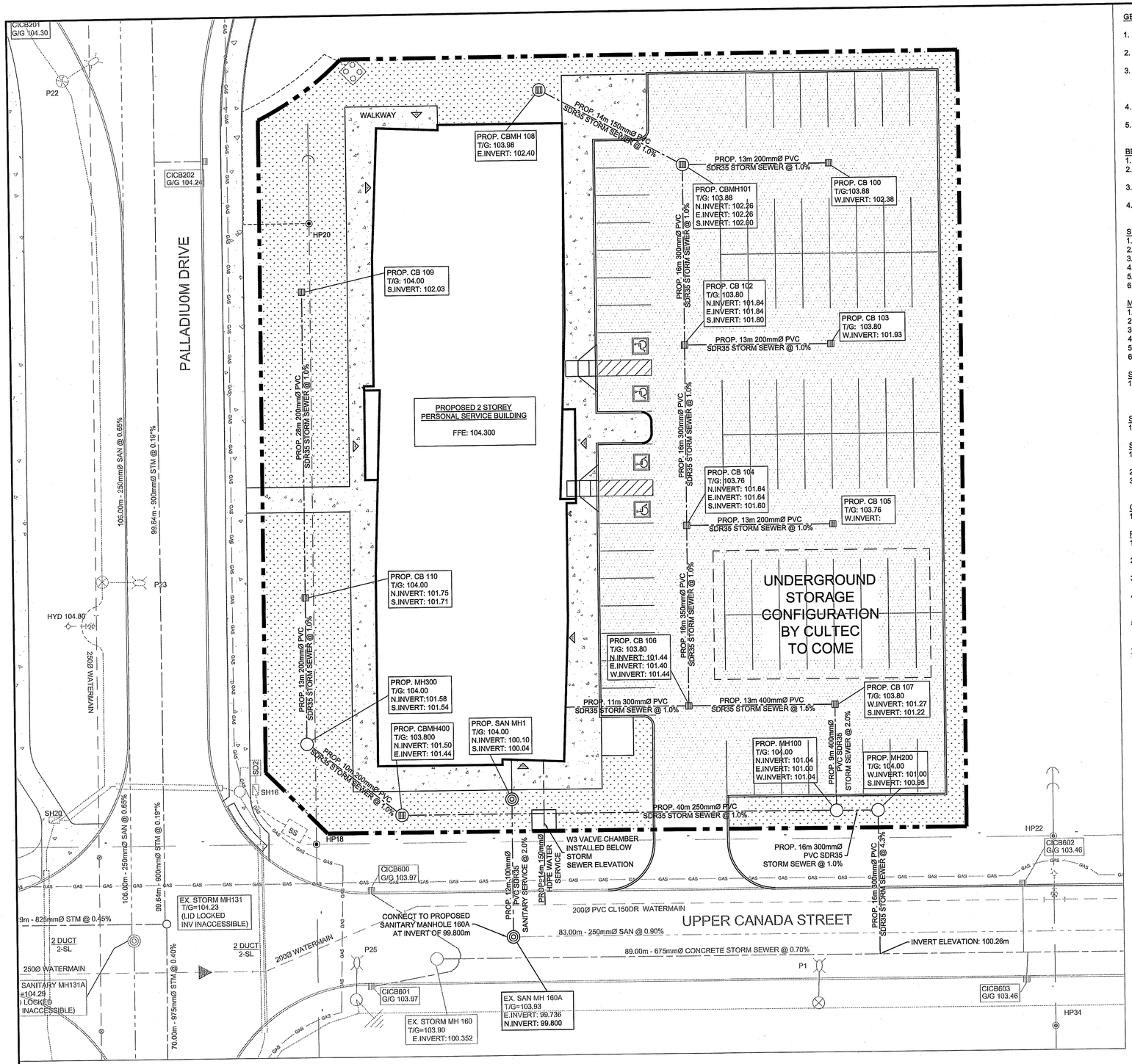
4.3 Erosion and Sediment Control

During construction, erosion and sediment control measures must be implemented to limit the sediment transfer to existing streams and storm systems. This project will implement the following control measures:

- Installation of light-duty silt fence along the south, east and north ends of the property.
- Installation of a "Mud-Mat" at the site access point at Upper Canada Street.
- Installation of a straw bale flow check dam at the low point of the existing site.
- Installation of geotextile cover for the catch basin and manholes on Upper Canada Street.

The Erosion and Sediment Control Plan may be viewed on Drawing SP3 in Appendix A.

APPENDIX A
Drawings SP1 to SP4



PLAN VIEW

SCALE: 1:200

GENERAL NOTES:

1. CONTRACTOR TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS AND BRING ANY DISCREPANCY TO THE ATTENTION OF THE ENGINEER.
2. CONTRACTOR TO ABIDE BY ALL APPLICABLE LEGISLATION, CITY OF OTTAWA SPECIFICATIONS, MOE REGULATIONS, AND BEST TRADE PRACTICES.
3. THE LOCATION OF UTILITIES, WHERE SHOWN, IS APPROXIMATE ONLY, AND THE EXACT LOCATION MUST BE DETERMINED BY CONTACTING THE PROPER AUTHORITIES CONCERNED. THE CONTRACTOR MUST PROVE THE LOCATION OF UTILITIES AND SHALL BE RESPONSIBLE FOR THEIR ADEQUATE PROTECTION FROM DAMAGE DURING CONSTRUCTION.
4. CONTRACTOR TO INSTALL ALL OBC REQUIRED, BARRIER-FREE COMPONENTS ASSOCIATED WITH BARRIER-FREE PARKING AND EXTERIOR WALKS.
5. CONTRACTOR TO INSTALL A TACTILE ATTENTION INDICATOR AT BASE OF EXTERIOR WALK RAMP AS PER OBC 3.8.3.2.(h) AND 3.8.3.18.

BEDDING MATERIALS:

1. ALL BEDDING MATERIALS TO CONFORM TO OPS STANDARDS AND SPECIFICATIONS.
2. GRANULAR A BEDDING MATERIAL TO BE IN ACCORDANCE WITH OPSS 1010, 314, 501 AND INSTALLED TO OPSD 708.030, 802.010M (GRAN. 'A' ONLY), AND 802.030M (CLASS B, GRAN. 'A' BEDDING AND COVER).
3. ALL BEDDING TO BE COMPACTED TO 95% STANDARD PROCTOR DENSITY AND TESTED BY AN INDEPENDENT COMPANY. HSP ENGINEER TO RECEIVE COPIES OF ALL TESTING REPORTS.
4. BACKFILL MAY CONSIST OF EXCAVATED SILT AND SAND AND/OR GLACIAL TILL AND TO BE COMPACTED TO 95% STANDARD PROCTOR DENSITY IN 300mm LIFTS.

SITE SERVICES:

1. STORM PIPING MATERIAL TO BE PVC SDR35 (GREEN ONLY).
2. SANITARY PIPING MATERIAL TO BE PVC DR29 (WHITE ONLY).
3. WATER SERVICE TO BE HDPE AS APPROVED BY THE CITY /w CURB BOX AND W3 VALVE CHAMBER.
4. GRANULAR 'A' BEDDING MATERIAL TO BE INSTALLED AS PER ABOVE.
5. CONNECTION AT EXISTING STORM SEWER SHALL BE THROUGH MANUFACTURED TEE.
6. DEPTH OF BURY OF WATER SERVICE TO BE MINIMUM 2.3m

MAINTENANCE HOLES AND CATCHBASINS:

1. MAINTENANCE HOLES TO BE 1200mm Ø AND AS PER OPSD 701.010 AND 701.030.
2. CATCHBASINS TO BE 600x600 AND AS PER OPSD 705.010, C/W SUMP.
3. CATCHBASIN GRATING TO BE AS PER OPSD 401.081 "FISH TYPE".
4. MAINTENANCE HOLE LID FOR ALL CATCH BASIN MANHOLES TO BE AS PER OPSD 401.081.
5. ADJUSTMENT UNITS AS PER OPSD 704.010.
6. ALL MAINTENANCE HOLES TO BE EQUIPPED WITH STEPS AS PER OPSD 405.010.

SPACING REQUIREMENTS:

1. AT ALL SEWER CROSSINGS, THE WATERMAIN SHALL BE LOCATED ABOVE THE SEWER. IF NOT FEASIBLE, THEN THE WATERMAIN SHALL GO BELOW WITH A MINIMUM SEPARATION OF 0.5m, AS PER MOE REQUIREMENTS.

STORM WATER QUANTITY NOTES:

1. MH100 TO BE FITTED WITH A HYDROVEX 250 VHV-2, DESIGNED FOR 65L/s AND 1.5m OF HEAD.

STORM WATER QUALITY NOTES:

1. CONTRACTOR TO INSTALL SPECIFIED TREATMENT SYSTEM OR PRE-APPROVED ALTERNATIVE TO MEET THE TOTAL SUSPENDED SOLID (TSS) REMOVAL OF AT LEAST 80%.
2. MH200 IS TO BE A STORMCEPTOR INLINE MODEL STC750.
3. THE UNIT IS TO BE MAINTAINED BY THE OWNER OF THE PROPERTY IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS FOR PROCEDURE AND FREQUENCY.

GRADING REQUIREMENTS:

1. EMBANKMENTS MUST NOT EXCEED 3:1 IN SLOPE.

PAVEMENT & CURBS:

1. ALL SITE CURBING TO BE INSTALLED AS PER OPSD 600.110. CONCRETE IS TO BE 32 MPa WITH 7% AIR, AS PER CITY STANDARD.
2. SITE ASPHALT PAVEMENT IS TO BE CONSTRUCTED WITH MINIMUM 400mm GRANULAR B TYPE II, 150mm GRANULAR 'A' , 50mm SUPERPAVE SP19.0 AND 40mm SUPERPAVE SP12.5 IN ALL ACCESS LANES.
3. SITE ASPHALT PAVEMENT IS TO BE CONSTRUCTED WITH MINIMUM 300mm GRANULAR B TYPE II, 150mm GRANULAR 'A' AND 50mm SUPERPAVE SP12.5 IN ALL CAR PARKING AREAS.
4. GRANULARS TO BE COMPACTED TO 100% STANDARD PROCTOR DENSITY AND ASPHALT TO BE COMPACTED TO 96% MARSHALL DENSITY. COMPACTION OF GRANULAR 'A' TO BE TESTED BY AN INDEPENDENT COMPANY WITH COPIES OF ALL REPORTS SENT TO THE HSP ENGINEER.
5. CONCRETE SIDEWALKS ARE TO BE CONSTRUCTED AS PER OPSD 310.010 AND 310.050 WITH 250mm GRANULAR A AND 32 MPa CONCRETE WITH 5±1% AIR.

CULTEC STORM WATER STORAGE SYSTEM:

1. ALL SITE STORM WATER TO BE STORED UNDERGROUND USING CULTEC STORAGE SYSTEM.

LEGEND

PROP.	EXIST.	
		STORM MAINTENANCE HOLE
		CATCHBASIN
		SAN. MAINTENANCE HOLE
		HYDRANT
		PRIMARY DOORWAY
HP22		UTILITY POLE
		ELEVATION
		STORM
		WATER
		SANITARY
GAS	GAS	GAS
		UNDERGROUND POWER
		O/H HYDRO
		LOT BOUNDARY

REVISION

DATE (MM/DD/YY)	REV. No.	REASON FOR REVISION	BY	APP'D BY

ISSUE No.	REV. No.	DATE (MM/DD/YY)	REASON FOR ISSUE	BY	APP'D BY
1	A	03/10/20	ISSUED FOR SITE PLAN APPLICATION	TMG	KJM

ISSUE

CONSULTANT

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T. M. GOVE
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March 10, 2020
PROVINCE OF ONTARIO

NORTH ARROW

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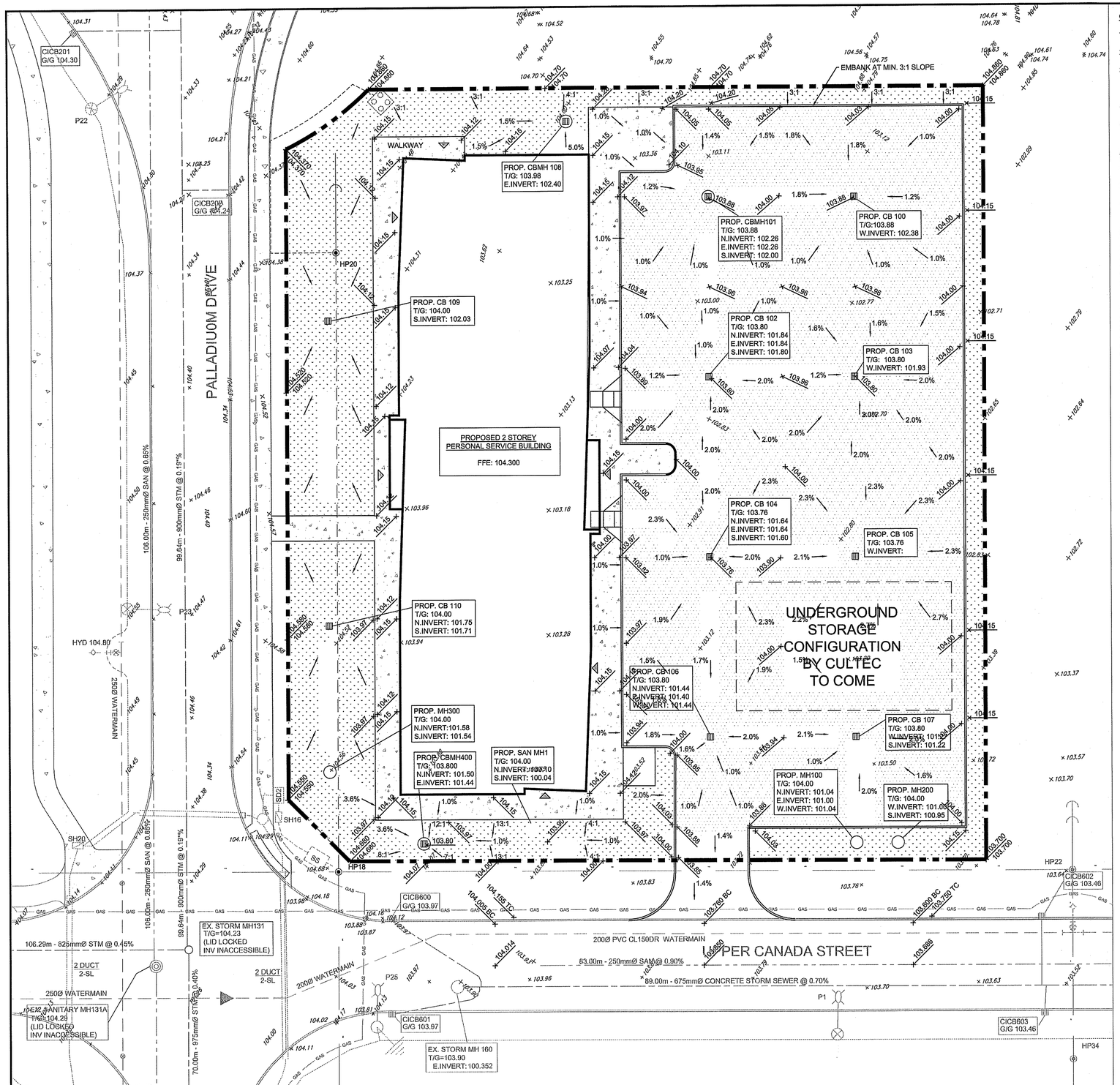
31-2000 THURSTON DRIVE
OTTAWA, ON
K1G 4K7

PROJECT:
PANORAMA WELLNESS CENTRE
3280 PALLADIUM DRIVE, OTTAWA
SITE SERVICING PLAN

DESIGNED BY: T.GOVE	CHECKED BY: B. SAMIS
DRAWN BY: T.GOVE	APPROVED BY: K. MACDONALD
SCALE: 1:200	DRAWING No. SP1
DATE: FEBRUARY 2020	PROJECT No. 10113
	SHEET 1 of 4 REVISION: A



SITE PLAN

SCALE: 1:200

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6. DEPTH OF BURY OF WATER SERVICE TO BE MINIMUM 2.3m

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2. CATCHBASINS TO BE 600x600 AND AS PER OPSD 705.010, C/W SUMP.
3. CATCHBASIN GRATING TO BE AS PER OPSD 401.081 "FISH TYPE".
4. MAINTENANCE HOLE LID FOR ALL CATCH BASIN MANHOLES TO BE AS PER OPSD 401.081.
5. ADJUSTMENT UNITS AS PER OPSD 704.010.
6. ALL MAINTENANCE HOLES TO BE EQUIPPED WITH STEPS AS PER OPSD 405.010.

SPACING REQUIREMENTS:

1. AT ALL SEWER CROSSINGS, THE WATERMAIN SHALL BE LOCATED ABOVE THE SEWER. IF NOT FEASIBLE, THEN THE WATERMAIN SHALL GO BELOW WITH A MINIMUM SEPARATION OF 0.5m, AS PER MOE REQUIREMENTS.

STORM WATER QUANTITY NOTES:

1. MH100 TO BE FITTED WITH A HYDROVEX 250 VHV-2, DESIGNED FOR 65L/s AND 1.5m OF HEAD.

STORM WATER QUALITY NOTES:

1. CONTRACTOR TO INSTALL SPECIFIED TREATMENT SYSTEM OR PRE-APPROVED ALTERNATIVE TO MEET THE TOTAL SUSPENDED SOLID (TSS) REMOVAL OF AT LEAST 80%.
2. MH200 IS TO BE A STORMCEPTOR INLINE MODEL STC750.
3. THE UNIT IS TO BE MAINTAINED BY THE OWNER OF THE PROPERTY IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS FOR PROCEDURE AND FREQUENCY.

GRADING REQUIREMENTS:

1. EMBANKMENTS MUST NOT EXCEED 3:1 IN SLOPE.

PAVEMENT & CURBS:

1. ALL SITE CURBING TO BE INSTALLED AS PER OPSD 600.110. CONCRETE IS TO BE 32 MPa WITH 7% AIR, AS PER CITY STANDARD.
2. SITE ASPHALT PAVEMENT IS TO BE CONSTRUCTED WITH MINIMUM 400mm GRANULAR B TYPE II, 150mm GRANULAR 'A' , 50mm SUPERPAVE SP19.0 AND 40mm SUPERPAVE SP12.5 IN ALL ACCESS LANES.
3. SITE ASPHALT PAVEMENT IS TO BE CONSTRUCTED WITH MINIMUM 300mm GRANULAR B TYPE II, 150mm GRANULAR 'A' AND 50mm SUPERPAVE SP12.5 IN ALL CAR PARKING AREAS.
4. GRANULARS TO BE COMPACTED TO 100% STANDARD PROCTOR DENSITY AND ASPHALT TO BE COMPACTED TO 96% MARSHALL DENSITY. COMPACTION OF GRANULAR 'A' TO BE TESTED BY AN INDEPENDENT COMPANY WITH COPIES OF ALL REPORTS SENT TO THE HSP ENGINEER.
5. CONCRETE SIDEWALKS ARE TO BE CONSTRUCTED AS PER OPSD 310.010 AND 310.050 WITH 250mm GRANULAR A AND 32 MPa CONCRETE WITH 5±1% AIR.

CULTEC STORM WATER STORAGE SYSTEM:

1. ALL SITE STORM WATER TO BE STORED UNDERGROUND USING CULTEC STORAGE SYSTEM.

LEGEND

PROP	EXIST	
		ELEVATION
		STORM
		WATER
		SANITARY
		GAS
		UNDERGROUND POWER
		O/H HYDRO
		LOT BOUNDARY

- STORM MAINTENANCE HOLE
- CATCHBASIN
- SAN. MAINTENANCE HOLE
- HYDRANT
- PRIMARY DOORWAY
- HP22 UTILITY POLE

REVISION

DATE (MM/DD/YY)	REV. No.	REASON FOR REVISION	BY	APP'D BY

ISSUE No.	REV. No.	DATE (MM/DD/YY)	REASON FOR ISSUE	BY	APP'D BY
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LICENSED PROFESSIONAL ENGINEER
T. M. GOVE
100211486
March 10, 2020
PROVINCE OF ONTARIO

NORTH ARROW

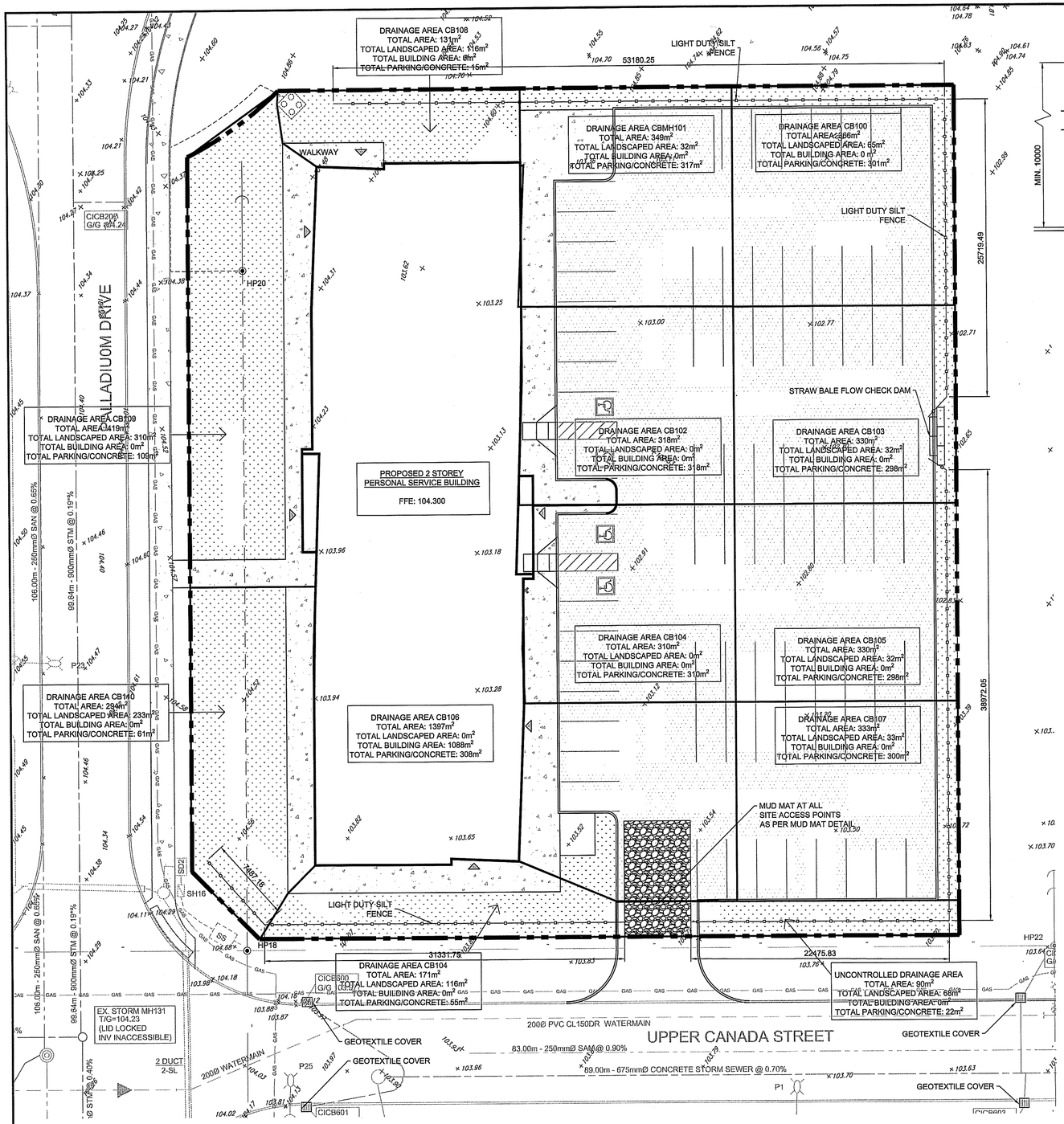
CLIENT:

GOVAN BROWN & ASSOCIATES LTD.
31-2000 THURSTON DRIVE
OTTAWA, ON
K1G 4K7

PROJECT:

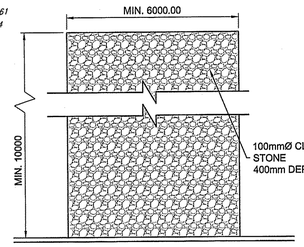
PANORAMA WELLNESS CENTRE
3280 PALLADIUM DRIVE, OTTAWA
SITE GRADING PLAN

DESIGNED BY:	CHECKED BY:
T.GOVE	B. SAMIS
DRAWN BY:	APPROVED BY:
T.GOVE	K. MACDONALD
SCALE: 1:200	DRAWING No. SP2
DATE: FEBRUARY 2020	PROJECT No. 10113
SHEET 2 of 4	REVISION: A



PLAN VIEW

SCALE: 1:200



UPPER CANADA STREET

MUD MAT DETAIL

SCALE: 1:100

GENERAL NOTES:

1. CONTRACTOR TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS AND BRING ANY DISCREPANCY TO THE ATTENTION OF THE ENGINEER.
2. CONTRACTOR TO ABIDE BY ALL APPLICABLE LEGISLATION, CITY OF OTTAWA SPECIFICATIONS, MOE REGULATIONS, AND BEST TRADE PRACTICES.
3. THE LOCATION OF UTILITIES, WHERE SHOWN, IS APPROXIMATE ONLY, AND THE EXACT LOCATION MUST BE DETERMINED BY CONTACTING THE PROPER AUTHORITIES CONCERNED. THE CONTRACTOR MUST PROVE THE LOCATION OF UTILITIES AND SHALL BE RESPONSIBLE FOR THEIR ADEQUATE PROTECTION FROM DAMAGE DURING CONSTRUCTION.
4. MUD MAT TO BE INSTALLED, MAINTAINED AND STONE REPLACED AS NECESSARY THROUGHOUT CONSTRUCTION.
5. MUD MAT TO BE MINIMUM 10m LONG FROM THE PROPERTY LINE, AND MINIMUM 6m IN WIDTH.
6. ANY DISTURBANCE, DAMAGE OR MUD TRACKING TO BE CLEANED BY THE CONTRACTOR TO THE SATISFACTION OF THE CONSULTANT OR CITY OF OTTAWA STAFF.

EROSION & SEDIMENT CONTROL

PRE-CONSTRUCTION

PRIOR TO ANY REMOVAL OF SOIL AND CONSTRUCTION.
- INSTALL SILT FENCE (GEOTEXTILE) AS NOTED
- INSTALL FILTER CLOTH OVER ALL MANHOLES.
- INSTALL STRAW BALE FLOW CHECK AS NOTED.
- INSTALL MUD MAT AT ALL SITE ACCESS POINTS
- CONTROL MEASURES TO BE INSPECTED ONCE INSTALLED.

CONSTRUCTION

- MINIMIZE THE EXTENT OF DISTURBED AREAS.
- PROTECT DISTURBED AREAS OF RUNOFF.
- PROVIDE COVER (I.E. MULCH) IF DISTURBED AREAS WILL NOT BE REINSTATED WITHIN A REASONABLE PERIOD OF TIME.
- INSPECT SILT FENCE REGULARLY DURING CONSTRUCTION. CLEAN AND REPAIR, AS REQUIRED.
- CONTROL DUST DURING CONSTRUCTION.

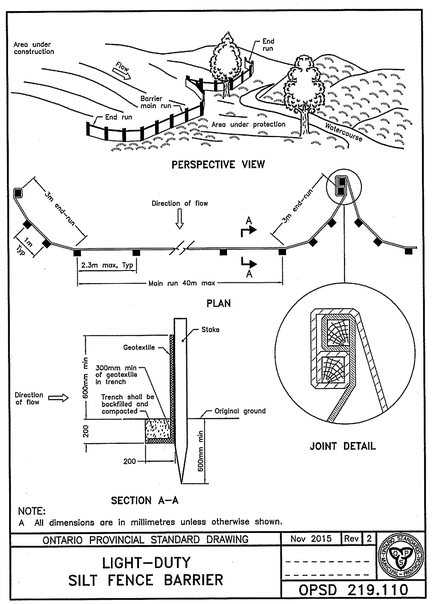
AFTER CONSTRUCTION

- PROVIDE PERMANENT COVER TO DISTURBED AREAS (I.E. TOPSOIL AND SEED)
- REMOVE ALL TEMPORARY EROSION AND SEDIMENT CONTROL ITEMS (SILT FENCE, STRAW BALE FLOW CHECK DAMS AND FILTER CLOTHS) ONCE DISTURBED AREAS HAVE BEEN REINSTATED.

INSPECTIONS

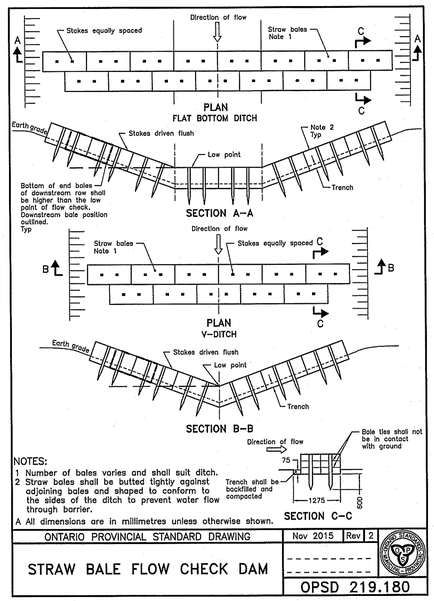
- EROSION AND SEDIMENT CONTROL MEASURES WILL BE INSPECTED UPON COMPLETION.
- CONTROL MEASURES ARE TO BE INSPECTED WEEKLY.

DEVELOPER TO BE RESPONSIBLE FOR INSTALLATION, INSPECTIONS AND MAINTENANCE OF ALL SEDIMENT AND EROSION CONTROL MEASURES MENTIONED ABOVE. THE DESCRIBED "EROSION & SEDIMENT CONTROL PLAN IS A LIVING DOCUMENT."



NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
LIGHT-DUTY SILT FENCE BARRIER	----------	OPSD 219.110



NOTES:
1 Number of bales varies and shall suit ditch.
2 Straw bales shall be butted tightly against adjoining bales and shaped to conform to the sides of the ditch to prevent water flow through barrier.

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
STRAW BALE FLOW CHECK DAM	----------	OPSD 219.180

REVISION

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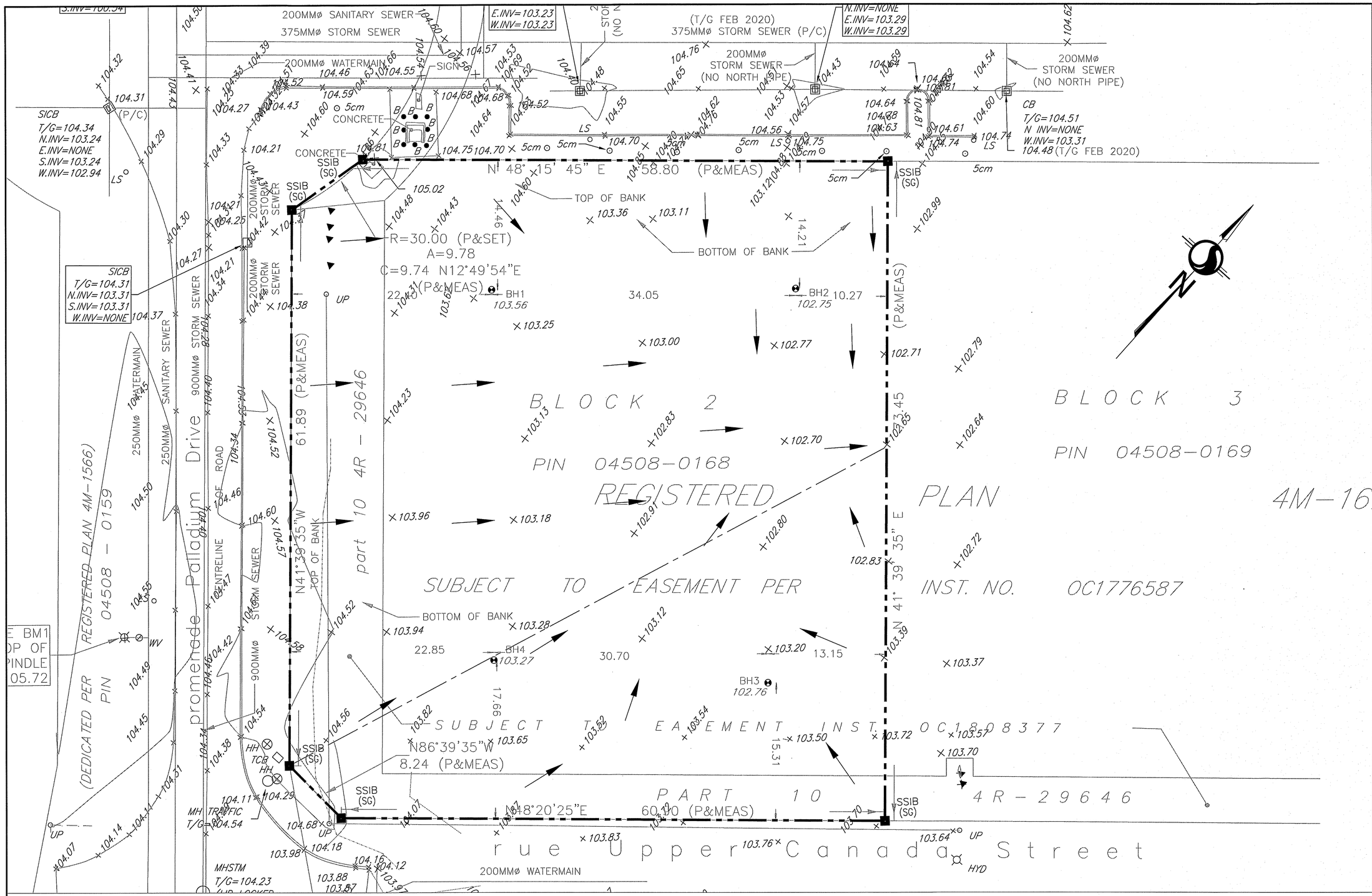
LICENSED PROFESSIONAL ENGINEER
K.M. GOVE
100211486
March 10, 2020
PROVINCE OF ONTARIO

NORTH ARROW

CLIENT:
GOVAN BROWN & ASSOCIATES LTD.
31-2000 THURSTON DRIVE
OTTAWA, ON
K1G 4K7

PROJECT:
PANORAMA WELLNESS CENTRE
3280 PALLADIUM DRIVE, OTTAWA
EROSION AND SEDIMENT CONTROL PLAN
& DRAINAGE AREAS

DESIGNED BY:	T.GOVE	CHECKED BY:	B. SAMIS
DRAWN BY:	T.GOVE	APPROVED BY:	K. MACDONALD
SCALE:	1:200	DRAWING No.	SP3
DATE:	FEBRUARY 2020	PROJECT No.	10113
SHEET 3 of 4		REVISION:	A



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LICENSED PROFESSIONAL ENGINEER
T. M. GOVE
100211486
March 10, 2020
PROVINCE OF ONTARIO

NORTH ARROW

CLIENT:
GOVAN BROWN & ASSOCIATES LTD.
31-2000 THURSTON DRIVE
OTTAWA, ON
K1G 4K7

PROJECT:
PANORAMA WELLNESS CENTRE
3280 PALLADIUM DRIVE, OTTAWA
EXISTING SITE CONDITIONS

DESIGNED BY: T.GOVE	CHECKED BY: B. SAMIS
DRAWN BY: T.GOVE	APPROVED BY: K. MACDONALD
SCALE: 1:100	DRAWING No. SP4
DATE: FEBRUARY 2020	PROJECT No. 10113
SHEET 4 of 4	REVISION: A

APPENDIX B
FUS Demand Calculations

Determine Building to be Assessed

Panorama Wellness Centre
3280 Palladium Dr., Ottawa, ON.
Fire Flow Demand Calculation

1) Initial Estimate of Required Fire Flow

F=220*C*SQRT (A)

F = the required fire flow in litres per minute
C = coefficient related to the type of construction
= 1.5 for wood frame construction (structure essentially all combustible)
= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior)
= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls)
= 0.6 for fire resistive construction (fully protected frame, floor, roof)
A = the total floor area in square metres (incl all storeys but not basements at least 50% below grade)

Fire flow shall not exceed 30,000 L/min unless it is a one storey building which must not exceed 25,000 L/min or be less than 2,000 L/min

Calculations for fire flow F:

A = 1974
C = 0.8
F = 8000 L/min = 133 L/s Rounded to Nearest 1,000 L/min.

2) Charge to required fire flow based on contents of building (Occupancy)

-25 % = reduction due to non-combustible contents
-15 % = reduction due to limited combustible contents
0 % = no charge due to combustible contents
15 % = surcharge due to free burning contents
25 % = surcharge due to rapid burning contents

OSR = -15% Contents are considered limited combustible

Decrease in Fire Flow = -1200

F = 6800 L/min = 113 L/s

3) Charge to Required Fire Flow Based on Presence of Automatic Sprinkler Protection

0 % = no reduction due to absence of automatic sprinkler system
-25 % = reduction proper system supervision including water flow and control valve alarm service
-50 % = reduction with system supervision including water flow and control valve alarm service

AS = -50% **Sprinler System installed with supervision**

Decrease in Fire Flow = -3400

4) Charge to Required Fire Flow Based on Proximity to Other Building

The charge for any one side generally should not exceed the following limits for the separations shown

Separation (m)		Charge		**Building Sepation**	
0 to	3	25% to	20%	**Wall**	**Distance**
3 to	10	20% to	15%	**Left**	**>30m**
10 to	20	15% to	10%	**Right**	**6m**
20 to	30	10% to	5%	**Front**	**>30m**
30 to	45	5% to	0%	**Back**	**37.7m**

Calculation of Fire Flow Increase due to Proximity to Other Buildings

PB = PL+PR+PF+PRR
Where,
PL = proximity charge for left side of building = **5.0%**
PR = proximity charge for right side of building = **17.1%**
PF = proximity charge for front of building = **5.0%**
PRR = proximity charge for rear of building = **2.6%**

PB = 29.7%

Increase in Fire Flow = 2020

F = 5000 = 83 L/s Rounded to nearest 1000 L/min

*Note that firewalls were not considered in the calculation above (Conservative estimate)
*Note that seperation distrance were taken to building property line on sides notadjacent to road as it is currently an undevelopped area

APPENDIX C
ICI Sanitary Sewer Design Table

IBI GROUP
IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: KANATA WEST BUSINESS PARK
LOCATION: 333 HUNTMAR DRIVE
CLIENT: TAGGART

LOCATION				RESIDENTIAL									ICI AREAS								INFILTRATION ALLOWANCE			FIXED FLOW	TOTAL FLOW	PROPOSED SEWER DESIGN						
				UNIT TYPES				AREA	POPULATION		PEAK FACTOR	PEAK FLOW	AREA (Ha)							PEAK FLOW	AREA (Ha)		FLOW			CAPACITY	LENGTH	DIA	SLOPE	VELOCITY (full)	VELOCITY (actual)	AVAILABLE CAPACITY	
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH	APT	(Ha)	IND	CUM		(L/s)	PRESTIGE BUISNESS PK		COMMERCIAL		INDUSTRIAL			(L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(m/s)	(m/s)	L/s	(%)
													IND	CUM	IND	CUM	IND	CUM	PF													
KANATA WEST BUSINESS PARK																																
Upper Canada Street	Blocks 30, 31, 33, 53	MH154A	MH153A														2.78	2.78	5.40	6.08	3.00	3.00	0.99	0.00	7.07	43.87	110.00	250	0.50	0.866	0.607	36.80	83.88
	Blocks 34, 35	MH153A	MH152A										1.86	1.86				2.78	5.40	6.99	2.08	5.08	1.68	0.00	8.66	39.24	114.86	250	0.40	0.774	0.601	30.57	77.92
	Blocks 39	MH152A	MH151A										4.52	6.38				2.78	5.40	9.18	4.55	9.63	3.18	0.00	12.36	36.70	10.84	250	0.35	0.724	0.611	24.34	66.32
		MH151A	MH150A											6.38				2.78	5.40	9.18	0.20	9.83	3.24	0.00	12.43	36.70	102.56	250	0.35	0.724	0.653	24.28	66.14
		MH150A	MH101A											6.38				2.78	5.40	9.18	0.11	9.94	3.28	0.00	12.46	36.70	63.86	250	0.35	0.724	0.653	24.24	66.04
Campeau Drive	Blocks 3, 38	MH99A	MH100A										5.84	5.84						2.84	6.34	6.34	2.09	0.00	4.93	50.02	112.75	250	0.65	0.987	0.607	45.09	90.14
	Blocks 4, 37	MH100A	MH101A										1.58	7.42						3.61	1.83	8.17	2.70	0.00	6.30	51.91	101.44	250	0.70	1.024	0.630	45.60	87.86
Nipissing Court	Blocks 1, 7	MH123A	MH122A														1.93	1.93	6.25	4.89	2.29	2.29	0.76	0.00	5.64	50.02	65.18	250	0.65	0.987	0.607	44.38	88.72
	Blocks 2	MH122A	MH121A										0.79	0.79				1.93	6.25	5.27	0.99	3.28	1.08	0.00	6.35	50.02	100.00	250	0.65	0.987	0.607	43.66	87.30
	Block 5	MH121A	MH101A										0.78	1.57				1.93	6.25	5.65	1.02	4.30	1.42	0.00	7.07	85.51	97.00	250	1.90	1.688	1.007	78.45	91.73
Campeau Drive	Block 36	MH101A	MH103A										0.33	15.70				4.71	4.75	16.69	0.56	22.97	7.58	0.00	24.27	43.87	93.00	250	0.50	0.866	0.866	19.59	44.66
	Block 32, 54	MH103A	MH104A										1.00	16.70				4.71	4.75	17.18	1.31	24.28	8.01	0.00	25.19	43.87	120.00	250	0.50	0.866	0.866	18.67	42.57
Campeau Drive	Block 29	MH104A	MH105A										0.69	17.39				4.71	4.75	17.52	0.83	25.11	8.29	0.00	25.80	43.87	53.11	250	0.50	0.866	0.900	18.07	41.18
KWRC	Blocks 6, 8, 9, 10		MH 105A												11.78	11.78				5.73	11.78	11.78	3.89	0.00	9.61	39.24	12.01	250	0.40	0.774	0.601	29.62	75.50
Campeau Drive		MH105A	MH106A											17.39		11.78		4.71	4.75	23.24	0.28	37.17	12.27	0.00	35.51	59.68	87.77	300	0.35	0.818	0.851	24.17	40.50
	Block 24	MH106A	MH107A										0.75	18.14		11.78		4.71	4.75	23.61	1.10	38.27	12.63	0.00	36.24	59.68	90.92	300	0.35	0.818	0.851	23.45	39.28
Upper Canada Street	Blocks 27, 28	MH154A	MH156A														1.90	1.90	6.00	4.62	2.11	2.11	0.70	0.00	5.31	50.02	107.00	250	0.65	0.987	0.607	44.70	89.37
	Block 25	MH156A	MH131A										0.60	0.60				1.90	6.00	4.91	0.79	2.90	0.96	0.00	5.87	50.02	101.71	250	0.65	0.987	0.607	44.15	88.27
Palladium Drive	Blocks 17, 26	MH130A	MH131A											0.00			1.91	1.91	6.00	4.64	2.38	2.38	0.79	0.00	5.43	50.02	106.00	250	0.65	0.987	0.607	44.59	89.15
Palladium Drive		MH131A	MH132A											0.60				3.81	5.25	8.39	0.23	5.51	1.82	0.00	10.21	43.87	67.35	250	0.50	0.866	0.672	33.66	76.72
	Block 23	MH132A	MH133A										1.01	1.61				3.81	5.25	8.89	1.27	6.78	2.24	0.00	11.12	43.87	71.26	250	0.50	0.866	0.672	32.75	74.64
		MH133A	MH107A											1.61				3.81	5.25	8.89	0.17	6.95	2.29	0.00	11.18	107.45	42.79	250	3.00	2.121	1.304	96.28	89.60
Campeau Drive	Block 49	MH107A	MH108A											19.75	0.42	12.20		8.52	4.40	30.72	0.97	46.19	15.24	0.00	45.96	59.68	120.00	300	0.35	0.818	0.900	13.72	22.99
		MH108A	EX604A											19.75		12.20		8.52	4.40	30.72	0.49	46.68	15.40	0.00	46.12	59.68	120.00	300	0.35	0.818	0.900	13.56	22.72
	Block 22	MH 604A	MH 603A										2.63	22.38		12.20		8.52	4.40	32.00	3.03	49.71	16.40	0.00	48.40	62.51	102.12	300	0.38	0.857	0.942	14.11	22.58
Upper Canada Street	Blocks 18, 19, 20, 21	MH160A	MH161A											0.00			2.25	2.25	5.75	5.24	2.48	2.48	0.82	0.00	6.06	58.86	83.00	250	0.90	1.162	0.714	52.80	89.70
	Block 14- 16	MH161A	MH162A										2.23	2.23				2.25	5.75	6.32	2.45	4.93	1.63	0.00	7.95	50.02	112.00	250	0.65	0.987	0.692	42.07	84.10
		MH162A	MH140A											2.23				2.25	5.75	6.32	0.22	5.15	1.70	0.00	8.02	63.57	110.98	250	1.05	1.255	0.772	55.55	87.38
Upper Canada Street	Blocks 40, 41	MH167A	MH166A											0.00			1.45	1.45	6.25	3.67	1.66	1.66	0.55	0.00	4.22	51.91	72.00	250	0.70	1.024	0.611	47.69	91.87
	Block 42	MH166A	MH165A											0.00			0.74	2.19	5.70	5.06	0.94	2.60	0.86	0.00	5.91	50.02	100.00	250	0.65	0.987	0.607	44.10	88.17
	Blocks 12, 13	MH165A	MH140A											0.00			1.49	3.68	5.30	7.90	1.68	4.28	1.41	0.00	9.31	39.24	99.02	250	0.40	0.774	0.601	29.92	76.26
Journeyman Street		MH140A	MH141A											2.23				5.93	5.00	13.10	0.30	9.73	3.21	0.00	16.31	31.02	120.00	250	0.25	0.612	0.612	14.71	47.43
		MH141A	MH (84)											2.23				5.93	5.00	13.10	0.22	9.95	3.28	0.00	16.38	31.02	40.30	250	0.25	0.612	0.612	14.64	47.20
		Stub	MH 603A											2.23				5.93	5.00	13.10	0.00	9.95	3.28	0.00	16.38	31.63	32.98	250	0.26	0.624	0.624	15.26	48.22
Campeau Drive	Block 11	MH 603A	MH 602A										2.40	27.01		12.20		14.45	3.80	41.30	2.83	62.49	20.62	0.00	61.93	103.47	105.24	375	0.32	0.908	0.944	41.54	40.15
	Tanger Outlet Centres	MH 602A	MH 601A											27.01	16.40	28.60		14.45	3.80	49.28	16.84	79.33	26.18	0.00	75.46	109.75	107.73	375	0.36	0.963	1.032	34.29	31.25
	Block 52	MH 601A	MH 600A										2.16	29.17		28.60		14.45	3.80	50.33	2.54	81.87	27.02	0.00	77.34	109.75	106.95	375	0.36	0.963	1.032	32.40	29.53
Campeau Drive	Block XX	MH XXX	MH XXX	Light Grey = Constructed Sewer																												

Design Parameters:

Residential			ICI Areas			
SF	3.4	p/p/u				Peak Factor (PF)
TH/SD	2.7	p/p/u	P.B.P.	28,000	L/Ha/day	1.5
APT	1.8	p/p/u	COM	28,000	L/Ha/day	1.5
Other	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart

Notes:
1. Manning's coefficient (n) = 0.013
2. Demand (per capita): 280 L/day 300 L/day
3. Infiltration allowance: 0.33 L/s/Ha 0.4 L/s/Ha
4. Residential Peaking Factor:
Harmon Formula = 1+(14/(4+P^0.5)) K=0.8
where P = population in thousands

Designed: LME
Checked:
Dwg. Reference: 14289-501

No.	Revision	Date
1.	City submission No. 1	11/25/2014
2.	City submission No. 2	4/8/2015
3.	City submission No. 3	6/18/2015
4.	City submission No. 4	10/15/2015
5.	Revised for Phase 2 Registration	4/19/2018
6.	Revised for Phase 3 Registration	9/14/2018
7.	Revised per City Comments (Phase 3)	12/14/2018

File Reference: 14289.5.7.1
Date: 4/19/2018
Sheet No: 1 of 1

APPENDIX D
Storm Water Calculations

Panorama Wellness Centre
Storm Water Calculations - Pre-development
Pre-development status was undeveloped lot

Controlled Flow

1. Determine Average Runoff Coefficient "C" for Controlled Flow

Item	Area (m^2)	Runoff Coefficient
Building	0	0.90
Paved	0	0.90
Grass	4856	0.20
	4,856.00	
C_{avg} =	**0.20**	

2. Determine Rainfall Intensity (i) - 2 year storm, (ii) - 100 year storm.

Duration	2 yr Intensity (mm/hr)	100 yr Intensity (mm/hr)
5	112.50	249.90
10	69.30	154.00
15	52.20	116.00
20	45.00	101.00
25	37.00	86.00
30	32.10	71.40
60	19.80	44.00
120	12.20	27.10
360	5.70	12.60
720	3.50	7.70
1440	2.10	4.80

3. Determine pre-development time of concentration

Given the existing elevations, the maximum drainage length is 75m
Over this length, the average slope is 0.022 m/m
Using the Airport equation with an area of 4856m2
Tc = 6 minutes
Use 5 min. for design

4. Determine Flow Rates - Rational Method for Controlled Flow
Q = 2.78CiA

			2 YEAR				100 YEAR			
Item	Area (ha)	C_{avg}	'i' (mm)	Q (per unit area)	Q (m^3/s)	Q (L/s)	'i' (mm)	Q (per unit area)	Q (m^3/s)	Q (L/s)
Lot	0.4856	0.20	112.50	0.063	0.0304	30.37	249.90	0.139	0.0675	67.47

	2 YEAR	100 YEAR
Controlled Flow:	0.0304	0.0675

Post Development
Storm Water Calculations - 2 yr & 100 yr

Controlled Flow
1. Determine Average Runoff Coefficient "C".

Item	Area (m^2)	C	Product
Building	1088	0.90	979.20
Paved Areas	2686	0.90	2417.40
Grass	992	0.20	198.40
	4766.00		3595.00
C_{avg} =	**0.75**		

2. Determine Rainfall Intensity (i).

Duration	2 yr Intensity (mm/hr)	100 yr Intensity (mm/hr)
5	112.50	249.90
10	69.30	154.00
15	52.20	116.00
20	45.00	101.00
25	37.00	86.00
30	32.10	71.40

Unit Rate of Runoff
Q = 2.78Ci
Q= 235.90773

3. Determine Flow Rates for Controlled Flow
Q = 2.78CiA
5 yr Q = 112.43 L/s
= 0.1124 m^3/s

Item	Area (ha)	C_{avg}	2 YEAR 'i' (mm)	2 YEAR Q (per unit area)	2 YEAR Q (m^3/s)	2 YEAR Q (L/s)	100 YEAR 'i' (mm)	100 YEAR Q (per unit area)	100 YEAR Q (m^3/s)	100 YEAR Q (L/s)
Developed Lot	0.4766	0.75	112.50	0.236	0.1124	112.43	249.90	0.524	0.2498	249.75
	0.4766									

4. Determine Flow Rates for Uncontrolled Flow

Item	Area (m^2)	'C' 5 Yr	Product 5 Yr
Building	0	0.90	0
Paved	22	0.90	20
Grass	68	0.20	14
	90.00		33
C_{avg} =	**0.37**		

Q = 2.78CiA

Item	Area (ha)	C_{avg}	2 YEAR 'i' (mm)	2 YEAR Q (per unit area)	2 YEAR Q (m^3/s)	2 YEAR Q (L/s)	100 YEAR 'i' (mm)	100 YEAR Q (per unit area)	100 YEAR Q (m^3/s)	100 YEAR Q (L/s)
Lot	0.009	0.37	112.50	0.116	0.0010	1.04	249.90	0.258	0.0023	2.32

	2 YEAR	100 YEAR
Controlled Flow:	0.1124	0.2498
Uncontrolled Flow:	0.0010	0.0023
Total Flow under the design storm:	**0.1135**	**0.2521**

	2 YEAR	100 YEAR
Therefore, total flow Pre Development:	0.0304	0.0675
Total Flow Post Development:	**0.1135**	**0.2521**
Uncontrolled Flow Post Development	0.0010	0.0023
Allowed Controlled Flow (Pre - Post Uncontrolled)	**0.0293**	**0.0652**

Developed Parcel Only
2 yr Storm Water Calculations

Storm Sewer Design					AREA		FLOW TIME			DESIGN FLOWS			SEWER DESIGN					STORAGE		
Line	From	To	Sub-Area	Length of Sewer (m)	Increment (ha)	Cumul. Total (ha)	To Upper End (min)	In Section (min)	Unit Rate of Runoff (m^3/ha*s)	Flow (m^3/s)	Cumul. Flow (m^3/s)	Allowed Flow (m^3/s)	Pipe Diam. (mm)	Slope m/m	Capacity Full (m^3/s)	Velocity Full (m/s)	Percent Full (%)	Pipe Area (m^2)	Avail. Area (m^2)	Avail. Volume (m^3)
1	CB100	CBMH101	Paved/Bldg		0.0301		5		0.281	0.0085										
			Landscape	13	0.0065	0.0366	5		0.063	0.0004	0.0089	0.0089	200	0.01	0.0328	1.044	27.11	0.031	0.02	0.30
2	CB108	CBMH101	Paved/Bldg		0.0015		5		0.281	0.0004										
			Landscape	14	0.0116	0.0131	5		0.063	0.0007	0.0011	0.0011	150	0.01	0.0152	0.862	7.22	0.018	0.02	0.23
3	CBMH101	CB102	Paved/Bldg		0.0633		5		0.281	0.0178										
			Landscape	16	0.0213	0.0846	5		0.063	0.0013	0.0191	0.0191	300	0.01	0.0968	1.369	19.78	0.071	0.06	0.91
4	CB103	CB102	Paved/Bldg		0.0298		5		0.281	0.0084										
			Landscape	13	0.0032	0.0330	5		0.063	0.0002	0.0086	0.0086	200	0.01	0.0328	1.044	26.16	0.031	0.02	0.30
5	CB102	CB104	Paved/Bldg		0.1249		5		0.281	0.0352										
			Landscape	17	0.0245	0.1494	5		0.063	0.0015	0.0367	0.0367	300	0.01	0.0968	1.369	37.90	0.071	0.04	0.75
6	CB105	CB104	Paved/Bldg		0.0298		5		0.281	0.0084										
			Landscape	13	0.0032	0.0330	5		0.063	0.0002	0.0086	0.0086	200	0.01	0.0328	1.044	26.16	0.031	0.02	0.30
7	CB104	CB106	Paved/Bldg		0.1857		5		0.281	0.0523										
			Landscape	17	0.0405	0.2262	5		0.063	0.0025	0.0548	0.0548	350	0.01	0.1460	1.517	37.53	0.096	0.06	1.02
8	BLDG	CB106	Paved/Bldg		0.1088		5		0.281	0.0306										
			Landscape	12	0.0000	0.1088	5		0.063	0.0000	0.0306	0.0306	300	0.01	0.0968	1.369	31.64	0.071	0.05	0.58
9	CB106	CB107	Paved/Bldg		0.3253		5		0.281	0.0916										
			Landscape	13	0.0405	0.3658	5		0.063	0.0025	0.0941	0.0907	400	0.01	0.2085	1.658	43.51	0.126	0.07	0.92
10	CB107	MH100	Paved/Bldg		0.3553		5		0.281	0.1000										
			Landscape	9	0.0438	0.3991	5		0.063	0.0027	0.1027	0.1027	400	0.02	0.2948	2.345	34.85	0.126	0.08	0.74
11	CB109	CB110	Paved/Bldg	28	0.0310		5		0.281	0.0087										
			Landscape		0.0109	0.0419	5		0.063	0.0007	0.0094	0.0094	200	0.01	0.0328	1.044	28.65	0.031	0.02	0.00
12	CB110	MH300	Paved/Bldg		0.0371		5		0.281	0.0104										
			Landscape	13	0.0342	0.0713	5		0.063	0.0021	0.0126	0.0126	200	0.01	0.0328	1.044	38.32	0.031	0.02	0.25
13	MH300	MH400	Paved/Bldg		0.0371		5		0.281	0.0104										
			Landscape	10	0.0342	0.0713	5		0.063	0.0021	0.0126	0.0126	200	0.01	0.0328	1.044	38.32	0.031	0.02	0.19
14	MH400	MH100	Paved/Bldg		0.0426		5		0.281	0.0120										
			Landscape	40	0.0449	0.0875	5		0.063	0.0028	0.0148	0.0148	250	0.01	0.0595	1.212	24.86	0.049	0.04	1.48
15	MH100	MH200	Paved/Bldg		0.3774		5		0.281	0.1062										
			Landscape	3	0.0992	0.4766	5		0.063	0.0062	0.1124	0.0290	300	0.005	0.0684	0.968	42.37	0.071	0.04	0.12

Note: 29 L/s is the Pre-Development Flow Rate for the 2 Year Storm.

Developed Parcel Only
100yr Storm Water Calculations

Storm Sewer Design					AREA		FLOW TIME			DESIGN FLOWS			SEWER DESIGN					STORAGE		
Line	From	To	Sub-Area	Length of Sewer (m)	Increment (ha)	Cumul. Total (ha)	To Upper End (min)	In Section (min)	Unit Rate of Runoff (m^3/ha*s)	Flow (m^3/s)	Cumul. Flow (m^3/s)	Allowed Flow (m^3/s)	Pipe Diam. (mm)	Slope m/m	Capacity Full (m^3/s)	Velocity Full (m/s)	Percent Full (%)	Pipe Area (m^2)	Avail. Area (m^2)	Avail. Volume (m^3)
1	CB100	CB101	Paved/Bldg		0.0301		5		0.625	0.0188										
			Landscape	13	0.0065	0.0366	5		0.139	0.0009	0.0197	0.0197	200	0.01	0.0328	1.044	60.07	0.031	0.01	0.16
2	CB108	CB101	Paved/Bldg		0.0015		5		0.625	0.0009										
			Landscape	14	0.0116	0.0131	5		0.139	0.0016	0.0025	0.0025	150	0.01	0.0152	0.862	16.72	0.018	0.01	0.21
3	CBMH101	CB102	Paved/Bldg		0.0633		5		0.625	0.0396										
			Landscape	16	0.0213	0.0846	5		0.139	0.0030	0.0425	0.0425	300	0.01	0.0968	1.369	43.94	0.071	0.04	0.63
4	CB103	CB102	Paved/Bldg		0.0298		5		0.625	0.0186										
			Landscape	13	0.0032	0.0330	5		0.139	0.0004	0.0191	0.0191	200	0.01	0.0328	1.044	58.11	0.031	0.01	0.17
5	CB102	CB104	Paved/Bldg		0.1249		5		0.625	0.0781										
			Landscape	17	0.0245	0.1494	5		0.139	0.0034	0.0815	0.0815	300	0.01	0.0968	1.369	84.19	0.071	0.01	0.19
6	CB105	CB104	Paved/Bldg		0.0298		5		0.625	0.0186										
			Landscape	13	0.0032	0.0330	5		0.139	0.0004	0.0191	0.0191	200	0.01	0.0328	1.044	58.11	0.031	0.01	0.17
7	CB104	CB106	Paved/Bldg		0.1857		5		0.625	0.1161										
			Landscape	17	0.0405	0.2262	5		0.139	0.0056	0.1217	0.1217	350	0.01	0.1460	1.517	83.37	0.096	0.02	0.27
8	BLDG	CB106	Paved/Bldg		0.1088		5		0.625	0.0680										
			Landscape	12	0.0000	0.1088	5		0.139	0.0000	0.0680	0.0680	300	0.01	0.0968	1.369	70.28	0.071	0.02	0.25
9	CB106	CB107	Paved/Bldg		0.3253		5		0.625	0.2034										
			Landscape	13	0.0405	0.3658	5		0.139	0.0056	0.2090	0.2090	400	0.015	0.2553	2.030	81.87	0.126	0.02	0.30
10	CB107	MH100	Paved/Bldg		0.3553		5		0.625	0.2222										
			Landscape	9	0.0438	0.3991	5		0.139	0.0061	0.2282	0.2282	400	0.02	0.2948	2.345	77.42	0.126	0.03	0.26
11	CB109	CB110	Paved/Bldg	28	0.0310		5		0.625	0.0194										
			Landscape		0.0109	0.0419	5		0.139	0.0015	0.0209	0.0209	200	0.01	0.0328	1.044	63.65	0.031	0.01	0.00
12	CB110	MH300	Paved/Bldg		0.0371		5		0.625	0.0232										
			Landscape	13	0.0342	0.0713	5		0.139	0.0048	0.0279	0.0279	200	0.01	0.0328	1.044	85.13	0.031	0.00	0.06
13	MH300	CBMH400	Paved/Bldg		0.0371		5		0.625	0.0232										
			Landscape	10	0.0342	0.0713	5		0.139	0.0048	0.0279	0.0279	200	0.01	0.0328	1.044	85.13	0.031	0.00	0.05
14	CBMH400	MH100	Paved/Bldg		0.0426		5		0.625	0.0266										
			Landscape	40	0.0458	0.0884	5		0.139	0.0064	0.0330	0.0330	250	0.01	0.0595	1.212	55.44	0.049	0.02	0.88
15	MH100	MH200	Paved/Bldg		0.3774		5		0.625	0.2360										
			Landscape	3	0.0992	0.4766	5		0.139	0.0138	0.2498	0.0652	300	0.01	0.0968	1.369	67.36	0.071	0.02	0.07

Note: 65.2 L/s is the Pre-Development Flow Rate for the 100 Year Storm.

Hydrograph
MH100 - 2 yr Storm

VARIABLES

AREA 0.4766 ha

Step 1

Item	Area (m^2)	'C'	Product
Paved/Bldg	0	0.90	0.00
Building	3774	0.90	3396.60
Grass	992	0.20	198.40
Total =	4766		3595.00
C_{avg} =	**0.75**		

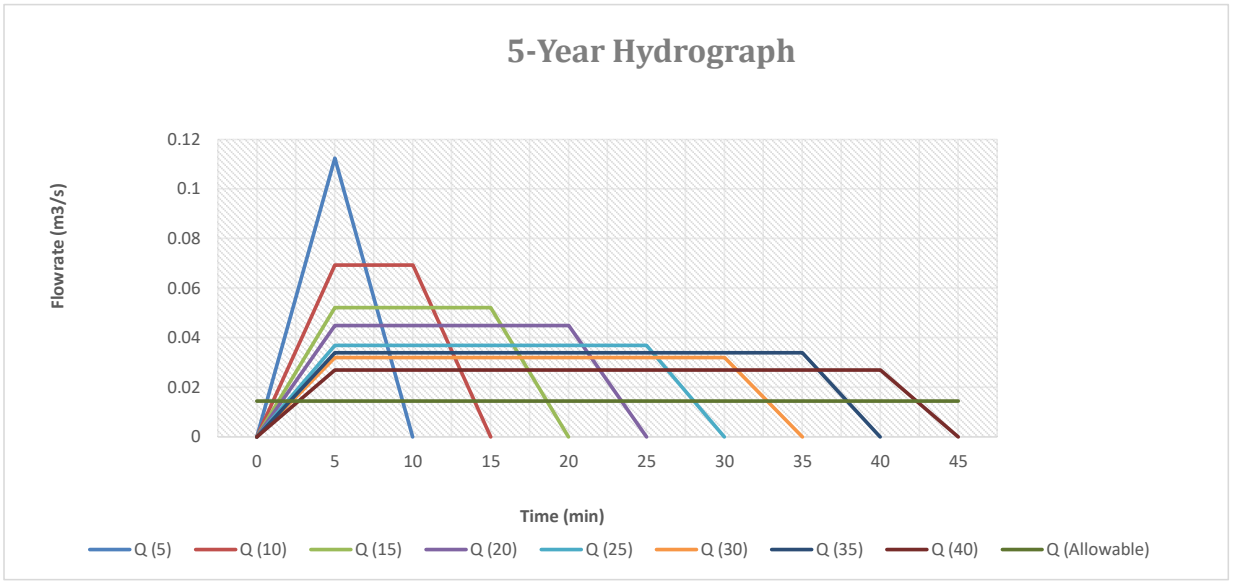
Allowable Release Rate = **14.50** *L/s *allowable release rate reduced by 50%
Time of Concentration = **5** min

Step 2

Duration	Intensity
5	112.50
10	69.30
15	52.20
20	45.00
25	37.00
30	32.10
35	34.00
40	27.00

Step 3

Time	Q (5)	Q (10)	Q (15)	Q (20)	Q (25)	Q (30)	Q (35)	Q (40)	$Q_{all\ (M3/S)}$
0	0	0	0	0	0	0	0	0	0.0145
5	0.1124	0.0693	0.0522	0.0450	0.0370	0.0321	0.0340	0.0270	0.0145
10	0	0.0693	0.0522	0.0450	0.0370	0.0321	0.0340	0.0270	0.0145
15		0	0.0522	0.0450	0.0370	0.0321	0.0340	0.0270	0.0145
20			0	0.0450	0.0370	0.0321	0.0340	0.0270	0.0145
25				0	0.0370	0.0321	0.0340	0.0270	0.0145
30					0	0.0321	0.0340	0.0270	0.0145
35						0	0.0340	0.0270	0.0145
40							0	0.0270	0.0145
45								0	0.0145



Step 4

Duration	Area OF trapeziod (m^3)	Sim. Triangle Time Value (min) X	Area under allowed flow (m^3)	Storage (m^3)
5	33.73	0.645	8.139	25.59
10	41.56	1.047	12.139	29.42
15	46.95	1.390	16.191	30.76
20	53.97	1.612	20.348	33.62
25	55.47	1.961	24.394	31.07
30	57.75	2.260	28.484	29.26
35	57.75	2.260	32.834	24.91
40	57.75	2.260	37.184	20.56
REQUIRED				**33.62**

Therefore, below ground storage of 34m^3 is required for the Cultec System.

Hydrograph
MH100 - 100 yr Storm

VARIABLES

AREA 0.4766 ha

Step 1

Item	Area (m^2)	'C'	Product
Pavement	0.00	0.90	0.00
Building	3774	0.90	3396.60
Grass	992	0.20	198.40
Total =	4766		3595.00
C_{avg} =	**0.75**		

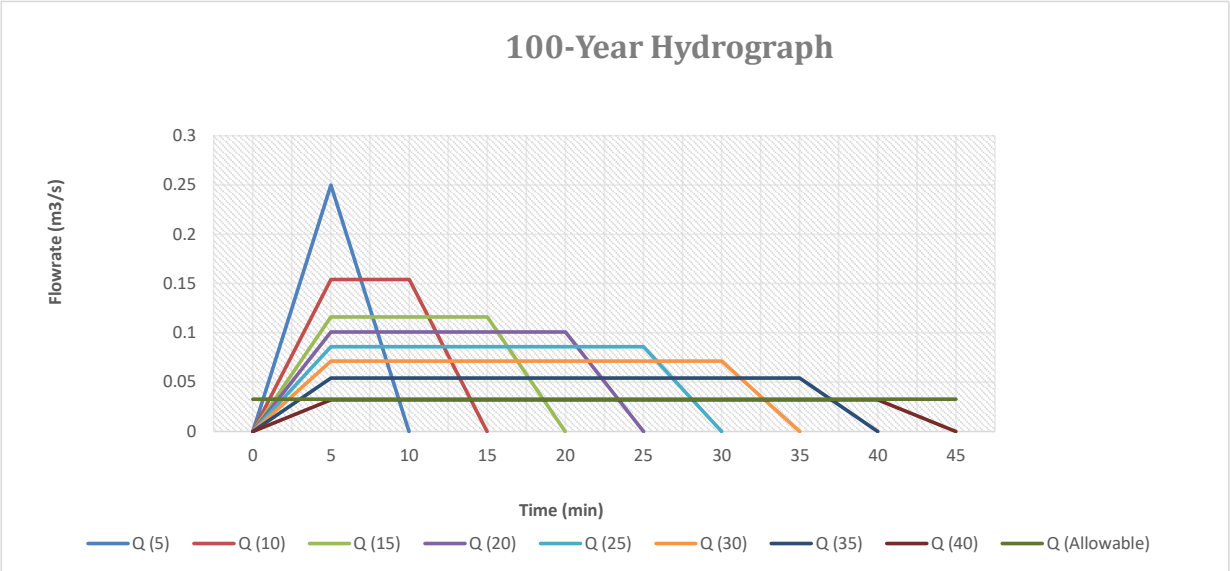
Allowable Release Rate = **32.60** *L/s *allowable release rate reduced by 50%
Time of Concentration = **5** min

Step 2

Duration	Intensity
5	249.90
10	154.00
15	116.00
20	101.00
25	86.00
30	71.40
35	54.00
40	32.00

Step 3

Time	Q (5)	Q (10)	Q (15)	Q (20)	Q (25)	Q (30)	Q (35)	Q (40)	$Q_{all\ (M3/S)}$
0	0	0	0	0	0	0	0	0	0.0326
5	0.2498	0.1539	0.1159	0.1009	0.0859	0.0714	0.0540	0.0320	0.0326
10	0	0.1539	0.1159	0.1009	0.0859	0.0714	0.0540	0.0320	0.0326
15		0	0.1159	0.1009	0.0859	0.0714	0.0540	0.0320	0.0326
20			0	0.1009	0.0859	0.0714	0.0540	0.0320	0.0326
25				0	0.0859	0.0714	0.0540	0.0320	0.0326
30					0	0.0714	0.0540	0.0320	0.0326
35						0	0.0540	0.0320	0.0326
40							0	0.0320	0.0326
45								0	0.0326



Step 4

Duration	Area OF trapeziod (m^3)	Sim. Triangle Time Value (min) X	Area under allowed flow (m^3)	Storage (m^3)
5	74.93	0.653	18.283	56.64
10	92.35	1.059	27.268	65.08
15	104.34	1.406	36.370	67.97
20	121.13	1.615	45.741	75.39
25	128.92	1.896	54.971	73.95
30	85.63	1.615	45.741	39.89
35	80.95	1.896	54.971	25.98
REQUIRED				**75.39**

Therefore, below ground storage of 76m^3 is required for the Cultec System.

APPENDIX E
Stormceptor Design Report

Detailed Stormceptor Sizing Report – Panorama Wellness Centre

Project Information & Location			
Project Name	Panorama Wellness Centre	**Project Number**	10113
City	Ottawa	**State/ Province**	Ontario
Country	Canada	**Date**	3/6/2020
Designer Information		**EOR Information (optional)**	
Name	Troy Gove	**Name**	
Company	HSP Consultants Inc.	**Company**	
Phone #	613-932-3289	**Phone #**	
Email	tgove@hsp.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	Panorama Wellness Centre
Recommended Stormceptor Model	STC 750
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	82
PSD	Fine Distribution
Rainfall Station	OTTAWA MACDONALD-CARTIER INT'L A

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	
Stormceptor Model	**% TSS Removal Provided**
STC 300	73
STC 750	82
STC 1000	83
STC 1500	84
STC 2000	86
STC 3000	88
STC 4000	90
STC 5000	91
STC 6000	92
STC 9000	94
STC 10000	94
STC 14000	96
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**	4093
Rainfall Station Name	OTTAWA MACDONALD-CARTIER INT'L A	**Total Rainfall (mm)**	20978.1
Station ID #	6000	**Average Annual Rainfall (mm)**	567.0
Coordinates	45°19'N, 75°40'W	**Total Evaporation (mm)**	1504.6
Elevation (ft)	370	**Total Infiltration (mm)**	4392.6
Years of Rainfall Data	37	**Total Rainfall that is Runoff (mm)**	15080.9

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)	0.476
Imperviousness %	79.00

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)	101.00
Stormceptor Outlet Invert Elev (m)	100.95
Stormceptor Rim Elev (m)	104.00
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	300
Pipe Material	PVC - plastic
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.

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	Panorama Wellness Centre

Site Details

Drainage Area

Total Area (ha)	0.476
Imperviousness %	79.00

Surface Characteristics

Width (m)	138.00
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	

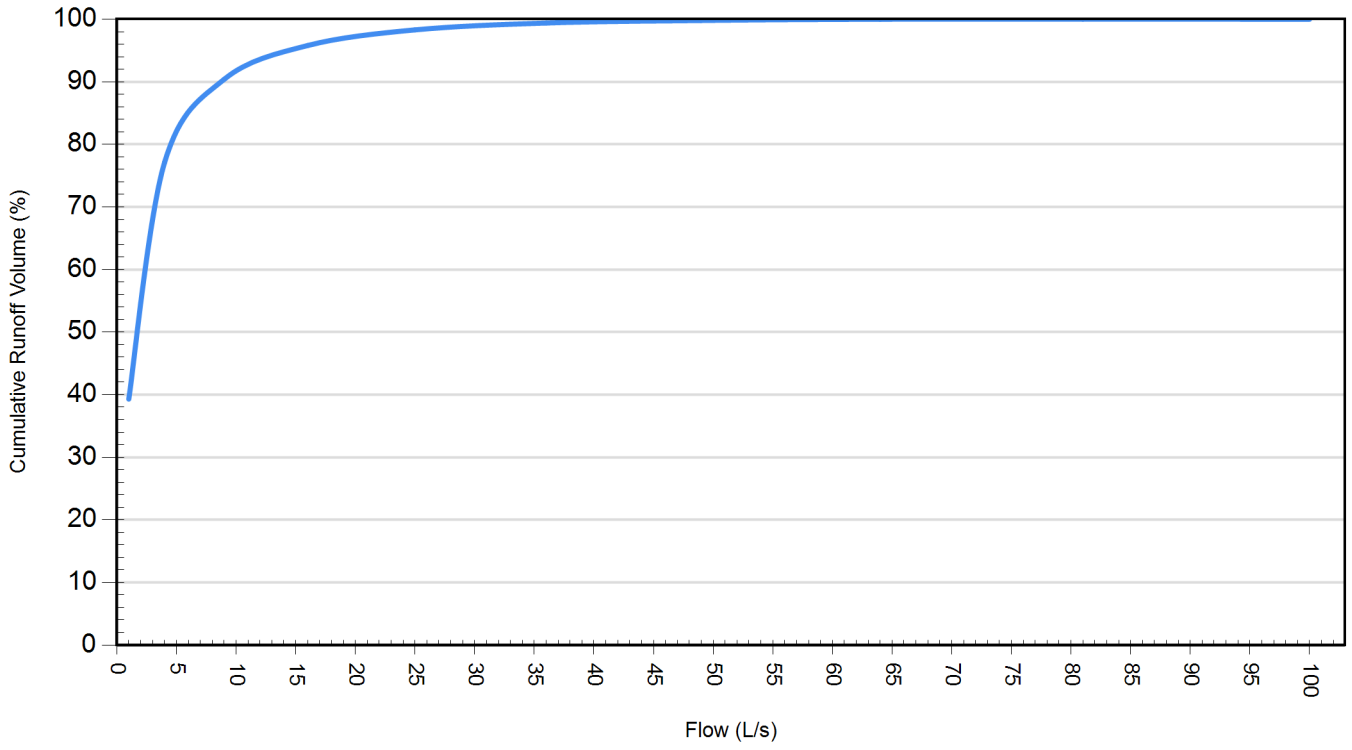
TSS Availability Parameters

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

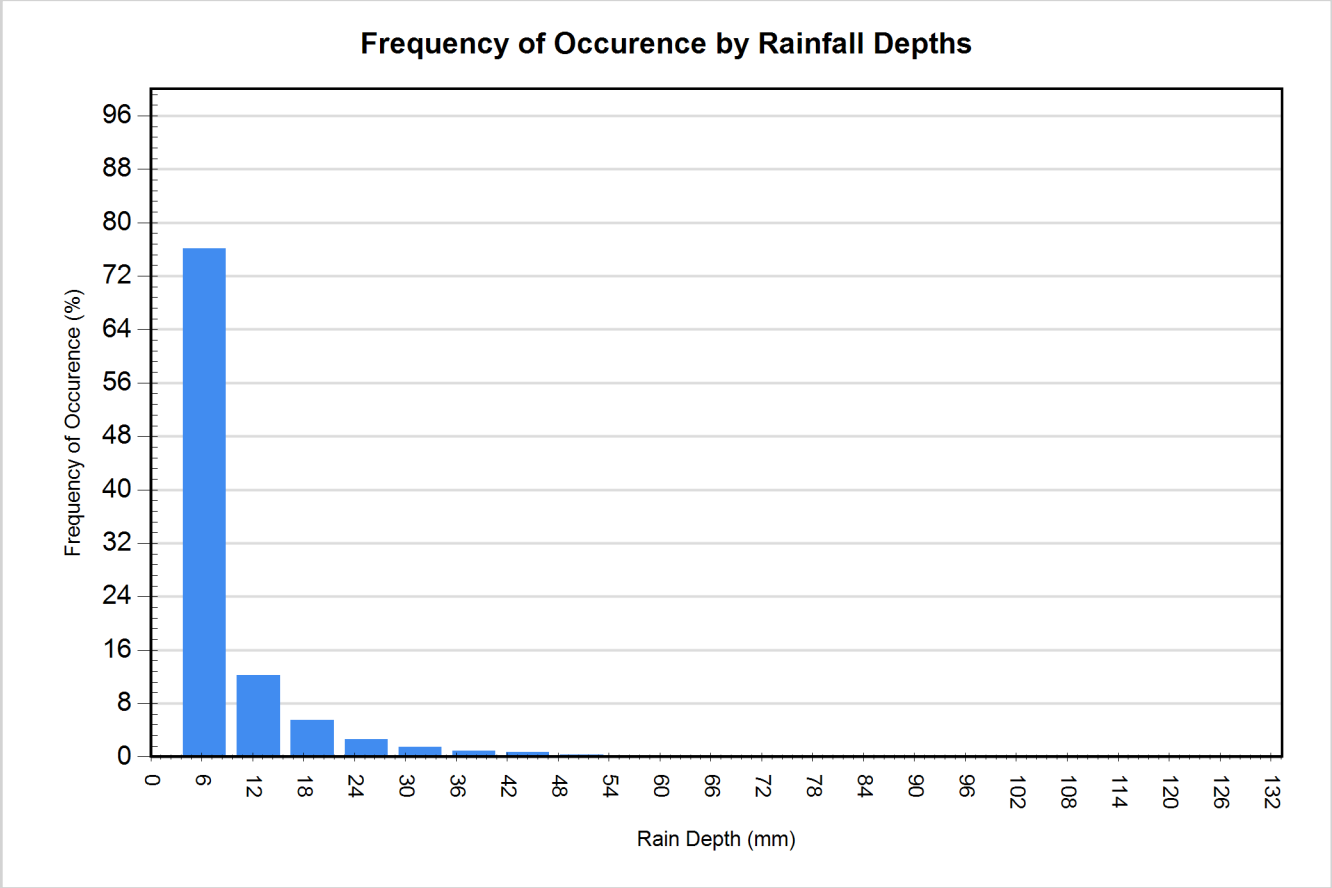
Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	Runoff Volume (m^3)	Volume Over (m^3)	Cumulative Runoff Volume (%)
1	28428	43838	39.3
4	55727	16542	77.1
9	65308	6961	90.4
16	69250	3020	95.8
25	71008	1262	98.3
36	71818	452	99.4
49	72153	117	99.8
64	72249	21	100.0
81	72270	0	100.0
100	72270	0	100.0

Cumulative Runoff Volume by Runoff Rate

For area: 0.476(ha), imperviousness: 79.00%, rainfall station: OTTAWA MACDONALD-CARTIER INT'L A



Rainfall Event Analysis				
Rainfall Depth (mm)	**No. of Events**	**Percentage of Total Events (%)**	**Total Volume (mm)**	**Percentage of Annual Volume (%)**
6.35	3113	76.1	5230	24.9
12.70	501	12.2	4497	21.4
19.05	225	5.5	3469	16.5
25.40	105	2.6	2317	11.0
31.75	62	1.5	1765	8.4
38.10	35	0.9	1206	5.8
44.45	28	0.7	1163	5.5
50.80	12	0.3	557	2.7
57.15	7	0.2	378	1.8
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



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