

10376YongeStreet•Suite307•RichmondHill•Ontario•L4C3B8•T:905•237•5410,F:905•237•5413

STORMWATER MANAGEMENTREPORT

PROPOSED INDUSTRIAL WAREHOUSE

10533KEELE STREET
CITY OF VAUGHAN, ONTARIO

York Region File - SP.23.V.0097
4th Submission

13th OCTOBER, 2026

SOSCIA PROJECT # 24-020

SOSCIA PROFESSIONAL ENGINEERS INC.





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Table of Contents

1.0 INTRODUCTION 4
2.0 STUDY AREA 4
3.0 PROPOSED DEVELOPMENT 5
4.0 OBJECTIVES OF STORMWATER DRAINAGE AND SITE SERVICING 5
5.0 EXISTING TOPOGRAPHY AND DRAINAGE PATTERN 6
6.0 STORMWATER MANAGEMENT CRITERIA 6
7.0 STORMWATER MANAGEMENT STUDY 7
7.1 Runoff Coefficients 7
7.2 Peak Flow Calculation 8
7.3 Pre Development Peak Flow 9
7.4 Post Development Drainage Pattern and Peak Flow Rates 9
7.5 Uncontrolled Flow 9
7.6 Allowable Peak Flow 10
8.0 QUANTITY CONTROL 10
8.1 Vortex Flow Control Calculations 10
8.2 Storage for Quantity Control 10
9.0 WATER BALANCE 11
10.0 WATER QUALITY CONTROL 11
11.0 EROSION AND SEDIMENT CONTROL 11
12.0 SUMMARY & CONCLUSIONS 12

List of Appendix

Appendix A - Drawings
Appendix B - Flow Analysis
Appendix C - 100 year Required Storage & Available Storage
Appendix D - Storm Sewer Design Sheet
Appendix E - OGS Sizing
Appendix F - Underground Storage Tank
Appendix G - Vortex Flow Regulator
Appendix H - Site-Specific Water Balance Assessment




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REFERENCES

The stormwater management for the proposed development utilizes the criteria and guidelines provided in the following reference documents:

- Stormwater Management Planning and Design Manual, MOE, 2003
- Engineering Design Criteria and Standard Drawings (**EDCSD**), City of Vaughan
- York Region Road Design Guidelines, January 2023

Some technical reports further provide data while selecting appropriate procedure in SWM:

- Survey Report for the site KRCMAR SURVEYORS LTD., dated 17th August, 2022.

1.0 INTRODUCTION

SOSCIA Professional Engineers Inc. is retained by the owner of the property to undertake the Servicing and Stormwater Management (SWM) design for the proposed site development. The purpose of this report is to present the storm sewer, sanitary sewage disposal, water distribution and appropriate SWM measures to mitigate the impact of post development storm runoff from the proposed development.

2.0 STUDY AREA

Municipal address of the site is 10533 Keele Street, Vaughan, Ontario. Site is located at north east corner of Keele Street and Drummond Dr. in the City of Vaughan. The total area of the property is approximately 0.22 ha. (Refer Key Plan in Figure 1).

A legal and topographic survey has been prepared by KRCMAR SURVEYORS LTD., dated 17th of August 2022 which identifies the site as part of Lot 24 Concession 3 in the City of Vaughan under Municipality of York.



Figure 1 – Key Plan

3.0 PROPOSED DEVELOPMENT

The subject land is proposed to develop an Industrial Warehouse with finished floor elevation of 258.55. The proposed finished floor elevation is above highest water level (HWL) of proposed parking lot ponding for 100 year rainfall event of 258.35. Grades around the site are proposed to be matched at the boundary limits.

4.0 OBJECTIVES OF STORMWATER DRAINAGE AND SITE SERVICING

Stormwater management (SWM) strategies considered to mitigate any potential impact as per design guidelines of authorities of jurisdictions are as follows:

- Identifying existing runoff pattern and control quantity of runoff discharge from subject site;
- Identifying post development runoff from the site towards the existing municipality right of way and neighboring property line ;
- Propose site servicing systems as per design requirements
- Address the concerns of the reviewing agencies including City of Vaughan



Figure 2 - Existing Site Conditions




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5.0 EXISTING TOPOGRAPHY AND DRAINAGE PATTERN

The total site area is approximately 0.22 ha. At present time, shown in Figure 2, the site contains an existing building, and surface covered in landscape hardscape. The topographical survey plan (Refer: Appendix A – Topographical Survey Plan) indicates that the site is sloped from north towards south limit. The highest elevation of the property is 258.87 m, at the north side and it goes down to 257.59m at south side at a slope of approximately 4.9%.

6.0 STORMWATER MANAGEMENT CRITERIA

SWM Criteria for the proposed development site was determined based on following guidelines and manuals:

- Stormwater Management Planning and Design Manual, MECP, 2003
- Engineering Design Criteria and Standard Drawings (EDCSD), City of Vaughan
- York Region Road Design Guidelines, January 2023

The criteria for the proposed development are summarized below:

- **Water Quantity Control –** As per York Region guidelines, 100 year Post Development Flows from the site to be controlled to 5 year Pre-Development flow rate;

- **Water Quality Control -** –Stormwater discharged from the post-development site are required to meet an enhanced level of Ministry of the Environment, Conservation and Parks guidelines (80% TSS removal);

- **Erosion and Sediment Control** – Potential erosion during construction to be assessed using methods described in "Erosion and Sediment Control Guideline for Urban Construction (December 2006)" of temporary erosion and sediment control measures suitable for construction sites.




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7.0 STORMWATER MANAGEMENT STUDY

7.1 Runoff Coefficients

Runoff parameters used for site under existing and proposed conditions as per City design standards are shown in Table below,

Runoff Coefficients

Land use	Runoff Coefficient
Roof	0.90
Open space	0.25
Paved Areas	0.90

Pre-development runoff coefficients calculated based on existing landuse and presented in Appendix B (Calculation Sheet 1). Post development catchment areas have been shown in Post development catchment area plan in Appendix A. Calculations for pre-and post development imperviousness included in Appendix B and summarized below in Table below.

Runoff Coefficients

	Pre-development	Considered Pre-development coefficient	Post development
Runoff Coefficient 'C'	0.75	0.25	0.80





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7.2 Peak Flow Calculation

The Rational Method has been used to determine the peak flows from the subject site under pre-development and post development conditions. The rainfall-runoff relationship is as follows:

$$Q = RAIN$$

Where:
Q = Flow in m^3/s;
A = Effective area of drainage basin in hectares (ha);
C = runoff coefficient; and
I = Rainfall intensity in mm/hr.

I (mm/hr) = [A / (T + B) ^{c}] * Constant,
Where T = 15 mins

Rainfall intensities calculated using the rainfall intensity-duration-frequency (IDF) values. The IDF values obtained from the York Region Road Design Guidelines, January 2023 are as below:-

IDF Values Table

Return period	5-yr	10-yr	25-yr	50-yr	100-yr
A	1045.41	1331.42	1045.41	1045.41	1045.41
B	4.9	5.26	4.9	4.9	4.9
C	0.83	0.84	0.83	0.83	0.83
Constant	1	1	1.39	1.54	1.69
INTENSITY I (mm/hr)	**87.35**	**106.35**	**121.41**	**134.51**	**147.61**




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7.3 Pre Development Peak Flow

Pre development flows calculated based on 0.25 runoff coefficient as per York Region Guidelines are presented in Appendix B. The results are summarized in Table below.

Pre Development Peak Flow (L/sec)

Return period	5-yr	10-yr	25-yr	50-yr	100-yr
Q(l/sec)	13.30	16.19	18.48	20.48	22.47

7.4 Post Development Drainage Pattern and Peak Flow Rates

The proposed site development includes a mix of paved and landscaped areas as well as an Industrial building. Proposed site grades designed to ensure that vehicular access will be unimpeded. Perimeter grades have been adjusted to ensure confinement of stormwater within the site and protect adjacent properties from overland flow.

Post development peak flows were calculated and presented in Appendix B. The results are summarized in Table below.

Post Development Peak Flow (L/sec)

Return period	5-yr	10-yr	25-yr	50-yr	100-yr
Q(l/sec)	42.71	52.00	59.37	65.78	72.18

7.5 Uncontrolled Flow

Uncontrolled flows from the property were calculated and presented in Appendix B. The results are summarized in Table below.

Post Development Peak Flow (L/sec)

Return period	5-yr	10-yr	25-yr	50-yr	100-yr
Q(l/sec)	4.15	5.04	5.77	6.39	7.01




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7.6 Allowable Peak Flow

Storm sewers are to be designed to control 100 year post development flows to 5 year Pre development flows.

Allowable flow = 5 year pre-development – uncontrolled flow
= 13.30 – 7.01
= **6.29 l/s**

8.0 QUANTITY CONTROL

Post-development flow for 100 years rainfall event will be controlled by proposed orifice to control discharge rate under allowable discharge rate for respective rainfall events.

8.1 Vortex Flow Control Calculations

A 375-CF75-A Vortex flow regulator is proposed at upstream of Storm Control Manhole MH11 in order to ensure that the total storm drainage to the existing system does not exceed the allowable release rate of 6 L/s.

8.2 Storage for Quantity Control

Allowable discharge rate, controlled flow rate and required detention Storage calculated based on controlled flow from Orifice are presented in Appendix C and summarized in Table below.

Detention Storage (m^3)

Required Detention Storage (m3)	66.81
Manhole and Catch Basin(m^3)	6.25
Pipes (m^3)	9.21
Underground Tank (m^3)	66.43
Surface Ponding (m^3)	5
Total Proposed Storage (m^3)	86.88




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9.0 WATER BALANCE

According to the site-specific water balance assessment conducted by GHD, the average annual runoff over the site is expected to increase by 10 m^3/yr under proposed conditions. Please refer to Site-specific water balance assessment by GHD in Appendix H.

As per city of Vaughan's standrards Section 3.3.6, runoff from a 5 mm rainfall event must be retained on-site for reuse, infiltration, or evapotranspiration. Based on this, runoff from roof will be retained in proposed precast rainwater storage tank with capacity of 10cu.m. This water will be reused for irrigating the landscape area of the site

10.0 WATER QUALITY CONTROL

Jellyfish filter model JF4 is proposed to achieve 80% removal of Total Suspended Solids (TSS) to substantially improve the water quality of the stormwater leaving the site. The sizing details for the OGS unit are provided in Appendix E.

11.0 EROSION AND SEDIMENT CONTROL

During construction, various temporary measures proposed to be implemented to prevent the discharge of sediment laden stormwater from the site. These measures include silt fencing, catch basin buffers and mud-mats etc.

In addition to the above, the following "good housekeeping" measures are recommended:

- All exposed soil shall be stabilized as soon as possible with a seed and mulch application as directed by the Engineer;
- No construction activity or machinery shall intrude beyond the silt/snow fence or limit of construction area.
- All construction vehicles shall leave the site at designated locations as shown on the plans;
- Stockpiles of soil shall be set back from any watercourse and stabilized against erosion as soon as possible. A set back of at least 15m from any top-of-bank, watercourse or pond is required;
- Cleaning and repairs of mud-mats and any other temporary sediment control measures shall be completed as deemed necessary through regular inspection;





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- Sediment/silt shall be removed from the sediment control devices after each storm event and deposited in areas as approved by the engineer; and

- All re-graded areas within the development which are not occupied by buildings, roadways, sidewalks, or driveways shall be top-soiled and sodded/seeded immediately after completion of final grading operations as directed by the engineer.

12.0 SUMMARY & CONCLUSIONS

Post-Development flows upto 100 years have been controlled to release rate of 6 l/s with the help of 375-CF CF75-A Vortex flow regulator proposed upstream of control MH No.11. An underground cultec with capacity of 76m^3 has been proposed to store the controlled storm water runoff. A Jellyfish filter model JF4 is proposed to achieve 80% removal of Total Suspended Solids (TSS) to substantially improve the water quality of the stormwater leaving the site. The stormwater after quality and quantity control will be discharged into existing CBMH along 600mm municipal storm sewer running along the Keele Street.

PREPARED BY:

Yours truly,

Sandro Soscia, P. Eng.
SOSCIA Professional Engineers Inc.





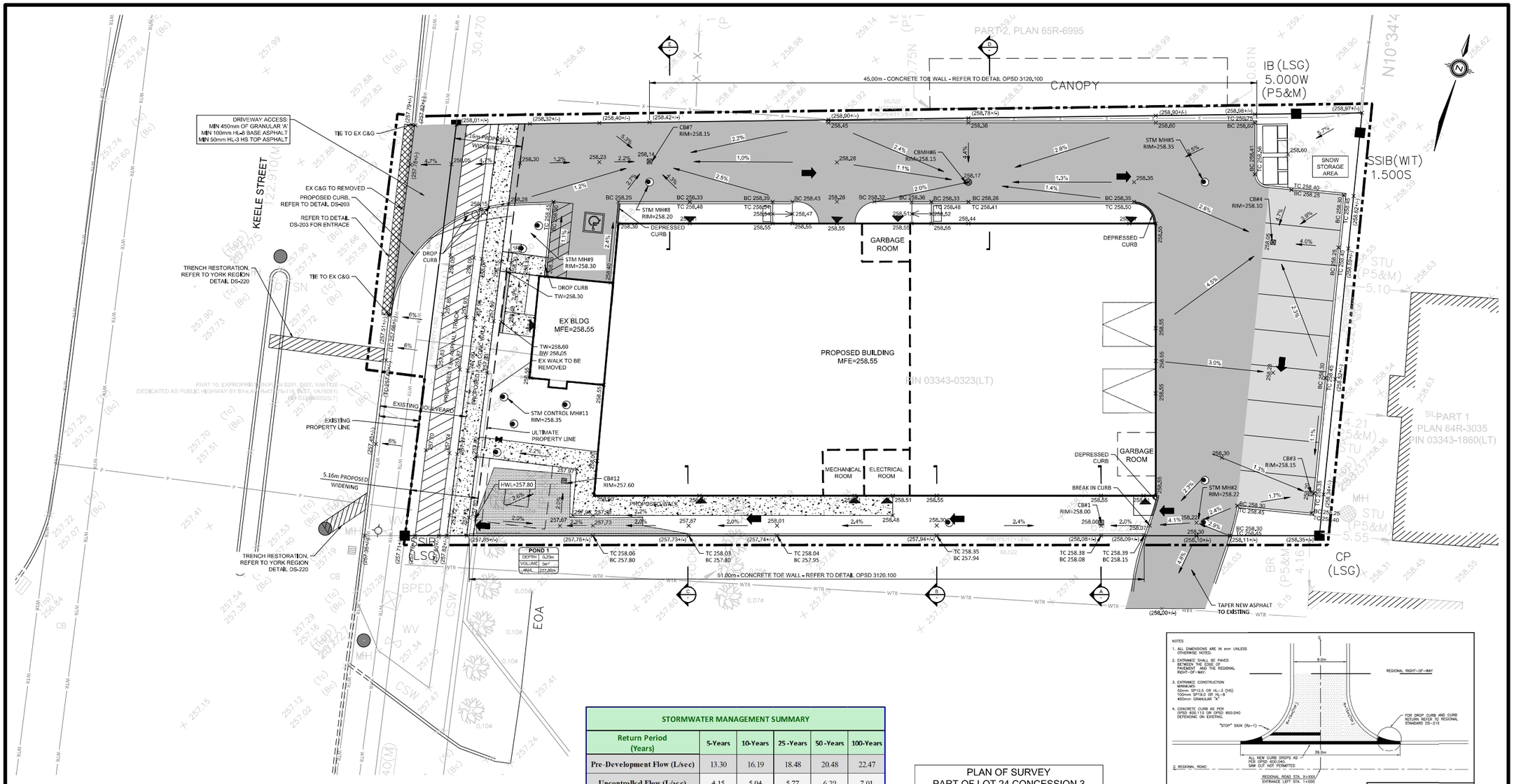


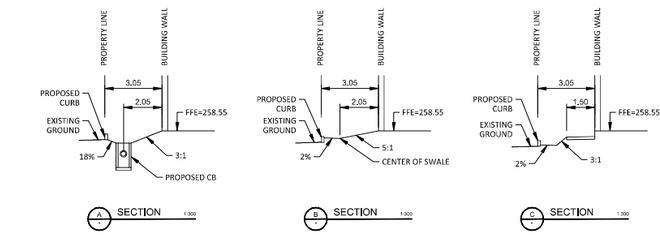


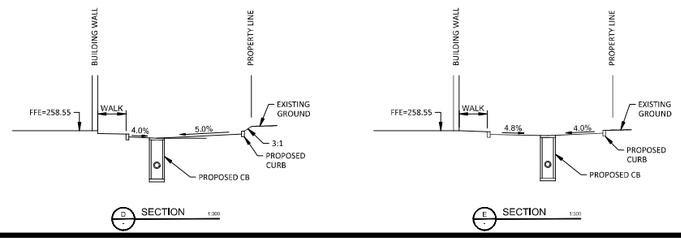
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APPENDIX

Appendix A
Drawings







STORMWATER MANAGEMENT SUMMARY					
Return Period (Years)	5-Years	10-Years	25-Years	50-Years	100-Years
Pre-Development Flow (L/sec)	13.30	16.19	18.48	20.48	22.47
Uncontrolled Flow (L/sec)	4.15	5.04	5.77	6.39	7.01
Post-Development Flow (L/sec)	42.71	52.00	59.37	65.78	72.18
Allowable Flow (L/sec)	6.29				
Vortex Controlled Flow (L/sec)	6				

PLAN OF SURVEY
PART OF LOT 24 CONCESSION 3
CITY OF VAUGHAN
REGIONAL MUNICIPALITY OF YORK

NOTES:

1. BEARINGS SHOWN HEREON ARE ASTRONOMIC AND ARE REFERRED TO THE EASTERLY LIMIT OF KEELE STREET AS SHOWN ON EXPROPRIATION PLAN 8291, INST. VA61426 HAVING A BEARING OF N09°12'10"W.
2. ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE RELATED TO CITY OF VAUGHAN BENCH MARK No. 105090140 HAVING AN ELEVATION OF 240.744 METRES.

ROADWORKS NOTES:

1. ENTRANCE DRIVEWAYS SHALL BE CONSTRUCTED WITH HEAVY DUTY ASPHALT FROM THE BACK OF THE MUNICIPAL CURB OR EDGE OF PAVEMENT TO THE PROPERTY LINE (AREA HIGHLIGHTED ON DRAWING(S)) IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
   - 50mm COMPACTED DEPTH OF HL3 ASPHALT - TOP COURSE
   - 100mm COMPACTED DEPTH OF HL8 ASPHALT - BINDER COURSE
   - 150mm COMPACTED DEPTH OF 20 MM CRUSHER-RUN LIMESTONE - GRANULAR BASE
   - 300mm COMPACTED DEPTH OF 50 MM CRUSHER-RUN LIMESTONE - GRANULAR SUB-BASE
2. THE SURFACE OF ALL LOADING SPACES AND RELATED DRIVEWAYS, PARKING SPACES, AND MANEUVERING AREAS WITHIN THE SITE SHALL BE PAVED WITH A HARD SURFACE. THE MINIMUM DEPTH REQUIREMENTS ARE AS FOLLOWS, OR AS SPECIFIED BY GEOTECHNICAL ENGINEER:
   - 40mm COMPACTED DEPTH HL3 ASPHALT - TOP COURSE
   - 150mm COMPACTED DEPTH 20 MM CRUSHER-RUN LIMESTONE - GRANULAR BASE
   - 200mm COMPACTED DEPTH 50 MM CRUSHER-RUN LIMESTONE - GRANULAR SUB-BASE
3. FOR CONDOMINIUM UNIT DRIVEWAYS, THE MINIMUM DEPTH REQUIREMENTS ARE AS FOLLOWS, OR AS SPECIFIED BY GEOTECHNICAL ENGINEER:
4. 25mm COMPACTED DEPTH HL3 ASPHALT TOP COURSE (TOP COURSE ASPHALT SHALL NOT BE PLACED UNTIL THE BASE COURSE ASPHALT HAS BEEN IN PLACE FOR ONE WINTER SEASON. OTHER HARD SURFACES MAY BE INSTALLED AS APPROVED BY THE CITY.)
5. 50mm COMPACTED DEPTH HL8 ASPHALT BASE COURSE
6. 200mm COMPACTED DEPTH 20 MM CRUSHER-RUN LIMESTONE BASE
7. ALL CONCRETE CURB FROM EXISTING ROAD CURB TO STREET LINE SHALL BE BARRIER CURB OPSD 600.110. ALL CONCRETE CURB HEIGHTS SHALL BE 150mm UNLESS OTHERWISE NOTED. ENTRANCE DRIVEWAY CURB TO BE DISCONTINUOUS AT SIDEWALK AND TAPERED BACK 600mm MINIMUM.
8. ALL REQUIRED CURB CUTTING AT ENTRANCE DRIVEWAY AND CURB DEPRESSIONS AT SIDEWALK CROSSINGS SHALL BE INSTALLED TO THE SATISFACTION OF THE CITY.
9. EXISTING ROADWAY CURB AND GUTTER TO BE CONTINUOUS THROUGH THE PROPOSED NEW DRIVEWAY ENTRANCE(S) ALONG WITH THE MUNICIPAL SIDEWALK.
10. SIDEWALK TO BE 200 MM THICK THROUGH DRIVEWAY ENTRANCE PER CITY STANDARD R-128 AND TO INCLUDE TACTILE INDICATORS IN ACCORDANCE WITH YORK REGION STANDARD.
11. ENTRANCE DRIVEWAYS SHALL BE SETBACK A MINIMUM CLEARANCE OF 1.0m FROM ALL ABOVEGROUND SERVICES OR OTHER OBSTRUCTIONS.
12. PAVEMENT GRADES: MIN. 0.5%; MAX 5%.

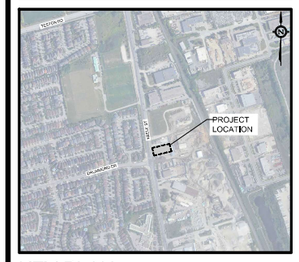
GENERAL NOTES:

1. STANDARD DRAWINGS OF THE CITY OF VAUGHAN CONSTITUTE PART OF THESE DRAWING(S).
2. ALL CONSTRUCTION WORK TO BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS.
3. THE OWNER SHALL RETAIN THE SERVICES OF HIS CONSULTANTS TO ENSURE REQUIRED INSPECTION REPORTS AND OR CERTIFICATION REQUIREMENTS ARE SUBMITTED TO THE DEVELOPMENT ENGINEERING DEPARTMENT AND OTHER AFFECTED CITY DEPARTMENTS.
4. THE OWNER AND/OR HIS REPRESENTATIVE SHALL RECTIFY ALL DISTURBED AREAS TO ORIGINAL CONDITION OR BETTER AND TO THE SATISFACTION OF THE CITY.
5. THE LOCATION OF ALL UNDERGROUND/ABOVE GROUND UTILITIES AND STRUCTURES IS APPROXIMATE ONLY AND WHERE SHOWN ON THE DRAWING(S) THE ACCURACY OF THE LOCATION OF SUCH UTILITIES IS NOT GUARANTEED. THE OWNER AND/OR HIS REPRESENTATIVE SHALL DETERMINE THE LOCATION OF ALL SUCH UTILITIES AND STRUCTURES BY CONSULTING THE APPROPRIATE AUTHORITIES OR UTILITY COMPANIES CONCERNED. THE OWNER SHALL PROVE THE LOCATION OF SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE OR RESTORATION OR ADJUSTMENT FOR THE SAME.
6. ANY CONFLICTS WITH EXISTING SERVICES SHALL BE RECTIFIED AT THE OWNER'S EXPENSE.
7. APPROPRIATE CONSTRUCTION DETAILS SHOULD BE PROVIDED FOR RETAINING WALLS HIGHER THAN 1.0 M. DETAILS SHALL BE DESIGNED AND CERTIFIED BY A PROFESSIONAL ENGINEER UPON APPROVAL. HANDRAIL/GUARD/FENCE IS REQUIRED WHEN HEIGHT EXCEEDS 0.60 M (AS PER CITY STANDARD DRAWING FRW-105 OR APPROVED EQUAL), UPON COMPLETION. RETAINING WALLS GREATER THAN 1.0 M TO BE CERTIFIED BY A STRUCTURAL AND GEOTECHNICAL ENGINEERS.
8. LANDSCAPING WORK SHALL NOT ENCROACH ON BOULEVARD NOR SHALL BOULEVARD GRADES BE ALTERED.
9. SLOPES IN LANDSCAPED AREAS AND ON BERMS SHALL NOT EXCEED 3 HORIZONTAL TO 1 VERTICAL.
10. GRASSED DRAINAGE SWALE GRADES: MIN. 2%. MAX 5%.
11. OUTSIDE LIGHTING SHALL BE DIRECTED DOWNWARD AND INWARD AND DESIGNED TO MAINTAIN ZERO CUT-OFF LIGHT LEVEL DISTRIBUTION AT THE PROPERTY LINE.
12. SILT FENCE(S) AND OTHER EROSION CONTROL MEASURES TO BE INSTALLED AND MAINTAINED TO PREVENT SILT FLOWING ONTO ADJACENT LANDS UNTIL THE COMPLETION OF SODDING ACTIVITIES.
13. CONSTRUCTION ACCESS SHALL BE CONSTRUCTED WITH A MINIMUM DEPTH OF 450 MM CRUSHED STONE BASE FROM THE MUNICIPAL CURB OR EDGE OF PAVEMENT TO THE PROPERTY LINE, TO THE SATISFACTION OF THE CITY.
14. ALL PROPOSED BARRIER-FREE PARKING SPACES TO INCLUDE "RB-93 BY PERMIT ONLY" TRAFFIC SIGN AND BARRIER-FREE PAVEMENT SYMBOL MARKING.

Contractor must check and verify all dimensions and be res- ponsible for same, reporting any discrepancies to the Engineer before commencing work.
Prints shall not be used for construction until signed 'Approved For Construction' by the Engineer.
Prints are not to be scaled.
All drawings, prints and specifications are the property of the Engineer and shall be returned to him on completion of the work.
All work shall be performed in accordance with the latest edition of the ONTARIO BUILDING CODE, NATIONAL BUILDING CODE and regulatory regulations of the Town of Oshawa Building Department.
These notes are to be read in conjunction with all drawings and specifications.

The Contractor shall check all dimensions and other data from the job and report any discrepancies to the Architects before proceeding.

No	DATE	REVISION	DRN	CHKD
1	2024-04-18	ISSUED FOR APPROVAL	DB	SS
2	2024-10-28	ISSUED FOR APPROVAL	DB	SS
3	2025-03-19	ISSUED FOR APPROVAL	DB	SS
4	2025-09-25	REVISED AS PER CITY & REGION COMMENTS	DB	SS
5	2026-05-12	REVISED AS PER UPDATED ARCH SITE PLAN	DB	SS
6	2026-08-05	REVISED AS PER UPDATED ARCH SITE PLAN / BLDG MECH	DB	SS
7	2026-10-13	REVISED AS PER SPA COMMENTS	DB	SS



KEY PLAN

SCALE: NTS

LEGEND

- CONSTRUCTION BOUNDARY
- EXISTING PROPERTY LINE
- ULTIMATE PROPERTY LINE
- 258.20 PROPOSED ELEVATION
- BC 258.00 PROPOSED ELEVATION BOTTOM CURB
- TC 258.00 PROPOSED ELEVATION TOP OF CURB
- (183.34±) EXISTING ELEVATION
- 1.0% PROPOSED SLOPE
- (1.0%) EXISTING SLOPE
- DIRECTION OF PROPOSED OVERLAND FLOW
- PROPERTY LINE
- EXISTING CURB & GUTTER
- EXISTING FENCE
- CATCHBASIN
- CATCHBASIN MAINTENANCE HOLE
- MAINTENANCE HOLE
- EXISTING MAINTENANCE HOLE
- PONDING AREA
- HEAVY DUTY PAVEMENT
- LIGHT DUTY PAVEMENT
- ASPHALT CYCLE TRACK
- CONCRETE WALK

LICENSED PROFESSIONAL ENGINEER — SOSCIA — OCTOBER 7, 2024 — PROVINCE OF ONTARIO

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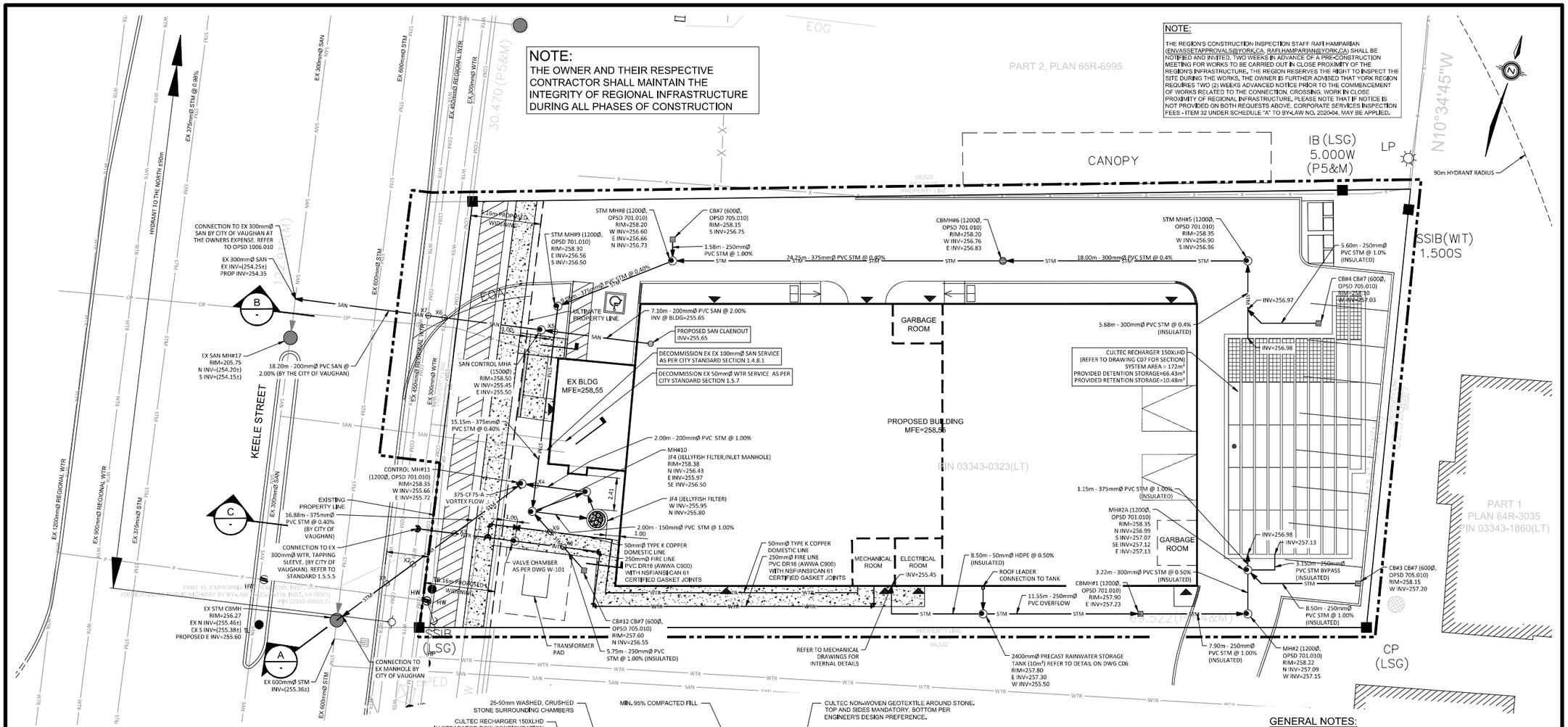
PROJECT: PROPOSED INDUSTRIAL WAREHOUSE
CITY FILE:DA.24.032

10533 KEELE STREET
VAUGHAN (MAPLE), ONTARIO

SHEET TITLE:	JOB NO:
SITE GRADING PLAN	24-020
SCALE: 1:150	DATE: OCTOBER, 2026
DRAWN: DB	CHECKED: SS
DWG NO: C01	

NOTE:
THE OWNER AND THEIR RESPECTIVE CONTRACTOR SHALL MAINTAIN THE INTEGRITY OF REGIONAL INFRASTRUCTURE DURING ALL PHASES OF CONSTRUCTION

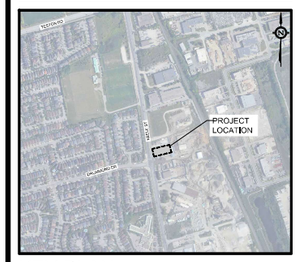
NOTE:
THE REGION'S CONSTRUCTION INSPECTION STAFF RAFI HAMPARIAN (ENVASSETAPPROVALS@YORK.CA, RAFI.HAMPARIAN@YORK.CA) SHALL BE NOTIFIED AND INVITED, TWO WEEKS IN ADVANCE OF A PRE-CONSTRUCTION MEETING FOR WORKS TO BE CARRIED OUT IN CLOSE PROXIMITY OF THE REGION'S INFRASTRUCTURE. THE REGION RESERVES THE RIGHT TO INSPECT THE SITE DURING THE WORKS. THE OWNER IS FURTHER ADVISED THAT YORK REGION REQUIRES TWO (2) WEEKS ADVANCED NOTICE PRIOR TO THE COMMENCEMENT OF WORKS RELATED TO THE CONNECTION, CROSSING, WORK IN CLOSE PROXIMITY OF REGIONAL INFRASTRUCTURE. PLEASE NOTE THAT IF NOTICE IS NOT PROVIDED ON BOTH REQUESTS ABOVE, CORPORATE SERVICES INSPECTION FEES - ITEM 32 UNDER SCHEDULE 'A' TO BY-LAW NO. 2020-04, MAY BE APPLIED.



Contractor must check and verify all dimensions and be res- ponsible for same, reporting any discrepancies to the Engineer before commencing work.
Prints shall not be used for construction until signed 'Approved For Construction' by the Engineer.
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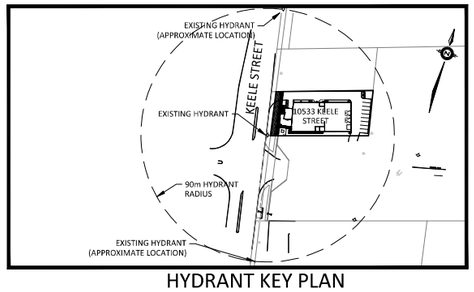
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2	2024-10-28	ISSUED FOR APPROVAL	DB	SS
3	2025-03-19	ISSUED FOR APPROVAL	DB	SS
4	2025-09-25	REVISED AS PER CITY & REGION COMMENTS	DB	SS
5	2026-05-12	REVISED AS PER UPDATED ARCH SITE PLAN	DB	SS
6	2026-08-05	REVISED AS PER UPDATED ARCH SITE PLAN / BLDG MECH	DB	SS
7	2026-10-13	REVISED AS PER SPA COMMENTS	DB	SS



KEY PLAN
SCALE: NTS

LEGEND
- CONSTRUCTION BOUNDARY
- PROPERTY LINE
- EXISTING CURB & GUTTER
- STM — EXISTING STORM
- SAN — EXISTING SANITARY
- WTR — EXISTING WATER
- EXISTING MAINTENANCE HOLE
- EXISTING VALVE
- EXISTING CATCHBASIN
- EXISTING HYDRANT
- STM — PROPOSED STORM
- SAN — PROPOSED SANITARY
- WTR — PROPOSED WATER
- PROPOSED MAINTENANCE HOLE
- PROPOSED CATCHBASIN MAINTENANCE HOLE
- PROPOSED CATCHBASIN
- PROPOSED WATER METER
- PROPOSED BACKFLOW PREVENTER

LICENSED PROFESSIONAL ENGINEER — S. SOSCIA — OCTOBER 13, 2026 — PROVINCE OF ONTARIO



HYDRANT KEY PLAN
1:2000

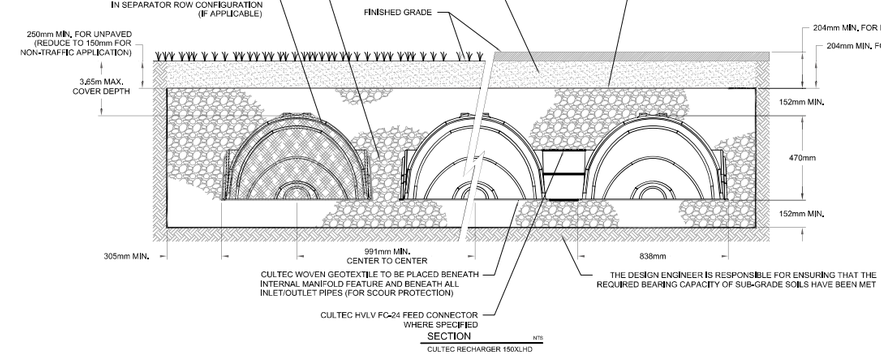
PLAN OF SURVEY
PART OF LOT 24 CONCESSION 3
CITY OF VAUGHAN
REGIONAL MUNICIPALITY OF YORK

NOTES:
1. BEARINGS SHOWN HEREON ARE ASTRONOMIC AND ARE REFERRED TO THE EASTERLY LIMIT OF KEELE STREET AS SHOWN ON EXPROPRIATION PLAN 8291, INST. VA61426 HAVING A BEARING OF N09°12'10"W
2. ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE RELATED TO CITY OF VAUGHAN BENCH MARK No. 1000901140 HAVING AN ELEVATION OF 240.744 METRES.

DEEP UTILITY PIPE CROSSING TABLE

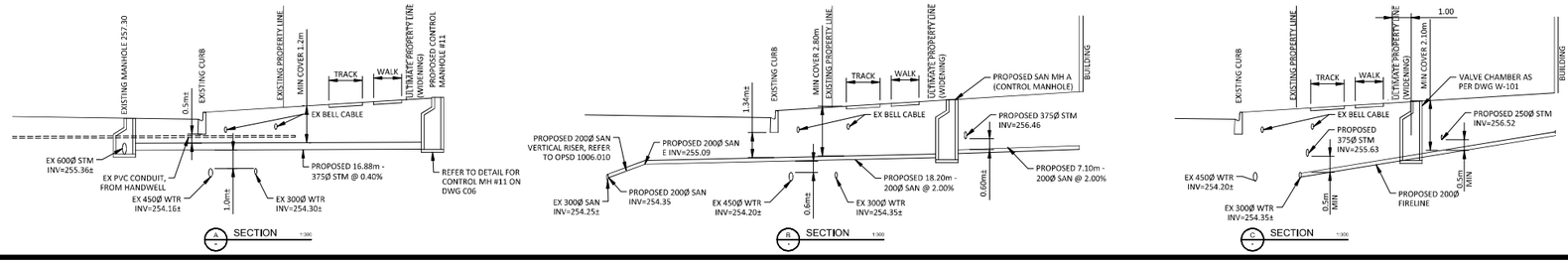
PROJECT NAME: 10533 Keele Street Industrial Warehouse — DATE: August 5, 2026
PROJECT No.: 24-020 — CALCULATED BY: DB

CROSSING No.	PIPE 1	INV 1	SIZE	TOP 1	PIPE 2	INV 2	SIZE	TOP 2	DIFF (m)
X1	STM	256.01	0.375	256.39	WTR	254.60	0.450	255.05	0.96
X2	STM	256.02	0.375	256.40	WTR	254.60	0.300	254.90	1.12
X3	STM	255.64	0.375	256.02	WTR	254.66	0.150	254.81	0.83
X4	STM	255.73	0.200	255.93	STM	256.45	0.375	256.83	0.52
X5	STM	256.49	0.375	256.87	SAN	255.52	0.200	255.72	0.77
X6	SAN	255.31	0.200	255.51	WTR	254.35	0.300	254.65	0.66
X7	SAN	255.27	0.200	255.47	WTR	254.20	0.450	254.65	0.62
X8	STM	256.53	0.250	256.78	WTR	255.88	0.150	256.03	0.50
X9	STM	256.51	0.250	256.76	WTR	255.88	0.050	255.93	0.58



SEWER & WATER NOTES:
1. SANITARY AND STORM CONTROL MAINTENANCE HOLES SHALL BE IN ACCORDANCE WITH ALL APPLICABLE OPSD
2. DETAILS, FRAME AND COVER SHALL BE OPSD 401.010 TYPE A OR APPROVED EQUAL. THE MAINTENANCE HOLES SHALL BE BENCHED TO THE OBVERT (TOP) OF PIPES.
3. ALL SANITARY MAINTENANCE HOLE COVERS IN THE PONDING AREAS TO BE WATER TIGHT SEALED COVERS.
4. ALL CATCHBASINS SHALL BE INSTALLED IN ACCORDANCE WITH CITY STANDARD DRAWING S-103. ALL CATCHBASIN
5. FRAMES AND GRATES SHALL BE OPSD 400.010 OR OPSD 400.110 OR APPROVED EQUAL.
6. WATERMAIN SHALL HAVE A MINIMUM VERTICAL SEPARATION OF 0.5 M AND HORIZONTAL SEPARATION OF 2.5m BETWEEN ANY SEWER OR MAINTENANCE HOLE UNLESS OTHERWISE NOTED.
7. HYDRANTS TO BE INSTALLED AS PER CITY STANDARD W-104 WITH 1.0 M MINIMUM CLEAR FROM ALL OBSTRUCTIONS.
8. ALL INDUSTRIAL/COMMERCIAL/CONDO/MINIUM WATERMAIN CONNECTIONS SHALL BE CONSTRUCTED IN ACCORDANCE WITH CITY STANDARD DRAWINGS C-102, C-103, W-106, W-109 AND RELATED STANDARD DRAWINGS.
9. SANITARY, STORM AND WATER SERVICE CONNECTIONS WHICH ARE NOT IN PLACE ON THE MUNICIPAL ROAD ALLOWANCE TO THE PROPERTY LINE SHALL BE ARRANGED FOR INSTALLATION BY THE CITY ON PAYMENT OF INSTALLATION COSTS BY THE OWNER. TO INITIATE THE INSTALLATION OF THE SERVICE CONNECTION(S), THE OWNER SHALL FILE AN APPLICATION WITH THE CONSTRUCTION SERVICES DIVISION OF THE DEVELOPMENT ENGINEERING DEPARTMENT WHICH INCLUDES 2 COPIES OF THE APPROVED SITE SERVICING AND GRADING DRAWING(S) WITH DEPARTMENT'S APPROVAL SEAL AND, IF REQUIRED, A COPY OF THE REGION OF YORK APPROVAL SCHEDULE AS PER THE EXECUTED SITE PLAN AGREEMENT.

GENERAL NOTES:
1. STANDARD DRAWINGS OF THE CITY OF VAUGHAN CONSTITUTE PART OF THESE DRAWING(S).
2. ALL CONSTRUCTION WORK TO BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS.
3. THE OWNER SHALL RETAIN THE SERVICES OF HIS CONSULTANTS TO ENSURE REQUIRED INSPECTION REPORTS AND OR CERTIFICATION REQUIREMENTS ARE SUBMITTED TO THE DEVELOPMENT ENGINEERING DEPARTMENT AND OTHER AFFECTED CITY DEPARTMENTS.
4. THE OWNER AND/OR HIS REPRESENTATIVE SHALL RECTIFY ALL DISTURBED AREAS TO ORIGINAL CONDITION OR BETTER AND TO THE SATISFACTION OF THE CITY.
5. THE LOCATION OF ALL UNDERGROUND UTILITIES AND STRUCTURES IS APPROXIMATE ONLY AND WHERE SHOWN ON THE DRAWING(S) THE ACCURACY OF THE LOCATION OF SUCH UTILITIES IS NOT GUARANTEED. THE OWNER AND/OR HIS REPRESENTATIVE SHALL DETERMINE THE LOCATION OF ALL SUCH UTILITIES AND STRUCTURES BY CONSULTING THE APPROPRIATE AUTHORITIES OR UTILITY COMPANIES CONCERNED. THE OWNER SHALL PROVE THE LOCATION OF SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE OR RESTORATION OR ADJUSTMENT FOR THE SAME.
6. ANY CONFLICTS WITH EXISTING SERVICES SHALL BE RECTIFIED AT THE OWNER'S EXPENSE.
7. APPROPRIATE CONSTRUCTION DETAILS SHOULD BE PROVIDED FOR RETAINING WALLS HIGHER THAN 1.0 M. DETAILS SHALL BE DESIGNED AND CERTIFIED BY A PROFESSIONAL ENGINEER UPON APPROVAL. HANDRAIL/GUARD/FENCE IS REQUIRED WHEN HEIGHT EXCEEDS 0.60 M (AS PER CITY STANDARD DRAWING FRW-105 OR APPROVED EQUAL), UPON COMPLETION. RETAINING WALLS GREATER THAN 1.0 M TO BE CERTIFIED BY A STRUCTURAL AND GEOTECHNICAL ENGINEERS.
8. LANDSCAPING WORK SHALL NOT ENCROACH ON BOULEVARD NOR SHALL BOULEVARD GRADES BE ALTERED.
9. SLOPES IN LANDSCAPED AREAS AND ON BERMS SHALL NOT EXCEED 3 HORIZONTAL TO 1 VERTICAL.
10. GRASSED DRAINAGE SWALE GRADES: MIN. 2%; MAX 5%.
11. OUTSIDE LIGHTING SHALL BE DIRECTED DOWNWARD AND INWARD AND DESIGNED TO MAINTAIN ZERO CUT-OFF LIGHT LEVEL DISTRIBUTION AT THE PROPERTY LINE.
12. SILT FENCE(S) AND OTHER EROSION CONTROL MEASURES TO BE INSTALLED AND MAINTAINED TO PREVENT SILT FLOWING ONTO ADJACENT LANDS UNTIL THE COMPLETION OF SODDING ACTIVITIES.
13. CONSTRUCTION ACCESS SHALL BE CONSTRUCTED WITH A MINIMUM DEPTH OF 450 MM CRUSHED STONE BASE FROM THE MUNICIPAL CURB OR EDGE OF PAVEMENT TO THE PROPERTY LINE, TO THE SATISFACTION OF THE CITY.
14. ALL PROPOSED BARRIER-FREE PARKING SPACES TO INCLUDE "RB-93 BY PERMIT ONLY" TRAFFIC SIGN AND BARRIER-FREE PAVEMENT SYMBOL MARKING.

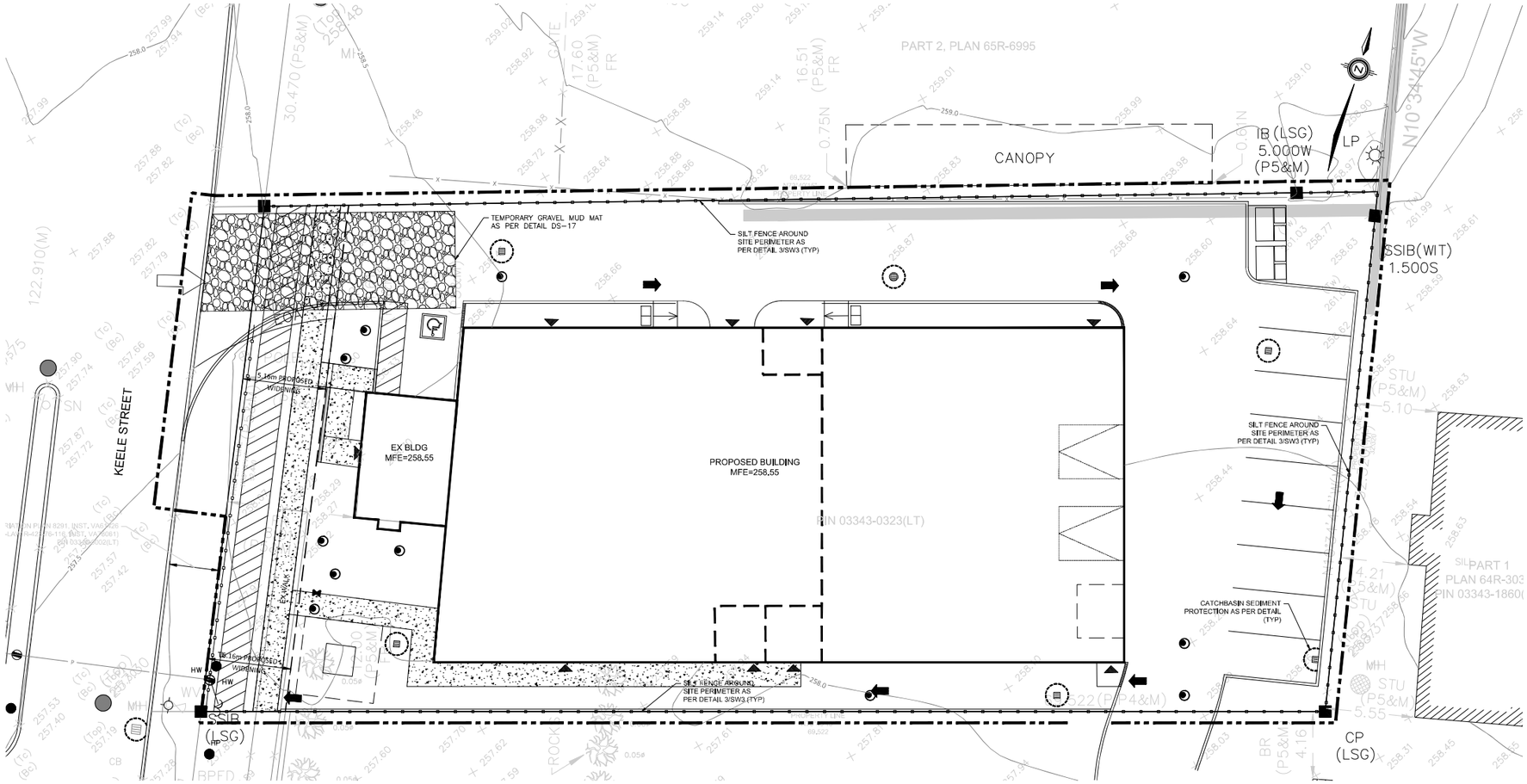


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ph 905 237 5410
fax 905 237 5413

PROJECT: PROPOSED
INDUSTRIAL WAREHOUSE
CITY FILE:DA.24.032

10533 KEELE STREET
VAUGHAN (MAPLE), ONTARIO

SHEET TITLE:		JOB NO:
SITE SERVICING PLAN		24-020
SCALE: 1:150	DATE: OCTOBER, 2026	DWG NO: C02
DRAWN: DB	CHECKED: SS	



GENERAL NOTES:

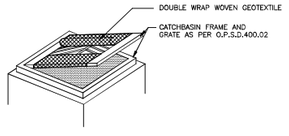
1. STANDARD DRAWINGS OF THE CITY OF VAUGHAN CONSTITUTE PART OF THESE DRAWING(S).
2. ALL CONSTRUCTION WORK TO BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS.
3. THE OWNER SHALL RETAIN THE SERVICES OF HIS CONSULTANTS TO ENSURE REQUIRED INSPECTION REPORTS AND OR CERTIFICATION REQUIREMENTS ARE SUBMITTED TO THE DEVELOPMENT ENGINEERING DEPARTMENT AND OTHER AFFECTED CITY DEPARTMENTS.
4. THE OWNER AND/OR HIS REPRESENTATIVE SHALL RECTIFY ALL DISTURBED AREAS TO ORIGINAL CONDITION OR BETTER AND TO THE SATISFACTION OF THE CITY.
5. THE LOCATION OF ALL UNDER/ABOVE GROUND UTILITIES AND STRUCTURES IS APPROXIMATE ONLY AND WHERE SHOWN ON THE DRAWING(S) THE ACCURACY OF THE LOCATION OF SUCH UTILITIES IS NOT GUARANTEED. THE OWNER AND/OR HIS REPRESENTATIVE SHALL DETERMINE THE LOCATION OF ALL SUCH UTILITIES AND STRUCTURES BY CONSULTING THE APPROPRIATE AUTHORITIES OR UTILITY COMPANIES CONCERNED. THE OWNER SHALL PROVE THE LOCATION OF SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE OR RESTORATION OR ADJUSTMENT FOR THE SAME.
6. ANY CONFLICTS WITH EXISTING SERVICES SHALL BE RECTIFIED AT THE OWNER'S EXPENSE.
7. APPROPRIATE CONSTRUCTION DETAILS SHOULD BE PROVIDED FOR RETAINING WALLS HIGHER THAN 1.0 M. DETAILS SHALL BE DESIGNED AND CERTIFIED BY A PROFESSIONAL ENGINEER UPON APPROVAL. HANDRAIL/GUARD/FENCE IS REQUIRED WHEN HEIGHT EXCEEDS 0.60 M (AS PER CITY STANDARD DRAWING FRN-105 OR APPROVED EQUAL), UPON COMPLETION. RETAINING WALLS GREATER THAN 1.0 M TO BE CERTIFIED BY A STRUCTURAL AND GEOTECHNICAL ENGINEERS.
8. LANDSCAPING WORK SHALL NOT ENCROACH ON BOULEVARD NOR SHALL BOULEVARD GRADES BE ALTERED.
9. SLOPES IN LANDSCAPED AREAS AND ON BERMS SHALL NOT EXCEED 3 HORIZONTAL TO 1 VERTICAL.
10. GRASSED DRAINAGE SWALE GRADES: MIN. 2%; MAX 5%.
11. OUTSIDE LIGHTING SHALL BE DIRECTED DOWNWARD AND INWARD AND DESIGNED TO MAINTAIN ZERO CUT-OFF LIGHT LEVEL DISTRIBUTION AT THE PROPERTY LINE.
12. SILT FENCE(S) AND OTHER EROSION CONTROL MEASURES TO BE INSTALLED AND MAINTAINED TO PREVENT SILT FLOWING ONTO ADJACENT LANDS UNTIL THE COMPLETION OF SODDING ACTIVITIES.
13. CONSTRUCTION ACCESS SHALL BE CONSTRUCTED WITH A MINIMUM DEPTH OF 450 MM CRUSHED STONE BASE FROM THE MUNICIPAL CURB OR EDGE OF PAVEMENT TO THE PROPERTY LINE, TO THE SATISFACTION OF THE CITY.
14. ALL PROPOSED BARRIER-FREE PARKING SPACES TO INCLUDE "RB-93 BY PERMIT ONLY" TRAFFIC SIGN AND BARRIER-FREE PAVEMENT SYMBOL MARKING.

EROSION CONTROL NOTES:

1. PROTECT ALL EXPOSED SURFACES AND CONTROL RUNOFF DURING CONSTRUCTION.
2. ALL EROSION CONTROL MEASURES ARE TO BE IN PLACE BEFORE STARTING CONSTRUCTION AND REMAIN IN PLACE UNTIL RESTORATION IS COMPLETE.
3. MAINTAIN EROSION CONTROL MEASURES DURING CONSTRUCTION..
4. ALL COLLECTED SEDIMENT MUST BE DISPOSED OF AT AN APPROVAL LOCATION.
5. MINIMIZE THE AREA DISTURBED DURING CONSTRUCTION.
6. ALL DEWATERING MUST BE DISPOSED OF IN AN APPROVED SEDIMENTATION BASIN.
7. PROTECT ALL CATCH BASINS, MAINTENANCE HOLES AND PIPE ENDS FROM SEDIMENT INTRUSION WITH GEOTAXTILE (TERRAFIX 270R OR EQUAL).
8. KEEP ALL SUMPS CLEAN DURING CONSTRUCTION.
9. PREVENT WIND-BLOWN DUST.
10. STRAW BALES TO BE USED IN LOCALIZED AREAS AS SHOWN AND AS DIRECTED BY THE ENGINEER DURING CONSTRUCTION FOR WORKS WHICH ARE IN OR ADJACENT TO FLOODLINES, FILL LINES AND HAZARDOUS SLOPES.
11. STRAW BALES TO BE TEMINATED USING ROUNDING BALES TO CONTAIN AND FILTER RUNOFF.
12. EROSION AND SEDIMENTATION CONTROL DEVICES ARE TO BE INSPECTED MINIMUM WEEKLY, AFTER EVERY RAINFALL AND MAINTAINED AND CLEARED AS REQUIRED.

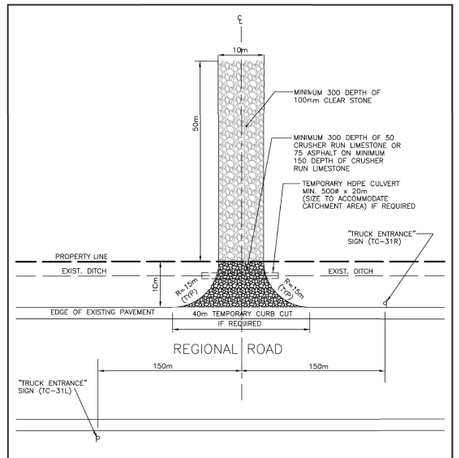
NOTE

1. TO BE USED UNDER APPROPRIATE DRAINAGE CIRCUMSTANCES, BETWEEN APRIL AND DECEMBER
2. WOVEN GEOTEXTILE TO HAVE EQUIVALENT OPENING SIZE OF 0.15mm AND A MAXIMUM EQUIVALENT OPENING SIZE OF 0.25mm
3. WOVEN GEOTEXTILE TO BE REPLACED PERIODICALLY WHEN ACCUMULATED SEDIMENTS INTERFERES WITH DRAINAGE.



CATCHBASIN
SEDIMENT PROTECTION

1
SW3



NOTES

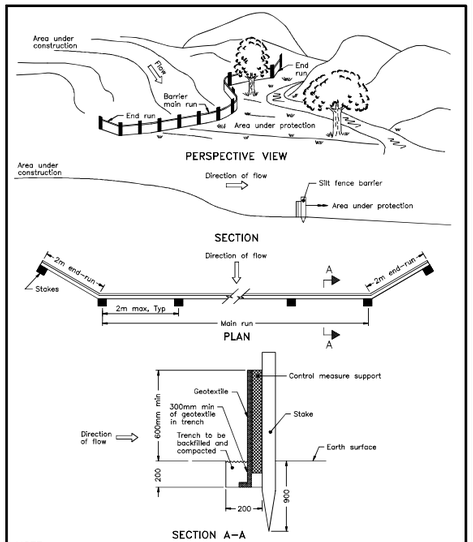
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE NOTED.
2. TEMPORARY "TRUCK ENTRANCE" SIGNS(TC-31) SHALL BE INSTALLED ON THE SHOULDER, 150M IN ADVANCE OF THE ACCESS (NOTE: SEE DETAILS ON USE OF THESE SIGNS IN THE ONTARIO TRAFFIC MANUAL, BOOK 7.) THE APPLICANT WILL BE RESPONSIBLE FOR THE COST OF OBTAINING, ERECTING AND MAINTAINING THESE SIGNS.
3. TEMPORARY CONSTRUCTION ACCESS SHALL BE REMOVED FROM THE REGIONAL ROAD ALLOWANCE AND ALL DISTURBED AREAS SHALL BE RESTORED TO ORIGINAL OR BETTER CONDITION.

York Region Transportation Services

MUD MAT FOR TEMPORARY CONSTRUCTION ACCESS

DATE:	MARCH 2015	SCALE N.T.S.
REV.	X	X

DS-217



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

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2006 | Rev | 1

3
SW4

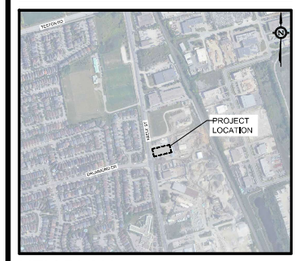
HEAVY-DUTY
SILT FENCE BARRIER

OPSD 219.130

Contractor must check and verify all dimensions and be res- ponsible for same, reporting any discrepancies to the Engineer before commencing work.
Prints shall not be used for construction until signed 'Approved For Construction' by the Engineer.
Prints are not to be scaled.
All drawings, prints and specifications are the property of the Engineer and shall be returned to him on completion of the work.
All work shall be performed in accordance with the latest edition of the ONTARIO BUILDING CODE. NATIONAL BUILDING CODE and regulatory regulations of the Town of Oshawa Building Department.
These notes are to be read in conjunction with all drawings and specifications.

The Contractor shall check all dimensions and other data from the job and report any discrepancies to the Architects before proceeding.

No	DATE	REVISION	DRN	CHKD
1	2024-04-18	ISSUED FOR APPROVAL	DB	SS
2	2024-10-28	ISSUED FOR APPROVAL	DB	SS
3	2025-03-19	ISSUED FOR APPROVAL	DB	SS
4	2025-09-25	REVISED AS PER CITY & REGION COMMENTS	DB	SS
5	2026-05-12	REVISED AS PER UPDATED ARCH SITE PLAN	DB	SS
6	2026-08-05	REVISED AS PER UPDATED ARCH SITE PLAN / BLDG MECH	DB	SS
7	2026-10-13	REVISED AS PER SPA COMMENTS	DB	SS



KEY PLAN

SCALE: NTS

LEGEND

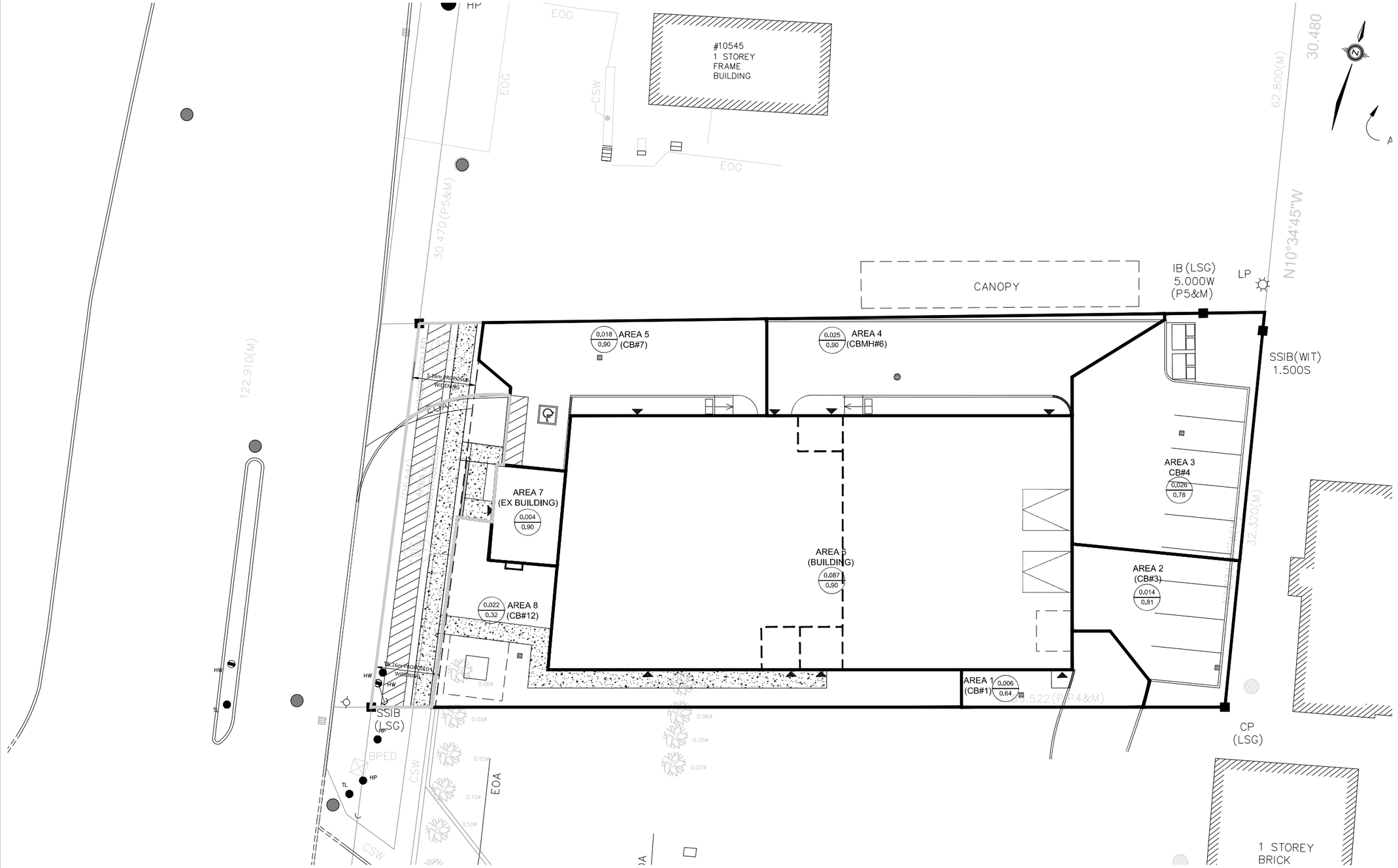
- CONSTRUCTION BOUNDARY
- EXISTING PROPERTY LINE
- ULTIMATE PROPERTY LINE
- EXISTING CURB & GUTTER
- PROPOSED SILT FENCE
- TEMPORARY GRAVEL MUD MAT
- TEMPORARY SEDIMENT TRAP
- TEMPORARY CONSTRUCTION ACCESS
- PROPOSED CATCHBASIN
- EXISTING CATCHBASIN

LICENSED PROFESSIONAL ENGINEER
S. SOSCIA
OCTOBER 1, 2026
PROVINCE OF ONTARIO

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PROFESSIONAL ENGINEERS INC.
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fax 905 237 5413

PROJECT: CITY FILE:DA.24.032
PROPOSED
INDUSTRIAL WAREHOUSE
10533 KEELE STREET
VAUGHAN (MAPLE), ONTARIO

SHEET TITLE:		JOB NO:
EROSION & SEDIMENT CONTROL PLAN		24-020
SCALE: 1:150	DATE: OCTOBER, 2026	DWG NO: C03
DRAWN: DB	CHECKED: SS	

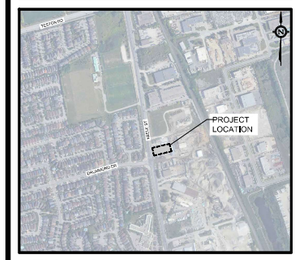


STORM CATCHMENT AREAS					
AREA NO.	AREA NAME	LANDSCAPE AREA (m²)	ASPHALT/CONC AREA (m²)	BUILDING AREA (m²)	TOTAL AREA (m²)
1	CB#1	24	36	-	60
2	CB#3	18	115	-	133
3	CB#4	42	223	-	265
4	CBMH#6	-	250	-	250
5	CB#7	-	165	-	165
6	BUILDING	-	-	865	865
7	EXBUILDING	-	-	44	44
8	CB#12	184	34	-	218
9	UNCONTROLLED	59	133	-	192

Contractor must check and verify all dimensions and be res- ponsible for same, reporting any discrepancies to the Engineer before commencing work.
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These notes are to be read in conjunction with all drawings and specifications.

The Contractor shall check all dimensions and other data from the job and report any discrepancies to the Architects before proceeding.

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6	2026-08-05	REVISED AS PER UPDATED ARCH SITE PLAN / BLDG MECH	DB	SS
7	2026-10-13	REVISED AS PER SPA COMMENTS	DB	SS



KEY PLAN

SCALE: NTS

LEGEND

PRE-DEVELOPMENT DRAINAGE BOUNDARY

AREA 1 — POST DEVELOPMENT DRAINAGE AREA NUMBER
CB#1
--- ha — POST DEVELOPMENT DRAINAGE AREA
--- — POST DEVELOPMENT COEFFICIENT

LICENSED PROFESSIONAL ENGINEER — S. SOSCIA — OCTOBER 13, 2026 — PROVINCE OF ONTARIO

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PROFESSIONAL ENGINEERS INC.
10376 Yonge Street, Suite 307
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fax 905 237 5413

PROJECT: PROPOSED INDUSTRIAL WAREHOUSE
CITY FILE:DA.24.032

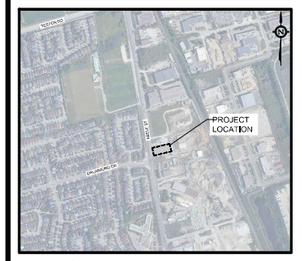
10533 KEELE STREET
VAUGHAN (MAPLE), ONTARIO

SHEET TITLE:		JOB NO:
POST DEVELOPMENT CATCHMENT AREA PLAN		24-020
SCALE: 1:150	DATE: OCTOBER, 2026	DWG NO: C04
DRAWN: DB	CHECKED: SS	

Contractor must check and verify all dimensions and be res- ponsible for same, reporting any discrepancies to the Engineer before commencing work.
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5	2026-05-12	REVISED AS PER UPDATED ARCH SITE PLAN	DB	SS
6	2026-08-05	REVISED AS PER UPDATED ARCH SITE PLAN / BLDG MECH	DB	SS
7	2026-10-13	REVISED AS PER SPA COMMENTS	DB	SS



KEY PLAN

SCALE: NTS

LEGEND

PRE-DEVELOPMENT DRAINAGE BOUNDARY

A1 PRE
--- ha

PRE-DEVELOPMENT DRAINAGE AREA NUMBER
PRE-DEVELOPMENT DRAINAGE AREA
PRE-DEVELOPMENT COEFFICIENT

PRE
0.22 ha
0.25

#10545
1 STOREY
FRAME
BUILDING

PART 2, PLAN 65R-6995

CANOPY

EX RETAINING WALL

ASPHALT

EDGE OF ASPHALT

CON

SSIB(WIT)
1.500S

IB (LSG)
5.000W
(P5&M)

LP

EXISTING BUILDING

EXISTING BUILDING

ASPHALT AND GRAVEL

PIN 03343-0323(LT)

PART 1
PLAN 64R-3035
PIN 03343-1860(LT)

KEELE STREET

EOA

EX WALK

PERGOLA

SSCB
(LSG)

69.522(P,P4&M)

CP
(LSG)

PART 4
PLAN 65R-29208
PIN 03343-1860(LT)

1 STOREY
BRICK
BUILDING

LOT 24, CONCESSION

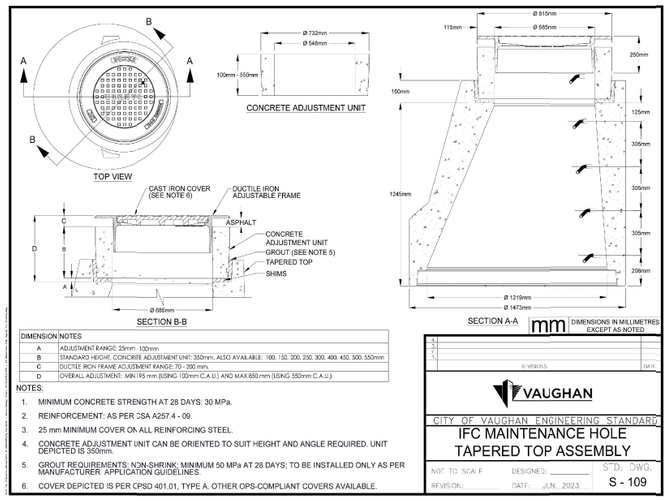
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PROFESSIONAL ENGINEERS INC.
10376 Yonge Street, Suite 307
Richmond Hill, ON. L4C 3B8
WWW.ssosciaeng.ca
ph 905 237 5410
fax 905 237 5413

PROJECT: PROPOSED
INDUSTRIAL WAREHOUSE

CITY FILE:DA.24.032

10533 KEELE STREET
VAUGHAN (MAPLE), ONTARIO

SHEET TITLE:		JOB NO:
PRE-DEVELOPMENT DRAINAGE PLAN		24-020
SCALE: 1:150	DATE: OCTOBER, 2026	DWG NO: C05
DRAWN: DB	CHECKED: SS	



DIMENSION	NOTES
A	ADJUSTMENT RANGE 25mm - 100mm
B	STANDARD HEIGHT, CONCRETE ADJUSTMENT UNIT: 350mm, ALSO AVAILABLE: 100, 150, 200, 250, 300, 400, 450, 500, 550mm
C	DUCTILE IRON FRAME ADJUSTMENT RANGE: 70 - 200 mm.
D	OVERALL ADJUSTMENT: MIN 195 mm (USING 130mm C.A.U.) AND MAX 850 mm (USING 550mm C.A.U.)

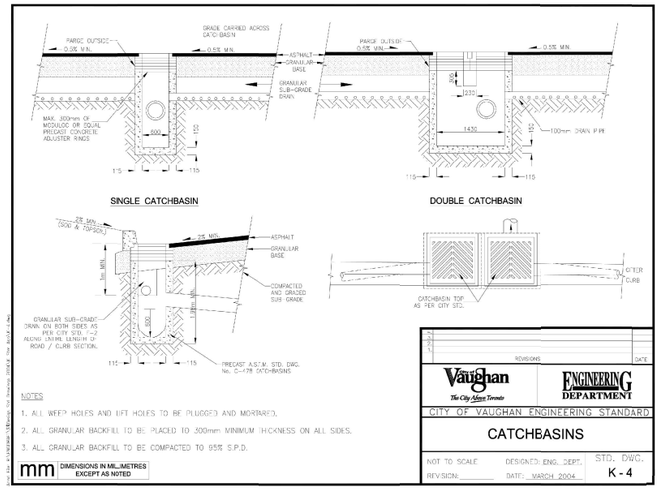
NOTES:
1. MINIMUM CONCRETE STRENGTH AT 28 DAYS: 30 MPa.
2. REINFORCEMENT: AS PER CSA A257.4 - 09.
3. 25 mm MINIMUM COVER ON ALL REINFORCING STEEL.
4. CONCRETE ADJUSTMENT UNIT CAN BE ORIENTED TO SUIT HEIGHT AND ANGLE REQUIRED. UNIT DEPICTED IS 350mm.
5. GROUT REQUIREMENTS: NON-SHRINK; MINIMUM 50 MPa AT 28 DAYS; TO BE INSTALLED ONLY AS PER MANUFACTURER APPLICATION GUIDELINES.
6. COVER DEPICTED IS PER OPSD 401.01, TYPE A. OTHER OPS-COMPLIANT COVERS AVAILABLE.

REVISIONS | DATE

CITY OF VAUGHAN ENGINEERING STANDARD

IFC MAINTENANCE HOLE
TAPERED TOP ASSEMBLY

NOT TO SCALE | DESIGNED: _____ | STD. DWG.
REVISION: _____ | DATE: JUN. 2023 | S - 109



NOTES
1. ALL WEEP HOLES AND LIFT HOLES TO BE PLUGGED AND MORTARED.
2. ALL GRANULAR BACKFILL TO BE PLACED TO 300mm MINIMUM THICKNESS ON ALL SIDES.
3. ALL GRANULAR BACKFILL TO BE COMPACTED TO 95% S.P.D.

mm DIMENSIONS IN MILLIMETRES EXCEPT AS NOTED

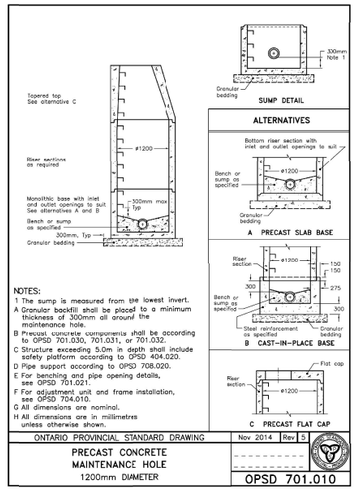
REVISIONS | DATE

The Corporation of the City of Vaughan | ENGINEERING DEPARTMENT

CITY OF VAUGHAN ENGINEERING STANDARD

CATCHBASINS

NOT TO SCALE | DESIGNED: ENG. DEPT. | STD. DWG.
REVISION: _____ | DATE: MARCH 2004 | K - 4

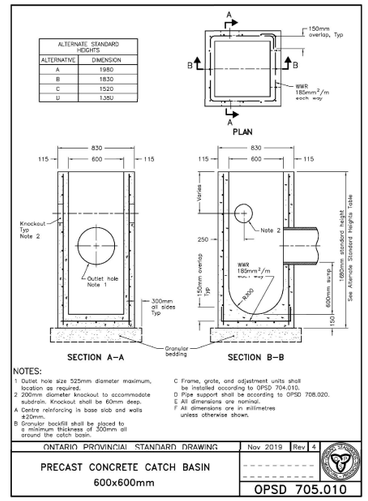


NOTES:
1 The sump is measured from the lowest invert.
A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
B Precast concrete components shall be according to OPSD 701.030, 701.031, or 701.032.
C Structure exceeding 5.0m in depth shall include safety platform according to OPSD 404.020.
D Pipe support according to OPSD 708.020.
E For benching and pipe opening details, see OPSD 701.021
F For adjustment unit and frame installation, see OPSD 704.010.
G All dimensions are nominal.
H All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev 5

PRECAST CONCRETE MAINTENANCE HOLE 1200mm DIAMETER

OPSD 701.010



NOTES:
1 Outlet hole size 525mm diameter maximum, location as required.
2 200mm diameter knockout to accommodate subdrain. Knockout shall be 60mm deep.
A Centre reinforcing in base slab and walls ±20mm.
B Granular backfill shall be placed to a minimum thickness of 300mm all around the catch basin.
C Frame, grate, and adjustment units shall be installed according to OPSD 704.010.
D Pipe support shall be according to OPSD 708.020.
E All dimensions are nominal.
F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2019 | Rev 4

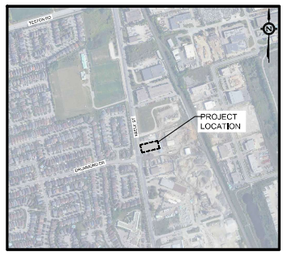
PRECAST CONCRETE CATCH BASIN 600x600mm

OPSD 705.010

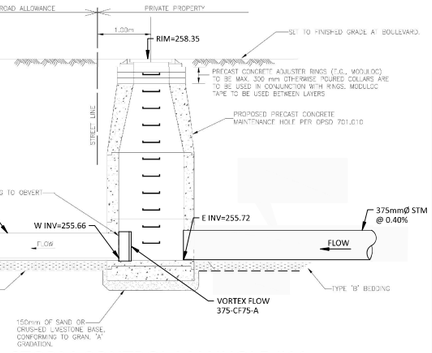
Contractor must check and verify all dimensions and be res- ponsible for same, reporting any discrepancies to the Engineer before commencing work.
Prints shall not be used for construction until signed 'Approved For Construction' by the Engineer.
Prints are not to be scaled.
All drawings, prints and specifications are the property of the Engineer and shall be returned to him on completion of the work.
All work shall be performed in accordance with the latest edition of the ONTARIO BUILDING CODE, NATIONAL BUILDING CODE and regulatory regulations of the Town of Oshawa Building Department.
These notes are to be read in conjunction with all drawings and specifications.

The Contractor shall check all dimensions and other data from the job and report any discrepancies to the Architects before proceeding.

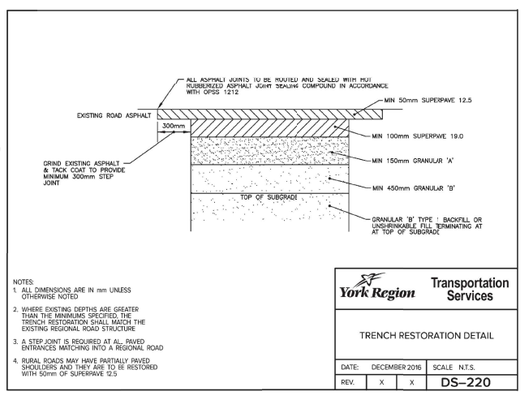
No	DATE	REVISION	DRN	CHKD
1	2024-04-18	ISSUED FOR APPROVAL	DB	SS
2	2024-10-28	ISSUED FOR APPROVAL	DB	SS
3	2025-03-19	ISSUED FOR APPROVAL	DB	SS
4	2025-09-25	REVISED AS PER CITY & REGION COMMENTS	DB	SS
5	2026-05-12	REVISED AS PER UPDATED ARCH SITE PLAN	DB	SS
6	2026-08-05	REVISED AS PER UPDATED ARCH SITE PLAN / BLDG MECH	DB	SS
7	2026-10-13	REVISED AS PER SPA COMMENTS	DB	SS



KEY PLAN
SCALE: NTS



STORM CONTROL MANHOLE #11
WITH VORTEX FLOW CONTROL
NTS

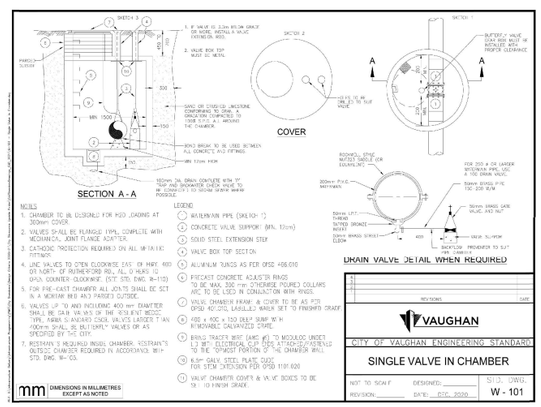


NOTES:
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE NOTED
2. WHERE EXISTING DEPTHS ARE GREATER THAN THE MINIMUMS SPECIFIED, THE TRENCH RESTORATION SHALL MATCH THE EXISTING REGIONAL ROAD STRUCTURE
3. A STEP JOINT IS REQUIRED AT ALL PAVED ENTRANCES MATCHING INTO A REGIONAL ROAD
4. RURAL ROADS MAY HAVE PARTIALLY PAVED SHOULDERS AND THEY ARE TO BE RESTORED WITH 50mm OF SUPERPAVE 12.5

York Region Transportation Services

TRENCH RESTORATION DETAIL

DATE: DECEMBER 2016 | SCALE N.T.S.
REV. | X | X | DS-220



NOTES
1. CHAMBER TO BE DESIGNED FOR H20 LOADING AT 300mm COVER.
2. VALVES SHALL BE FLANGED TYPE, COMPLETE WITH MECHANICAL JOINT FLANGE ADAPTER.
3. CATHODIC PROTECTION REQUIRED ON ALL METALLIC FITTINGS.
4. LINE VALVES TO OPEN CLOCKWISE (CW) OF HWP, 600 CW NORTH OF WATERFORD RD., ALL O HEADS TO OPEN COUNTER-CLOCKWISE (CCT. STD. DWG. W-112)
5. FOR PRE-CAST CHAMBER ALL JOINTS SHALL BE SET IN A MINIMUM BED AND PARGED OUTSIDE.
6. VALVES UP TO AND INCLUDING 400 mm DIAMETER SHALL BE CAST VALVES OR THE EQUIVALENT RESILIENT WEDGE TYPE, AWWA STANDARD C509. VALVES LARGER THAN 400mm SHALL BE BUTTERFLY VALVES OR AS SPECIFIED BY THE CITY.
7. ACCESS IS REQUIRED INSIDE CHAMBER. KOSTMAN'S OUTLET CHAMBER REQUIRED IN ACCORDANCE WITH STD. DWG. W-103.

LEGEND
1. WATERMAIN PIPE (SIZE NO. 1)
2. CONCRETE VALVE SUPPORT (MIN. 10cm)
3. SOLID STEEL EXTENSION STEP
4. VALVE BOX TOP SECTION
5. ALUMINUM RINGS AS PER OPSD 408.010
6. PRECAST CONCRETE ADJUSTER RINGS TO BE MAX. 300 mm OTHERWISE POURED COLLARS ARE TO BE USED IN CONJUNCTION WITH RINGS.
7. VALVE CHAMBER FRAME & COVER TO BE AS PER OPSD 401.010, LABELLED 'WATER' SET TO FINISHED GRADE
8. 400 x 400 x 150 DEEP SUMP W/ H REMOVABLE GALVANIZED COVER
9. BRASS TRACER WIRE (MIN. #6) TO MODULOC UNDER L.I. WIT. ELECTRICAL CLIP TYPE ATTACHED/SOLDERED TO THE TOP MOST PORTION OF THE CHAMBER WALL
10. 6.35mm GALV. STEEL PLATE, CUT20 FOR STEM EXTENSION PER OPSD 1101.020
11. VALVE CHAMBER COVER & VALVE BOXES TO BE 19 : 10 FINISH GRADE.

mm DIMENSIONS IN MILLIMETRES EXCEPT AS NOTED

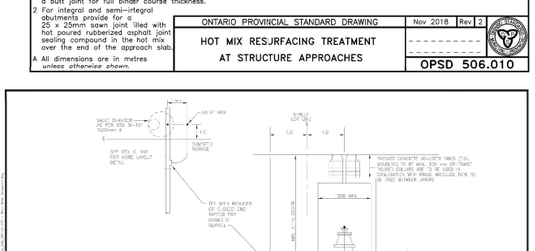
REVISIONS | DATE

VAUGHAN

CITY OF VAUGHAN ENGINEERING STANDARD

SINGLE VALVE IN CHAMBER

NOT TO SCALE | DESIGNED: _____ | STD. DWG.
REVISION: _____ | DATE: DEC. 2020 | W - 101



NOTES:
1 As an alternative, cold mill existing hot mix to provide a butt joint for full binder course thickness.
2 For integral and semi-integral abutments provide for a 25 x 25mm sawn joint filled with hot poured rubberized asphalt joint sealing compound in the hot mix over the end of the approach slab.
A All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2018 | Rev 2

HOT MIX RESURFACING TREATMENT AT STRUCTURE APPROACHES

OPSD 506.010

NOTES
1. 'DOG' BREAKER TO BE USED BETWEEN ALL CONCRETE AND FITTINGS.
2. PROVIDE RESTRAINED MECHANICAL JOINTS OR SLIP-ON JOINTS WITH TIE RODS & CLAMPS AS REQUIRED.
3. THRUST BLOCKS SHALL NOT BE USED WITHIN VALVE CHAMBERS.
4. THRUST BLOCKS SHALL NOT BE USED ON PVC WATERMAINS.

mm DIMENSIONS IN METRES EXCEPT AS NOTED

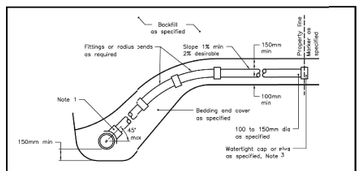
REVISIONS | DATE

VAUGHAN

CITY OF VAUGHAN ENGINEERING STANDARD

BLOCK WATER CONNECTION

NOT TO SCALE | DESIGNED: _____ | STD. DWG.
REVISION: _____ | DATE: DEC. 2020 | C - 103

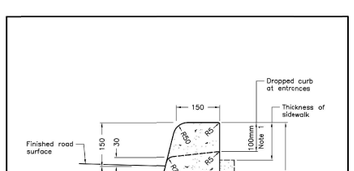


NOTES:
1 Sewer service connections to the main pipe sewer shall be made using factory made tees, strap-on-saddles, or other approved saddles.
2 Vertical risers shall be as specified.
3 Cap or plug at property line shall be adequately braced.
A Maintenance holes shall be used at the main sewer to connect service connections greater than 200mm.
B For new construction, saddles shall be installed on the main pipe before that pipe is laid.
C Approved cut-in tool shall be used for field made connections.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2021 | Rev 4

SEWER SERVICE CONNECTIONS FOR MAIN PIPE SEWER

OPSD 1006.010

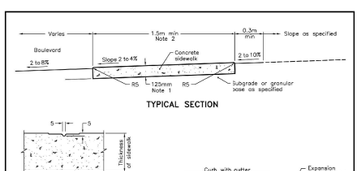


NOTES:
1 When sidewalk is continuously adjacent, the dropped curb at entrances shall be reduced to 75mm.
2 For slipforming procedure a 5% batter is acceptable.
A Treatment at entrances shall be according to OPSD 351.010.
B Outlet treatment shall be according to the OPSD 610 Series.
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev 2

CONCRETE BARRIER CURB

OPSD 600.110

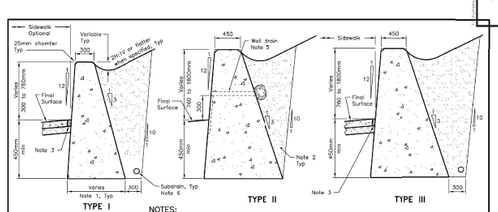


NOTES:
1 Sidewalk thickness at residential driveways and adjacent tc curb shall be 150mm. At commercial and industrial driveways, the thickness shall be 200mm.
2 Sidewalk width shall be wider when specified.
3 This OPSD shall be read in conjunction with OPSD 310.030, 310.031, 310.033, and 310.039.
4 Contraction Joint may be tooled or sawcut.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2019 | Rev 3

CONCRETE SIDEWALK

OPSD 310.010

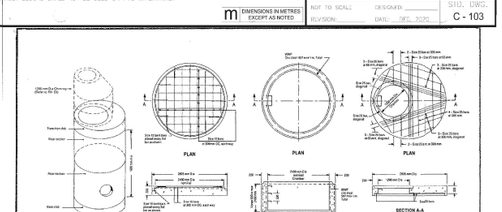


NOTES:
1 Walls shall be founded on undisturbed soil having a minimum bearing capacity at ultimate limit states of 200kPa for Type I and 300kPa for Type II and Type III.
2 Excavation for toe walls shall be backfilled with free draining granular material.
3 10mm preformed joint filler, Type A, non-extruding and resilient bituminous type as specified.
4 Cold applied rubber asphalt joint sealing compound.
5 Where specified, wall drains shall be installed as per OPSD 3190.100.
6 150mm dia perforated pipe subdrain wrapped in geotextile.
A Maximum height of slope above top of wall is 4m.
B Concrete for toe walls shall be 30MPa.
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev 2

WALLS RETAINING CONCRETE TOE WALL

OPSD 3120.100



NOTES:
A Max straight through pipe size: 1200 mm dia.
Max right angle side/entry pipe size: 1050 mm dia.
B All monitoring ports shall have 25 mm min cover.
C Where holes, where required, shall be placed so that the bottom of the opening on the inside and the top of the invert on the outside are level.
D All dimensions are in millimetres unless otherwise specified.
E Structures exceeding 6.6 m in depth to invert safety grate as per OPSD 404.02.

CON CAST PIPE | No. 7C1.08

CONCAST
RR#3, 43, Guelph, Ontario N1H 6H9
Tel: 1-800-668-PIPE (7473)

2400 mm Dia.
PRECAST CONCRETE MAINTENANCE HOLES (COMPONENTS)
DEPTH - 10.0 m MAX

LICENSED PROFESSIONAL ENGINEER
SOSCIA
OCTOBER 1, 2020
PROVINCE OF ONTARIO

SOSCIA
PROFESSIONAL ENGINEERS INC.
10376 Yonge Street, Suite 307
Richmond Hill, ON. L4C 3B8
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ph 905 237 5410
fax 905 237 5413

PROJECT: PROPOSED INDUSTRIAL WAREHOUSE
CITY FILE:DA.24.032

10533 KEELE STREET
VAUGHAN (MAPLE), ONTARIO

SHEET TITLE:	JOB NO:
DETAILS	24-020
SCALE: N/A	DATE: OCTOBER, 2026
DRAWN: DB	CHECKED: SS
DWG NO: C06	

Standard Development Construction Practices for Works on York Region Roads

1. It is the responsibility of the Owner/ Developer or his Consultant responsible for administering the contract to notify their Contractor(s) to be familia- with and understand the foregoing conditions below. Contractors are expected to have sufficient knowledge, experience and equipment for working on Regional Roads.

2. **No start-up** of road construction projects will be permitted after November 15th or prior to March 31st without special exemption and permission from York Region's Development Engineering Section.

3. **Winter Work:** Any approved development construction within the Regional road allowance, between **November 15th and March 31st** in any given year, will be considered winter work. Any work (new or ongoing) in the road allowance between these dates may not continence or continue without the written consent of the Region's Program Manager of Development Construction. This written consent may be revoked by the Region at any time. **At the Region's discretion, any non-conforming work, in accordance with Provincial and Regional specifications, shall be removed and replaced at the developer's expense, or other measures implemented as determined by the Region.**

   Prior to demobilizing for the winter (the "Winter Shutdown"), the following requirements must be met:

   (a) All excavations must be backfilled.

   (b) The Site must be left clean, tidy and safe.

   (c) Road subgrade and/or road granular shall not be exposed during the Winter Shutdown unless approved in advance by the Region upon written request from the Contractor. The work shall be scheduled such that the asphalt base course is completed on any completed road granular base prior to the Winter Shutdown. Gravel or milled pavement surfaces will not be permitted for the travelled roadway during the Winter Shutdown period.

   (d) Roadways must have temporary or permanent pavement markings and appropriate traffic signage installed in accordance with the Ontario Traffic Manual (OTM), which must be maintained at all times. All construction work areas shall be properly protected from the travelled lanes during the Winter Shutdown.

   (e) Cut or fill slopes left without vegetative cover or erosion control blankets shall be treated before the onset of winter with hydraulic mulch ground cover.

   (f) Positive flow for all storm culverts shall be maintained. If the Contractor is unable to complete the construction of the storm system within the allotted construction window, then additional measures to allow for positive drainage will be implemented by the contractor. This includes the provision of additional creek channelization and/or sandbags as needed to divert the flow to existing culverts or channels and maintain flow.

   (g) Catchbasins and maintenance hole grates shall be adjusted to match the grade of asphalt, ensuring positive drainage and limiting snow removal hazards.

   (h) Repairs to the roadway, interim drainage conditions, erosion control, signage and delineation shall be performed by the Contractor, as required, throughout the Winter Shutdown period as required at the sole discretion of the Region.

   (i) The Region will perform snow clearing and de-icing operations for roads which are open to the public during the Winter Shutdown period. However, any roads where the Region cannot perform these duties will be responsible solely on the developer's contractor prior to opening lanes to the public.

   (j) The Contractor shall be responsible for snow clearing, snow removal, and de-icing of any areas in which they have elected to perform work during the Winter Shutdown period. Snow in these areas shall be removed from the right-of-way and must not impede Regional efforts to keep travelled lanes clear of snow/winter debris.

4. All traffic control devices and signage must be maintained in their proper locations, cleaned, weighted down by sandbags only, and maintained throughout the duration of the Contract. Regional forces will not reinstate temporary signage displaced by winter maintenance operations. The Contractor shall ensure that all construction signs affected by winter maintenance operations are immediately cleaned and reinstated or replaced. A safety log shall be kept ensuring that all temporary safety measures have been inspected regularly and are in good working condition. The Region may request this log at any time.

5. Unless otherwise specified, Ontario Provincial Standards and Specifications (OPSS) and York Region Design Standard Drawings and construction specifications/practices shall be adhered to.

6. A copy of the "**Notice of Project**" shall be submitted to the Development Construction Coordinator at the pre-construction meeting, posted on the contractor safety board on-site and attached to the pre-construction meeting minutes.

7. The Owner/ Developer will ensure that the Regional road surfaces, ditches and boulevards are kept **clear of dust, mud/building and other debris** until the lands represented by this approval are fully developed and assumed by York Region Road Operations. The Owner/Developer acknowledges that the Region will carry out any work deemed necessary at the Owner's expense if such requirements are not carried out within 24 hours of notice being given to the applicant, consulting engineer, Owner or without any notice if, in the opinion of the Commissioner of Corporate Services Department or the designate, it is required immediately. **Repeat infractions will be considered a safety violation and may be subject to invoking a stop work order, revoking of the Road Occupancy Permit (ROP) and/or the required reapplication of the construction access approval including a safety inspection fee of $2,600.00, or as outlined in Schedule "A" to By-law No. 2020-04, as amended.**

   The Region reserves the right to require a **wheel wash station** if it is deemed necessary for the safety of the public, on per project basis.

   In the event that the Region must rectify any deficiencies, make any remedies or must carry out the cleanup of roads from mud, dust, refuse or debris, the Owner acknowledges that the **Region shall invoice the Owner, for each occurrence, a minimum of $2,600.00 or twice the actual cost to perform the work, whichever is greater, as outlined in Schedule "A" to By-law No. 2020-04, as amended.**

8. **Prior to starting any development construction work** within the Regional Road allowance, please contact the following Development Construction Coordinator, 1-877-464-9675 or email to arrange for a pre-construction meeting prior to construction:

   - Joshua Ashfield; 1-877-464-9675 ext. 78012; email: joshua.ashfield@york.ca
     Municipality Area: Town of Whitchurch-Stouffville, City of Markham
   - Ivan Gonzalez; 1-877-464-9675 ext. 75759; email: ivan.gonzalez@york.ca
     Municipality Area: City of Vaughan
   - Henry Leung; 1-877-464-9675 email: henry.leung@york.ca
     Municipality Area: All York Region
   - Nasir Mahmood; 1-877-464-9675 ext. 76929; email: nasir.mahmood@york.ca
     Municipality Area: Town of Newmarket, Town of East Gwillimbury, Town of Georgina, Town of Aurora
   - Wyatt Werner; 1-877-464-9675 ext. 73114; email: wyatt.werner@york.ca
     Municipality Area: City of Richmond Hill, Township of King

9. It is the responsibility of the Owner/Developer or his Consultant for inspections to ensure that the contractor's **locates are staked out prior to any construction** and all utilities are relocated to the approved design grades and location.

10. Prior to any related development construction activity on the Region Road allowance, the Owner/ Developer or designate shall apply to the Region to obtain a **Road Occupancy Permit (ROP)**. The Road Occupancy Permit application is now online only and can be obtained at www.york.ca/roadpermits. Specific traffic control measures such as temporary traffic lights are to be approved by Traffic Safety and Permit prior to implementation. For general inquires please contact 1-877-464-9675, x75700 or permits@york.ca.

11. If the Region deems necessary, **portable variable messaging signs (PVMS)** shall be provided at least 1 week prior to start of development related road widenings and any other road works in the Region right of way to warn the public of potential traffic delays.

12. It is the responsibility of the Owner/Developer or his Consultant to ensure that all emergency services, public transportation routes and school bus services, including York Region Roads Operations Dispatch (**tm_roads_operations_dispatch@york.ca**), or (905)-830-4444 x75200, are notified of any partial or full Regional road closures at least 2 weeks prior to start of development.

13. All existing Regional and local Municipal sanitary and storm infrastructure in the Regional Right-of-way is to be video inspected and condition assessed prior to commencement and post-construction. Video and pictures of the existing site conditions are to be submitted to the Construction Coordinator at the pre-construction meeting and post-construction video inspection to be submitted prior to any security reductions/releases.

14. All new sewer infrastructure installed within the Regional Right-of-way requires a **post-construction video inspection** submitted to the Development Construction Coordinator prior to any security reductions/releases. This includes any extension to existing infrastructure (e.g., road culverts and sewer extensions).

15. **Construction accesses** onto Regional roads are not permitted unless written approval is granted by the Region, provided the Owner/ Developer apply for approval to the York Region Development Engineering Division. Temporary "truck entrance" signs must be installed on the shoulder of the Regional right-of-way and visible from all approaches. Reference shall be made to OTM Book 7 for details on the use and placement of signs. The Owner shall be responsible for the costs of obtaining, erecting and maintaining these signs until the construction access is decommissioned. **Construction accesses shall be constructed as per York Region Drawing No. DS-217. The mud mat is to be fully paved for the entire width of the Regional boulevard (15.0 m typ.), when the hauling operations exceed 75,000 cu.m. total or 40 truck trips per day, whichever is greater, or at the discretion of York Region.** Truck route is to be monitored and cleaned by the contractor/consultant/builder/developer as required and non-compliance will result in the work being completed by York Region's forces and/or full closure of the access and revoking of the ROP at the full expense of the Owner/ Developer per By Law 2020-04, as amended. After completion of the works, the construction access shall be removed and the road, curbs, ditches and boulevard restored to the satisfaction of the Development Construction Coordinator or designate.

    All existing accesses such as old residential/commercial driveways/farm accesses, etc. to the Regional Road cannot be used as a construction access without expressed approval by the Region.

16. One lane of traffic in each direction on Regional roads **must be kept open** between the hours of 9:30 a.m. and 3:30 p.m. or as otherwise permitted by the ROP permit conditions. This is provided that the proper signage and flag persons are present to protect the workers and direct traffic safely through the work zone as per the Occupational Health and Safety Act and Regulations for Construction Projects and OTM Book 7. At all other times, all existing lanes of traffic shall be kept open.

    Loading and unloading of materials and equipment shall take place **off the travelled portion of road** wherever possible. Otherwise, loading and unloading of material and equipment shall only take place between the hour of 9:30 a.m. and 3:30 p.m., provided that proper signage and warning signs are present to protect the workers and direct traffic safely. All steel track equipment or other equipment that may cause damage to the road surface is not permitted for unloading off a Regional Road. **Any damages to the existing Regional Road surface due to unloading activities shall be reinstated in its entirety at the Owner's cost and at the sole discretion of the Region.**

    Truck queuing on Regional Roads is not permitted at any time for the duration of the construction phase of the project.

17. Prior to the commencement of any construction, the Owner agrees that if construction works involve excavating soil or other material that qualifies as "excess soil" under O. Reg. 406/19 – On-Site and Excess Soil Management, as amended, made under the Environmental Protection Act, R.S.O. 1990, c E.19, (O. Reg. 406/19) and/or the importation from another site of "excess soil" for a beneficial use at the site, the Owner shall comply with the applicable requirements of O. Reg. 406/19.

18. All drainage works require **Erosion and Sediment Controls (ESC)** satisfactory to the approval agencies during construction periods. Prior to and during construction, procedures and controls need to be in place for the minimization of erosion and migration of sediment which might occur during construction. The Owner/ Developer shall ensure routine inspections, as well as after every major storm event, for the ESC control devices to maintain their efficiency as per design and field conditions. **Cleanup/bydowse of existing infrastructure, including manholes, catchbasins, culverts, etc., may be required after ESC failures.** The Owner/ Developer or their consultants responsible for inspections are to ensure the contractor adheres to best construction practices and the T.R.C.A./ L.S.R.C.A.'s "Erosion & Sediment Control Guideline for Urban Construction" (current version) in all regulated areas. The Region is to be copied on all ESC reports.

19. It is the responsibility of the Owner/Developer or their Consultant for inspections to ensure that an elevation detail of the existing aerial plant is submitted when overhead cabling is present. **Cables shall not be less than 5.0 m** clearance from the proposed finished grade to the lowest point of the aerial cable as per 3.2.5.6.-Access Route Design, Ontario Building Code Standards.

20. Any **dewatering** discharge activity requires an approved application. Applications are available online by completing the form at www.york.ca/seweruse or contacting 1-877-464-9675 extension 75067 at Public Works Department, Environmental Services.

21. **Tunnel shafts and auger pits** shall be located at the bottom of the ditch line and back slope of the ditch, or beyond the toe of slope in a fill area. All open excavations impacting pedestrian and vehicular traffic shall be protected by barricades with proper crash attenuation measures in place within the Regional road allowance. **No torpedo is to be used** under any of the Regional paved road at any time unless written approval is granted.

22. Steel Liners are required to be installed for watermain, sanitary sewer and sanitary forcemain crossing Regional Road within the ultimate pavement area and extending a minimum of 1.0 m beyond the ultimate edge of pavement or ultimate back of the curb. Steel liners shall have a minimum cover of 2.1 m below the center line of the road. Steel Liners are not required when watermain, sanitary sewer or forcemain crossing of Regional Road is installed via directional drilling.

23. **Trenches** proposed across Regional roads shall be backfilled with unshrinkable fill as per OPSS 1359 material specification for unshrinkable backfill up to road subgrade. Placement shall be a minimum of 1.0 m beyond the existing edge of pavement or back of curb. The trench shall be covered for a minimum of 24 hours with steel plates of sufficient strength to support traffic, prior to restoration of granular and asphalt make up. **The steel plates shall be recessed** into minimum 300 mm wide by 50 mm deep step joint provided in the existing pavement. If the sewer or watermain within the Regional right-of-way is less than 1.2 m in depth, insulation shall be installed with 50 mm of SM insulation or approved equal, in accordance with OPSD 1109.030 & OPSS MUNI 1605, and self-compacting 19 mm (¾") crushed granular material in lieu of unshrinkable fill shall be placed. **The use of High Performance or other rounded granular stone is not permitted.** No traffic is permitted on the granular backfill unless it is protected by approved road plates or asphalt pavement as specified.

24. Where the stability, safety or function of the existing roadway or underground facilities may be impaired due to the contractor's method of operations, the contractor shall provide such protection as may be required. This protection may include **sheathing, shoring and the driving of piles** where necessary, to prevent damage to existing adjacent services or proposed works. Construction for shoring, bracing and protection schemes shall conform to the specifications of OPSS MUNI 404 and OPSS MUNI 539 current version. Additionally, all works shall be carried out in conformity with the Occupational Health and Safety Act and Regulations for Construction Projects. The Consulting Engineer responsible for inspections and/or York Region Development Engineering Division staff **shall notify the Ministry of Labour**, if in their opinion, unsafe conditions exist on site in accordance with Ontario Regulation for Construction Projects and the Owner fails to rectify said unsafe conditions in a timely manner.

25. In urban sections, **all subdrains** shall be 150 mm diameter perforated pipe (OPSS 405) wrapped in nonwoven geotextile (OPSS 1860). In rural sections, subdrains will be required where granular base does not connect with the ditch invert. Ditch inverts shall be at a lower elevation than the granular base to ensure positive drainage. All rural subdrains shall be 150 mm diameter perforated pipe (OPSS 405) wrapped in nonwoven geotextile (OPSS 1860) with rodent gates installed at all outlets spaced at 50.0 m to 70.0 m intervals.

26. **All curb returns** to Regional curb and gutter to be constructed in accordance with the Regional standard curb return drawing number DS-216, OPSS MUNI 353 and OPSS MUNI 1850 current versions for all standard entrances unless otherwise approved. Curb returns in rural sections shall be offset 0.5 m from the edge of travelled portion of the road.

27. When determined by the Region, **catchbasin lids** on existing maintenance holes shall be replaced with a **maintenance hole cover** OPSD 401.010 and the new catchbasin with frame & grate shall be OPSD 400.1100.

28. Modified needed for final adjustments to maintenance holes and catchbasins on driven portions of road shall be a maximum of 150 mm. Any adjustments requiring greater than 150 mm shall require a riser section to be installed.

29. The Owner acknowledges the asphalt on Regional property may contain asbestos, a prescribed designated substance under O.Reg. 409/19 – Designated Substances, as amended, made under the Occupational Health and Safety Act, R.S.O. 1990, c.O.1. The Owner is solely responsible for completing any due diligence required and for compliance with all applicable laws related to designated substances including, but not limited to the Occupational Health and Safety Act, R.S.O. 1990, c.O.1 and the Environmental Protection Act, R.S.O. 1990, c.E.19. The Owner is responsible to ensure the safety of its workers, contractors, subcontractors, consultants, the general public, and others that may be in proximity to the work.

30. **Granular road base** on Regional Roads shall be installed as per OPSS MUNI 314 and OPSS MUNI 1010 and shall be a minimum of 450 mm Granular 'B Type I' and 150 mm Granular 'A' or match existing depths, whichever is greater, or as approved by the Region. All granular material placed under pavement shall be compacted to 100% of the maximum dry density. All other native materials shall be compacted to 95% of the maximum dry density. The results of the compaction tests and analysis shall be monitored by the geotechnical consultant on a **full-time basis**, and reports shall be submitted to the York Region, Development Engineering Division, and attention: Development Construction Coordinator. **Recycled granular material will not be accepted.**

31. **All new asphalt shall be:**
    - **Base course** – minimum of 100 mm (2 lifts of 50 mm) Superpave 19.0 Performance Graded Asphalt Cement (PGAC) 64-28 Category 'D' Roadway, compacted to between 91.0% to 96.5% of Maximum Relative Density (MRD)
      - The maximum Reclaimed Asphalt Pavement (RAP) content allowed in SP 19.0 hot-mix asphalt (HMA) is 15%.
      - The use of recycled shingle tabs in any mix is not permitted.
      - The use of slag as an aggregate in any mix is not permitted.
      - 4.8% PGAC content
      - 5.0% PGAC content is to be used instead of 4.8% when the base course asphalt will be exposed over one or more winter periods.
    - **Top course** – minimum of 50 mm Superpave 12.5 FC 1 PGAC 64-28 Category 'D' Roadway, compacted to between 92.0% to 97.5% of MRD, or as specified
      - No RAP to be used in SP 12.5 top course asphalt
      - 5.0% PGAC content
    - **Tack coat** required between lifts, on existing asphalt, at step joints and on areas specified by the Geotechnical Engineer and/or Development Construction Coordinator in accordance with OPSS 310
    - The Contractor shall use a **material transfer vehicle** that has on-board mixing capabilities, and a minimum storage capacity of 25 tonnes. A material transfer system such as a shuttle buggy (Roadtec SB-2500C Shuttle Buggy ® or approved equivalent) shall be used (note: delete this requirement if scope of work is relatively small i.e., paving small areas)
    - **Joint heaters** shall be used in the construction of longitudinal joints to eliminate the occurrence of cold joints
    - Longitudinal and transverse step joints between the new HMA pavement and the previously paved pavement shall be constructed by trimming the previously paved pavement edge to a straight, clean, vertical surface of at least 50 mm
    - All mixed designs to be submitted to York Region's Development Construction Coordinator at least 48hrs prior to commencing paving operations
    - A **pre-paving meeting** shall be scheduled by the Owner/ Consultant at the discretion of York Region's Development Construction Coordinator
    - The results of the **compaction tests and analysis** shall be submitted to the York Region, Development Engineering Division, Attention: Development Construction Coordinator. The Region requires copies of original asphalt material tickets and summaries to verify material type and quantities
    - All asphalt placed shall be in accordance with OPSS 310, MUNI 1101, MUNI 1151 current versions.
    - Placing of HMA must adhere to OPSS-310.07.06.02 Operational Constraints

32. **Single Unit Residential Driveway** construction makeup:
    Min. 300 mm of Granular 'A'
    Min. 50 mm HL-3 top asphalt

    Multiple Unit Residential/Condominium/Commercial/Industrial Driveway construction makeup:
    Min. 450 mm of Granular 'A'
    Min. 100 mm HL-8 base asphalt
    Min. 50 mm HL-3 HS top asphalt

33. All asphalt tapers and road widening(s) require a **fully paved shoulder** with full depth granular and asphalt for all rural cross-sections. Typical paved shoulder width is 2.5 m, following a granular rounding to the edge of top of slope.

34. All asphalt joints shall include a minimum 500 mm wide by 50 mm depth **step joint** into the existing top course asphalt. Depending on specific site conditions, the width of the step joint may be required to **be increased at the Region's discretion beyond 500 mm** to ensure proper cross-fall from the existing road cross-section and ensure a stable joint into the existing pavement. The Development Construction Coordinator shall be contacted in advance for an on-site field inspection and consultation prior to any paving. All joints will require rout and seal as per material specification OPSS 1212 and construction specification OPSS-341, DensoBand (OPSS.MUNI 1103) or approved equivalent.

35. All permanent durable pavement markings shall be installed in accordance with Regional Specifications and conform to OPSS 710, OPS 1712, OPS 1713, OPS 1714 & OPS 1750.

36. All new **curb drops** to follow OPSD 600.040 concrete barrier curb and gutter standard. Concrete **sidewalk ramps** at intersections to be AODA compliant in accordance with standard drawings DS-119, 120 and 121 and/or as shown in the approved electrical drawings.

37. Any existing driveways, curb drops or ramps that are not proposed/approved **shall be removed** and replaced with full curb as per OPSD 600.040 in urbanized areas or replaced with proper ditch sloping in rural areas, with 100 mm topsoil and sod to stabilize the restoration. Existing driveways cannot be used as construction accesses without approval from the Region as this is a change of the driveway's use.

38. No landscaping, hoarding, fencing, signs, steps, stairs, canopy, sprinkler systems, temporary accesses or any other **encroaching structures are to be permitted** within the Regional road allowance without written approval or encroachment permit from York Region Development Engineering Division.

39. All **grassed areas** disturbed during construction on the Regional Road right-of-way shall be restored with 100 to 200 mm of topsoil and sod placed (staked on slopes and ditches) to the bottom of the granular 'A' shoulder rounding or as required by the Development Construction Coordinator, in accordance with OPSS 803 current version. **All revegetated areas to be maintained periodically or as required (grass watering,grass cutting and boulevard maintenance) by the applicant until final release of securities/assumption by the Region.**

40. Final **restoration works** are to be completed within 6 months of asphalt placement and non- compliance may result in work completed by York Region forces at the expense of the owner with the project application securities used or withheld to ensure payment and final work.

41. Approved drawings, including engineering, underground, landscaping, electrical and detailed traffic management plans **must be adhered to at all times** unless otherwise directed by the Development Construction Coordinator. All works on Regional right-of-way shall be carried out as per the approved drawings and Regional standards/guidelines, OPSS & OPSD drawings & regulatory specifications, policies and/or as required by the Region's Development Construction Coordinator or designate.

42. **New intersections and/or new legs of an existing intersection are not to be opened to any use** until all traffic control measures are installed, including all illumination, signalization, pavement markings, and signage. For new signalized intersections, a signal inspection shall be scheduled by York Region Electrical prior to energization. Final approval for opening shall be determined by York Region Electrical Construction Coordinators and Traffic Operations Technologists. New intersections are to be barricaded to prevent access until specific permission has been given by the Region.

43. **Regulatory and hazard warnings signs** as per OTM Book 5 and OTM Book 6 shall be shown on the approved drawings and/or as required on site by the Development Construction Coordinator and/or the Electrical Construction Coordinator. All permanent signage in the Region's right-of-way shall be installed on minimum **100 mm x 100 mm pressure-treated wooden posts** and as per OTM/York Region standards.

44. The approach ends of a **raised median** on the Regional road shall have the typical "Keep Right" sign and object marker as per the Region specification E-7.01, installed immediately after the median construction. Right in/right out access controlled by a raised median requires a "one way" regulatory control sign as per OTM Book 5, which must be installed prior to the opening of the access.

45. Approved **emergency accesses** to Regional roads are to be in place prior to any building permits being issued for the subdivision. **All gates, bollards etc. shall be located on private property/local municipal lands.** Temporary construction accesses shall be closed off permanently on the Regional road prior to the first residential occupancy or if the Owner/ Developer can demonstrate to the Region that there is no residential use. Temporary sales access use shall be for sales access only and be relocated to the new adjacent road(if applicable) once constructed and open to public traffic.

46. It is the responsibility of the Owner/Developer to **protect all existing survey monumentation** on or adjacent to the site that may be destroyed/ disturbed during construction. Should these monuments be damaged in any way, the owner shall have the survey monuments replaced by an Ontario Land Surveyor (OLS) prior to the reduction or release of any security.

47. All **landscape features** including retaining walls, steps/stairs, footings and columns, fencing, sprinkler systems, etc. to be located on the Private Property and/or behind 0.3 m reserve, will require an OLS Certificate in conformation, **along with a copy of the survey/drawing/sketch** submitted prior to reduction or release of any security. OLS must certify that all 0.3 m reserves through accesses (i.e.: new intersections or driveways) have been lifted prior to public use.

48. **Interlocking concrete paving stones** must be supported on a 125 mm concrete base (including wire mesh and spacing of drainage holes) as per York Region standard SS-100.

49. The Owner/Developer or their Consulting Engineer responsible for inspections shall advise the Contractor that the integrity of the above and below ground Regional road facilities shall be properly located and maintained. Any above/below ground infrastructure damaged during construction is to be reported to the appropriate Regional Development Construction Coordinator, and the repair may require the work to be completed by the Region at the Owner's expense.

50. All **construction correspondence** is to be directed to the York Region Construction Coordinator, Development Engineering Division, and must specify the appropriate **Regional approval and file numbers.**

51. Prior to any **security reduction or release** of the development security deposit, all applicable requirements listed in the "York Region Security Release and Reduction List of Requirements" (current version) shall be submitted to the attention of the appropriate Development Construction Coordinator for Regional clearance. A final inspection must be conducted by the Region and Owner's/Developer's consultant prior to any security reduction or release.

52. The Owner/Developer agrees to **indemnify** the Region, and its employees, elected officials, contractors and agents against any and all actions, causes of legal action, lawsuits, claims and demands whatsoever which may arise either directly or indirectly by reason of undertaking any of the Owner/ Developer's work with respect to the development approvals and construction.

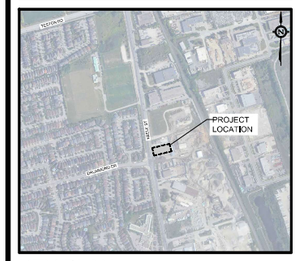
53. The Owner/ Developer must retain a Consulting Engineer as Consultant to ensure compliance of all work within the Region's right-of-way. The Region **at any time may request a copy of the daily construction reports or other timing/scheduling as required** at the sole discretion of the Region.

54. It is a condition of Regional Approval that the Owner/ Developer or their Consultant (responsible for inspections and compliance) **is liable with respect to all work done on Regional property.** This liability shall extend to such time as the works have been granted final compliance, including all invoices paid, land conveyances and listed Region requirements are completed to the Region's satisfaction prior to reduction or release of any security.

Contractor must check and verify all dimensions and be res- possible for same, reporting any discrepancies to the Engineer before commencing work.
Prints shall not be used for construction until signed 'Approved For Construction' by the Engineer.
Prints are not to be scaled.
All drawings, prints and specifications are the property of the Engineer and shall be returned to him on completion of the work.
All work shall be performed in accordance with the latest edition of the ONTARIO BUILDING CODE. NATIONAL BUILDING CODE and regulatory regulations of the Town of Oshawa Building Department.
These notes are to be read in conjunction with all drawings and specifications.

The Contractor shall check all dimensions and other data from the job and report any discrepancies to the Architects before proceeding.

No	DATE	REVISION	DRN	CHKD
1	2024-04-18	ISSUED FOR APPROVAL	DB	SS
2	2024-10-28	ISSUED FOR APPROVAL	DB	SS
3	2025-03-19	ISSUED FOR APPROVAL	DB	SS
4	2025-09-25	REVISED AS PER CITY & REGION COMMENTS	DB	SS
5	2026-05-12	REVISED AS PER UPDATED ARCH SITE PLAN	DB	SS
6	2026-08-05	REVISED AS PER UPDATED ARCH SITE PLAN / BLDG MECH	DB	SS
7	2026-10-13	REVISED AS PER SPA COMMENTS	DB	SS



KEY PLAN

SCALE: NTS

SOSCIA
PROFESSIONAL ENGINEERS INC.
10376 Yonge Street, Suite 307
Richmond Hill, ON. L4C 3B8
WWW.sosciaeng.ca
ph 905 237 5410
fax 905 237 5413

PROJECT: CITY FILE:DA.24.032
PROPOSED
INDUSTRIAL WAREHOUSE

10533 KEELE STREET
VAUGHAN (MAPLE), ONTARIO

SHEET TITLE:		JOB NO:
NOTES		24-020
SCALE: N/A	DATE: OCTOBER, 2026	DWG NO: C07
DRAWN: DB	CHECKED: SS	

Appendix B

Flow Analysis

Calculation Sheet 1

Project:	**PROPOSED INDUSTRIAL WAREHOUSE**
Address:	**10533 KEELE STREET VAUGHAN (MAPLE), ONTARIO**
Town/Township/City	**City of Vaughan, ON**
Project No.	**24-020**

PRE-DEVELOPMENT RUNOFF COFFICENT

AREA TYPE	AREA (M2)	RUNOFF COEFFICIENT "C"	AREA x C
ASPHALT	1507.5	0.90	1356.75
BUILDING ROOF	188.6	0.90	169.74
LANDSCAPED AREA	495.9	0.25	123.98
		ΣAREA X C	1650.47
		WEIGHTED AVERAGE "C"	0.75
		Conisidered "C"	**0.25**
		AREA "A" (Hectares)	0.22

Rainfall intensity:

$$I = At^{B}$$

Where:
I = Rainfall Intensity (mm/hr)
a = coefficient
b = coefficient
c = coefficient

T_d=Time of concentration(min)) 15.00

Design Flow:

$$\mathbf{Q = RAIN}$$

Where:

Q= volume of runoff (m^3/second)
C = Runoff coefficient
A = contributing draingae area (hectares)
I= rainfall intensity (milimeters/hour)

Return Period (Years)	5-Years	10 -Years	25 -Years	50 -Years	100-Years
A	1045.41	1331.42	1045.41	1045.41	1045.41
B	4.900	5.260	4.900	4.900	4.900
c	0.830	0.840	0.830	0.830	0.830
T_d (mins)	15.00	15.00	15.00	15.00	15.00
i (mm/hr)	87.35	106.35	121.41	134.51	147.61
C	0.25	0.25	0.25	0.25	0.25
Q (m^3/sec)	0.013	0.02	0.02	0.02	0.02
Q (l/sec)	13.30	16.19	18.48	20.48	22.47

Calculation Sheet 2

Project:	**PROPOSED INDUSTRIAL WAREHOUSE**
Address:	**10533 KEELE STREET VAUGHAN (MAPLE), ONTARIO**
Town/Township/City	**City of Vaughan, ON**
Project No.	**24-020**

POST-DEVELOPMENT RUNOFF COFFICENT

AREA TYPE	AREA (M^2)	RUNOFF COEFFICIENT "C"	AREA x C
ASPHALT	956.00	0.90	860.40
BUILDING ROOF	909.00	0.90	818.10
LANDSCAPED AREA	327.00	0.25	81.75
		ΣAREA X C	1760.25
		WEIGHTED AVERAGE "C"	**0.80**
		AREA "A" (Hectares)	0.22

Rainfall intensity:

$$i = \frac{A}{(t+B)^C}$$

Where:
I = Rainfall Intensity (mm/hr)
a = coefficient
b = coefficient
c = coefficient
T_d=Time of concentration(min)) 15.00

Design Flow:

$$Q = 0.002778CIA$$

Where:
Q= volume of runoff (m^3/second)
C = Runoff coefficient
A = contributing draingae area (hectares)
I= rainfall intensity (milimeters/hour)

Return Period (Years)	5-Years	10 -Years	25 -Years	50 -Years	100-Years
A	1045.410	1331.420	1045.410	1045.410	1045.410
B	4.900	5.260	4.900	4.900	4.900
c	0.830	0.840	0.830	0.830	0.830
T_d (mins)	15.00	15.00	15.00	15.00	15.00
i (mm/hr)	87.35	106.35	121.41	134.51	147.61
C	0.80	0.80	0.80	0.80	0.80
Q (m^3/sec)	0.04	0.05	0.06	0.07	0.07
Q (l/sec)	42.71	52.00	59.37	65.78	72.18

Calculation Sheet 3

Project:	**PROPOSED INDUSTRIAL WAREHOUSE**
Address:	**10533 KEELE STREET VAUGHAN (MAPLE), ONTARIO**
Town/Township/City	**City of Vaughan, ON**
Project No.	**24-020**

Uncontrolled flow

AREA TYPE	AREA (M^2)	RUNOFF COEFFICIENT "C"	AREA x C
ASPHALT/CONC.	133.00	0.90	119.70
BUILDING	0.00	0.90	0.00
LANDSCAPED AREA	59.00	0.25	14.75
		ΣAREA X C	134.45
		WEIGHTED AVERAGE "C"	**0.70**
		AREA "A" (Hectares)	0.02

Rainfall intensity:

$$I = At^B$$

Where:

I = Rainfall Intensity (mm/hr)

a = coefficient

b = coefficient

T_d=Time of concentration(min) 15.00

Design Flow:

$$Q = 0.002778CIA$$

Where:

Q= volume of runoff (m^3/second)

C = Runoff coefficient

A = contributing draingae area (hectares)

I= rainfall intensity (milimeters/hour)

Return Period (Years)	5-Years	10 -Years	25 -Years	50 -Years	100-Years
A	1045.4	1331.4	1045.4	1045.4	1045.4
B	4.9	5.3	4.9	4.9	4.9
C	0.830	0.840	0.830	0.830	0.830
t (mins)	15.00	15.00	15.00	15.00	15.00
I (mm/hr)	111.06	134.94	154.37	171.03	187.68
C	0.70	0.70	0.70	0.70	0.70
Q (m^3/sec)	0.00	0.01	0.01	0.01	0.01
Q (l/sec)	4.15	5.04	5.77	6.39	7.01

Appendix C

100 Year Storage & Available Storage

On-Site Storage Calculator

City of Vaughan, ON

Project: **PROPOSED INDUSTRIAL WAREHOUSE**

10533 KEELE STREET VAUGHAN (MAPLE), C

Project No.: **24-020**

Table 2F - 100 Years Storage

Equation of IDF:

$$i = \frac{A}{(t+B)^C}$$

I = Rainfall Intensity (mm/hr)

T = Time of Concentration (hr)

R =	0.80	
A =	0.22	ha
$Q_{release}$ =	0.006	m^3/s
	6.3	L/s

A= 1045.41

B= 4.9

C= 0.83

				Max. Storage Required (m^3)	75.54
t_c	i_{100}	Q_{100}	Q_{stored}	Peak Volume	Comments
(min)	(mm/hr)	(m^3/s)	(m^3/s)	(m^3)	
15	147.61	0.073	0.066	59.818	
16	141.73	0.070	0.064	61.020	
17	136.33	0.067	0.061	62.123	
18	131.37	0.065	0.058	63.137	
19	126.80	0.062	0.056	64.072	
20	122.55	0.060	0.054	64.936	
25	105.28	0.052	0.046	68.403	
30	92.60	0.046	0.039	70.833	
35	82.86	0.041	0.035	72.557	
40	75.13	0.037	0.031	73.773	
41	73.77	0.036	0.030	73.968	
42	72.46	0.036	0.029	74.147	
43	71.20	0.035	0.029	74.313	
44	69.99	0.034	0.028	74.466	
45	68.83	0.034	0.028	74.607	
46	67.70	0.033	0.027	74.735	
47	66.62	0.033	0.027	74.853	
48	65.57	0.032	0.026	74.959	
49	64.56	0.032	0.026	75.055	
50	63.58	0.031	0.025	75.142	
55	59.14	0.029	0.023	75.439	
56	58.34	0.029	0.022	75.474	
57	57.55	0.028	0.022	75.501	
58	56.79	0.028	0.022	75.521	
59	56.05	0.028	0.021	75.534	
60	55.34	0.027	0.021	75.541	
61	54.64	0.027	0.021	75.541	***
62	53.96	0.027	0.020	75.535	
63	53.30	0.026	0.020	75.523	
64	52.66	0.026	0.020	75.505	
65	52.03	0.026	0.019	75.482	

On-Site Avaiable Storage Calculator

City of Vaughan, ON

Table 3-100- Avilable Storage

Project:	**PROPOSED INDUSTRIAL WAREHOUSE**
Address:	**10533 KEELE STREET VAUGHAN (MAPLE), ONTARIO**
Project No.:	**24-020**

MH/CATCH BASIN

			HWL	**257.80**	
Description	**Length/Dia. (m)**	**Top Elevation**	**Invert Elevation**	**Height (m)**	**Volume (m^3)**
CB1	0.6	257.90	257.23	0.57	0.21
MH2	1.2	258.18	257.09	0.71	1.02
CB3	0.6	258.15	257.20	0.60	0.22
MH2A	1.2	258.18	256.99	0.81	1.17
CB4	0.6	258.10	257.04	0.76	0.27
MH5	1.2	258.35	256.90	0.90	1.30
CBMH6	1.2	258.20	256.76	1.04	0.52
CB7	0.6	258.15	256.75	1.05	0.13
MH8	1.2	258.20	256.60	1.20	0.60
MH9	1.2	258.30	256.50	1.30	0.65
CB12	0.6	257.60	256.55	1.25	0.16
TOTAL					6.25

PIPES

FROM MH	**TO MH**	**Length (m)**		**DIA (mm)**	**Volume (m^3)**
CB1	MH2	7.9		250	0.39
MH2	MH3	3.2		300	0.23
CB3	MH2A	8.5		250	0.42
MH2A	CULTEC	1.2		375	0.12
CB4	PIPE	6.6		250	0.32
CULTEC	MH5	5.7		300	0.40
MH5	CBMH6	18.0		300	1.27
STM PLUG	CULTEC	3.4		250	0.16
CBMH6	MH8	24.3		375	2.56
CB7	MH8	1.6		250	0.08
MH8	MH9	10.6		375	1.11
MH9	OGS MH10	12.6		375	1.33
CB12	OGS MH10	9.7		250	0.48
OGS MH10	MH11 CONTROL	3.4		375	0.35
TOTAL					9.21

SURFACE PONDING

Ponding Location		**Ponding Volume**
CB12	-	5.00
TOTAL		5.00

STORMWATER TANK

Manufacturer	**Volume**
CULTEC RECHARGER 150XLHD	66.43
MAXIMUM AVAILABLE VOLUME (m^3)	**86.88**
REQUIRED VOLUME (m^3) for 100 years rainfall event	**75.54**

Appendix D

Storm Sewer Design Sheet

PREPARED BY: N.T.
DATE PREPARED 19-Mar-25

Storm Sewer Design Chart

For Circular Drains Flowing Full

PROPOSED INDUSTRIAL WAREHOUSE

10533 KEELE STREET VAUGHAN (MAPLE), ONTARIO

City of Vaughan, ON

24-020

IDF CURVE	
Constants	**5 -yrs**
a	1045.410
b	4.900
c	0.830

Tc (start): 15.00 min

Catchments										Hydraulics							
Catchment ID	Total Area (m^2)	Captured By	Outlet to	Runoff Coeff. "R"	A x R	ACC. ΣA x R	t_d (min)	I_5	$Q_{5\text{-yrs}}$	STORM SEWER DESIGN INFORMATION size (mm)	slope (%)	length (m)	Q full (m^3/s)	V full (m/s)	TIME SECT. (min)	Flow %	Comments
CB1	60.00	CB1	MH2	0.64	0.004	0.004	15.00	87.35	0.001	250	1.0	7.9	0.059	1.211	0.11	1.6%	
CONVEYANCE		MH2	MH3			0.004	15.11	86.95	0.001	300	0.5	3.2	0.068	0.967	0.06	1.4%	
CB3	133.00	CB3	MH2A	0.81	0.011	0.011	15.00	87.35	0.003	250	1.0	8.5	0.059	1.211	0.12	4.4%	
CONVEYANCE		MH2A	CULTEC			0.015	15.16	86.75	0.004	375	1.0	1.2	0.175	1.587	0.01	2.0%	
BLDG	909.00	STM PLUG	CULTEC	0.90	0.082	0.08	15.00	87.35	0.020	250	2.6	3.4	0.096	1.957	0.03	20.7%	
CB4	265.00	CB4	PIPE	0.80	0.021	0.02	15.00	87.35	0.005	250	1.0	6.6	0.059	1.211	0.09	8.6%	
CONVEYANCE		CULTEC	MH5			0.118	15.18	86.71	0.028	300	0.4	5.7	0.061	0.865	0.11	46.3%	
CONVEYANCE	-	MH5	CBMH6	-	-	0.12	15.29	86.32	0.028	300	0.4	18.0	0.061	0.865	0.35	46.1%	
CBMH6	250.00	CBMH6	MH8	0.90	0.023	0.14	15.63	85.11	0.033	375	0.4	24.3	0.111	1.004	0.40	29.9%	
CB7	165.00	CB7	MH8	0.90	0.015	0.01	15.00	87.35	0.004	250	1.0	1.6	0.059	1.211	0.02	6.1%	
CONVEYANCE	-	MH8	MH9	-	-	0.15	16.04	83.75	0.036	375	0.4	10.6	0.111	1.004	0.18	32.5%	
CONVEYANCE		MH9	OGS MH10	-	-	0.15	16.21	83.17	0.036	375	0.4	12.6	0.111	1.004	0.21	32.3%	
CB12	218.00	CB12	OGS MH10	0.35	0.008	0.01	15.00	87.35	0.002	250	1.0	9.7	0.059	1.211	0.13	3.1%	
CONVEYANCE	-	OGS MH10	MH11 CONTROL	-	-	0.16	16.42	82.49	0.037	375	0.4	3.4	0.111	1.004	0.06	33.6%	
CONVEYANCE	-	MH11 CONTROL	EX. CBMH	-	-	0.16	16.47	82.31	0.043	375	0.4	15.7	0.111	1.004	0.26	39.0%	**Orifice**

Appendix E

OGS Sizing

STANDARD OFFLINE
Jellyfish Filter Sizing Report

Project Information

Date	Thursday, March 28, 2024
Project Name	10533 Keele St.
Project Number	24-020
Location	Vaughan

Jellyfish Filter Design Overview

This report provides information for the sizing and specification of the Jellyfish Filter. When designed properly in accordance to the guidelines detailed in the Jellyfish Filter Technical Manual, the Jellyfish Filter will exceed the performance and longevity of conventional horizontal bed and granular media filters.

Please see ***www.ImbriumSystems.com*** *for more information.*

Jellyfish Filter System Recommendation

The Jellyfish Filter model JF4-1-1 is recommended to meet the water quality objective by treating a flow of 7.6 L/s, which meets or exceeds 90% of the average annual rainfall runoff volume based on 18 years of TORONTO CENTRAL rainfall data for this site. This model has a sediment capacity of 85 kg, which meets or exceeds the estimated average annual sediment load.

Jellyfish Model	Number of High-Flo Cartridges	Number of Draindown Cartridges	Manhole Diameter (m)	Treatment Flow Rate (L/s)	Sediment Capacity (kg)
JF4-1-1	1	1	1.2	7.6	85

The Jellyfish Filter System

The patented Jellyfish Filter is an engineered stormwater quality treatment technology featuring unique membrane filtration in a compact stand-alone treatment system that removes a high level and wide variety of stormwater pollutants. Exceptional pollutant removal is achieved at high treatment flow rates with minimal head loss and low maintenance costs. Each lightweight Jellyfish Filter cartridge contains an extraordinarily large amount of membrane surface area, resulting in superior flow capacity and pollutant removal capacity.

Maintenance

Regular scheduled inspections and maintenance is necessary to assure proper functioning of the Jellyfish Filter. The maintenance interval is designed to be a minimum of 12 months, but this will vary depending on site loading conditions and upstream pretreatment measures. Quarterly inspections and inspections after all storms beyond the 5-year event are recommended until enough historical performance data has been logged to comfortably initiate an alternative inspection interval.

Please see ***www.ImbriumSystems.com*** *for more information.*

Thank you for the opportunity to present this information to you and your client.

Performance

Jellyfish efficiently captures a high level of Stormwater pollutants, including:

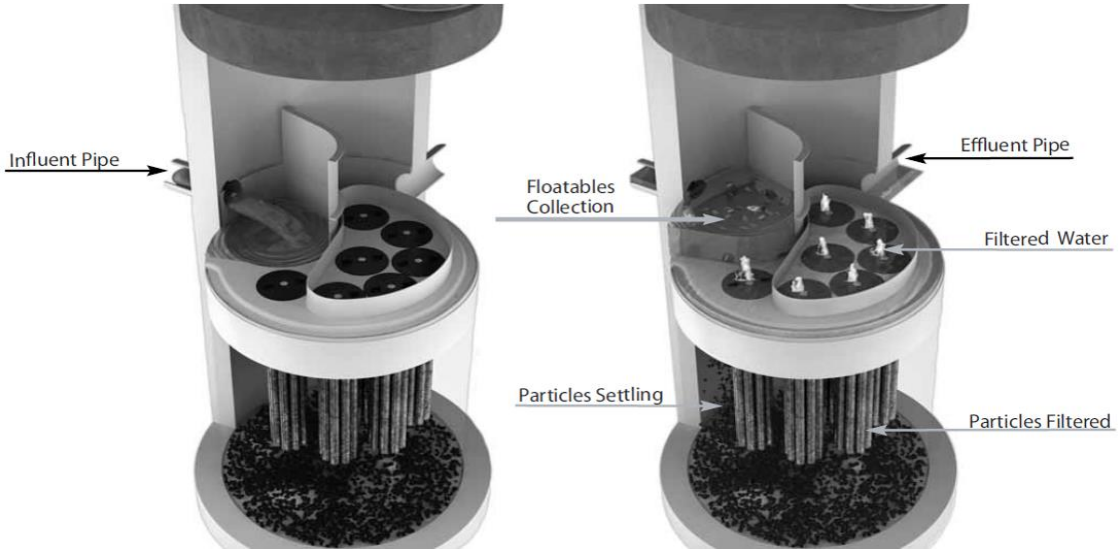
- ☑ 89% of the total suspended solids (TSS) load, including particles less than 5 microns
- ☑ 77% TP removal & 51% TN removal
- ☑ 90% Total Copper, 81% Total Lead, 70% Total Zinc
- ☑ Particulate-bound pollutants such as nutrients, toxic metals, hydrocarbons and bacteria
- ☑ Free oil, Floatable trash and debris

Field Proven Peformance

The Jellyfish filter has been field-tested on an urban site with 25 TAPE qualifying rain events and field monitored according to the TAPE field test protocol, demonstrating:

- A median TSS removal efficiency of 90%, and a median SSC removal of 99%;
- The ability to capture fine particles as indicated by an effluent d50 median of 3 microns for all monitotred storm events, and a median effluent turbidity of 5 NTUs;
- A median Total Phosphorus removal of 77%, and a median Total Nitrogen removal of 51%.

Jellyfish Filter Treatment Functions



Pre-treatment and Membrane Filtration

Jellyfish® Filter

Project Information

Date:	Thursday, March 28, 2024
Project Name:	10533 Keele St.
Project Number:	24-020
Location:	Vaughan

Designer Information

Company:	Soscia Professional Engineers Inc.
Contact:	Nihar Trivedi
Phone #:	

Notes

Rainfall

Name:	TORONTO CENTRAL
State:	ON
ID:	100
Record:	1982 to 1999
Co-ords:	45°30'N, 90°30'W

Drainage Area

Total Area:	0.23 ha
Imperviousness:	78%

Upstream Detention

Peak Release Rate:	n/a
Pretreatment Credit:	n/a

Design System Requirements

Flow Loading	90% of the Average Annual Runoff based on 18 years of TORONTO CENTRAL rainfall data:	**5.9 L/s**
Sediment Loading	Treating 90% of the average annual runoff volume, 1081 m³, with a suspended sediment concentration of 60 mg/L.	**65 kg**

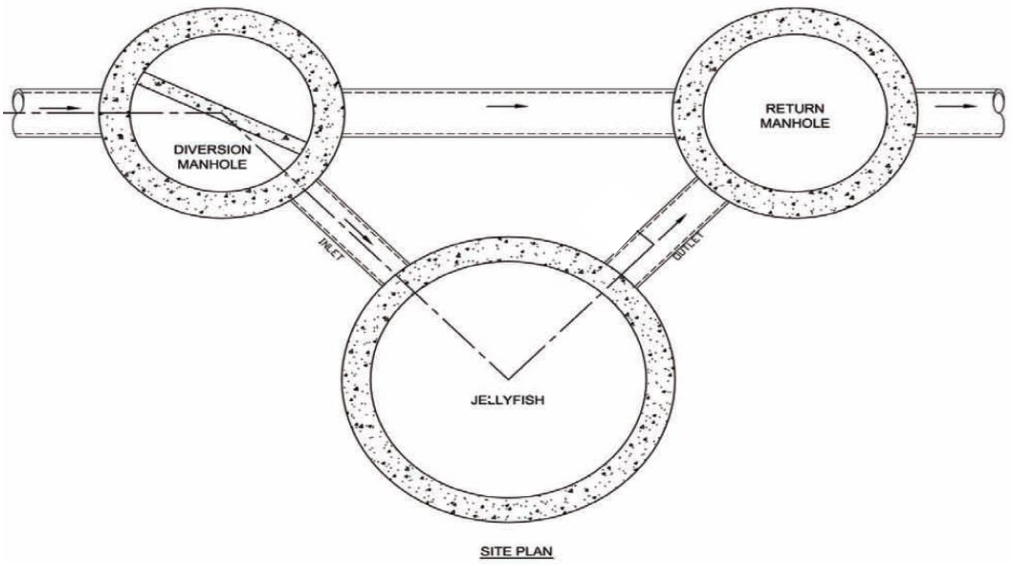
Recommendation

The Jellyfish Filter model JF4-1-1 is recommended to meet the water quality objective by treating a flow of 7.6 L/s, which meets or exceeds 90% of the average annual rainfall runoff volume based on 18 years of TORONTO CENTRAL rainfall data for this site. This model has a sediment capacity of 85 kg, which meets or exceeds the estimated average annual sediment load.

Jellyfish Model	Number of High-Flo Cartridges	Number of Draindown Cartridges	Manhole Diameter (m)	Wet Vol Below Deck (L)	Sump Storage (m³)	Oil Capacity (L)	Treatment Flow Rate (L/s)	Sediment Capacity (kg)
JF4-1-1	**1**	**1**	**1.2**	**2313**	**0.34**	**379**	**7.6**	**85**
JF4-2-1	2	1	1.2	2313	0.34	379	12.6	142
JF6-3-1	3	1	1.8	5205	0.79	848	17.7	199
JF6-4-1	4	1	1.8	5205	0.79	848	22.7	256
JF6-5-1	5	1	1.8	5205	0.79	848	27.8	313
JF6-6-1	6	1	1.8	5205	0.79	848	28.6	370
JF8-6-2	6	2	2.4	9252	1.42	1469	35.3	398
JF8-7-2	7	2	2.4	9252	1.42	1469	40.4	455
JF8-8-2	8	2	2.4	9252	1.42	1469	45.4	512
JF8-9-2	9	2	2.4	9252	1.42	1469	50.5	569
JF8-10-2	10	2	2.4	9252	1.42	1469	50.5	626
JF10-11-3	11	3	3.0	14456	2.21	2302	63.1	711
JF10-12-3	12	3	3.0	14456	2.21	2302	68.2	768
JF10-12-4	12	4	3.0	14456	2.21	2302	70.7	796
JF10-13-4	13	4	3.0	14456	2.21	2302	75.7	853
JF10-14-4	14	4	3.0	14456	2.21	2302	78.9	910
JF10-15-4	15	4	3.0	14456	2.21	2302	78.9	967
JF10-16-4	16	4	3.0	14456	2.21	2302	78.9	1024
JF10-17-4	17	4	3.0	14456	2.21	2302	78.9	1081
JF10-18-4	18	4	3.0	14456	2.21	2302	78.9	1138
JF10-19-4	19	4	3.0	14456	2.21	2302	78.9	1195
JF12-20-5	20	5	3.6	20820	3.2	2771	113.6	1280
JF12-21-5	21	5	3.6	20820	3.2	2771	113.7	1337
JF12-22-5	22	5	3.6	20820	3.2	2771	113.7	1394
JF12-23-5	23	5	3.6	20820	3.2	2771	113.7	1451
JF12-24-5	24	5	3.6	20820	3.2	2771	113.7	1508
JF12-25-5	25	5	3.6	20820	3.2	2771	113.7	1565
JF12-26-5	26	5	3.6	20820	3.2	2771	113.7	1622
JF12-27-5	27	5	3.6	20820	3.2	2771	113.7	1679

Jellyfish Filter Design Notes

- Typically the Jellyfish Filter is designed in an offline configuration, as all stormwater filter systems will perform for a longer duration between required maintenance services when designed and applied in off-line configurations. Depending on the design parameters, an optional internal bypass may be incorporated into the Jellyfish Filter, however note the inspection and maintenance frequency should be expected to increase above that of an off-line system. Speak to your local representative for more information.



Jellyfish Filter Typical Layout

- Typically, 18 inches (457 mm) of driving head is designed into the system, calculated as the difference in elevation between the top of the diversion structure weir and the invert of the Jellyfish Filter outlet pipe. Alternative driving head values can be designed as 12 to 24 inches (305 to 610mm) depending on specific site requirements, requiring additional sizing and design assistance.
- Typically, the Jellyfish Filter is designed with the inlet pipe configured 6 inches (150 mm) above the outlet invert elevation. However, depending on site parameters this can vary to an optional configuration of the inlet pipe entering the unit below the outlet invert elevation.
- The Jellyfish Filter can accommodate multiple inlet pipes within certain restrictions.
- While the optional inlet below deck configuration offers 0 to 360 degree flexibility between the inlet and outlet pipe, typical systems conform to the following:

Model Diameter (m)	Minimum Angle Inlet / Outlet Pipes	Minimum Inlet Pipe Diameter (mm)	Minimum Outlet Pipe Diameter (mm)
1.2	**62º**	**150**	**200**
1.8	59º	200	250
2.4	52º	250	300
3.0	48º	300	450
3.6	40º	300	450

- The Jellyfish Filter can be built at all depths of cover generally associated with conventional stormwater conveyance systems. For sites that require minimal depth of cover for the stormwater infrastructure, the Jellyfish Filter can be applied in a shallow application using a hatch cover. The general minimum depth of cover is 36 inches (915 mm) from top of the underslab to outlet invert.
- If driving head caclulations account for water elevation during submerged conditions the Jellyfish Filter will function effectively under submerged condtions.
- Jellyfish Filter systems may incorporate grated inlets depending on system configuration.
- For sites with water quality treatment flow rates or mass loadings that exceed the design flow rate of the largest standard Jellyfish Filter manhole models, systems can be designed that hydraulically connect multiple Jellyfish Filters in series or alternatively Jellyfish Vault units can be designed.

STANDARD SPECIFICATION
STORMWATER QUALITY – MEMBRANE FILTRATION TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

Specifies requirements for construction and performance of an underground stormwater quality membrane filtration treatment device that removes pollutants from stormwater runoff through the unit operations of sedimentation, floatation, and membrane filtration.

1.2 REFERENCE STANDARDS

ASTM C 891: Specification for Installation of Underground Precast Concrete Utility Structures
ASTM C 478: Specification for Precast Reinforced Concrete Manhole Sections
ASTM C 443: Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM D 4101: Specification for Copolymer steps construction

CAN/CSA-A257.4-M92
Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections and Fittings Using Rubber Gaskets

CAN/CSA-A257.4-M92
Precast Reinforced Circular Concrete Manhole Sections, Catch Basins and Fittings

Canadian Highway Bridge Design Code

1.3 SHOP DRAWINGS

Shop drawings for the structure and performance are to be submitted with each order to the contractor. Contractor shall forward shop drawing submittal to the consulting engineer for approval. Shop drawings are to detail the structure's precast concrete and call out or note the fiberglass (FRP) internals/components.

1.4 PRODUCT SUBSTITUTIONS

No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the engineer of record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

1.5 HANDLING AND STORAGE

Prevent damage to materials during storage and handling.

PART 2 – PRODUCTS

2.1 GENERAL

2.1.1 The device shall be a cylindrical or rectangular, all concrete structure (including risers), constructed from precast concrete riser and slab components or monolithic precast structure(s), installed to conform to ASTM C 891 and to any required state highway, municipal or local specifications; whichever is more stringent. The device shall be watertight.

2.1.2 Cartridge Deck The cylindrical concrete device shall include a fiberglass deck. The rectangular concrete device shall include a coated aluminum deck. In either instance, the insert shall be bolted and sealed watertight inside the precast concrete chamber. The deck shall serve as: (a) a horizontal divider between the lower treatment zone and the upper treated effluent zone; (b) a deck for attachment of filter cartridges such that the membrane filter elements of each cartridge extend into the lower treatment zone; (c) a platform for maintenance workers to service the filter cartridges (maximum manned weight = 450 pounds (204 kg)); (d) a conduit for conveyance of treated water to the effluent pipe.

2.1.3 Membrane Filter Cartridges Filter cartridges shall be comprised of reusable cylindrical membrane filter elements connected to a perforated head plate. The number of membrane filter elements per cartridge shall be a minimum of eleven 2.75-inch (70-mm) diameter elements. The length of each filter element shall be a minimum 15 inches (381 mm). Each cartridge shall be fitted into the cartridge deck by insertion into a cartridge receptacle that is permanently mounted into the cartridge deck. Each cartridge shall be secured by a cartridge lid that is threaded onto the receptacle, or similar mechanism to secure the cartridge into the deck. The maximum treatment flow rate of a filter cartridge shall be controlled by an orifice in the cartridge lid, or on the individual cartridge itself, and based on a design flux rate (surface loading rate) determined by the maximum treatment flow rate per unit of filtration membrane surface area. The maximum design flux rate shall be 0.21 gpm/ft² (0.142 lps/m²).

Each membrane filter cartridge shall allow for manual installation and removal. Each filter cartridge shall have filtration membrane surface area and dry installation weight as follows (if length of filter cartridge is between those listed below, the surface area and weight shall be proportionate to the next length shorter and next length longer as shown below):

Filter Cartridge Length (in / mm)	Minimum Filtration Membrane Surface Area (ft2 / m2)	Maximum Filter Cartridge Dry Weight (lbs / kg)
15	106 / 9.8	10.5 / 4.8
27	190 / 17.7	15.0 / 6.8
40	282 / 26.2	20.5 / 9.3
54	381 / 35.4	25.5 / 11.6

2.1.4 Backwashing Cartridges The filter device shall have a weir extending above the cartridge deck, or other mechanism, that encloses the high flow rate filter cartridges when placed in their respective cartridge receptacles within the cartridge deck. The weir, or other mechanism, shall collect a pool of filtered water during inflow events that backwashes the high flow rate cartridges when the inflow

event subsides. All filter cartridges and membranes shall be reusable and allow for the use of filtration membrane rinsing procedures to restore flow capacity and sediment capacity; extending cartridge service life.

2.1.5 Maintenance Access to Captured Pollutants The filter device shall contain an opening(s) that provides maintenance access for removal of accumulated floatable pollutants and sediment, removal of and replacement of filter cartridges, cleaning of the sump, and rinsing of the deck. Access shall have a minimum clear vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

2.1.6 Bend Structure The device shall be able to be used as a bend structure with minimum angles between inlet and outlet pipes of 90-degrees or less in the stormwater conveyance system.

2.1.7 Double-Wall Containment of Hydrocarbons The cylindrical precast concrete device shall provide double-wall containment for hydrocarbon spill capture by a combined means of an inner wall of fiberglass, to a minimum depth of 12 inches (305 mm) below the cartridge deck, and the precast vessel wall.

2.1.8 Baffle The filter device shall provide a baffle that extends from the underside of the cartridge deck to a minimum length equal to the length of the membrane filter elements. The baffle shall serve to protect the membrane filter elements from contamination by floatables and coarse sediment. The baffle shall be flexible and continuous in cylindrical configurations, and shall be a straight concrete or aluminum wall in rectangular configurations.

2.1.9 Sump The device shall include a minimum 24 inches (610 mm) of sump below the bottom of the cartridges for sediment accumulation, unless otherwise specified by the design engineer. Depths less than 24 inches may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

2.2 PRECAST CONCRETE SECTIONS

All precast concrete components shall be manufactured to a minimum live load of HS-20 truck loading or greater based on local regulatory specifications, unless otherwise modified or specified by the design engineer, and shall be watertight.

2.3 JOINTS All precast concrete manhole configuration joints shall use nitrile rubber gaskets and shall meet the requirements of ASTM C443, Specification C1619, Class D or engineer approved equal to ensure oil resistance. Mastic sealants or butyl tape are not an acceptable alternative.

2.4 GASKETS Only profile neoprene or nitrile rubber gaskets in accordance to CSA A257.3-M92 will be accepted. Mastic sealants, butyl tape or Conseal CS-101 are not acceptable gasket materials.

2.5 FRAME AND COVER Frame and covers must be manufactured from cast-iron or other composite material tested to withstand H-20 or greater design loads, and as approved by the

local regulatory body. Frames and covers must be embossed with the name of the device manufacturer or the device brand name.

2.6 DOORS AND HATCHES If provided shall meet designated loading requirements or at a minimum for incidental vehicular traffic.

2.7 CONCRETE All concrete components shall be manufactured according to local specifications and shall meet the requirements of ASTM C 478.

2.8 FIBERGLASS The fiberglass portion of the filter device shall be constructed in accordance with the following standard: ASTM D-4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks.

2.9 STEPS Steps shall be constructed according to ASTM D4101 of copolymer polypropylene, and be driven into preformed or pre-drilled holes after the concrete has cured, installed to conform to applicable sections of state, provincial and municipal building codes, highway, municipal or local specifications for the construction of such devices.

2.10 INSPECTION All precast concrete sections shall be inspected to ensure that dimensions, appearance and quality of the product meet local municipal specifications and ASTM C 478.

PART 3 – PERFORMANCE

3.1 GENERAL

3.1.1 Verification – The stormwater quality filter must be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV).

3.1.2 Function - The stormwater quality filter treatment device shall function to remove pollutants by the following unit treatment processes; sedimentation, floatation, and membrane filtration.

3.1.3 Pollutants - The stormwater quality filter treatment device shall remove oil, debris, trash, coarse and fine particulates, particulate-bound pollutants, metals and nutrients from stormwater during runoff events.

3.1.4 Bypass - The stormwater quality filter treatment device shall typically utilize an external bypass to divert excessive flows. Internal bypass systems shall be equipped with a floatables baffle, and must avoid passage through the sump and/or cartridge filtration zone.

3.1.5 Treatment Flux Rate (Surface Loading Rate) – The stormwater quality filter treatment device shall treat 100% of the required water quality treatment flow based on a maximum design treatment flux rate (surface loading rate) across the membrane filter cartridges of 0.21 gpm/ft² (0.142 lps/m²).

3.2 FIELD TEST PERFORMANCE

At a minimum, the stormwater quality filter device shall have been field tested and verified with a minimum 25 TARP qualifying storm events and field monitoring shall have been conducted according to the TARP 2009 NJDEP TARP field test protocol, and have received NJCAT verification.

3.2.1 Suspended Solids Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median TSS removal efficiency of 85% and a minimum median SSC removal efficiency of 95%.

3.2.2 Runoff Volume – The stormwater quality filter treatment device shall be engineered, designed, and sized to treat a minimum of 90 percent of the annual runoff volume determined from use of a minimum 15-year rainfall data set.

3.2.3 Fine Particle Removal - The stormwater quality filter treatment device shall have demonstrated the ability to capture fine particles as indicated by a minimum median removal efficiency of 75% for the particle fraction less than 25 microns, an effluent d_{50} of 15 microns or lower for all monitored storm events.

3.2.4 Turbidity Reduction - The stormwater quality filter treatment device shall have demonstrated the ability to reduce the turbidity from influent from a range of 5 to 171 NTU to an effluent turbidity of 15 NTU or lower.

3.2.5 Nutrient (Total Phosphorus & Total Nitrogen) Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median Total Phosphorus removal of 55%, and a minimum median Total Nitrogen removal of 50%.

3.2.6 Metals (Total Zinc & Total Copper) Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median Total Zinc removal of 55%, and a minimum median Total Copper removal of 85%.

3.3 INSPECTION and MAINTENANCE

The stormwater quality filter device shall have the following features:

3.3.1 Durability of membranes are subject to good handling practices during inspection and maintenance (removal, rinsing, and reinsertion) events, and site specific conditions that may have heavier or lighter loading onto the cartridges, and pollutant variability that may impact the membrane structural integrity. Membrane maintenance and replacement shall be in accordance with manufacturer's recommendations.

3.3.2 Inspection which includes trash and floatables collection, sediment depth determination, and visible determination of backwash pool depth shall be easily conducted from grade (outside the structure).

3.3.3 Manual rinsing of the reusable filter cartridges shall promote restoration of the flow capacity and sediment capacity of the filter cartridges, extending cartridge service life.

3.3.4 The filter device shall have a minimum 12 inches (305 mm) of sediment storage depth, and a minimum of 12 inches between the top of the sediment storage and bottom of the filter cartridge tentacles, unless otherwise specified by the design engineer. Variances may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

3.3.5 Sediment removal from the filter treatment device shall be able to be conducted using a standard maintenance truck and vacuum apparatus, and a minimum one point of entry to the sump that is unobstructed by filter cartridges.

3.3.6 Maintenance access shall have a minimum clear height that provides suitable vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

3.3.7 Filter cartridges shall be able to be maintained without the requirement of additional lifting equipment.

PART 4 – EXECUTION

4.1 INSTALLATION

4.1.1 PRECAST DEVICE CONSTRUCTION SEQUENCE

The installation of a watertight precast concrete device should conform to ASTM C 891 and to any state highway, municipal or local specifications for the construction of manholes, whichever is more stringent. Selected sections of a general specification that are applicable are summarized below.

4.1.1.1 The watertight precast concrete device is installed in sections in the following sequence:

- aggregate base
- base slab
- treatment chamber and cartridge deck riser section(s)
- bypass section
- connect inlet and outlet pipes
- concrete riser section(s) and/or transition slab (if required)
- maintenance riser section(s) (if required)
- frame and access cover

4.1.2 The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

4.1.3 Adjustment of the stormwater quality treatment device can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary to restore original condition and watertight seals. Once the stormwater quality treatment device has been constructed, any/all lift holes must be plugged watertight with mortar or non-shrink grout.

4.1.4 Inlet and Outlet Pipes Inlet and outlet pipes should be securely set into the device using approved pipe seals (flexible boot connections, where applicable) so that the structure is watertight, and such that any pipe intrusion into the device does not impact the device functionality.

4.1.5 Frame and Cover Installation Adjustment units (e.g. grade rings) should be installed to set the frame and cover at the required elevation. The adjustment units should be laid in a full bed of mortar with successive units being joined using sealant recommended by the manufacturer. Frames for the cover should be set in a full bed of mortar at the elevation specified.

4.2 MAINTENANCE ACCESS WALL
In some instances the Maintenance Access Wall, if provided, shall require an extension attachment and sealing to the precast wall and cartridge deck at the job site, rather than at the precast facility. In this instance, installation of these components shall be performed according to instructions provided by the manufacturer.

4.3 FILTER CARTRIDGE INSTALLATION Filter cartridges shall be installed in the cartridge deck only after the construction site is fully stabilized and in accordance with the manufacturer's guidelines and recommendations. Contractor to contact the manufacturer to schedule cartridge delivery and review procedures/requirements to be completed to the device prior to installation of the cartridges and activation of the system.

PART 5 – QUALITY ASSURANCE

5.1 FILTER CARTRIDGE INSTALLATION Manufacturer shall coordinate delivery of filter cartridges and other internal components with contractor. Filter cartridges shall be delivered and installed complete after site is stabilized and unit is ready to accept cartridges. Unit is ready to accept cartridges after is has been cleaned out and any standing water, debris, and other materials have been removed. Contractor shall take appropriate action to protect the filter cartridge receptacles and filter cartridges from damage during construction, and in accordance with the manufacturer's recommendations and guidance. For systems with cartridges installed prior to full site stabilization and prior to system activation, the contractor can plug inlet and outlet pipes to prevent stormwater and other influent from entering the device. Plugs must be removed during the activation process.

5.2 INSPECTION AND MAINTENANCE

5.2.1 The manufacturer shall provide an Owner's Manual upon request.

5.2.2 After construction and installation, and during operation, the device shall be inspected and cleaned as necessary based on the manufacturer's recommended inspection and maintenance guidelines and the local regulatory agency/body.

5.3 REPLACEMENT FILTER CARTRIDGES When replacement membrane filter elements and/or other parts are required, only membrane filter elements and parts approved by the manufacturer for use with the stormwater quality filter device shall be installed.

END OF SECTION

STANDARD PERFORMANCE SPECIFICATION
STORMWATER QUALITY – MEMBRANE FILTRATION TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground stormwater quality membrane filtration treatment device that removes pollutants from stormwater runoff through the unit operations of sedimentation, floatation, and membrane filtration.

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental Management – Environmental Technology Verification (ETV)

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: filtration surface area, treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, filtration treatment device product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 GENERAL

2.1.1 Maintenance Access to Captured Pollutants The filter device shall contain an opening(s) that provides maintenance access for removal of accumulated floatable pollutants and sediment, removal of and replacement of filter cartridges, cleaning of the sump, and rinsing of the internal components. Access shall have a minimum clear vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of their installed placement for the entire length of the cartridge.

2.1.2 Pollutant Storage: The Filter device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants.

PART 3 – PERFORMANCE

3.1 GENERAL

3.1.1 Verification – The stormwater quality filter treatment device shall have been field tested in accordance with either TARP Tier II Protocol (TARP, 2003) and New Jersey Tier II Stormwater Test Requirements – Amendments to TARP Tier II Protocol (NJDEP, 2009) or Washington State Technology Assessment Protocol – Ecology (TAPE), 2011 or later version. The field test shall have been verified in accordance with ISO 14034:2016 Environmental Management – Environmental Technology Verification (ETV). See Section 3.2 of this specification for field test performance requirements.

3.2 FIELD TEST PERFORMANCE

The field test (as specified in section 3.1.1)shall have monitored a minimum of twenty (20) TARP or TAPE qualifying storm events, and report at **minimum** the following results:

3.2.1 Suspended Solids Removal - The stormwater quality filter treatment device shall have ISO 14034 ETV verified load based median TSS removal efficiency of at least 85% and load based median SSC removal efficiency of at least 98%.

3.2.2 Runoff Volume – The stormwater quality filter treatment device shall be engineered, designed, and sized to treat a minimum of 90 percent of the annual runoff volume determined from use of a minimum 15-year rainfall data set.

3.2.3 Fine Particle Removal - The stormwater quality filter treatment device shall have demonstrated the ability to capture fine particles as indicated by a minimum median removal efficiency of 75% for the particle fraction less than 25 microns, and an effluent d_{50} of 15 microns or lower for all monitored storm events.

3.2.4 Turbidity Reduction - The stormwater quality filter treatment device shall have demonstrated the ability to reduce turbidity such that effluent turbidity is 15 NTU or lower.

3.2.5 Nutrients & Metals – The stormwater quality filter treatment device shall have ISO 14034 ETV Verified minimum load based removal efficiencies for the following:

3.2.5.1 Total Phosphorus (TP) Removal - Median TP removal efficiency of at least 49%.

3.2.5.2 Total Nitrogen (TN) Removal - Median TN removal efficiency of at least 39%.

3.2.5.3 Total Zinc (Zn) Removal - Median Zn removal efficiency of at least 69%.

3.2.5.4 Total Copper (Cu) Removal - Median Cu removal efficiency of at least 91%.

END OF SECTION

DRAWING NOT TO BE USED FOR CONSTRUCTION

GENERAL NOTES:

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. JELLYFISH STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE JELLYFISH SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

JELLYFISH STRUCTURE & DESIGN NOTES:

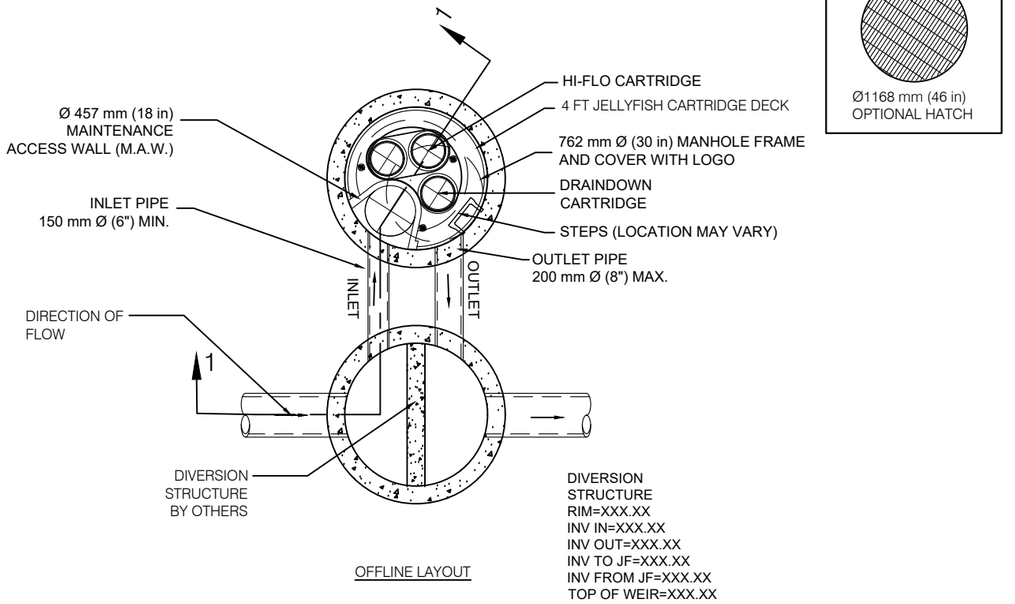
1. 457 MM Ø (18") MAINTENANCE ACCESS WALL TO BE USED FOR CLEANOUT AND ACCESS BELOW CARTRIDGE DECK.
2. CASTINGS OR DOORS OF THE JELLYFISH MANHOLE STRUCTURE TO EXTEND TO DESIGN FINISH GRADE. DEPTHS IN EXCESS OF 3.65 M (12') MAY REQUIRE THE DESIGN AND INSTALLATION OF INTERMEDIATE SAFETY GRATES OR OTHER STRUCTURAL ELEMENTS.
3. CASTINGS AND GRADE RINGS, OR DOORS AND DOOR RISERS, OR BOTH, SHALL BE GROUTED FOR WATERTIGHTNESS.
   STRUCTURE SHALL MEET AASHTO HS-20, ASSUMING EARTH COVER OF 0' - 3', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 LOAD RATING AND BE CAST WITH THE IMBRIUM LOGO.
4. ALL STRUCTURAL SECTIONS AND PARTS TO MEET OR EXCEED ASTM C-478, ASTM C-443, AND ASTM D-4097 CORRESPONDING TO AASHTO SPECIFICATIONS, AND ANY OTHER SITE OR LOCAL STANDARDS.
5. CONCRETE RISER SECTIONS FROM BOTTOM TO TOP WILL BE ADDED AS REQUIRED INCLUDING TRANSITION PIECES TO SMALLER DIAMETER RISERS FOR SURFACE ACCESSES WHERE WARRANTED BY SERVICING DEPTH.
6. IF MINIMUM DEPTH FROM TOP OF CARTRIDGE DECK TO BOTTOM OF STRUCTURAL TOP SLAB CANNOT BE ACHIEVED DUE TO PIPING INVERT ELEVATIONS OR OTHER SITE CONSTRAINTS. ALTERNATIVE HATCH CONFIGURATIONS MAY BE AVAILABLE. HATCH DOORS SHOULD BE SIZED TO PROVIDE FULL ACCESS ABOVE THE CARTRIDGES TO ACCOMMODATE MAINTENANCE.
7. STEPS TO BE APPROXIMATELY 330 MM (13") APART AND DIMENSIONS MUST MEET LOCAL STANDARDS. STEPS MUST BE INSTALLED AFTER CARTRIDGE DECK IS IN PLACE.
8. CONFIGURATION OF INLET AND OUTLET PIPE CAN VARY TO MEET SITE'S NEEDS.
9. IT IS THE RESPONSIBILITY OF OTHERS TO PROPERLY PROTECT THE TREATMENT DEVICE, AND KEEP THE DEVICE OFFLINE DURING CONSTRUCTION. FILTER CARTRIDGES SHALL NOT BE INSTALLED UNTIL THE PROJECT SITE IS CLEAN AND FREE OF DEBRIS, BY OTHERS. THE PROJECT SITE INCLUDES ANY SURFACE THAT CONTRIBUTES STORM DRAINAGE TO THE TREATMENT DEVICE. CARTRIDGES SHALL BE FURNISHED NEW, AT THE TIME OF FINAL ACCEPTANCE.
10. THIS DRAWING MUST BE VIEWED IN CONJUNCTION WITH THE STANDARD JELLYFISH SPECIFICATION, AND STORMWATER QUALITY FILTER TREATMENT JELLYFISH DOCUMENTS.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. CARTRIDGE INSTALLATION, BY IMBRIUM, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE JELLYFISH UNIT IS CLEAN AND FREE OF DEBRIS. CONTACT IMBRIUM TO COORDINATE CARTRIDGE INSTALLATION WITH SITE STABILIZATION.

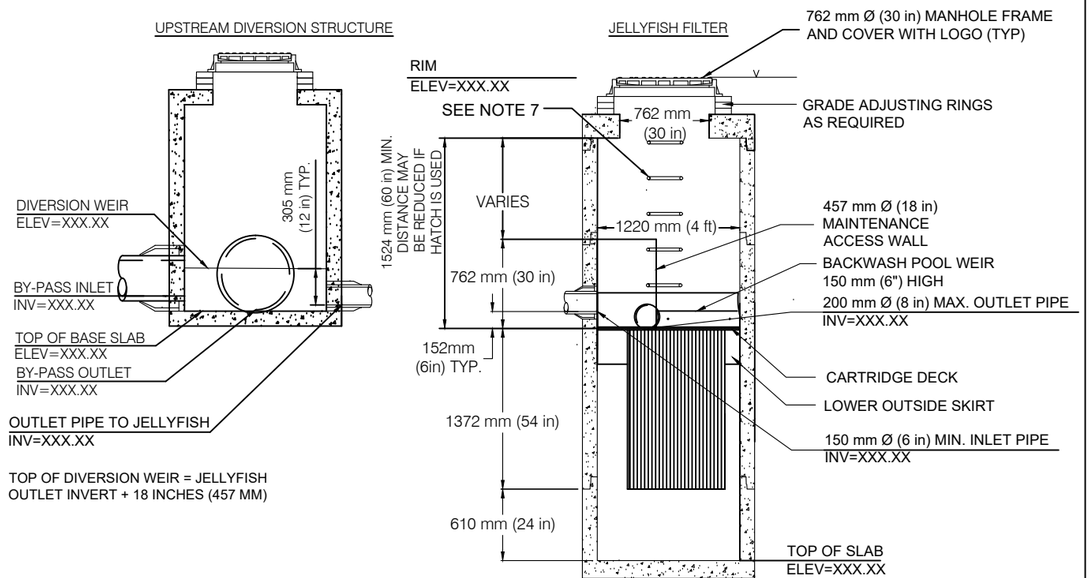
STANDARD OFFLINE JELLYFISH RECOMMENDED PIPE DIAMETERS			
MODEL DIAMETER (m)	MINIMUM ANGLE INLET/OUTLET PIPES	MINIMUM INLET PIPE DIAMETER (mm)	MINIMUM OULTET PIPE DIAMETER (mm)
1.2	62	150	200
1.8	59	200	250
2.4	52	250	300
3.0	48	300	450
3.6	40	300	450
CONTACT IMBRIUM SYSTEMS FOR ALTERNATE PIPE DIAMETERS			

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL JELLYFISH FILTER REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE.



OFFLINE LAYOUT

XXX.XX INFORMATION TO BE SUPPLIED BY ENGINEER OF RECORD



TOP OF DIVERSION WEIR = JELLYFISH OUTLET INVERT + 18 INCHES (457 MM)

CROSS SECTION 1-1

JELLYFISH DESIGN NOTES

JELLYFISH TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. THE STANDARD MANHOLE STYLE IS SHOWN. Ø1220 mm (48") MANHOLE JELLYFISH PEAK TREATMENT CAPACITY IS 12.7 L/s (0.54 CFS). TREATMENT FLOW RATE IS BASED ON 457 mm (18") OF HEAD PRESSURE.

CARTRIDGE SELECTION											
CARTRIDGE DEPTH	54"	40"		27"		15"					
OUTLET INVERT TO STRUCTURE BASE SLAB	90"	76"		63"		51"					
FLOW RATE HIGH-FLO / DRAINDOWN (L/s) (per cart)	5.09 / 2.55	3.68 / 1.84		2.55 / 1.27		1.41 / 0.71					
SEDIMENT CAPACITY HIGH-FLO / DRAINDOWN (kg) (per cart)	57 / 28	42 / 21		28 / 14		16 / 8					
MAX. CARTS HIGH-FLO/DRAINDOWN				2 / 1							
MAX. SEDIMENT CAPACITY (kg)	142	105		70		40					
MAX. TREATMENT (L/s)	12.7	9.3		6.2		3.4					

SITE SPECIFIC DATA REQUIREMENTS

JELLYFISH MODEL	*				
STRUCTURE ID					*
WATER QUALITY FLOW RATE (L/s)					*
PEAK FLOW RATE (L/s)					*
RETURN PERIOD OF PEAK FLOW (yrs)					*
# OF CARTRIDGES REQUIRED (HF / DD)					*
CARTRIDGE SIZE (inches)					*
PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

MARK	DATE	REVISION DESCRIPTION	BY
1	08/01/2015	NOTES	BSF
0	10/01/2014	INTIAL RELEASE	BSF

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Jellyfish
JF4 STANDARD
Scale = 1:50
info@imbriumsystems.com
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imbrium
7037 Ridge Road, Suite 350, Hanover, MD 21076
USA 888-239-8826 CA 800-565-4801 INTL +1-416-960-9900
Jellyfish® Filter

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 7,425,262; 7,470,366; 7,704,393; 8,277,651; 8,303,811; CA 2, 906, 482 ; CA 2,843,643,CA 2,886,482; KR 10-1297578; NZ 593481; NZ 609021; ZL 201210370556.1; ZL 201310170264.0; 201310170264.0

DATE: #####
DESIGNED: —
DRAWN: BSF
CHECKED: BSF
APPROVED: SP
PROJECT #: #####
PROJECT NAME: #####
SHEET: 1 OF 2

I:\IMBRIUM\PRODUCTS\JELLYFISH FILTER\40 DRAWINGS & DETAILS\STANDARD DETAILS\JELLYFISH FILTER - OFFLINE\JELLYFISH FILTER JF4 - OFFLINE DIVERSION MANHOLE.DWG 5/17/2017 1:57 PM

JELLYFISH® FILTER - SPECIFICATIONS

GENERAL

A. WORK INCLUDED: SPECIFIES REQUIREMENTS FOR CONSTRUCTION AND PERFORMANCE OF AN UNDERGROUND STORMWATER QUALITY, MEMBRANE FILTRATION, AND TREATMENT DEVICE THAT REMOVES POLLUTANTS FROM STORMWATER RUNOFF THROUGH THE UNIT OPERATIONS OF SEDIMENTATION, FLOATATION, AND MEMBRANE FILTRATION.

B. REFERENCE STANDARDS:
ASTM C 891: SPECIFICATION FOR INSTALLATION OF UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES
ASTM C 478: SPECIFICATION FOR PRECAST REINFORCED CONCRETE MANHOLE SECTIONS
ASTM C 990: SPECIFICATION FOR JOINTS FOR CONCRETE MANHOLES USING PREFORMED FLEXIBLE JOINT SEALANTS
ASTM D 4101: SPECIFICATION FOR COPOLYMER STEPS CONSTRUCTION

C. SHOP DRAWINGS: SHOP DRAWINGS FOR THE STRUCTURE AND PERFORMANCE ARE TO BE SUBMITTED WITH EACH ORDER TO THE CONTRACTOR. CONTRACTOR SHALL FORWARD SHOP DRAWING SUBMITTAL TO THE CONSULTING ENGINEER FOR APPROVAL. SHOP DRAWINGS ARE TO DETAIL THE STRUCTURE PRECAST CONCRETE AND CALL OUT OR NOTE THE FIBERGLASS (FRP) INTERNALS/COMPONENTS.

D. PRODUCT SUBSTITUTIONS: NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD. SUBMISSIONS FOR SUBSTITUTIONS REQUIRE REVIEW AND APPROVAL BY THE ENGINEER OF RECORD, FOR HYDRAULIC PERFORMANCE, IMPACT TO PROJECT DESIGNS, EQUIVALENT TREATMENT PERFORMANCE, AND ANY REQUIRED PROJECT PLAN AND REPORT (HYDROLOGY/HYDRAULIC, WATER QUALITY, STORMWATER POLLUTION) MODIFICATIONS THAT WOULD BE REQUIRED BY THE APPROVING JURISDICTIONS/AGENCIES. CONTRACTOR TO COORDINATE WITH THE ENGINEER OF RECORD ANY APPLICABLE MODIFICATIONS TO THE PROJECT ESTIMATES OF COST, BONDING AMOUNT DETERMINATIONS, PLAN CHECK FEES FOR CHANGES TO APPROVED DOCUMENTS, AND/OR ANY OTHER REGULATORY REQUIREMENTS RESULTING FROM THE PRODUCT SUBSTITUTION.

E. HANDLING AND STORAGE: PREVENT DAMAGE TO MATERIALS DURING STORAGE AND HANDLING.

PRODUCTS

A. THE DEVICE SHALL BE A CYLINDRICAL OR RECTANGULAR, ALL CONCRETE STRUCTURE (INCLUDING RISERS), CONSTRUCTED FROM PRECAST CONCRETE RISER AND SLAB COMPONENTS OR MONOLITHIC PRECAST STRUCTURE(S), INSTALLED TO CONFORM TO ASTM C 891 AND TO ANY REQUIRED STATE HIGHWAY, MUNICIPAL OR LOCAL SPECIFICATIONS; WHICHEVER IS MORE STRINGENT. THE DEVICE SHALL BE WATERTIGHT.

B. THE CYLINDRICAL CONCRETE DEVICE SHALL INCLUDE A FIBERGLASS CARTRIDGE DECK INSERT. THE RECTANGULAR CONCRETE DEVICE SHALL INCLUDE A COATED ALUMINUM INSERT. IN EITHER INSTANCE, THE INSERT SHALL BE BOLTED AND SEALED WATERTIGHT INSIDE THE PRECAST CONCRETE CHAMBER. THE INSERT SHALL SERVE AS: (A) A HORIZONTAL DIVIDER BETWEEN THE LOWER TREATMENT ZONE AND THE UPPER TREATED EFFLUENT ZONE; (B) A DECK FOR ATTACHMENT OF FILTER CARTRIDGES SUCH THAT THE MEMBRANE FILTER ELEMENTS OF EACH CARTRIDGE EXTEND INTO THE LOWER TREATMENT ZONE; (C) A PLATFORM FOR MAINTENANCE WORKERS TO SERVICE THE FILTER CARTRIDGES (MAXIMUM MANNED WEIGHT = 450 POUNDS); (D) A CONDUIT FOR CONVEYANCE OF TREATED WATER TO THE EFFLUENT PIPE.

C. MEMBRANE FILTER CARTRIDGES SHALL BE COMPRISED OF REUSABLE CYLINDRICAL MEMBRANE FILTER ELEMENTS CONNECTED TO A PERFORATED HEAD PLATE. THE NUMBER OF MEMBRANE FILTER ELEMENTS PER CARTRIDGE SHALL BE A MINIMUM OF ELEVEN 2.75-INCH (70-MM) OR GREATER DIAMETER ELEMENTS. THE LENGTH OF EACH FILTER ELEMENT SHALL BE A MINIMUM 15 INCHES (381 MM). EACH CARTRIDGE SHALL BE FITTED INTO THE CARTRIDGE DECK BY INSERTION INTO A CARTRIDGE RECEPTACLE THAT IS PERMANENTLY MOUNTED INTO THE CARTRIDGE DECK. EACH CARTRIDGE SHALL BE SECURED BY A CARTRIDGE LID THAT IS THREADED ONTO THE RECEPTACLE, OR SIMILAR MECHANISM TO SECURE THE CARTRIDGE INTO THE DECK. THE MAXIMUM TREATMENT FLOW RATE OF A FILTER CARTRIDGE SHALL BE CONTROLLED BY AN ORIFICE IN THE CARTRIDGE LID, OR ON THE INDIVIDUAL CARTRIDGE ITSELF, AND BASED ON A DESIGN FLUX RATE (SURFACE LOADING RATE) DETERMINED BY THE MAXIMUM TREATMENT FLOW RATE PER UNIT OF FILTRATION MEMBRANE SURFACE AREA. THE MAXIMUM FLUX RATE SHALL BE 0.21 GPM/FT2 (0.142 LPS/M2). EACH MEMBRANE FILTER CARTRIDGE SHALL ALLOW FOR MANUAL INSTALLATION AND REMOVAL.

D. ALL FILTER CARTRIDGES AND MEMBRANES SHALL BE REUSABLE AND ALLOW FOR THE USE OF FILTRATION MEMBRANE RINSING PROCEDURES TO RESTORE FLOW CAPACITY AND SEDIMENT CAPACITY; EXTENDING CARTRIDGE SERVICE LIFE.

E. ACCESS SHALL HAVE A MINIMUM CLEAR HEIGHT OF 60" OVER ALL OF THE FILTER CARTRIDGES, OR BE ACCESSIBLE BY A HATCH OR OTHER MECHANISM THAT PROVIDES MINIMUM 60" VERTICAL CLEAR SPACE OVER ALL OF THE FILTER CARTRIDGES. FILTER CARTRIDGES SHALL BE ABLE TO BE LIFTED STRAIGHT VERTICALLY OUT OF THE RECEPTACLES AND DECK FOR THE ENTIRE LENGTH OF THE CARTRIDGE.

F. THE DEVICE SHALL INCLUDE A MINIMUM 24 INCHES (610 MM) OF SUMP BELOW THE BOTTOM OF THE CARTRIDGES FOR SEDIMENT ACCUMULATION, UNLESS OTHERWISE SPECIFIED BY THE DESIGN ENGINEER. DEPTHS LESS THAN 24" MAY HAVE AN IMPACT ON THE TOTAL PERFORMANCE AND/OR LONGEVITY BETWEEN CARTRIDGE MAINTENANCE/REPLACEMENT OF THE DEVICE.

G. ALL PRECAST CONCRETE COMPONENTS SHALL BE MANUFACTURED TO A MINIMUM LIVE LOAD OF HS-20 TRUCK LOADING OR GREATER BASED ON LOCAL REGULATORY SPECIFICATIONS, UNLESS OTHERWISE MODIFIED OR SPECIFIED BY THE DESIGN ENGINEER, AND SHALL BE WATERTIGHT.

H. GASKETS AND/OR SEALANTS TO PROVIDE WATER TIGHT SEAL BETWEEN CONCRETE JOINTS. JOINTS SHALL BE SEALED WITH PREFORMED JOINT SEALING COMPOUND CONFORMING TO ASTM C 990.

I. FRAME AND COVERS MUST BE MANUFACTURED FROM CAST-IRON OR OTHER COMPOSITE MATERIAL TESTED TO WITHSTAND H-20 OR GREATER DESIGN LOADS, AND AS APPROVED BY THE LOCAL REGULATORY BODY. FRAMES AND COVERS MUST BE EMBOSSED WITH THE NAME OF THE DEVICE MANUFACTURER OR THE DEVICE BRAND NAME.

J. DOOR AND HATCHES, IF PROVIDED SHALL MEET DESIGNATED LOADING REQUIREMENTS OR AT A MINIMUM FOR INCIDENTAL VEHICULAR TRAFFIC.

K. ALL CONCRETE COMPONENTS SHALL BE MANUFACTURED ACCORDING TO LOCAL SPECIFICATIONS AND SHALL MEET THE REQUIREMENTS OF ASTM C 478.

L. THE FIBERGLASS PORTION OF THE FILTER DEVICE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE FOLLOWING STANDARD: ASTM D-4097: CONTACT MOLDED GLASS FIBER REINFORCED CHEMICAL RESISTANT TANKS.

M. STEPS SHALL BE CONSTRUCTED ACCORDING TO ASTM D4101 OF COPOLYMER POLYPROPYLENE, AND BE DRIVEN INTO PREFORMED OR PRE-DRILLED HOLES AFTER THE CONCRETE HAS CURED, INSTALLED TO CONFORM TO APPLICABLE SECTIONS OF STATE, PROVINCIAL AND MUNICIPAL BUILDING CODES, HIGHWAY, MUNICIPAL OR LOCAL SPECIFICATIONS FOR THE CONSTRUCTION OF SUCH DEVICES.

N. ALL PRECAST CONCRETE SECTIONS SHALL BE INSPECTED TO ENSURE THAT DIMENSIONS, APPEARANCE AND QUALITY OF THE PRODUCT MEET LOCAL MUNICIPAL SPECIFICATIONS AND ASTM C 478.

PERFORMANCE

A. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL FUNCTION TO REMOVE POLLUTANTS BY THE FOLLOWING UNIT TREATMENT PROCESSES; SEDIMENTATION, FLOATATION, AND MEMBRANE FILTRATION.

B. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL REMOVE OIL, DEBRIS, TRASH, COARSE AND FINE PARTICULATES, PARTICULATE-BOUND POLLUTANTS, METALS AND NUTRIENTS FROM STORMWATER DURING RUNOFF EVENTS.

C. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL TYPICALLY UTILIZE AN EXTERNAL BYPASS TO DIVERT EXCESSIVE FLOWS. INTERNAL BYPASS SYSTEMS SHALL BE EQUIPPED WITH A FLOATABLES BAFFLE, AND MUST PASS WATER OVER THE CARTRIDGE DECK, AND AVOID PASSAGE THROUGH THE SUMP AND/OR CARTRIDGE FILTRATION ZONE.

D. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL TREAT 100% OF THE REQUIRED WATER QUALITY TREATMENT FLOW BASED ON A MAXIMUM TREATMENT FLUX RATE (SURFACE LOADING RATE) ACROSS THE MEMBRANE FILTER CARTRIDGES NOT TO EXCEED 0.21 GPM/FT2 (0.142 LPS/M2).

E. AT A MINIMUM, THE STORMWATER QUALITY FILTER DEVICE SHALL HAVE BEEN FIELD TESTED AND VERIFIED WITH A MINIMUM 25 QUALIFYING STORM EVENTS AND FIELD MONITORING CONDUCTED ACCORDING TO THE TARP TIER II OR TAPE FIELD TEST PROTOCOL, AND HAVE RECEIVED NJCAT VERIFICATION.

F. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL HAVE DEMONSTRATED A MINIMUM MEDIAN TSS REMOVAL EFFICIENCY OF 85% AND A MINIMUM MEDIAN SSC REMOVAL EFFICIENCY OF 95%.

G. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL HAVE DEMONSTRATED THE ABILITY TO CAPTURE FINE PARTICLES AS INDICATED BY A MINIMUM MEDIAN REMOVAL EFFICIENCY OF 75% FOR THE PARTICLE FRACTION LESS THAN 25 MICRONS, AN EFFLUENT D50 OF 15 MICRONS OR LOWER FOR ALL MONITORED STORM EVENTS, AND AN EFFLUENT TURBIDITY OF 15 NTUS OR LOWER.

H. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL HAVE DEMONSTRATED A MINIMUM MEDIAN TOTAL PHOSPHORUS REMOVAL OF 55%, AND A MINIMUM MEDIAN TOTAL NITROGEN REMOVAL OF 50%.

I. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL HAVE DEMONSTRATED A MINIMUM MEDIAN TOTAL ZINC REMOVAL OF 50%, AND A MINIMUM MEDIAN TOTAL COPPER REMOVAL OF 75%.

INSPECTION AND MAINTENANCE

A. DURABILITY OF MEMBRANES ARE SUBJECT TO GOOD HANDLING PRACTICES DURING INSPECTION AND MAINTENANCE (REMOVAL, RINSING, AND REINSERTION) EVENTS, AND SITE SPECIFIC CONDITIONS THAT MAY HAVE HEAVIER OR LIGHTER LOADING ONTO THE CARTRIDGES, AND POLLUTANT VARIABILITY THAT MAY IMPACT THE MEMBRANE STRUCTURAL INTEGRITY. MEMBRANE MAINTENANCE AND REPLACEMENT SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

B. INSPECTION WHICH INCLUDES TRASH AND FLOATABLES COLLECTION, SEDIMENT DEPTH DETERMINATION, AND VISIBLE DETERMINATION OF BACKWASH POOL DEPTH SHALL BE EASILY CONDUCTED FROM GRADE (OUTSIDE THE STRUCTURE).

C. MANUAL RINSING OF THE REUSABLE FILTER CARTRIDGES SHALL PROMOTE RESTORATION OF THE FLOW CAPACITY AND SEDIMENT CAPACITY OF THE FILTER CARTRIDGES, EXTENDING CARTRIDGE SERVICE LIFE.

D. SEDIMENT REMOVAL FROM THE FILTER TREATMENT DEVICE SHALL BE ABLE TO BE CONDUCTED USING A STANDARD MAINTENANCE TRUCK AND VACUUM APPARATUS, AND A MINIMUM ONE POINT OF ENTRY TO THE SUMP THAT IS UNOBSTRUCTED BY FILTER CARTRIDGES.

E. MAINTENANCE ACCESS SHALL HAVE A MINIMUM CLEAR HEIGHT OF 60" OVER ALL OF THE FILTER CARTRIDGES, OR BE ACCESSIBLE BY A HATCH OR OTHER MECHANISM THAT PROVIDES MINIMUM 60" VERTICAL CLEAR SPACE OVER ALL OF THE FILTER CARTRIDGES. FILTER CARTRIDGES SHALL BE ABLE TO BE LIFTED STRAIGHT VERTICALLY OUT OF THE RECEPTACLES AND DECK FOR THE ENTIRE LENGTH OF THE CARTRIDGE.

F. FILTER CARTRIDGES SHALL BE ABLE TO BE MAINTAINED WITHOUT THE USE OF ADDITIONAL LIFTING EQUIPMENT.

EXECUTION

A. THE INSTALLATION OF A WATERTIGHT PRECAST CONCRETE DEVICE SHOULD CONFORM TO ASTM C 891 AND TO ANY STATE HIGHWAY, MUNICIPAL OR LOCAL SPECIFICATIONS FOR THE CONSTRUCTION OF MANHOLES, WHICHEVER IS MORE STRINGENT. SELECTED SECTIONS OF A GENERAL SPECIFICATION THAT ARE APPLICABLE ARE SUMMARIZED BELOW.

B. THE WATERTIGHT PRECAST CONCRETE DEVICE IS INSTALLED IN SECTIONS IN THE FOLLOWING SEQUENCE:
- AGGREGATE BASE
- BASE SLAB
- TREATMENT CHAMBER AND CARTRIDGE DECK RISER SECTION(S)
- BYPASS SECTION
- CONNECT INLET AND OUTLET PIPES
- CONCRETE RISER SECTION(S) AND/OR TRANSITION SLAB (IF REQUIRED)
- MAINTENANCE RISER SECTION(S) (IF REQUIRED)
- FRAME AND ACCESS COVER

C. INLET AND OUTLET PIPES SHOULD BE SECURELY SET INTO THE DEVICE USING APPROVED PIPE SEALS (FLEXIBLE BOOT CONNECTIONS, WHERE APPLICABLE) SO THAT THE STRUCTURE IS WATERTIGHT, AND SUCH THAT ANY PIPE INTRUSION INTO THE DEVICE DOES NOT IMPACT THE DEVICE FUNCTIONALITY.

D. ADJUSTMENT UNITS (E.G. GRADE RINGS) SHOULD BE INSTALLED TO SET THE FRAME AND COVER AT THE REQUIRED ELEVATION. THE ADJUSTMENT UNITS SHOULD BE LAID IN A FULL BED OF MORTAR WITH SUCCESSIVE UNITS BEING JOINED USING SEALANT RECOMMENDED BY THE MANUFACTURER. FRAMES FOR THE COVER SHOULD BE SET IN A FULL BED OF MORTAR AT THE ELEVATION SPECIFIED.

E. IN SOME INSTANCES THE MAINTENANCE ACCESS WALL, IF PROVIDED, SHALL REQUIRE AN EXTENSION ATTACHMENT AND SEALING TO THE PRECAST WALL AND CARTRIDGE DECK AT THE JOB SITE, RATHER THAN AT THE PRECAST FACILITY. IN THIS INSTANCE, INSTALLATION OF THESE COMPONENTS SHALL BE PERFORMED ACCORDING TO INSTRUCTIONS PROVIDED BY THE MANUFACTURER.

F. FILTER CARTRIDGES SHALL BE INSTALLED IN THE CARTRIDGE DECK AFTER THE CONSTRUCTION SITE IS FULLY STABILIZED AND IN ACCORDANCE WITH THE MANUFACTURERS GUIDELINES AND RECOMMENDATIONS. CONTRACTOR TO CONTACT THE MANUFACTURER TO SCHEDULE CARTRIDGE DELIVERY AND REVIEW PROCEDURES/REQUIREMENTS TO BE COMPLETED TO THE DEVICE PRIOR TO INSTALLATION OF THE CARTRIDGES AND ACTIVATION OF THE SYSTEM.

G. MANUFACTURER SHALL COORDINATE DELIVERY OF FILTER CARTRIDGES AND OTHER INTERNAL COMPONENTS WITH CONTRACTOR. FILTER CARTRIDGES SHALL BE DELIVERED AND INSTALLED COMPLETE AFTER SITE IS STABILIZED AND UNIT IS READY TO ACCEPT CARTRIDGES. UNIT IS READY TO ACCEPT CARTRIDGES AFTER IS HAS BEEN CLEANED OUT AND ANY STANDING WATER, DEBRIS, AND OTHER MATERIALS HAVE BEEN REMOVED. CONTRACTOR SHALL TAKE APPROPRIATE ACTION TO PROTECT THE FILTER CARTRIDGE RECEPTACLES AND FILTER CARTRIDGES FROM DAMAGE DURING CONSTRUCTION, AND IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND GUIDANCE. FOR SYSTEMS WITH CARTRIDGES INSTALLED PRIOR TO FULL SITE STABILIZATION AND PRIOR TO SYSTEM ACTIVATION, THE CONTRACTOR CAN PLUG INLET AND OUTLET PIPES TO PREVENT STORMWATER AND OTHER INFLUENT FROM ENTERING THE DEVICE. PLUGS MUST BE REMOVED DURING THE ACTIVATION PROCESS.

H. THE MANUFACTURER SHALL PROVIDE AN OWNER'S MANUAL UPON REQUEST.

I. AFTER CONSTRUCTION AND INSTALLATION, AND DURING OPERATION, THE DEVICE SHALL BE INSPECTED AND CLEANED AS NECESSARY BASED ON THE MANUFACTURER'S RECOMMENDED INSPECTION AND MAINTENANCE GUIDELINES AND THE LOCAL REGULATORY AGENCY/BODY.

J. WHEN REPLACEMENT MEMBRANE FILTER ELEMENTS AND/OR OTHER PARTS ARE REQUIRED, ONLY MEMBRANE FILTER ELEMENTS AND PARTS APPROVED BY THE MANUFACTURER FOR USE WITH THE STORMWATER QUALITY FILTER DEVICE SHALL BE INSTALLED.

END OF SECTION

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0	10/01/2014	INITIAL RELEASE	BSF
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#	#	#	#

JELLYFISH FILTER SPECIFICATIONS

Jellyfish

JF4 STANDARD

Scale – 1:50

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Jellyfish Filter

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING PATENTS: U.S. 7,425,262 B2; 7,470,366 B2; 7,857,967 B2; 8,545,693 B2; CA 2, 599,482; CA 2,634,842;CA 2,856,466; AR 10-1-0378729; NZ 563461; NZ 604427; AU 2007331906; OTHER PATENTS PENDING WORLDWIDE

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CHECKED: BSF	APPROVED: SP
PROJECT #: #####	PROJECT NAME: #####
SHEET: 2 OF 2	

I:\IMBRIUM\PRODUCTS\JELLYFISH FILTER\40 DRAWINGS & DETAILS\STANDARD DETAILS\JELLYFISH FILTER - OFFLINE\JELLYFISH FILTER JF4 - OFFLINE DIVERSION MANHOLE.DWG 5/17/2017 1:57 PM

DRAWING NOT TO BE USED FOR CONSTRUCTION

GENERAL NOTES:

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. JELLYFISH STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE JELLYFISH SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

JELLYFISH STRUCTURE & DESIGN NOTES:

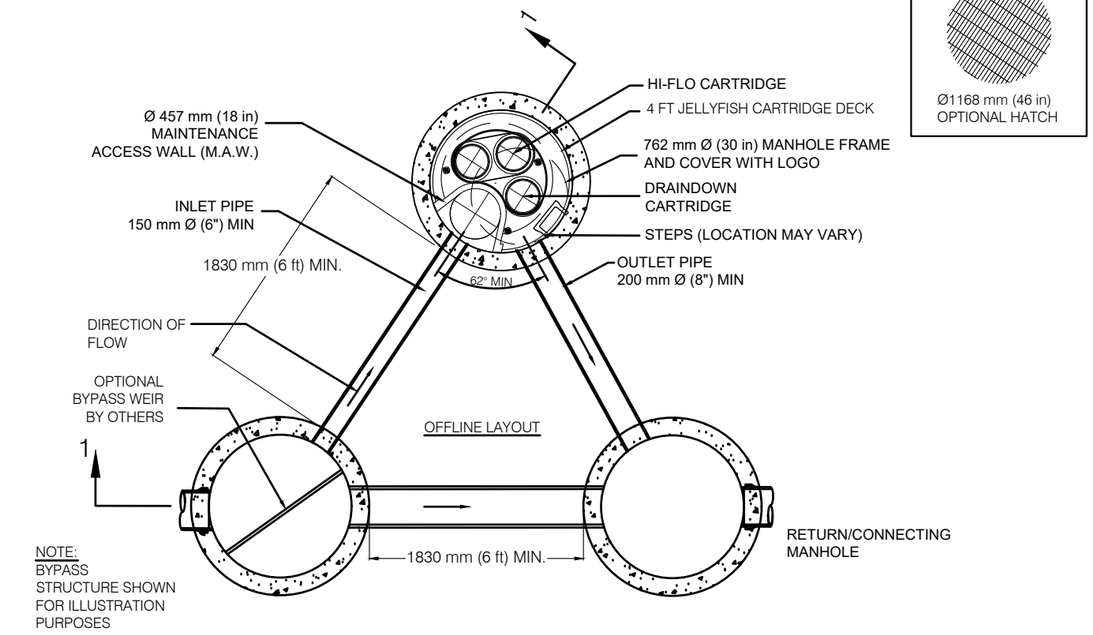
1. 457 MM Ø (18") MAINTENANCE ACCESS WALL TO BE USED FOR CLEANOUT AND ACCESS BELOW CARTRIDGE DECK.
2. CASTINGS OR DOORS OF THE JELLYFISH MANHOLE STRUCTURE TO EXTEND TO DESIGN FINISH GRADE. DEPTHS IN EXCESS OF 3.65 M (12') MAY REQUIRE THE DESIGN AND INSTALLATION OF INTERMEDIATE SAFETY GRATES OR OTHER STRUCTURAL ELEMENTS.
3. CASTINGS AND GRADE RINGS, OR DOORS AND DOOR RISERS, OR BOTH, SHALL BE GROUTED FOR WATERTIGHTNESS.
   STRUCTURE SHALL MEET AASHTO HS-20, ASSUMING EARTH COVER OF 0' - 3', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 LOAD RATING AND BE CAST WITH THE IMBRIUM LOGO.
4. ALL STRUCTURAL SECTIONS AND PARTS TO MEET OR EXCEED ASTM C-478, ASTM C-443, AND ASTM D-4097 CORRESPONDING TO AASHTO SPECIFICATIONS, AND ANY OTHER SITE OR LOCAL STANDARDS.
5. CONCRETE RISER SECTIONS FROM BOTTOM TO TOP WILL BE ADDED AS REQUIRED INCLUDING TRANSITION PIECES TO SMALLER DIAMETER RISERS FOR SURFACE ACCESSES WHERE WARRANTED BY SERVICING DEPTH.
6. IF MINIMUM DEPTH FROM TOP OF CARTRIDGE DECK TO BOTTOM OF STRUCTURAL TOP SLAB CANNOT BE ACHIEVED DUE TO PIPING INVERT ELEVATIONS OR OTHER SITE CONSTRAINTS. ALTERNATIVE HATCH CONFIGURATIONS MAY BE AVAILABLE. HATCH DOORS SHOULD BE SIZED TO PROVIDE FULL ACCESS ABOVE THE CARTRIDGES TO ACCOMMODATE MAINTENANCE.
7. STEPS TO BE APPROXIMATELY 330 MM (13") APART AND DIMENSIONS MUST MEET LOCAL STANDARDS. STEPS MUST BE INSTALLED AFTER CARTRIDGE DECK IS IN PLACE.
8. CONFIGURATION OF INLET AND OUTLET PIPE CAN VARY TO MEET SITE'S NEEDS.
9. IT IS THE RESPONSIBILITY OF OTHERS TO PROPERLY PROTECT THE TREATMENT DEVICE, AND KEEP THE DEVICE OFFLINE DURING CONSTRUCTION. FILTER CARTRIDGES SHALL NOT BE INSTALLED UNTIL THE PROJECT SITE IS CLEAN AND FREE OF DEBRIS, BY OTHERS. THE PROJECT SITE INCLUDES ANY SURFACE THAT CONTRIBUTES STORM DRAINAGE TO THE TREATMENT DEVICE. CARTRIDGES SHALL BE FURNISHED NEW, AT THE TIME OF FINAL ACCEPTANCE.
10. THIS DRAWING MUST BE VIEWED IN CONJUNCTION WITH THE STANDARD JELLYFISH SPECIFICATION, AND STORMWATER QUALITY FILTER TREATMENT JELLYFISH DOCUMENTS.

INSTALLATION NOTES

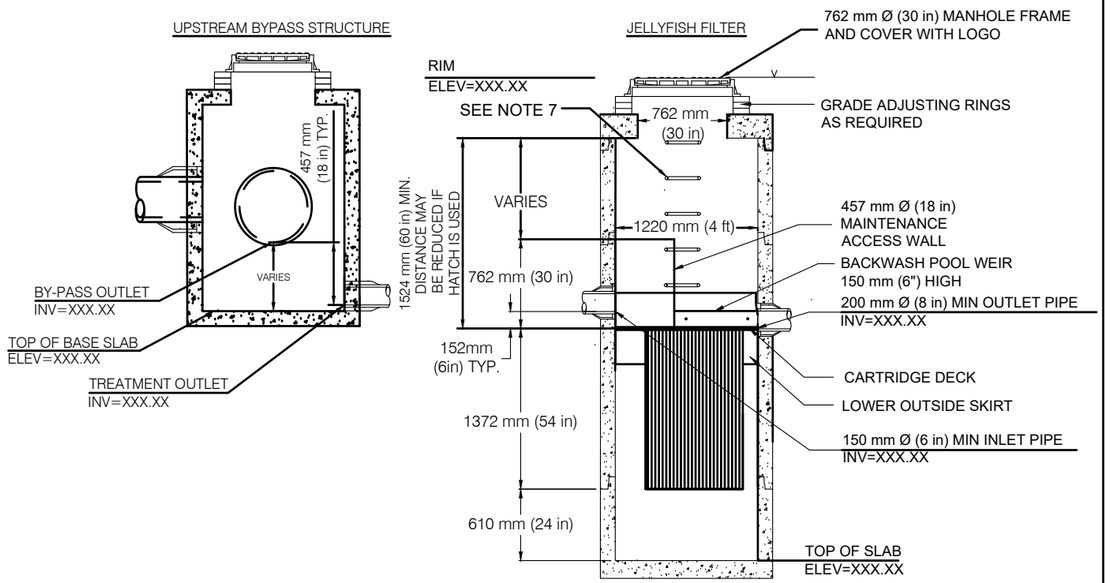
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. CARTRIDGE INSTALLATION, BY IMBRIUM, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE JELLYFISH UNIT IS CLEAN AND FREE OF DEBRIS. CONTACT IMBRIUM TO COORDINATE CARTRIDGE INSTALLATION WITH SITE STABILIZATION.

STANDARD OFFLINE JELLYFISH RECOMMENDED PIPE DIAMETERS			
MODEL DIAMETER (m)	MINIMUM ANGLE INLET/OUTLET PIPES	MINIMUM INLET PIPE DIAMETER (mm)	MINIMUM OULTET PIPE DIAMETER (mm)
1.2	62	150	200
1.8	59	200	250
2.4	52	250	300
3.0	48	300	450
3.6	40	300	450
CONTACT IMBRIUM SYSTEMS FOR ALTERNATE PIPE DIAMETERS			

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL JELLYFISH FILTER REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE.



XXX.XX INFORMATION TO BE SUPPLIED BY ENGINEER OF RECORD



CROSS SECTION 1-1

JELLYFISH DESIGN NOTES

JELLYFISH TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. THE STANDARD MANHOLE STYLE IS SHOWN. Ø1220 mm (48") MANHOLE JELLYFISH PEAK TREATMENT CAPACITY IS 12.7 L/s (0.54 CFS). TREATMENT FLOW RATE IS BASED ON 457 mm (18") OF HEAD PRESSURE.

CARTRIDGE SELECTION		54"	40"		27"		15"		
CARTRIDGE DEPTH		90"	76"		63"		51"		
OUTLET INVERT TO STRUCTURE BASE SLAB		5.09 / 2.55	3.68 / 1.84		2.55 / 1.27		1.41 / 0.71		
FLOW RATE HIGH-FLO / DRAINDOWN (L/s) (per cart)		57 / 28	42 / 21		28 / 14		16 / 8		
SEDIMENT CAPACITY HIGH-FLO / DRAINDOWN (kg) (per cart)				2 / 1					
MAX. CARTS HIGH-FLO/DRAINDOWN									
MAX. SEDIMENT CAPACITY (kg)		142	105		70		40		
MAX. TREATMENT (L/s)		12.7	9.3		6.2		3.4		

SITE SPECIFIC DATA REQUIREMENTS

JELLYFISH MODEL	*
STRUCTURE ID	*
WATER QUALITY FLOW RATE (L/s)	*
PEAK FLOW RATE (L/s)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
# OF CARTRIDGES REQUIRED (HF / DD)	*
CARTRIDGE SIZE (inches)	*

PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

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1	08/01/2015	NOTES	BSF
0	10/01/2014	INTIAL RELEASE	BSF

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Jellyfish

JF4 STANDARD

Scale = 1:50

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Jellyfish® Filter

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DATE: #####

DESIGNED:	DRAWN:
	BSF
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BSF	SP
PROJECT #:	PROJECT NAME:
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SHEET: 1 OF 2

\\AD.CONTECH-CPI.COM\ROOT\CORPORATE\MARKETING\IMBRIUM\CAD & PDF\JELLYFISH\JELLYFISH FILTER JF4 - OFFLINE.DWG 8/5/2016 9:14 AM

JELLYFISH® FILTER - SPECIFICATIONS

GENERAL

A. WORK INCLUDED: SPECIFIES REQUIREMENTS FOR CONSTRUCTION AND PERFORMANCE OF AN UNDERGROUND STORMWATER QUALITY, MEMBRANE FILTRATION, AND TREATMENT DEVICE THAT REMOVES POLLUTANTS FROM STORMWATER RUNOFF THROUGH THE UNIT OPERATIONS OF SEDIMENTATION, FLOATATION, AND MEMBRANE FILTRATION.

B. REFERENCE STANDARDS:
ASTM C 891: SPECIFICATION FOR INSTALLATION OF UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES
ASTM C 478: SPECIFICATION FOR PRECAST REINFORCED CONCRETE MANHOLE SECTIONS
ASTM C 990: SPECIFICATION FOR JOINTS FOR CONCRETE MANHOLES USING PREFORMED FLEXIBLE JOINT SEALANTS
ASTM D 4101: SPECIFICATION FOR COPOLYMER STEPS CONSTRUCTION

C. SHOP DRAWINGS: SHOP DRAWINGS FOR THE STRUCTURE AND PERFORMANCE ARE TO BE SUBMITTED WITH EACH ORDER TO THE CONTRACTOR. CONTRACTOR SHALL FORWARD SHOP DRAWING SUBMITTAL TO THE CONSULTING ENGINEER FOR APPROVAL. SHOP DRAWINGS ARE TO DETAIL THE STRUCTURE PRECAST CONCRETE AND CALL OUT OR NOTE THE FIBERGLASS (FRP) INTERNALS/COMPONENTS.

D. PRODUCT SUBSTITUTIONS: NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD. SUBMISSIONS FOR SUBSTITUTIONS REQUIRE REVIEW AND APPROVAL BY THE ENGINEER OF RECORD, FOR HYDRAULIC PERFORMANCE, IMPACT TO PROJECT DESIGNS, EQUIVALENT TREATMENT PERFORMANCE, AND ANY REQUIRED PROJECT PLAN AND REPORT (HYDROLOGY/HYDRAULIC, WATER QUALITY, STORMWATER POLLUTION) MODIFICATIONS THAT WOULD BE REQUIRED BY THE APPROVING JURISDICTIONS/AGENCIES. CONTRACTOR TO COORDINATE WITH THE ENGINEER OF RECORD ANY APPLICABLE MODIFICATIONS TO THE PROJECT ESTIMATES OF COST, BONDING AMOUNT DETERMINATIONS, PLAN CHECK FEES FOR CHANGES TO APPROVED DOCUMENTS, AND/OR ANY OTHER REGULATORY REQUIREMENTS RESULTING FROM THE PRODUCT SUBSTITUTION.

E. HANDLING AND STORAGE: PREVENT DAMAGE TO MATERIALS DURING STORAGE AND HANDLING.

PRODUCTS

A. THE DEVICE SHALL BE A CYLINDRICAL OR RECTANGULAR, ALL CONCRETE STRUCTURE (INCLUDING RISERS), CONSTRUCTED FROM PRECAST CONCRETE RISER AND SLAB COMPONENTS OR MONOLITHIC PRECAST STRUCTURE(S), INSTALLED TO CONFORM TO ASTM C 891 AND TO ANY REQUIRED STATE HIGHWAY, MUNICIPAL OR LOCAL SPECIFICATIONS; WHICHEVER IS MORE STRINGENT. THE DEVICE SHALL BE WATERTIGHT.

B. THE CYLINDRICAL CONCRETE DEVICE SHALL INCLUDE A FIBERGLASS CARTRIDGE DECK INSERT. THE RECTANGULAR CONCRETE DEVICE SHALL INCLUDE A COATED ALUMINUM INSERT. IN EITHER INSTANCE, THE INSERT SHALL BE BOLTED AND SEALED WATERTIGHT INSIDE THE PRECAST CONCRETE CHAMBER. THE INSERT SHALL SERVE AS: (A) A HORIZONTAL DIVIDER BETWEEN THE LOWER TREATMENT ZONE AND THE UPPER TREATED EFFLUENT ZONE; (B) A DECK FOR ATTACHMENT OF FILTER CARTRIDGES SUCH THAT THE MEMBRANE FILTER ELEMENTS OF EACH CARTRIDGE EXTEND INTO THE LOWER TREATMENT ZONE; (C) A PLATFORM FOR MAINTENANCE WORKERS TO SERVICE THE FILTER CARTRIDGES (MAXIMUM MANNED WEIGHT = 450 POUNDS); (D) A CONDUIT FOR CONVEYANCE OF TREATED WATER TO THE EFFLUENT PIPE.

C. MEMBRANE FILTER CARTRIDGES SHALL BE COMPRISED OF REUSABLE CYLINDRICAL MEMBRANE FILTER ELEMENTS CONNECTED TO A PERFORATED HEAD PLATE. THE NUMBER OF MEMBRANE FILTER ELEMENTS PER CARTRIDGE SHALL BE A MINIMUM OF ELEVEN 2.75-INCH (70-MM) OR GREATER DIAMETER ELEMENTS. THE LENGTH OF EACH FILTER ELEMENT SHALL BE A MINIMUM 15 INCHES (381 MM). EACH CARTRIDGE SHALL BE FITTED INTO THE CARTRIDGE DECK BY INSERTION INTO A CARTRIDGE RECEPTACLE THAT IS PERMANENTLY MOUNTED INTO THE CARTRIDGE DECK. EACH CARTRIDGE SHALL BE SECURED BY A CARTRIDGE LID THAT IS THREADED ONTO THE RECEPTACLE, OR SIMILAR MECHANISM TO SECURE THE CARTRIDGE INTO THE DECK. THE MAXIMUM TREATMENT FLOW RATE OF A FILTER CARTRIDGE SHALL BE CONTROLLED BY AN ORIFICE IN THE CARTRIDGE LID, OR ON THE INDIVIDUAL CARTRIDGE ITSELF, AND BASED ON A DESIGN FLUX RATE (SURFACE LOADING RATE) DETERMINED BY THE MAXIMUM TREATMENT FLOW RATE PER UNIT OF FILTRATION MEMBRANE SURFACE AREA. THE MAXIMUM FLUX RATE SHALL BE 0.21 GPM/FT2 (0.142 LPS/M2). EACH MEMBRANE FILTER CARTRIDGE SHALL ALLOW FOR MANUAL INSTALLATION AND REMOVAL.

D. ALL FILTER CARTRIDGES AND MEMBRANES SHALL BE REUSABLE AND ALLOW FOR THE USE OF FILTRATION MEMBRANE RINSING PROCEDURES TO RESTORE FLOW CAPACITY AND SEDIMENT CAPACITY; EXTENDING CARTRIDGE SERVICE LIFE.

E. ACCESS SHALL HAVE A MINIMUM CLEAR HEIGHT OF 60" OVER ALL OF THE FILTER CARTRIDGES, OR BE ACCESSIBLE BY A HATCH OR OTHER MECHANISM THAT PROVIDES MINIMUM 60" VERTICAL CLEAR SPACE OVER ALL OF THE FILTER CARTRIDGES. FILTER CARTRIDGES SHALL BE ABLE TO BE LIFTED STRAIGHT VERTICALLY OUT OF THE RECEPTACLES AND DECK FOR THE ENTIRE LENGTH OF THE CARTRIDGE.

F. THE DEVICE SHALL INCLUDE A MINIMUM 24 INCHES (610 MM) OF SUMP BELOW THE BOTTOM OF THE CARTRIDGES FOR SEDIMENT ACCUMULATION, UNLESS OTHERWISE SPECIFIED BY THE DESIGN ENGINEER. DEPTHS LESS THAN 24" MAY HAVE AN IMPACT ON THE TOTAL PERFORMANCE AND/OR LONGEVITY BETWEEN CARTRIDGE MAINTENANCE/REPLACEMENT OF THE DEVICE.

G. ALL PRECAST CONCRETE COMPONENTS SHALL BE MANUFACTURED TO A MINIMUM LIVE LOAD OF HS-20 TRUCK LOADING OR GREATER BASED ON LOCAL REGULATORY SPECIFICATIONS, UNLESS OTHERWISE MODIFIED OR SPECIFIED BY THE DESIGN ENGINEER, AND SHALL BE WATERTIGHT.

H. GASKETS AND/OR SEALANTS TO PROVIDE WATER TIGHT SEAL BETWEEN CONCRETE JOINTS. JOINTS SHALL BE SEALED WITH PREFORMED JOINT SEALING COMPOUND CONFORMING TO ASTM C 990.

I. FRAME AND COVERS MUST BE MANUFACTURED FROM CAST-IRON OR OTHER COMPOSITE MATERIAL TESTED TO WITHSTAND H-20 OR GREATER DESIGN LOADS, AND AS APPROVED BY THE LOCAL REGULATORY BODY. FRAMES AND COVERS MUST BE EMBOSSED WITH THE NAME OF THE DEVICE MANUFACTURER OR THE DEVICE BRAND NAME.

J. DOOR AND HATCHES, IF PROVIDED SHALL MEET DESIGNATED LOADING REQUIREMENTS OR AT A MINIMUM FOR INCIDENTAL VEHICULAR TRAFFIC.

K. ALL CONCRETE COMPONENTS SHALL BE MANUFACTURED ACCORDING TO LOCAL SPECIFICATIONS AND SHALL MEET THE REQUIREMENTS OF ASTM C 478.

L. THE FIBERGLASS PORTION OF THE FILTER DEVICE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE FOLLOWING STANDARD: ASTM D-4097: CONTACT MOLDED GLASS FIBER REINFORCED CHEMICAL RESISTANT TANKS.

M. STEPS SHALL BE CONSTRUCTED ACCORDING TO ASTM D4101 OF COPOLYMER POLYPROPYLENE, AND BE DRIVEN INTO PREFORMED OR PRE-DRILLED HOLES AFTER THE CONCRETE HAS CURED, INSTALLED TO CONFORM TO APPLICABLE SECTIONS OF STATE, PROVINCIAL AND MUNICIPAL BUILDING CODES, HIGHWAY, MUNICIPAL OR LOCAL SPECIFICATIONS FOR THE CONSTRUCTION OF SUCH DEVICES.

N. ALL PRECAST CONCRETE SECTIONS SHALL BE INSPECTED TO ENSURE THAT DIMENSIONS, APPEARANCE AND QUALITY OF THE PRODUCT MEET LOCAL MUNICIPAL SPECIFICATIONS AND ASTM C 478.

PERFORMANCE

A. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL FUNCTION TO REMOVE POLLUTANTS BY THE FOLLOWING UNIT TREATMENT PROCESSES; SEDIMENTATION, FLOATATION, AND MEMBRANE FILTRATION.

B. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL REMOVE OIL, DEBRIS, TRASH, COARSE AND FINE PARTICULATES, PARTICULATE-BOUND POLLUTANTS, METALS AND NUTRIENTS FROM STORMWATER DURING RUNOFF EVENTS.

C. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL TYPICALLY UTILIZE AN EXTERNAL BYPASS TO DIVERT EXCESSIVE FLOWS. INTERNAL BYPASS SYSTEMS SHALL BE EQUIPPED WITH A FLOATABLES BAFFLE, AND MUST PASS WATER OVER THE CARTRIDGE DECK, AND AVOID PASSAGE THROUGH THE SUMP AND/OR CARTRIDGE FILTRATION ZONE.

D. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL TREAT 100% OF THE REQUIRED WATER QUALITY TREATMENT FLOW BASED ON A MAXIMUM TREATMENT FLUX RATE (SURFACE LOADING RATE) ACROSS THE MEMBRANE FILTER CARTRIDGES NOT TO EXCEED 0.21 GPM/FT2 (0.142 LPS/M2).

E. AT A MINIMUM, THE STORMWATER QUALITY FILTER DEVICE SHALL HAVE BEEN FIELD TESTED AND VERIFIED WITH A MINIMUM 25 QUALIFYING STORM EVENTS AND FIELD MONITORING CONDUCTED ACCORDING TO THE TARP TIER II OR TAPE FIELD TEST PROTOCOL, AND HAVE RECEIVED NJCAT VERIFICATION.

F. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL HAVE DEMONSTRATED A MINIMUM MEDIAN TSS REMOVAL EFFICIENCY OF 85% AND A MINIMUM MEDIAN SSC REMOVAL EFFICIENCY OF 95%.

G. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL HAVE DEMONSTRATED THE ABILITY TO CAPTURE FINE PARTICLES AS INDICATED BY A MINIMUM MEDIAN REMOVAL EFFICIENCY OF 75% FOR THE PARTICLE FRACTION LESS THAN 25 MICRONS, AN EFFLUENT D50 OF 15 MICRONS OR LOWER FOR ALL MONITORED STORM EVENTS, AND AN EFFLUENT TURBIDITY OF 15 NTUS OR LOWER.

H. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL HAVE DEMONSTRATED A MINIMUM MEDIAN TOTAL PHOSPHORUS REMOVAL OF 55%, AND A MINIMUM MEDIAN TOTAL NITROGEN REMOVAL OF 50%.

I. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL HAVE DEMONSTRATED A MINIMUM MEDIAN TOTAL ZINC REMOVAL OF 50%, AND A MINIMUM MEDIAN TOTAL COPPER REMOVAL OF 75%.

INSPECTION AND MAINTENANCE

A. DURABILITY OF MEMBRANES ARE SUBJECT TO GOOD HANDLING PRACTICES DURING INSPECTION AND MAINTENANCE (REMOVAL, RINSING, AND REINSERTION) EVENTS, AND SITE SPECIFIC CONDITIONS THAT MAY HAVE HEAVIER OR LIGHTER LOADING ONTO THE CARTRIDGES, AND POLLUTANT VARIABILITY THAT MAY IMPACT THE MEMBRANE STRUCTURAL INTEGRITY. MEMBRANE MAINTENANCE AND REPLACEMENT SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

B. INSPECTION WHICH INCLUDES TRASH AND FLOATABLES COLLECTION, SEDIMENT DEPTH DETERMINATION, AND VISIBLE DETERMINATION OF BACKWASH POOL DEPTH SHALL BE EASILY CONDUCTED FROM GRADE (OUTSIDE THE STRUCTURE).

C. MANUAL RINSING OF THE REUSABLE FILTER CARTRIDGES SHALL PROMOTE RESTORATION OF THE FLOW CAPACITY AND SEDIMENT CAPACITY OF THE FILTER CARTRIDGES, EXTENDING CARTRIDGE SERVICE LIFE.

D. SEDIMENT REMOVAL FROM THE FILTER TREATMENT DEVICE SHALL BE ABLE TO BE CONDUCTED USING A STANDARD MAINTENANCE TRUCK AND VACUUM APPARATUS, AND A MINIMUM ONE POINT OF ENTRY TO THE SUMP THAT IS UNOBSTRUCTED BY FILTER CARTRIDGES.

E. MAINTENANCE ACCESS SHALL HAVE A MINIMUM CLEAR HEIGHT OF 60" OVER ALL OF THE FILTER CARTRIDGES, OR BE ACCESSIBLE BY A HATCH OR OTHER MECHANISM THAT PROVIDES MINIMUM 60" VERTICAL CLEAR SPACE OVER ALL OF THE FILTER CARTRIDGES. FILTER CARTRIDGES SHALL BE ABLE TO BE LIFTED STRAIGHT VERTICALLY OUT OF THE RECEPTACLES AND DECK FOR THE ENTIRE LENGTH OF THE CARTRIDGE.

F. FILTER CARTRIDGES SHALL BE ABLE TO BE MAINTAINED WITHOUT THE USE OF ADDITIONAL LIFTING EQUIPMENT.

EXECUTION

A. THE INSTALLATION OF A WATERTIGHT PRECAST CONCRETE DEVICE SHOULD CONFORM TO ASTM C 891 AND TO ANY STATE HIGHWAY, MUNICIPAL OR LOCAL SPECIFICATIONS FOR THE CONSTRUCTION OF MANHOLES, WHICHEVER IS MORE STRINGENT. SELECTED SECTIONS OF A GENERAL SPECIFICATION THAT ARE APPLICABLE ARE SUMMARIZED BELOW.

B. THE WATERTIGHT PRECAST CONCRETE DEVICE IS INSTALLED IN SECTIONS IN THE FOLLOWING SEQUENCE:
- AGGREGATE BASE
- BASE SLAB
- TREATMENT CHAMBER AND CARTRIDGE DECK RISER SECTION(S)
- BYPASS SECTION
- CONNECT INLET AND OUTLET PIPES
- CONCRETE RISER SECTION(S) AND/OR TRANSITION SLAB (IF REQUIRED)
- MAINTENANCE RISER SECTION(S) (IF REQUIRED)
- FRAME AND ACCESS COVER

C. INLET AND OUTLET PIPES SHOULD BE SECURELY SET INTO THE DEVICE USING APPROVED PIPE SEALS (FLEXIBLE BOOT CONNECTIONS, WHERE APPLICABLE) SO THAT THE STRUCTURE IS WATERTIGHT, AND SUCH THAT ANY PIPE INTRUSION INTO THE DEVICE DOES NOT IMPACT THE DEVICE FUNCTIONALITY.

D. ADJUSTMENT UNITS (E.G. GRADE RINGS) SHOULD BE INSTALLED TO SET THE FRAME AND COVER AT THE REQUIRED ELEVATION. THE ADJUSTMENT UNITS SHOULD BE LAID IN A FULL BED OF MORTAR WITH SUCCESSIVE UNITS BEING JOINED USING SEALANT RECOMMENDED BY THE MANUFACTURER. FRAMES FOR THE COVER SHOULD BE SET IN A FULL BED OF MORTAR AT THE ELEVATION SPECIFIED.

E. IN SOME INSTANCES THE MAINTENANCE ACCESS WALL, IF PROVIDED, SHALL REQUIRE AN EXTENSION ATTACHMENT AND SEALING TO THE PRECAST WALL AND CARTRIDGE DECK AT THE JOB SITE, RATHER THAN AT THE PRECAST FACILITY. IN THIS INSTANCE, INSTALLATION OF THESE COMPONENTS SHALL BE PERFORMED ACCORDING TO INSTRUCTIONS PROVIDED BY THE MANUFACTURER.

F. FILTER CARTRIDGES SHALL BE INSTALLED IN THE CARTRIDGE DECK AFTER THE CONSTRUCTION SITE IS FULLY STABILIZED AND IN ACCORDANCE WITH THE MANUFACTURERS GUIDELINES AND RECOMMENDATIONS. CONTRACTOR TO CONTACT THE MANUFACTURER TO SCHEDULE CARTRIDGE DELIVERY AND REVIEW PROCEDURES/REQUIREMENTS TO BE COMPLETED TO THE DEVICE PRIOR TO INSTALLATION OF THE CARTRIDGES AND ACTIVATION OF THE SYSTEM.

G. MANUFACTURER SHALL COORDINATE DELIVERY OF FILTER CARTRIDGES AND OTHER INTERNAL COMPONENTS WITH CONTRACTOR. FILTER CARTRIDGES SHALL BE DELIVERED AND INSTALLED COMPLETE AFTER SITE IS STABILIZED AND UNIT IS READY TO ACCEPT CARTRIDGES. UNIT IS READY TO ACCEPT CARTRIDGES AFTER IS HAS BEEN CLEANED OUT AND ANY STANDING WATER, DEBRIS, AND OTHER MATERIALS HAVE BEEN REMOVED. CONTRACTOR SHALL TAKE APPROPRIATE ACTION TO PROTECT THE FILTER CARTRIDGE RECEPTACLES AND FILTER CARTRIDGES FROM DAMAGE DURING CONSTRUCTION, AND IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND GUIDANCE. FOR SYSTEMS WITH CARTRIDGES INSTALLED PRIOR TO FULL SITE STABILIZATION AND PRIOR TO SYSTEM ACTIVATION, THE CONTRACTOR CAN PLUG INLET AND OUTLET PIPES TO PREVENT STORMWATER AND OTHER INFLUENT FROM ENTERING THE DEVICE. PLUGS MUST BE REMOVED DURING THE ACTIVATION PROCESS.

H. THE MANUFACTURER SHALL PROVIDE AN OWNER'S MANUAL UPON REQUEST.

I. AFTER CONSTRUCTION AND INSTALLATION, AND DURING OPERATION, THE DEVICE SHALL BE INSPECTED AND CLEANED AS NECESSARY BASED ON THE MANUFACTURER'S RECOMMENDED INSPECTION AND MAINTENANCE GUIDELINES AND THE LOCAL REGULATORY AGENCY/BODY.

J. WHEN REPLACEMENT MEMBRANE FILTER ELEMENTS AND/OR OTHER PARTS ARE REQUIRED, ONLY MEMBRANE FILTER ELEMENTS AND PARTS APPROVED BY THE MANUFACTURER FOR USE WITH THE STORMWATER QUALITY FILTER DEVICE SHALL BE INSTALLED.

END OF SECTION

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	MARK	DATE	REVISION DESCRIPTION	BY
#	0	10/01/2014	INITIAL RELEASE	BSF
#	#	#	#	#
#	#	#	#	#
#	#	#	#	#

JELLYFISH FILTER SPECIFICATIONS

Jellyfish

JF4 STANDARD

Scale = 1:50

www.imbriumsystems.com

imbrium

7037 Ridge Road, Suite 350, Hanover, MD 21076
USA 888-279-8826 CA 365-545-4801 INTL +1-416-960-9900

Jellyfish Filter

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING PATENTS: US 6,511,595; US 7,425,262; US 7,470,366; US 7,857,967; CA 2,399,462; CA 2,634,842; CA 2,666,466; UK 10-1-2878.76; NZ 563461; NZ 594427; AU 2001281056; OTHER PATENTS PENDING WORLDWIDE

DATE: #####

DESIGNED:	DRAWN:
CHECKED: BSF	APPROVED: SP
PROJECT #: #####	PROJECT NAME: #####

SHEET: 2 OF 2

\\AD.CONTECH-CPI.COM\ROOT\CORPORATE\MARKETING\IMBRIUM\CAD & PDF\JELLYFISH\JELLYFISH FILTER.JF4 - OFFLINE.DWG 8/5/2016 9:14 AM

Appendix F

Underground Storage Tank

PROPOSED INDUSTRIAL WAREHOUSE

10533 KEELE STREET

VAUGHAN, ON

DRAWING INDEX

TITLE	SHEET NO.
COVER SHEET	1 OF 5
SYSTEM LAYOUT SHEET	2 OF 5
SYSTEM CALCULATION SHEET	3 OF 5
SYSTEM OVERLAY SHEET	4 OF 5
150XLHD DETAIL SHEET	5 OF 5

PROJECT INFORMATION						
PROJECT NO:	24-1099					
CULTEC SALES REP:	DOMINIC TURNER 438-266-4033 DOMINIC.TURNER@CULTEC.COM					
CULTEC TECHNICAL SALES ENGINEER:						
CULTEC PROJECT COORDINATOR:	TYLER BRUSH 475-289-7120 TYLER.BRUSH@CULTEC.COM					
ENGINEER OF RECORD	SOSCIA ARCHITECTS AND ENGINEERS INC.					
REVISIONS:	ITERATION	DATE	BY	COMMENTS	EOR SHEET REFERENCE	DATE
	00	9/10/2024	SRA	INITIAL SUBMITTAL DRAWINGS	SITE SERVICING PLAN	8/30/2024

CULTEC

Subsurface Stormwater Management Systems

P.O. Box 280
878 Federal Road
Brookfield, CT 06804
www.cultec.com

PH: 1(203) 775-4416
PH: 1(800) 4-CULTEC
CT-tech@cultec.com

NOTE: THESE SHOP DRAWINGS MAY CONTAIN COMPONENTS INCLUDING BUT NOT LIMITED TO MANHOLES, CATCH BASINS, STORM PIPES AND FITTINGS, MANIFOLDS, CASTINGS AND OTHER NECESSARY APPURTENANCES THAT MAY NOT BE SUPPLIED BY CULTEC, INC. IT IS THE RESPONSIBILITY OF THE CONTRACTOR AND/OR SUPPLIER TO CONFIRM WITH CULTEC THE MATERIALS PROVIDED.

BEFORE YOU BEGIN - REQUIRED MATERIALS AND EQUIPMENT

1. PROPER GEOTECHNICAL SOIL EVALUATION BY A QUALIFIED ENGINEER OR SOIL SCIENTIST TO DETERMINE SUITABILITY OF STRUCTURAL INSTALLATION
2. OSHA COMPLIANCE
3. CULTEC WARNING TAPE, OR EQUIVALENT
4. ASSURANCES FROM LOCAL UTILITIES THAT NO UNDERGROUND GAS, ELECTRICAL OR OTHER POTENTIALLY DANGEROUS PIPELINES OR CONDUITS ARE ALREADY BURIED AT THE SITE
5. ACCEPTABLE 1- 2 INCH (25 - 51 mm) WASHED, CRUSHED STONE AS DETAILED IN CULTEC'S INSTALLATION INSTRUCTIONS. CLEANLINESS OF STONE TO BE VERIFIED BY ENGINEER.
6. ACCEPTABLE FILL MATERIAL AS SHOWN IN CULTEC'S INSTALLATION INSTRUCTIONS.
7. ALL CULTEC CHAMBERS AND ACCESSORIES AS SPECIFIED IN THE ENGINEER'S PLANS INCLUDING CULTEC NO. 410 NON-WOVEN GEOTEXTILE, CULTEC STORMFILTER AND CULTEC NO. 4800 WOVEN GEOTEXTILE, WHERE APPLICABLE.
8. RECIPROCATING SAW OR ROUTER
9. STONE BUCKET
10. STONE CONVEYOR AND/OR TRACKED EXCAVATOR
11. TRANSIT OR LASER LEVEL MEASURING DEVICE
12. COMPACTION EQUIPMENT WITH MAXIMUM GROSS VEHICLE WEIGHT OF 12,000 LBS (5,440 KGS). VIBRATORY ROLLERS MAY ONLY BE USED ON THE STONE BASE PRIOR TO THE INSTALLATION OF CHAMBERS.
13. CHECK CULTEC CHAMBERS FOR DAMAGE PRIOR TO INSTALLATION. DO NOT USE DAMAGED CULTEC CHAMBERS, CONTACT YOUR SUPPLIER IMMEDIATELY TO REPORT DAMAGE OR PACKING-LIST DISCREPANCIES.

REQUIREMENTS FOR CULTEC CHAMBER SYSTEM INSTALLATIONS

1. INSTALLING CONTRACTORS ARE EXPECTED TO COMPREHEND AND USE THE MOST CURRENT INSTALLATION INSTRUCTIONS PRIOR TO BEGINNING A SYSTEM INSTALLATION. IF THERE IS ANY QUESTION AS TO WHETHER YOU POSSESS THE MOST CURRENT INSTRUCTIONS, CONTACT CULTEC AT (203) 775-4416 OR VISIT WWW.CULTEC.COM.
2. CONTACT CULTEC AT LEAST THIRTY DAYS PRIOR TO SYSTEM INSTALLATION TO ARRANGE FOR A PRE-CONSTRUCTION MEETING.
3. ALL CULTEC SYSTEM DESIGNS MUST BE CERTIFIED BY A REGISTERED PROFESSIONAL ENGINEER.
4. USE CULTEC INSTALLATION INSTRUCTIONS AS A GUIDELINE ONLY FOR MINIMUM/MAXIMUM REQUIREMENTS. ACTUAL DESIGN MAY VARY. REFER TO APPROVED CONSTRUCTION DRAWINGS FOR JOB-SPECIFIC DETAILS. BE SURE TO FOLLOW THE ENGINEER'S DRAWINGS AS YOUR PRIMARY GUIDE.
5. THE FOUNDATION STONE SHALL BE LEVEL AND COMPACTED PRIOR TO CHAMBER INSTALLATION.
6. OVERLAPPING RIB CONNECTIONS OF CHAMBERS SHALL BE FULLY SHOULDERED PRIOR TO STONE PLACEMENT.
7. CENTER-TO-CENTER SPACING SHALL BE CHECKED AND MAINTAINED THROUGHOUT INSTALLATION PROCESS.
8. ANY DISCREPANCIES WITH THE SYSTEM SUB-GRADE SOIL'S BEARING CAPACITY MUST BE REPORTED TO THE DESIGN ENGINEER.
9. NON-WOVEN GEOTEXTILE MUST BE USED AS SPECIFIED IN THE ENGINEER'S DRAWINGS.
10. CULTEC REQUIRES THE CONTRACTOR TO REFER TO CULTEC'S INSTALLATION INSTRUCTIONS CONCERNING VEHICULAR TRAFFIC. RESPONSIBILITY FOR PREVENTING VEHICLES THAT EXCEED CULTEC'S REQUIREMENTS FROM TRAVELING ACROSS OR PARKING OVER THE CHAMBER SYSTEM LIES SOLELY WITH THE CONTRACTOR THROUGHOUT THE ENTIRE SITE CONSTRUCTION PROCESS. THE PLACEMENT OF WARNING TAPE, TEMPORARY FENCING, AND/OR APPROPRIATELY LOCATED SIGNS IS HIGHLY RECOMMENDED. IMPRINTED WARNING TAPE IS AVAILABLE FROM CULTEC. FOR ACCEPTABLE VEHICLE LOAD INFORMATION, REFER TO CULTEC INSTALLATION INSTRUCTIONS.
11. TRAFFIC OF INSTALLATION EQUIPMENT OR OTHER VEHICULAR TRAFFIC OVER TOP OF THE CULTEC STORMWATER SYSTEM IS STRICTLY RESTRICTED AND PROHIBITED UNTIL SATISFACTORY COVER AND COMPACTION IS ACHIEVED ACCORDING TO CULTEC'S MANUFACTURER INSTALLATION INSTRUCTIONS.
12. EROSION AND SEDIMENT-CONTROL MEASURES MUST MEET LOCAL CODES AND THE DESIGN ENGINEER'S SPECIFICATIONS THROUGHOUT THE ENTIRE SITE CONSTRUCTION PROCESS.
13. CULTEC SYSTEMS MUST BE DESIGNED AND INSTALLED IN ACCORDANCE WITH CULTEC'S MINIMUM REQUIREMENTS. FAILURE TO DO SO WILL VOID THE LIMITED WARRANTY.
14. CONTACT CULTEC, INC. AT 203-775-4416 WITH ANY QUESTIONS OR FURTHER CLARIFICATION OF REQUIREMENTS.
15. PLACEMENT OF EMBEDMENT STONE MUST BE IN ACCORDANCE WITH CULTEC'S INSTALLATION INSTRUCTIONS. STONE COLUMN HEIGHT DEFERENTIAL MUST NEVER EXCEED 12" (305 mm) BETWEEN CHAMBER ROWS, ADJACENT CHAMBERS OR STONE PERIMETER. STONE MUST BE PLACED OVER THE CROWN OF THE CHAMBERS TO ANCHOR THE CHAMBERS IN PLACE AND MAINTAIN ROW SPACING.
16. EMBEDMENT STONE MUST ONLY BE PLACED BY EXCAVATOR OR TELESCOPING CONVEYOR BOOM. PLACEMENT OF EMBEDMENT STONE WITH BULLDOZER IS NOT AN ACCEPTABLE METHOD OF INSTALLATION AND MAY CAUSE DAMAGE TO THE CHAMBERS. ANY CHAMBERS DAMAGED USING AN UNACCEPTABLE METHOD OF BACKFILL ARE NOT COVERED UNDER THE CULTEC LIMITED WARRANTY.

THIS DRAWING HAS BEEN PREPARED TO SUPPORT THE PROJECT ENGINEER OF RECORD FOR THE PROPOSED SYSTEM. THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO CULTEC UNDER THE DIRECTION OF THE PROJECT ENGINEER OF RECORD OR OTHER PROJECT REPRESENTATIVE. IT IS ULTIMATE RESPONSIBILITY OF THE PROJECT ENGINEER OF RECORD TO ENSURE THAT THE CULTEC SYSTEM'S DESIGN IS IN FULL COMPLIANCE WITH ALL APPLICABLE LAWS, REGULATIONS AND MANUFACTURER REQUIREMENTS.

PROPOSED STORMWATER MANAGEMENT SYSTEM ELEVATIONS

(TO BE APPROVED BY ENGINEER OF RECORD)
*ENGINEER OF RECORD TO CONFIRM MINIMUM AND MAXIMUM BURIAL REQUIREMENTS ARE MET)

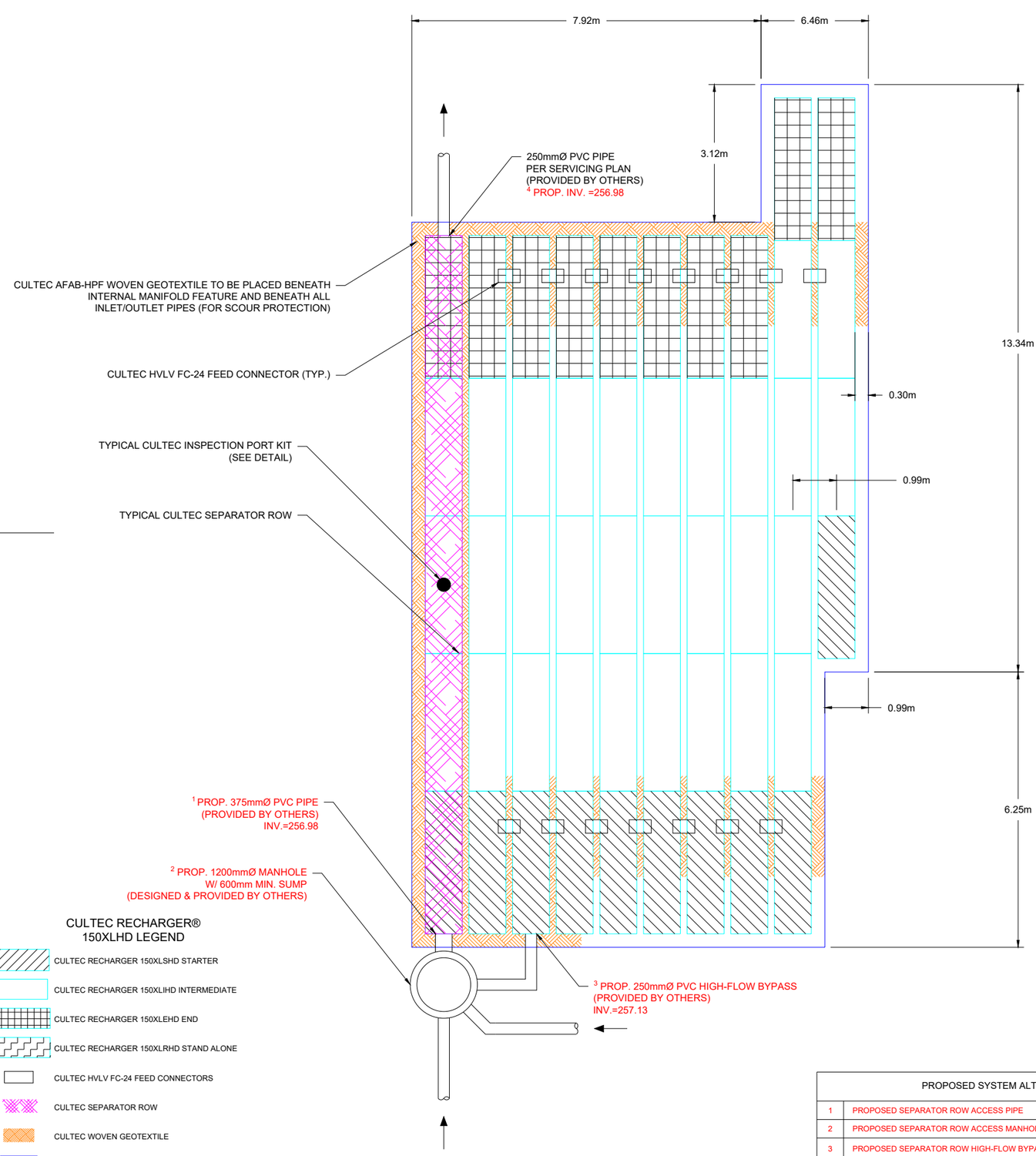
MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT OR UNPAVED)	261.11
MINIMUM ALLOWABLE GRADE (UNPAVED TRAFFIC)	257.86
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT)	257.81
MINIMUM ALLOWABLE GRADE (TOP OF RIGID PAVEMENT)	257.81
TOP OF STONE ELEVATION	257.60
TOP OF CHAMBER ELEVATION	257.45
250mm HIGH-FLOW BYPASS PIPE INVERT	257.13
250mm OUTLET PIPE INVERT	256.98
375mm INLET PIPE INVERT	256.98
BOTTOM OF CHAMBER ELEVATION	256.98
BOTTOM OF STONE ELEVATION	256.83
CULTEC STORMWATER MANAGEMENT SYSTEM SUMMARY	
TOTAL ACTIVE STORAGE PROVIDED (m^3)	66.43
TOTAL DEAD STORAGE PROVIDED (m^3)	10.48
% STONE POROSITY	40
SYSTEM AREA (m^2)	171.99
DEPTH OF EMBEDMENT STONE (mm)	152
DEPTH OF BEDDING STONE (mm)	152
STONE PERIMETER (mm)	305
SPACING BETWEEN CHAMBER ROWS (mm)	152

NOTE: ALL EXTERNAL SYSTEM STRUCTURES, INLET/OUTLET PIPES AND PROPOSED ELEVATIONS MUST BE DESIGNED AND APPROVED BY THE ENGINEER OF RECORD. ALL PROPOSED SYSTEM ELEVATIONS PROVIDED MUST BE VERIFIED BY THE ENGINEER OF RECORD AND THE ENGINEER OF RECORD MUST ENSURE CHAMBER BURIAL REQUIREMENTS ARE MET

MATERIALS LIST SUPPLIED BY CULTEC

PRODUCT DESCRIPTION	SKU	QUANTITY	UNIT OF MEASURE
CULTEC RECHARGER 150XLHD STARTER	150XLSHD	10	PIECES
CULTEC RECHARGER 150XLHD INTERMEDIATE	150XLIHD	30	PIECES
CULTEC RECHARGER 150XLHD END	150XLEHD	10	PIECES
CULTEC HVLV FEED CONNECTORS	FC-24	15	PIECES
CULTEC NO. 410 NON-WOVEN GEOTEXTILE	75NWG410	597	SQ. METERS
CULTEC AFAB-HPF WOVEN GEOTEXTILE	75WGHPF	42	METERS
CULTEC INSPECTION PORT KIT	1299CGC	1	PIECES
MATERIALS LIST NOT SUPPLIED BY CULTEC			
1-2 INCH WASHED, CRUSHED STONE	---	94	CUBIC METERS
8 OZ. NON-WOVEN GEOTEXTILE	---	N/A	SQ. METERS
30 MIL. PVC THERMOPLASTIC LINER	---	N/A	SQ. METERS

1 SYSTEM LAYOUT DETAIL
NTS



CULTEC RECHARGER® 150XLHD LEGEND

- CULTEC RECHARGER 150XLSHD STARTER
- CULTEC RECHARGER 150XLIHD INTERMEDIATE
- CULTEC RECHARGER 150XLEHD END
- CULTEC RECHARGER 150XLRHD STAND ALONE
- CULTEC HVLV FC-24 FEED CONNECTORS
- CULTEC SEPARATOR ROW
- CULTEC WOVEN GEOTEXTILE
- STONE BORDER

PROPOSED SYSTEM ALTERATION TABLE

1	PROPOSED SEPARATOR ROW ACCESS PIPE
2	PROPOSED SEPARATOR ROW ACCESS MANHOLE
3	PROPOSED SEPARATOR ROW HIGH-FLOW BYPASS PIPE
4	PROPOSED PIPE INVERT. MAXIMUM PIPE INVERT FOR PROPER CONNECTION TO CHAMBER

CULTEC STORMWATER CHAMBER

PROJECT NO: 24-1099.00
DESIGNED BY: SRA
SCALE: N.T.S.
DATE: 9/10/2024
CHECKED BY: TNB
SHEET NO: 2 OF 5

PROPOSED INDUSTRIAL WAREHOUSE
10533 KEELE STREET
VAUGHAN, ON
SYSTEM LAYOUT SHEET

CULTEC
Subsurface Stormwater Management Systems
P.O. Box 280
878 Federal Road
Brookfield, CT 06804
www.cultec.com
PH: 1(203) 775-4416
PH: 1(800) 4-CULTEC
CT-tech@cultec.com

THIS DRAWING HAS BEEN PREPARED TO SUPPORT THE PROJECT ENGINEER OF RECORD FOR THE PROPOSED SYSTEM. THIS DRAWING MAY BE USED BY THE PROJECT ENGINEER OF RECORD AS AN INSTRUMENT OF SERVICE TO FACILITATE THE DESIGN AND CONSTRUCTION OF THE CULTEC SYSTEM SHOWN ON THIS DRAWING. ANY OTHER USE OF THIS DRAWING, INCLUDING BUT NOT LIMITED TO ITS USE FOR BIDDING OR CONSTRUCTION PURPOSES BY ANY OTHER PARTY, IS THE RESPONSIBILITY OF THE PARTY MAKING SUCH USE. CULTEC, INC. MAKES NO REPRESENTATIONS OR WARRANTIES AS TO THE ACCURACY OR COMPLETENESS OF THIS DRAWING OR OTHER PROJECT REPRESENTATIVE. IT IS ULTIMATE RESPONSIBILITY OF THE PROJECT ENGINEER OF RECORD TO ENSURE THAT THE CULTEC SYSTEM SHOWN ON THIS DRAWING COMPLIES WITH ALL APPLICABLE LAWS, REGULATIONS AND MANUFACTURER REQUIREMENTS

CULTEC Recharger 150XLHD Stormwater System Calculations

Consulting Engineer:

Soscia Architects and Engineers Inc.
Richmond Hill, ON

Calculations Performed By:

Tyler Brush
Cultec
878 Federal Rd.
Brookfield, CT 06804
PH: 203-775-4416
FX: 203-775-5887

Project Information:

Proposed Industrial Warehouse
10533 Keele Street
Vaughan, ON

Date: 9/10/24

Project Number: 24-1099.00

System Information

Irregular Bed Inputs

No. of Rows	10		Total No. of Chambers	50	
System Area (sq. ft) (from CAD)	1851.37		System Perimeter (ft) (from CAD)	196.5	

Given:

Storage required		CF	60	m^3
CULTEC AFAB-HPF For Internal Manifolds	60	feet		
Number of Inlet/Outlet Pipes (Excluding Separator Rows)	1			
Stone **Base**	6	inches	152	mm
Stone **Above**	6	inches	152	mm
Spacing **Between** Rows	6	inches	152	mm
No. of HVLV FC-24 Feed Connectors	15	units		
12" PVC Universal Inline Drain Body Only - Kit	1	units		
12" Ductile Iron Square Solid Drain Base Cover	1	units		
Stone Porosity	40	%		
Stone **Border Width**	12	inches	305	mm

☐ Discount stone base from Total storage provided (If Applicable)
☐ Discount stone above from Total storage provided (If Applicable)

Other Parameters:

Length of Separator Row	52	feet	15.850	m
Type of Lining	None			
☐ Sand Filter Depth (If Applicable)		feet	0.000	m
☐ Sloped Sides (1:1) (If Applicable)				

Assumptions

Model Name		Chamber Height	Design Unit Height	Chamber Width	Chamber Spacing	Design Unit Width	Chamber Volume per Linear Foot	Design Unit Volume	Installed Chamber Length
		inches	feet	inches	inches	feet	cu. ft/ft	cu. ft/ft	feet
		mm	m	mm	mm	m	cu. m/m	cu. m/m	m
Recharger® 150XLRHD Stand Alone	English	18.5	2.54	33	6	3.25	2.65	4.89	11.00
	Metric	470	0.77	838	152	0.99	0.25	0.45	3.35
Recharger® 150XLIHD Intermediate	English	18.5	2.54	33	6	3.25	2.65	4.90	10.25
	Metric	470	0.77	838	152	0.99	0.25	0.45	3.12
Recharger® 150XLSHD Starter	English	18.5	2.54	33	6	3.25	2.65	4.89	10.63
	Metric	470	0.77	838	152	0.99	0.25	0.45	3.24
Recharger® 150XLEHD End	English	18.5	2.54	33	6	3.25	2.65	4.89	10.63
	Metric	470	0.77	838	152	0.99	0.25	0.45	3.24
HVLV™ FC-24 Feed Connectors	English	12	n/a	16	n/a	n/a	0.91	n/a	0.50
	Metric	305	n/a	406	n/a	n/a	0.08	n/a	0.15

Storage Provided Within CULTEC Recharger 150XLHD Stormwater Chambers and HVLV FC-24 Feed Connectors - not including stone

Number of Recharger 150XLRHD Stand Alone	by design			=	0 pcs	
	0	pcs x	11.00	=	0.00 feet	0 m
Number of Recharger 150XLIHD Intermediates	by design			=	30 pcs	
	30	pcs x	10.25	=	307.50 feet	93.73 m
Number of Recharger 150XLSHD Starters	by design			=	10 pcs	
	10	pcs x	10.63	=	106.25 feet	32.385 m
Number of Recharger 150XLEHD Ends	by design			=	10 pcs	
	10	pcs x	10.63	=	106.25 feet	32.385 m
Number of HVLV FC-24 Feed Connectors				=	15 pcs	
	15	pcs x	0.50	=	7.50 feet	2.286 m
Total footage of Recharger 150XLHD chambers				=	520.00 feet	158.50 m
Total footage of HVLV FC-24 Feed Connectors				=	7.50 feet	2.29 m
Storage provided within Recharger 150XLHD chambers				=	1379.56 CF	39.07 m^3
Storage within HVLV FC-24 Feed Connectors				=	6.83 CF	0.19 m^3
Total Storage within chambers and feed connectors				=	**1386.39 CF**	**39.26 m^3**

Storage Provided Within Entire CULTEC Stormwater System - including stone

Bed Depth	2.54 feet	0.77 m	
Total Area	1851.37 sq. ft.	171.99 m^2	
Volume of Effective Excavation *(not including additional cover)*	4705.57 CF	133.26 m^3	
Perimeter of Bed	196.50 feet	59.89 m	
Total Storage within CULTEC Recharger 150XLHD chambers and feed connectors	1386 CF	39.26 m^3	
Total Stone Required	3319 CF	94.00 m^3	
	123 CY		
	172 tons		
Storage provided within stone	1327.67 CF	37.60 m^3	
Total Storage within CULTEC Stormwater System	**= 2715 CF**	**76.89 m^3**	*Req. storage attained.*

CULTEC MATERIALS LIST

Model	Model #	Quantity	Unit of Measure	Quantity	Unit of Measure
Recharger 150XLRHD Stand Alone Heavy Duty	150XLRHD	0	pcs		
Recharger 150XLSHD Starter Heavy Duty	150XLSHD	10	pcs		
Recharger 150XLIHD Intermediate Heavy Duty	150XLIHD	30	pcs		
Recharger 150XLEHD End Heavy Duty	150XLEHD	10	pcs		
HVLV FC-24 Feed Connectors	FC-24	15	pcs		
CULTEC No. 410 Non-Woven Geotextile	NWG410	714	Sq. Yards	597	m2
CULTEC AFAB-HPF Woven Geotextile 7.5' x 100'	75WGHPF	136	feet	42	m
12" PVC Universal Inline Drain Body Only - Kit	2712AGSB	1	pcs		
12" Ductile Iron Square Solid Drain Base Cover	1299CGC	1	pcs		
Total Stone		123	cubic yards	94	m3

SYSTEM STORAGE CALCULATION

CULTEC Recharger 150XLHD Stormwater Incremental Storage

Date: September 10, 2024

Project Information

Proposed Industrial Warehouse
10533 Keele Street
Vaughan, ON

Project Number

24-1099.00

Base of Stone Elevation- 256.83

CULTEC Recharger 150XLHD Incremental Storage Volumes

Height of System		Chamber Volume		HVLV FC-24 Feed Connector Volume		Stone Volume		Cumulative Storage Volume		Total Cumulative Storage Volume		Stage/Area		Elevation		
in	mm	ft^3	m^3	ft^3	m^3	ft^3	m^3	ft^3	m^3	ft^3	m^3	ft^2	m^2	ft	m	
30.50	775	0.00	0.00	0.00	0.00	61.71	1.75	61.71	1.75	2716.10	76.91	740.55	68.80	259.37	257.60	Top of Stone Elevation
29.50	749	0.00	0.00	0.00	0.00	61.71	1.75	61.71	1.75	2654.39	75.16	740.55	68.80	259.29	257.58	
28.50	724	0.00	0.00	0.00	0.00	61.71	1.75	61.71	1.75	2592.68	73.42	740.55	68.80	259.21	257.55	
27.50	699	0.00	0.00	0.00	0.00	61.71	1.75	61.71	1.75	2530.97	71.67	740.55	68.80	259.12	257.53	
26.50	673	0.00	0.00	0.00	0.00	61.71	1.75	61.71	1.75	2469.26	69.92	740.55	68.80	259.04	257.50	
25.50	648	0.00	0.00	0.00	0.00	61.71	1.75	61.71	1.75	2407.54	68.17	740.55	68.80	258.96	257.48	
24.50	622	3.12	0.09	0.00	0.00	29.61	0.84	32.73	0.93	2345.83	66.43	392.74	36.49	258.87	257.45	Top of Chamber Elevation
24.00	610	5.20	0.15	0.00	0.00	59.63	1.69	64.83	1.84	2313.10	65.50	777.99	72.28	258.83	257.44	
23.00	584	16.64	0.47	0.00	0.00	55.06	1.56	71.70	2.03	2248.27	63.66	860.36	79.93	258.75	257.41	
22.00	559	40.04	1.13	0.00	0.00	45.70	1.29	85.74	2.43	2176.57	61.63	1028.84	95.58	258.66	257.39	
21.00	533	53.04	1.50	0.00	0.00	40.50	1.15	93.54	2.65	2090.84	59.21	1122.44	104.27	258.58	257.36	
20.00	508	61.88	1.75	0.00	0.00	36.96	1.05	98.84	2.80	1997.30	56.56	1186.08	110.19	258.50	257.34	
19.00	483	69.68	1.97	0.00	0.00	33.84	0.96	103.52	2.93	1898.46	53.76	1242.24	115.40	258.41	257.31	
18.00	457	75.92	2.15	0.83	0.02	31.34	0.89	108.09	3.06	1794.94	50.83	1297.07	120.50	258.33	257.29	
17.00	432	81.12	2.30	0.68	0.02	29.26	0.83	111.06	3.14	1686.85	47.77	1332.71	123.81	258.25	257.26	
16.00	406	85.80	2.43	0.65	0.02	27.39	0.78	113.84	3.22	1575.79	44.62	1366.05	126.91	258.16	257.24	
15.00	381	89.44	2.53	0.64	0.02	25.94	0.73	116.01	3.29	1461.95	41.40	1392.17	129.33	258.08	257.21	
14.00	356	93.08	2.64	0.62	0.02	24.48	0.69	118.18	3.35	1345.94	38.11	1418.19	131.75	258.00	257.19	
13.00	330	95.68	2.71	0.59	0.02	23.44	0.66	119.71	3.39	1227.76	34.77	1436.55	133.46	257.91	257.16	
12.00	305	97.76	2.77	0.56	0.02	22.61	0.64	120.92	3.42	1108.05	31.38	1451.08	134.81	257.83	257.13	
11.00	279	99.32	2.81	0.53	0.02	21.98	0.62	121.84	3.45	987.12	27.95	1462.04	135.82	257.75	257.11	
10.00	254	100.36	2.84	0.47	0.01	21.57	0.61	122.39	3.47	865.28	24.50	1468.72	136.44	257.66	257.08	
9.00	229	101.40	2.87	0.35	0.01	21.15	0.60	122.90	3.48	742.89	21.04	1474.77	137.01	257.58	257.06	
8.00	203	102.44	2.90	0.15	0.00	20.74	0.59	123.33	3.49	619.99	17.56	1479.92	137.48	257.50	257.03	
7.00	178	107.64	3.05	0.10	0.00	18.66	0.53	126.39	3.58	496.67	14.06	1516.73	140.90	257.41	257.01	
6.00	152	0.00	0.00	0.00	0.00	61.71	1.75	61.71	1.75	370.27	10.48	740.55	68.80	257.33	256.98	Bottom of Chamber Elevation
5.00	127	0.00	0.00	0.00	0.00	61.71	1.75	61.71	1.75	308.56	8.74	740.55	68.80	257.25	256.96	
4.00	102	0.00	0.00	0.00	0.00	61.71	1.75	61.71	1.75	246.85	6.99	740.55	68.80	257.16	256.93	
3.00	76	0.00	0.00	0.00	0.00	61.71	1.75	61.71	1.75	185.14	5.24	740.55	68.80	257.08	256.91	
2.00	51	0.00	0.00	0.00	0.00	61.71	1.75	61.71	1.75	123.42	3.49	740.55	68.80	257.00	256.88	
1.00	25	0.00	0.00	0.00	0.00	61.71	1.75	61.71	1.75	61.71	1.75	740.55	68.80	256.91	256.86	
0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	256.83	256.83	Bottom of Stone Elevation
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SYSTEM STAGE-STORAGE TABLE

CULTEC STORMWATER CHAMBER

DATE: 9/10/2024
CHECKED BY: TNB
SHEET NO: 3 OF 5

PROJECT NO: 24-1099.00
DESIGNED BY: SRA
SCALE: N.T.S.

PROPOSED INDUSTRIAL WAREHOUSE
10533 KEELE STREET
VAUGHAN, ON
SYSTEM CALCULATION SHEET

CULTEC
Subsurface Stormwater Management Systems
P.O. Box 280
878 Federal Road
Brookfield, CT 06804
PH: 1(203) 775-4416
PH: 1(800) 4-CULTEC
CT-tech@cultec.com
www.cultec.com

THIS DRAWING HAS BEEN PREPARED TO SUPPORT THE PROJECT ENGINEER OF RECORD FOR THE PROPOSED SYSTEM. THIS DRAWING MAY BE REVISED AT THE DISCRETION OF CULTEC, INC. BASED ON ADDITIONAL INFORMATION PROVIDED TO CULTEC, INC. AFTER THE DATE OF THIS DRAWING. IT IS THE RESPONSIBILITY OF THE PROJECT ENGINEER OF RECORD TO ENSURE THAT THE CULTEC SYSTEM AS DESIGNED IN THIS CALCULATION SHEET AND SHOWN ON THE ACCOMPANYING SITE PLAN MEETS OR EXCEEDS ALL APPLICABLE LOCAL REGULATIONS AND MANUFACTURER'S REQUIREMENTS.

1.02

CBMH#6
RIM=258.20
W INV=256.76
E INV=256.83

STM MH#5
RIM=258.47
W INV=256.90
S INV=256.96

STM

17.65m - 300mmØ STM @ 0.4%

3.36m - 250mmØ
STM @ 2.61%

STM INV=256.45

INV=256.97

CB#4
RIM=258.10
W INV=257.04

STM

2.23m - 250mmØ
STM @ 1.1%

CULTEC UNDERGROUND TANK
REQUIRED DETENTION - 50 CU.M.
REQUIRED RETENTION - 10CU.M.
TOTAL REQUIRED - 60 CU.M.

SSIB(WIT)
1.500S

00MM PVC STM

POSED BUILDING
MFE=258.55

PIN 03343-0323(LT)

PROPERTY LINE

PART 1
PLAN 64R-3035
PIN 03343-1860(LT)

INV=257.05

8.83m - 250mmØ
STM @ 1.00%

CB#1
RIM=257.90
E INV=257.20

69.522 (P&M)

MH#2
RIM=258.18
N INV=257.06
W INV=257.12

PROPERTY LINE
69.522

7.56m - 250mmØ
STM @ 1.00%

CP
(LSG)

WTR

TESTON RD

DRUMMOND DR

KEY PLAN

SCALE: NTS

LEGEND

STM

SAN

WTR

CULTEC STORMWATER CHAMBER

PROJECT NO:	24-1099.00	DATE:	9/10/2024
DESIGNED BY:	SRA	CHECKED BY:	TNB
SCALE:	N.T.S.	SHEET NO:	4 OF 5

PROPOSED INDUSTRIAL WAREHOUSE
10533 KEELE STREET
VAUGHAN, ON
SYSTEM OVERLAY SHEET

CULTEC
Subsurface Stormwater Management Systems
P.O. Box 280
878 Federal Road
Brookfield, CT 06804
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PH: 1(203) 775-4416
PH: 1(800) 4-CULTEC
CT-tech@cultec.com

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1.02

CULTEC RECHARGER® 150XLHD SPECIFICATIONS

GENERAL
CULTEC RECHARGER® 150XLHD CHAMBERS ARE DESIGNED FOR UNDERGROUND STORMWATER MANAGEMENT. THE CHAMBERS MAY BE USED FOR RETENTION, RECHARGING, DETENTION OR CONTROLLING THE FLOW OF ON-SITE STORMWATER RUNOFF.

CHAMBER PARAMETERS

1. THE CHAMBERS SHALL BE MANUFACTURED BY CULTEC, INC. OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE CHAMBER SHALL BE VACUUM THERMOFORMED OF HIGH MOLECULAR WEIGHT HIGH DENSITY POLYETHYLENE (HMWHDPE) WITH A BLACK INTERIOR AND BLUE EXTERIOR
3. THE CHAMBER SHALL BE ARCHED IN SHAPE.
4. THE CHAMBER SHALL BE OPEN-BOTTOMED.
5. THE CHAMBER SHALL BE JOINED USING AN INTERLOCKING OVERLAPPING RIB METHOD. CONNECTIONS MUST BE FULLY SHOULDERED OVERLAPPING RIBS, HAVING NO SEPARATE COUPLINGS OR SEPARATE END WALLS.
6. THE NOMINAL CHAMBER DIMENSIONS OF THE CULTEC RECHARGER 150XLHD SHALL BE 18.5 INCHES (470 mm) TALL, 33 INCHES (838 mm) WIDE AND 11 FEET (3.35 m) LONG. THE INSTALLED LENGTH OF A JOINED RECHARGER 150XLHD SHALL BE 10.25 FEET (3.12 m).
7. MAXIMUM INLET OPENING ON THE CHAMBER ENDWALL IS 12 INCHES (300 mm) HDPE OR 15" (375 mm) SMOOTH-WALL PVC.
8. THE CHAMBER SHALL HAVE TWO SIDE PORTALS TO ACCEPT CULTEC HVLV® FC-24 FEED CONNECTORS TO CREATE AN INTERNAL MANIFOLD. THE NOMINAL INSIDE DIMENSIONS OF EACH SIDE PORTAL SHALL BE 8.5 INCHES (216 mm) HIGH BY 12 INCHES (304 mm) WIDE. MAXIMUM ALLOWABLE OUTER DIAMETER (O.D.) PIPE SIZE IN THE SIDE PORTAL IS 10.25 INCHES (260 mm).
9. THE NOMINAL CHAMBER DIMENSIONS OF THE CULTEC HVLV® FC-24 FEED CONNECTOR SHALL BE 12 INCHES (305 mm) TALL, 16 INCHES (406 mm) WIDE AND 24.2 INCHES (615 mm) LONG.
10. THE NOMINAL STORAGE VOLUME OF THE RECHARGER 150XLHD CHAMBER SHALL BE 2.650 FT³ / FT (0.246 m³ / m) - WITHOUT STONE. THE NOMINAL STORAGE VOLUME OF A JOINED RECHARGER 150XLHD SHALL BE 27.16 FT3 / UNIT (0.77 m³ / UNIT) - WITHOUT STONE.
11. THE NOMINAL STORAGE VOLUME OF THE HVLV FC-24 FEED CONNECTOR SHALL BE 0.913 FT³ / FT (0.085 m³ / m) - WITHOUT STONE.
12. THE RECHARGER 150XLHD CHAMBER SHALL HAVE THIRTY DISCHARGE HOLES BORED INTO THE SIDEWALLS OF THE UNIT'S CORE TO PROMOTE LATERAL CONVEYANCE OF WATER.
13. THE RECHARGER 150XLHD CHAMBER SHALL HAVE 20 CORRUGATIONS.
14. THE ENDWALL OF THE CHAMBER, WHEN PRESENT, SHALL BE AN INTEGRAL PART OF THE CONTINUOUSLY FORMED UNIT. SEPARATE END PLATES CANNOT BE USED WITH THIS UNIT.
15. THE RECHARGER 150XLRHD STAND ALONE UNIT MUST BE FORMED AS A WHOLE CHAMBER HAVING TWO FULLY FORMED INTEGRAL ENDWALLS AND HAVING NO SEPARATE END PLATES OR SEPARATE ENDWALLS.
16. THE RECHARGER 150XLSHD STARTER UNIT MUST BE FORMED AS A WHOLE CHAMBER HAVING ONE FULLY FORMED INTEGRAL ENDWALL AND ONE PARTIALLY FORMED INTEGRAL ENDWALL WITH A LOWER TRANSFER OPENING OF 10 INCHES (254 mm) HIGH X 20.5 INCHES (521 mm) WIDE.
17. THE RECHARGER 150XLIHD INTERMEDIATE UNIT MUST BE FORMED AS A WHOLE CHAMBER HAVING ONE FULLY OPEN ENDWALL AND ONE PARTIALLY FORMED INTEGRAL ENDWALL WITH A LOWER TRANSFER OPENING OF 10 INCHES (254 mm) HIGH X 20.5 INCHES (521 mm) WIDE.
18. THE RECHARGER 150XLEHD END UNIT MUST BE FORMED AS A WHOLE CHAMBER HAVING ONE FULLY FORMED INTEGRAL ENDWALL AND ONE FULLY OPEN END WALL AND HAVING NO SEPARATE END PLATES OR END WALLS.
19. THE HVLV® FC-24 FEED CONNECTOR MUST BE FORMED AS A WHOLE CHAMBER HAVING TWO OPEN END WALLS AND HAVING NO SEPARATE END PLATES OR SEPARATE END WALLS. THE UNIT SHALL FIT INTO THE SIDE PORTALS OF THE RECHARGER 150XLHD AND ACT AS CROSS FEED CONNECTIONS.
20. CHAMBERS MUST HAVE HORIZONTAL STIFFENING FLEX REDUCTION STEPS BETWEEN THE RIBS.
21. THE CHAMBER SHALL HAVE A RAISED INTEGRAL CAP AT THE TOP OF THE ARCH IN THE CENTER OF EACH UNIT TO BE USED AS AN OPTIONAL INSPECTION PORT OR CLEAN-OUT.
22. THE UNITS MAY BE TRIMMED TO CUSTOM LENGTHS BY CUTTING BACK TO ANY CORRUGATION.
23. THE CHAMBER SHALL BE MANUFACTURED IN AN ISO 9001:2008 CERTIFIED FACILITY.
24. THE CHAMBER SHALL BE DESIGNED TO WITHSTAND TRAFFIC LOADS WHEN INSTALLED ACCORDING TO CULTEC'S RECOMMENDED INSTALLATION INSTRUCTIONS.
25. THE CHAMBER SHALL BE DESIGNED AND MANUFACTURED TO MEET THE MATERIAL AND STRUCTURAL REQUIREMENTS OF IAPMO PS 63-2019, INCLUDING RESISTANCE TO AASHTO H-10 AND H-20 HIGHWAY LIVE LOADS, WHEN INSTALLED IN ACCORDANCE WITH CULTEC'S INSTALLATION INSTRUCTIONS.
26. THE CHAMBER SHALL BE DESIGNED AND MANUFACTURED IN ACCORDANCE WITH THE SPECIFICATION OF NSAI IRISH AGREEMENT BOARD CERTIFICATE FOR CULTEC ATTENUATION AND INFILTRATION.
27. MAXIMUM ALLOWED COVER OVER TOP OF UNIT SHALL BE 12 FEET (3.65 m).

CULTEC HVLV® FC-24 FEED CONNECTOR PRODUCT SPECIFICATIONS

GENERAL
CULTEC HVLV FC-24 FEED CONNECTORS ARE DESIGNED TO CREATE AN INTERNAL MANIFOLD FOR CULTEC RECHARGER 150XLHD STORMWATER CHAMBERS.

CHAMBER PARAMETERS

1. THE CHAMBERS SHALL BE MANUFACTURED BY CULTEC, INC. OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE CHAMBER SHALL BE VACUUM THERMOFORMED OF HIGH MOLECULAR WEIGHT HIGH DENSITY POLYETHYLENE (HMWHDPE) WITH A BLACK INTERIOR AND BLUE EXTERIOR.
3. THE CHAMBER SHALL BE ARCHED IN SHAPE.
4. THE CHAMBER SHALL BE OPEN-BOTTOMED.
5. THE NOMINAL CHAMBER DIMENSIONS OF THE CULTEC HVLV FC-24 FEED CONNECTOR SHALL BE 12 INCHES (305 MM) TALL, 16 INCHES (406 mm) WIDE AND 24.2 INCHES (614 mm) LONG.
6. THE NOMINAL STORAGE VOLUME OF THE HVLV FC-24 FEED CONNECTOR SHALL BE 0.913 FT3 / FT (0.085 m³ / m) - WITHOUT STONE.
7. THE HVLV FC-24 FEED CONNECTOR CHAMBER SHALL HAVE 2 CORRUGATIONS.
8. THE HVLV FC-24 FEED CONNECTOR MUST BE FORMED AS A WHOLE CHAMBER HAVING TWO OPEN END WALLS AND HAVING NO SEPARATE END PLATES OR SEPARATE END WALLS. THE UNIT SHALL FIT INTO THE SIDE PORTALS OF THE CULTEC RECHARGER STORMWATER CHAMBER AND ACT AS CROSS FEED CONNECTIONS CREATING AN INTERNAL MANIFOLD.
9. THE CHAMBER SHALL BE DESIGNED TO WITHSTAND TRAFFIC LOADS WHEN INSTALLED ACCORDING TO CULTEC'S RECOMMENDED INSTALLATION INSTRUCTIONS.
10. THE CHAMBER SHALL BE MANUFACTURED IN AN ISO 9001:2008 CERTIFIED FACILITY.

CULTEC NO. 410™ NON-WOVEN GEOTEXTILE
CULTEC NO. 410™ NON-WOVEN GEOTEXTILE MAY BE USED WITH CULTEC CONTACTOR® AND RECHARGER® STORMWATER INSTALLATIONS TO PROVIDE A BARRIER THAT PREVENTS SOIL INTRUSION INTO THE STONE.

GEOTEXTILE PARAMETERS

1. THE GEOTEXTILE SHALL BE PROVIDED BY CULTEC, INC. OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE GEOTEXTILE SHALL BE BLACK AND WHITE IN APPEARANCE.
3. THE GEOTEXTILE SHALL HAVE A TYPICAL WEIGHT OF 4.5 OZ/SY (142 G/M).
4. THE GEOTEXTILE SHALL HAVE A TENSILE STRENGTH VALUE OF 120 LBS (533 N) PER ASTM D4632 TESTING METHOD.
5. THE GEOTEXTILE SHALL HAVE AN ELONGATION @ BREAK VALUE OF 50% PER ASTM D4632 TESTING METHOD.
6. THE GEOTEXTILE SHALL HAVE A MULLEN BURST VALUE OF 225 PSI (1551 KPA) PER ASTM D3786 TESTING METHOD.
7. THE GEOTEXTILE SHALL HAVE A PUNCTURE STRENGTH VALUE OF 65 LBS (289 N) PER ASTM D4833 TESTING METHOD.
8. THE GEOTEXTILE SHALL HAVE A CBR PUNCTURE VALUE OF 340 LBS (1513 N) PER ASTM D6241 TESTING METHOD.
9. THE GEOTEXTILE SHALL HAVE A TRAPEZOID TEAR VALUE OF 50 LBS (222 N) PER ASTM D4533 TESTING METHOD.
10. THE GEOTEXTILE SHALL HAVE A AOS VALUE OF 70 U.S. SIEVE (0.212 MM) PER ASTM D4751 TESTING METHOD.
11. THE GEOTEXTILE SHALL HAVE A PERMITTIVITY VALUE OF 1.7 SEC-1 PER ASTM D4491 TESTING METHOD.
12. THE GEOTEXTILE SHALL HAVE A WATER FLOW RATE VALUE OF 135 GAL/MIN/SF (5500 L/MIN/SM) PER ASTM D4491 TESTING METHOD.
13. THE GEOTEXTILE SHALL HAVE A UV STABILITY @ 500 HOURS VALUE OF 70% PER ASTM D4355 TESTING METHOD.

CULTEC AFAB-HPF™ WOVEN GEOTEXTILE
CULTEC AFAB-HPF WOVEN GEOTEXTILE IS DESIGNED AS A UNDERLAYMENT TO PREVENT SCOURING CAUSED BY WATER MOVEMENT WITHIN THE CULTEC CHAMBERS AND FEED CONNECTORS UTILIZING THE CULTEC MANIFOLD FEATURE. IT MAY ALSO BE USED AS A COMPONENT OF THE CULTEC SEPARATOR ROW TO ACT AS A BARRIER TO PREVENT SOIL/CONTAMINANT INTRUSION INTO THE STONE WHILE ALLOWING FOR MAINTENANCE.

GEOTEXTILE PARAMETERS

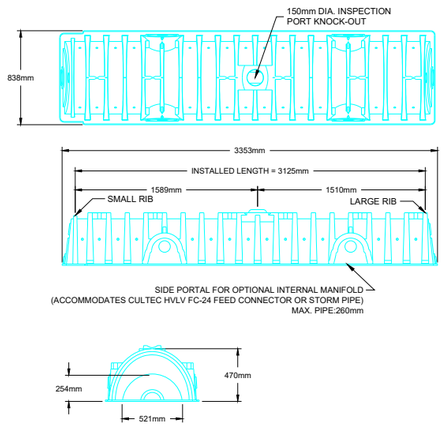
1. THE GEOTEXTILE SHALL BE PROVIDED BY CULTEC OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE GEOTEXTILE SHALL BE BLACK IN APPEARANCE.
3. THE GEOTEXTILE SHALL HAVE A TENSILE STRENGTH OF 320 X 320 LBS (1,420 X 1,420 N) PER ASTM D4632 TESTING METHOD.
4. THE GEOTEXTILE SHALL HAVE A ELONGATION @ BREAK RESISTANCE OF 15 X 15% PER ASTM D4632 TESTING METHOD.
5. THE GEOTEXTILE SHALL HAVE A WIDE WIDTH TENSILE RESISTANCE OF 3,563 X 3,563 LBS/FT (52 X 52 KN/M) PER ASTM D4595 TESTING METHOD.
6. THE GEOTEXTILE SHALL HAVE A CBR PUNCTURE RESISTANCE OF 1,500 LBS (6,670 N) PER ASTM D6241 TESTING METHOD.
7. THE GEOTEXTILE SHALL HAVE A TRAPEZOIDAL TEAR RESISTANCE OF 120 X 120 LBS (540 X 540 N) PER ASTM D4533 TESTING METHOD.
8. THE GEOTEXTILE SHALL HAVE AN APPARENT OPENING SIZE OF 30 US STD. SIEVE (0.60 MM) PER ASTM D4751 TESTING METHOD.
9. THE GEOTEXTILE SHALL HAVE A PERMITTIVITY RATING OF 0.2 SEC-1 PER ASTM D4491 TESTING METHOD.
10. THE GEOTEXTILE SHALL HAVE A WATER FLOW RATING OF 22 GPM/FT2 (900 LPM/M2) PER ASTM D4491 TESTING METHOD.
11. THE GEOTEXTILE SHALL HAVE A UV RESISTANCE OF 70% @ 500 HRS. PER ASTM D4355 TESTING METHOD.

150XLHD 1.0

GENERAL NOTES

MODEL 150XLRHD STAND ALONE	
SMALL RIB	LARGE RIB
MODEL 150XLSHD STARTER	
SMALL RIB	LARGE RIB
MODEL 150XLIHD INTERMEDIATE	
SMALL RIB	LARGE RIB
MODEL 150XLEHD END	
SMALL RIB	LARGE RIB

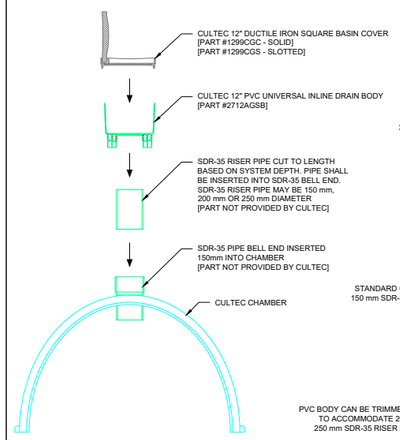
CULTEC RECHARGER 150XLHD CHAMBER STORAGE = 0.245m³/m
INSTALLED LENGTH ADJUSTMENT = 0.23m



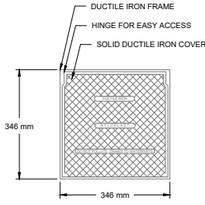
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CULTEC RECHARGER 150XLHD HEAVY DUTY THREE VIEW

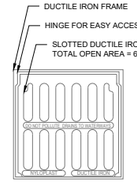
FINAL ASSEMBLY



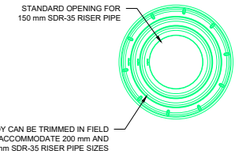
SOLID COVER OPTION



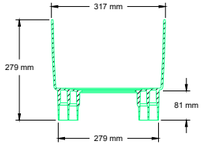
SLOTTED COVER OPTION



PVC BODY PLAN VIEW

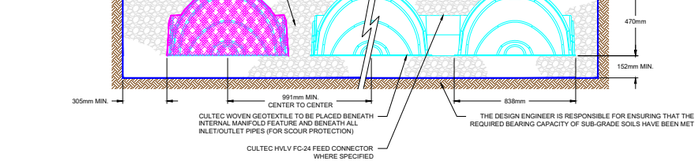


PVC BODY ELEVATION VIEW



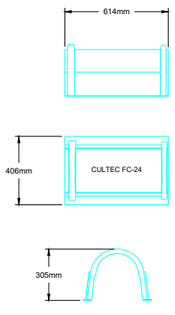
150XLHD 2.0

CULTEC UNIVERSAL INSPECTION PORT KIT DETAIL



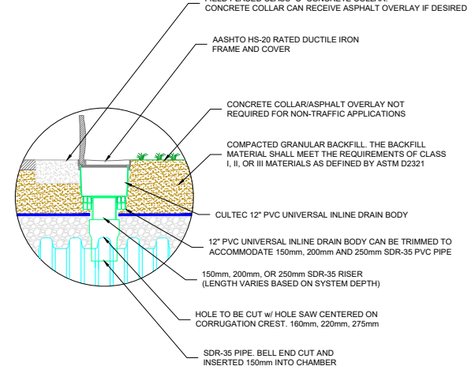
150XLHD 4.0

CULTEC RECHARGER 150XLHD HEAVY DUTY CROSS SECTION



150XLHD 7.0

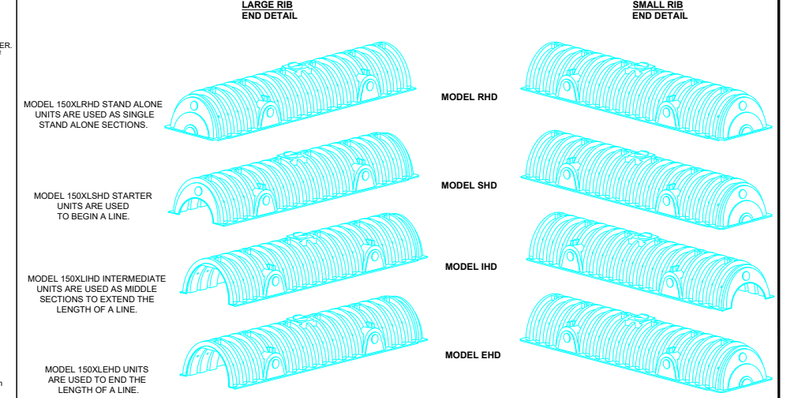
CULTEC HVLV FC-24 FEED CONNECTOR THREE VIEW



150XLHD 8.0

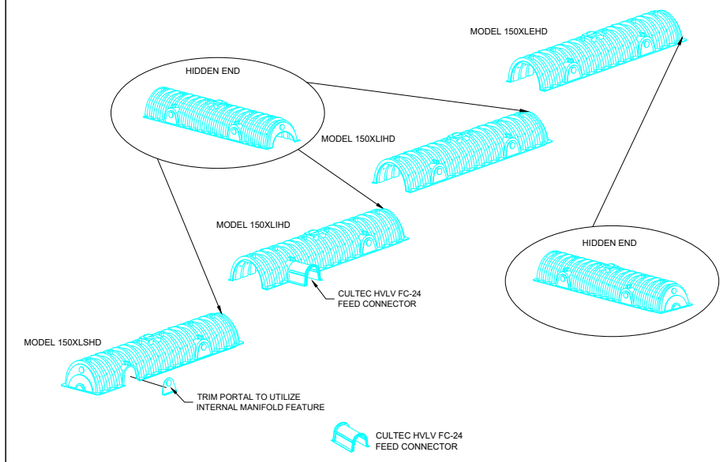
CULTEC INSPECTION PORT - ZOOM DETAIL

LARGE RIB END DETAIL / **SMALL RIB END DETAIL**



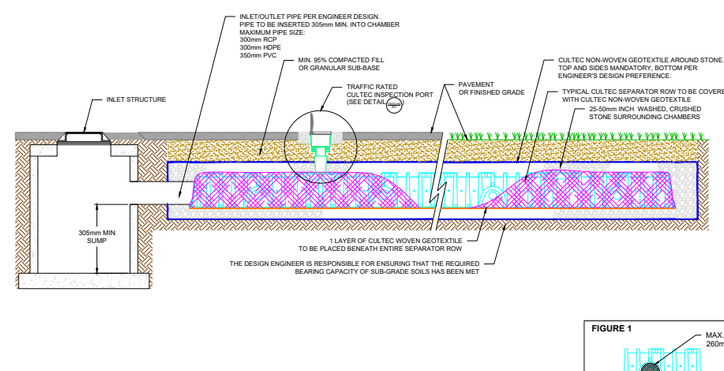
150XLHD 3.0

CULTEC RECHARGER 150XLHD HEAVY DUTY END DETAIL INFORMATION



150XLHD 5.0

CULTEC RECHARGER 150XLHD HEAVY DUTY TYPICAL INTERLOCK



150XLHD 9.0

CULTEC SEPARATOR ROW - CULTEC INSPECTION PORT DETAIL (IF APPLICABLE)

CULTEC STORMWATER CHAMBER

PROJECT NO:	24-1099.00	DESIGNED BY:	SRA
DATE:	9/10/2024	CHECKED BY:	TNB
SCALE:	N.T.S.	SHEET NO:	5 OF 5

PROPOSED INDUSTRIAL WAREHOUSE
10533 KEELE STREET
VAUGHAN, ON
SYSTEM DETAIL SHEET

CULTEC
Subsurface Stormwater Management Systems
P.O. Box 280
878 Federal Road
Brookfield, CT 06804
PH: 1(203) 775-4416
PH: 1(800) 4-CULTEC
CT-tech@cultec.com
www.cultec.com

THIS DRAWING HAS BEEN PREPARED TO SUPPORT THE PROJECT ENGINEER OF RECORD FOR THE PROPOSED SYSTEM. THIS DRAWING MAY BE INCORPORATED INTO THE PROJECT ENGINEER OF RECORD'S CONSTRUCTION DOCUMENTS, BUT IS NOT A CONTRACT DOCUMENT OR OTHER PROJECT REPRESENTATIVE. IT IS ULTIMATE RESPONSIBILITY OF THE PROJECT ENGINEER OF RECORD TO ENSURE THAT THE CULTEC'S SYSTEM IS DESIGNED & INSTALLED COMPLIANCE WITH ALL APPLICABLE LAWS, REGULATIONS AND MANUFACTURER RECOMMENDATIONS.

1 OF 2

Appendix G

Vortex Flow Control Valve

CONFLOW - Vortex Flow Regulator

375-CF75-A

Technical data sheet

Date : 2026-07-10

Project name:

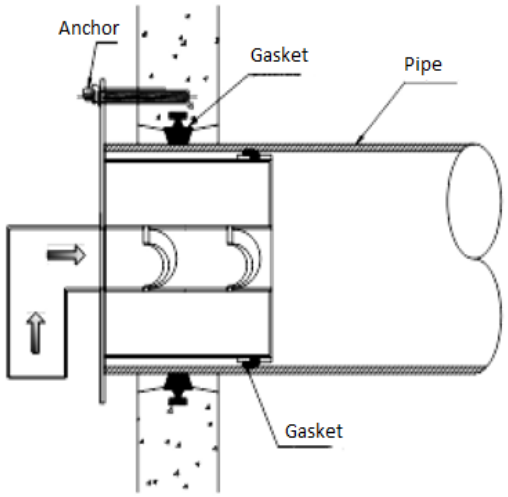
Proposed Industrial warehouse 10533 Keele St

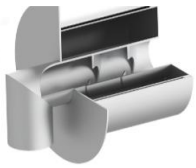
Location : ONTARIO

Project Number

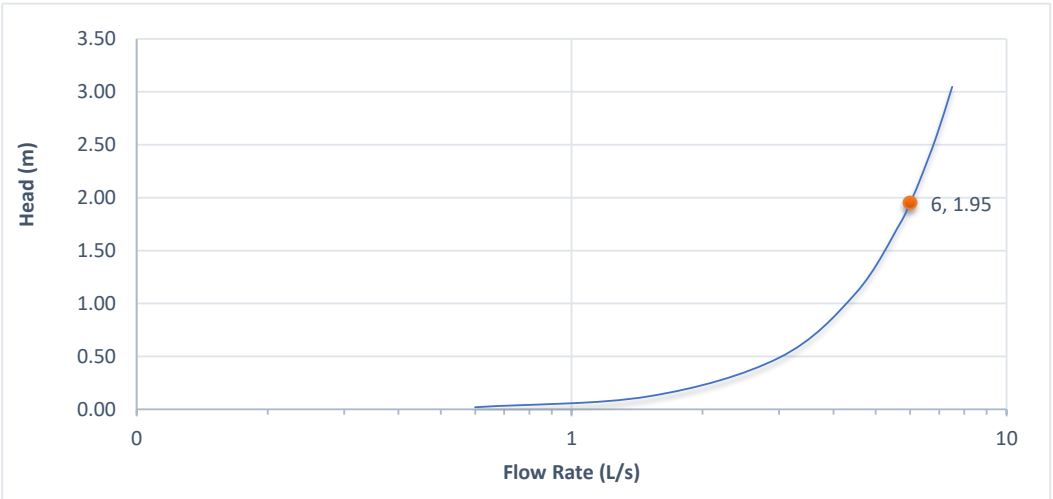
Specifications

Flow Rate (L/s)	6
Design Head (m)	1.95
Pipe Type	PVC
Pipe Diameter (mm)	375
Manhole Diameter or width (mm)	1200
Manhole ID	
Manhole type	Circular
Air vent	No
Model:	375-CF75-A
Minimum Clearance (mm):	300
Minimum pipe diameter (mm):	100





FLOW RATE - CONFLOW 375-CF75-A



Q (L/s)	h (m)
0.6	0.02
1.5	0.12
3.0	0.49
4.5	1.10
5.7	1.76
6.0	1.95
6.3	2.15
6.9	2.58
7.5	3.05
6	1.95

Appendix H

Site-specific water balance memorandum

Technical memorandum

08 July 2025

To	Highside Companies	**Contact No.**	519 340-3902
Copy to		**Email**	sarah.andrew@ghd.com
From	Sarah Andrew, GHD Maxwell Robinson, GHD	**Project No.**	12636323
Project Name	Highside - 10533 Keele Street Vaughan		
Subject	10533 Keele Street – Preliminary Water Balance Assessment		

1. Introduction

GHD Limited (GHD) was retained by Highside Companies to complete a Site-specific water balance assessment in support of the proposed industrial development at 10533 Keele Street, Vaughan, Ontario (Site). A non-continuous hydrological model (Thornthwaite and Mather) at a monthly resolution was adopted for this approach. The assessment was completed for existing and proposed (uncontrolled and controlled) conditions. The Site location is shown on Figure 1.

1.1 Purpose of this memorandum

The objective of the assessment is to conduct a Site-specific water balance analysis to characterize the impact of the proposed development on groundwater recharge in comparison to existing conditions. The approach used to complete the assessment is summarized below:

– Review available topographic data, climate data, hydrogeological data, and plans and drawings for the proposed development at the Site.
– Complete monthly water balance calculations using the Thornthwaite and Mather approach for the Site under existing and proposed (uncontrolled and controlled) conditions.
– Provide recommendations to meet existing conditions for infiltration through Low Impact Development (LID) measures, if applicable.

2. Scope and limitations

This technical memorandum has been prepared by GHD for Highside Companies. It is not prepared as, and is not represented to be, a deliverable suitable for reliance by any person for any purpose. It is not intended for circulation or incorporation into other documents. The matters discussed in this memorandum are limited to those specifically detailed in the memorandum and are subject to any limitations or assumptions specially set out.

GHD has prepared this memorandum on the basis of information provided by the Client and others who provided information to GHD (which may also include Government authorities), which GHD has not independently verified or checked for the purpose of this memorandum. GHD does not accept liability in connection with such unverified

information, including errors and omissions in the memorandum which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this memorandum are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this memorandum are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this memorandum.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

3. Site description

3.1 Existing conditions

Under existing conditions, the Site is situated in the northeast corner of Keele Street and Drummond Dr. in the City of Vaughan. The Site is bounded by Keele Street to the west, Kerect Scaffold Limited to the north, Maple Transfer and Recycling Inc. to the east, and Boffo Landscaping Inc. to the south. The Site is approximately 0.23 hectares (ha) and currently consists of an existing building used for commercial purposes as well as sections of pavement and landscaping. The Topographical Survey Plan prepared by SOSCIA Professional Engineers Inc. (SOSCIA) indicates that the Site is sloped from north to south with an approximate slope of 4.9%. The surficial soils within the Site were primarily clayey silt, silty clay, and silty sand based on borehole logs conducted by GHD (2024). A map of the existing conditions of the Site is provided on Figure 2.

The Site is located within the jurisdiction of the Toronto and Region Conservation Authority (TRCA) and is located within the Don River sub-watershed, which ultimately drains to Lake Ontario. The Site also sits within a Well Head Protection Area Q1 and Q2 [WHPA-Q1 and -Q2] per the TRCA's Drinking Water Source Protection Plan. No surface water features are present on-Site, with the closest water feature being a tributary of the west branch of the Don River located approximately 1 kilometre (km) west of the Site.

3.2 Proposed conditions

Under proposed conditions, the Site will consist of an industrial warehouse surrounded by parking lot, an access roadway, walkways, and landscaping. An underground CULTEC storage tank will be incorporated into the design to meet stormwater quantity control and water balance criteria. These areas are based on the "Stormwater Management Report and Functional Servicing Report" prepared by SOSCIA (January 2025).

As the Site Plan is currently in development, GHD understands that any changes to the Site Plan would require the revision of the proposed (uncontrolled and controlled) condition scenarios of the water balance assessment. A map of the proposed conditions, per the Site Plan to-date, for the Site is provided on Figure 3.

A land use breakdown of the existing and proposed (uncontrolled and controlled) conditions for the Site-specific water balance is provided below in Table 1.

Table 1 Land use breakdown of the existing and proposed condition areas

Land use	Area (ha)	Total percent area (%)
Existing		
Landscaping area	0.05	21.6
Existing commercial building	0.02	8.2
Walkways/parking lot/asphalt/gravel	0.16	70.2
Total Site area:	**0.23**	**100**
Proposed (uncontrolled)		
Landscaping area	0.05	20.8
Existing/proposed industrial buildings	0.09	39.7
Walkways/parking lot/asphalt	0.09	39.5
Total Site area:	**0.23**	**100**
Proposed (controlled)		
Landscaping area	0.04	19.0
Existing/proposed industrial buildings to CULTEC storage tank	0.09	39.7
Walkways/parking lot/asphalt	0.076	32.9
Landscaping area to CULTEC storage tank	0.004	1.8
Parking lot/asphalt to CULTEC storage tank	0.02	6.6
Total Site area:	**0.23**	**100**

4. Site-specific water balance

4.1 Methodology

The Site-specific water balance assessment was conducted based on the standard methodology developed by the Conservation Authorities Geoscience Group, as described in Cuddy et al. (2013). The standardized water balance approach is to utilize the monthly water balance summaries for different soil-water holding capacities provided by the Meteorological Service Data Analysis and Archive Division of Environment Canada (EC).

Water holding capacity (WHC)

The maximum soil storage is quantified as the water holding capacity (WHC), which is defined based on a combination of land use and soil type, as presented in Table 3.1 of the MOE SWM Manual (2003). The WHC represents the total amount of water that can be stored in the soil capillaries and is defined as the water content between the field capacity and wilting point (the practical maximum and minimum soil water content, respectively). WHC values typically range from approximately 10 millimetres (mm) for bedrock and impervious areas to 400 mm for mature forest over silt loam.

Climate data

The water balance assessment presented herein is based on composite meteorological data from the Environment and Climate Change Canada (ECCC) Thornthwaite and Mather water budget. Historical records spanning 65 years between 1960 to 2024 were compiled from four (4) nearby climate stations, with missing observations substituted with records from nearby stations (i.e., Uxbridge West, North York, Richmond Hill WPCP and Toronto Intl A). The stations are summarized in Table 2 with the ECCC data presented in Table A1 in Appendix A.

Table 2 ECCC climate stations near the Site

Climate ID	Station name	Record period(s)	Distance from Site (km)
6157012	Richmond Hill	1960 – 2014	5.5 E
615HMAK	Buttonville A	2014 – 2015	11.9 SE
6158410	Buttonville A	2015 – 2019	11.9 SE
6159123	Uxbridge West	2019 – 2019	38.1 NE
6154150	King City North	2019 – 2024	11.6 NW

Model approach

The results from the ECCC water balance model presents the following monthly output: temperature (mean), precipitation, rainfall, snowmelt, potential evapotranspiration (PET), actual evapotranspiration (AET), and water surplus (WS) for each of the years in the historic record, as well as average monthly values over the entire record. The model is used to estimate the soil storage (water) surplus based on a provided soil water holding capacities.

The Thornthwaite and Mather (1957) method is used to calculate the potential and actual amounts of evapotranspiration and water surplus. The calculations are performed daily and consists of daily precipitation (rainfall and snowmelt) and temperature data to estimate evapotranspiration (ET), soil-water storage, and water surplus. The EC water balance model utilizes a daily timestep developed by the Meteorological Service of Canada (MSC), as daily data allows for more accurate modelling of snowmelt and snow storage, which are of particular importance in a cold weather/winter climate (Johnstone and Louie, 1983).

The water balance calculations are based on the following equation:

$$P = S + ET + WS$$

Where:

P = precipitation

S = change in soil water storage

ET = evapotranspiration

WS = water surplus (surface runoff and infiltration)

Precipitation (P) is either rain or snow depending on the mean daily temperature. Evapotranspiration (ET) refers to the water that is lost to the atmosphere due to evaporation from soil or water and due to transpiration from plants and trees. The Thornthwaite & Mather (1957) methodology estimates AET based on the following condition: 1) AET equals PET when there is enough water available within the soil storage (water holding capacity) to meet the evapotranspiration demand; otherwise, 2) AET equals the amount of water that is available for evapotranspiration.

The water surplus (WS) is the difference between P and AET and is calculated when the water holding capacity of the soil storage is exceeded. The WS represents the total water available in each month to runoff as surface overland flow or infiltrate to the ground and recharge the groundwater table. The average annual water surplus is separated into infiltration and runoff based on an infiltration factor. The infiltration factor is presented in Table 3.1 of the MOE SWM Manual (2003). Site-specific infiltration factors are estimated based on aggregating the infiltration factors for topography, surficial soil type, and vegetative cover factors (land use).

4.2 Water balance parameters

The surficial soils are primarily clayey silt, silty clay, and silty sand deposits (i.e., silt loam) within the Site based on the borehole drilling logs completed by GHD (2024). Available topography for the Site can be classified as rolling to hilly land with an average slope between 3.8 - 28 m/km. The maximum soil storage was quantified using a WHC based on guidelines provided in Table 3.1 of the MOE SWM Manual (2003). The infiltration factors and WHCs for the existing

and proposed land uses, Site-specific topography, surficial soil type, and vegetative cover factors are presented for the Site-specific water balance assessment in Table A2 in Appendix A.

The water balance analysis was developed under the following assumptions:

– WHCs were chosen based on Table 3.1 in the MOE SWM Manual (2003) corresponding to the silt loam soil type, existing and proposed (uncontrolled and controlled) condition land uses for the Site-specific water balance.
– For the impervious areas, WHCs of 2 mm and 10 mm were chosen to represent the roofed and paved areas, respectively. A WHC of 2 mm was chosen for roofed areas as minimal depression storage is available on sloped roofs. A WHC of 10 mm was chosen for paved areas due to the presence of depressions throughout the surface which could hold runoff.
– Net surplus was estimated by multiplying the estimated monthly surplus for the assumed WHC by the associated drainage area. AET and surplus values were obtained from the meteorological data from the composite Richmond Hill ECCC Meteorological Station based on the WHC assigned to each land use area.
– Runoff was calculated as the difference between surplus and infiltration.

4.3 Water balance results

An average annual water balance was carried out on a Site-specific basis. The results for the existing and proposed (uncontrolled and controlled) conditions are presented in this section.

4.3.1 Existing conditions

Based on the results of the assessment, the average annual existing water balance was estimated on a Site-specific basis as summarized in Table 3, with detailed monthly values provided in Table A3 in Appendix A.

Table 3 Existing average annual water balance results

Land use	Area (ha)	Average annual volume m^3/a [1]				
		Precipitation (P)	Evapotranspiration (ET)	Surplus (S)	Infiltration (I)	Runoff (R)
Landscaping areas	0.05	430	280	150	70	80
Existing commercial building	0.02	165	85	80	-	80
Walkways/parking lot/ asphalt/gravel	0.16	1,400	755	650	-	650
Total	**0.23**	**1,995**	**1,120**	**880**	**70**	**810**

Notes:

1. Volumes are rounded for reporting purposes

4.3.2 Proposed (uncontrolled) conditions

Based on the results of the assessment, the average annual proposed (uncontrolled) water balance was estimated on a Site-specific basis as summarized in Table 4, with detailed monthly values provided in Table A4 in Appendix A.

Table 4 Proposed (uncontrolled) average annual water balance results - Site-specific

Land use	Area (ha)	Average annual volume m^3/a [1]				
		Precipitation (P)	Evapotranspiration (ET)	Surplus (S)	Infiltration (I)	Runoff (R)
Landscaping areas	0.05	415	270	145	65	80
Industrial Building	0.09	790	415	375	-	375

Land use	Area (ha)	Average annual volume m^3/a [1]				
		Precipitation (P)	Evapotranspiration (ET)	Surplus (S)	Infiltration (I)	Runoff (R)
Walkways/parking lot/ asphalt	0.09	790	425	365	-	365
Total	**0.23**	**1,995**	**1,110**	**885**	**65**	**820**

Notes:

1. Volumes are rounded for reporting purposes

4.3.3 Proposed (controlled) conditions

Under proposed (controlled) conditions, a CULTEC underground stormwater storage tank is proposed to be incorporated underneath the parking lot along the east boundary of the Site, with an excess storage capacity of 76 m^3 to meet the water quantity control requirements of the SWM criteria detailed in the SOSCIA SWM report. Per the SOSCIA SWM report, the underground stormwater storage tank was designed to capture the runoff from approximately 0.11 ha of landscaped, roofed, and paved area up to and including the 100-year design storm. The underground storage tank will utilize retention to meet the water quantity control requirements for the Site and will not contribute to the infiltration deficit as it will discharge to the storm sewer through the proposed stormwater servicing on-Site. For the purposes of this assessment, the runoff retained within the storage tank will continue to be considered as such.

Based on the results of the assessment, the average annual proposed (controlled) water balance was estimated on a Site-specific basis as summarized in Table 5, with detailed monthly values provided in Table A5 in Appendix A.

Table 5 Proposed (controlled) average annual water balance results - Site-specific

Land use	Area (ha)	Average annual volume m^3/a [1]				
		Precipitation (P)	Evapotranspiration (ET)	Surplus (S)	Infiltration (I)	Runoff (R)
Landscaping area	0.04	380	250	130	60	70
Existing/proposed industrial buildings to CULTEC storage tank	0.09	790	415	375	-	375
Walkways/parking lot/ asphalt	0.076	660	355	305	-	305
Landscaping area to CULTEC storage tank	0.004	35	20	15	5	10
Parking lot/asphalt to CULTEC storage tank	0.02	130	70	60	-	60
Total	**0.23**	**1,995**	**1,110**	**885**	**65**	**820**

Notes:

1. Volumes are rounded for reporting purposes

4.4 Summary of water balance results

A summary of the annual water balance assessment considering surplus, infiltration, and runoff for the existing and proposed (uncontrolled and controlled) conditions is provided in Table 6, with detailed annual values provided in Table A6 in Appendix A.

Table 6 Summary of average annual water balance results - Site-specific

Scenario	Area (ha)	Average annual volume [1]					
		Surplus (S)		Infiltration (I)		Runoff (R)	
		m^3/a	mm/a	m^3/a	mm/a	m^3/a	mm/a
Existing	0.23	880	384	70	31	810	353
Proposed (uncontrolled)	0.23	885	386	65	28	820	358
Proposed (controlled)	0.23	885	386	65	28	820	358
Difference from existing	-	5	2	(5)	(2)	10	4

Notes:

1. Volumes are rounded for reporting purposes

Under proposed (uncontrolled and controlled) conditions, Site-specific surplus is anticipated to increase by approximately 5 m^3/year (2 mm/yr), representing a corresponding decrease in evapotranspiration due to changes in land use. Direct infiltration is anticipated to decrease by approximately 5 m^3/yr (2 mm/yr) due to an increase in impervious area. This will increase the runoff generated within the Site by 10 m^3/yr (4 mm/yr). With the incorporation of the CULTEC underground stormwater storage tank, approximately 445 m^3/yr (194 mm/yr) of the runoff from the Site will be retained prior to discharge to the municipal storm sewer system.

5. Recommendations

5.1 Potential LID measures

Based on a Site-specific infiltration deficit of 5 m^3/year (2 mm/year), GHD recommends incorporating additional green space to meet existing conditions for infiltration. While LIDs are not recommended at this time, if there are changes to the Site plan that increase the infiltration deficit, LIDs may be required in the future. Generally, maintaining a separation of one (1) m between the base of potential LID controls and the seasonally high groundwater table or top of bedrock is recommended.

Table 7 Summary of nearby groundwater levels (April – June 2024)

Monitoring well	Minimum measured groundwater level (mbgs)	Maximum measured groundwater level (mbgs)
MW01-24	2.61	3.37
MW02-24	2.05	2.48
MW03-24	1.23	2.07
MW04-24	2.64	2.86

At this time, GHD recommends the incorporation of approximately 19 m^2 of additional green space to increase infiltration within the Site boundary to meet existing conditions.

6. Conclusions

Site-specific water balance analysis was completed to characterize the impact of the proposed development on groundwater recharge in comparison to existing conditions and to recommend LID measures to meet existing

condition infiltration volumes, if necessary. The assessment resulted in the following conclusions and recommendations.

– Compared to existing conditions (880 m^3/yr), average annual surplus over the Site area will increase by 5 m^3/yr (2 mm/yr) under proposed (uncontrolled and controlled) conditions.
– Compared to existing conditions (70 m^3/yr), average annual infiltration over the Site area will decrease by 5 m^3/yr (2 mm/yr) under proposed (uncontrolled and controlled) conditions.
– Compared to existing conditions (810 m^3/yr), average annual runoff over the Site area will increase by 10 m^3/yr (4 mm/yr) under proposed (uncontrolled and controlled) conditions.
– The CULTEC underground stormwater storage tank has capacity for approximately 445 m^3/yr (194 mm/yr) of the runoff from the Site prior to discharge to the municipal storm sewer system.
– GHD recommends the incorporation of additional green space to increase evapotranspiration and infiltrate surplus within the Site boundary to mitigate the minor infiltration deficit.

References

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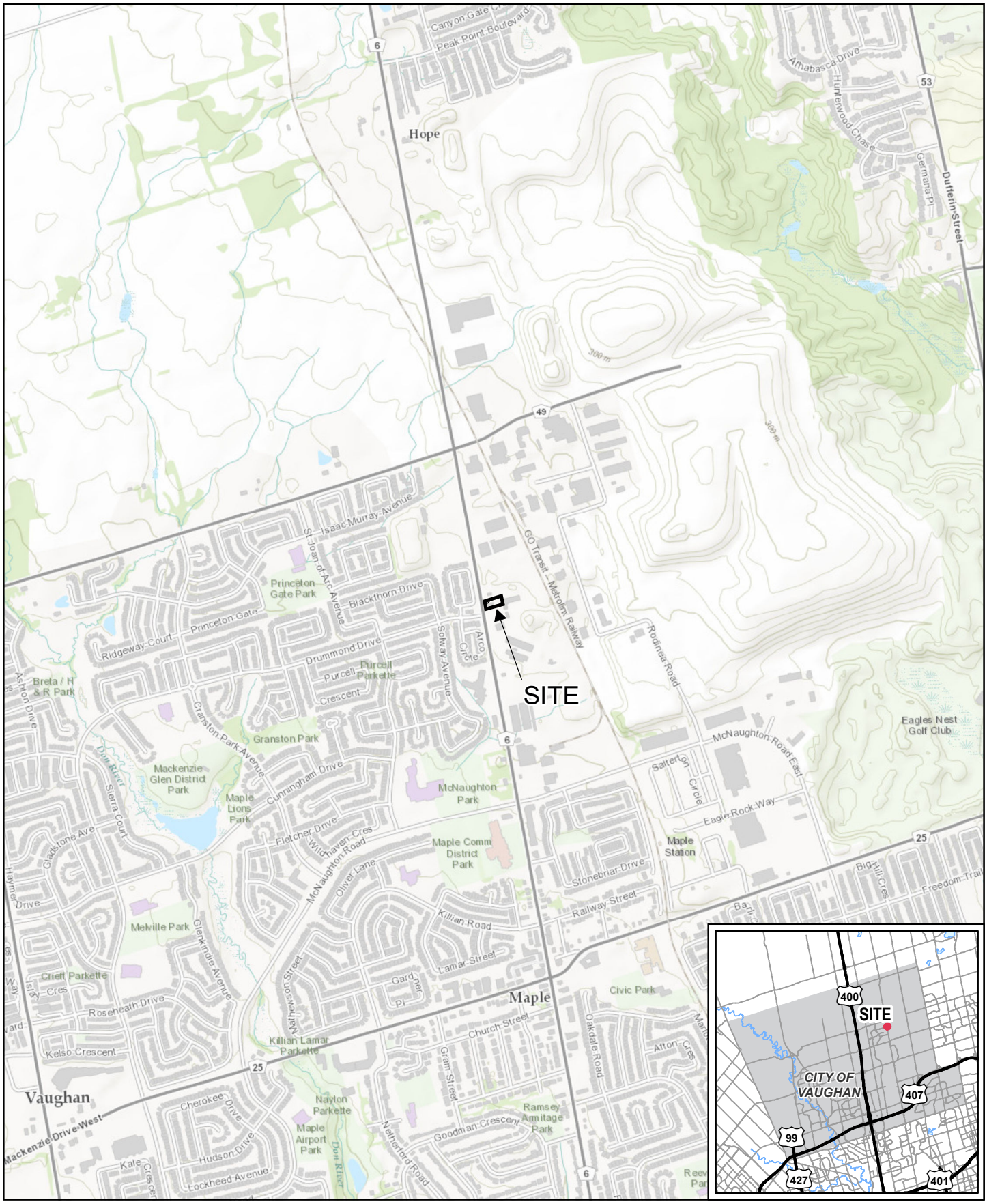
USDA, 2004. National Engineering Handbook Hydrology Chapters: Chapter 11 – Snowmelt. Retrieved 10 April 2022 from **https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17753.wba**

Project name		Highside - 10533 Keele Street Vaughan					
Document title		Technical memorandum					
Project number		12636323					
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[Status code]							
[Status code]							

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Figures



Paper Size ANSI A

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

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HIGHSIDE COMPANIES
10533 KEELE STREET, VAUGHAN, ONTARIO
SITE-SPECIFIC WATER BALANCE ASSESSMENT

Project No. **12636323**
Revision No. **-**
Date **Feb 26, 2025**

SITE LOCATION MAP

FIGURE 1

O:\GIS\PROJECTS\12636000s\12636323\GIS\Maps\Deliverables\202502_WaterBalance\12636323_001_SiteLocation.mxd
Print date: 26 Feb 2025 - 16:24

Data source: MNDMNRF 2024. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2025. Esri World Topographic Basemap, 2024.



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0 5 10 15

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

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HIGHSIDE COMPANIES
10533 KEELE STREET, VAUGHAN, ONTARIO
SITE-SPECIFIC WATER BALANCE ASSESSMENT

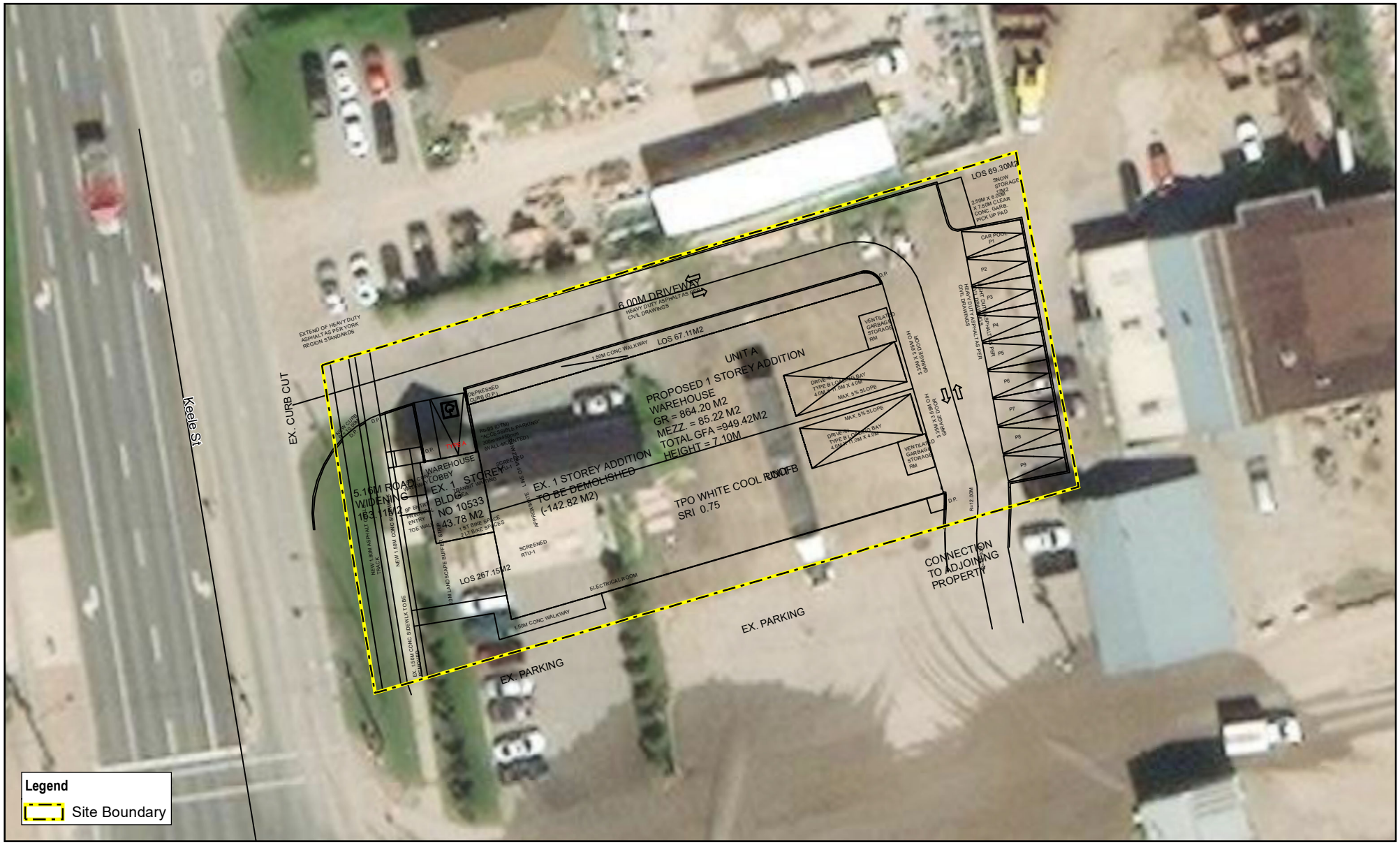
Project No. **12626113**
Revision No. **-**
Date **Feb 26, 2025**

EXISTING CONDITIONS

FIGURE 2

Q:\GIS\PROJECTS\12636000s\12636323\GIS\Maps\Deliverables\202502_WaterBalance\12636323_002_ExistingConditions.mxd
Print date: 26 Feb 2025 - 15:30

Data source: MNDMNRF, 2022. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, ©King's Printer 2025. Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community.



Paper Size ANSI A

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Meters

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Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

HIGHSIDE COMPANIES
10533 KEELE STREET, VAUGHAN, ONTARIO
SITE-SPECIFIC WATER BALANCE ASSESSMENT

Project No. **12626113**
Revision No. **-**
Date **Feb 26, 2025**

PROPOSED CONDITIONS

FIGURE 3

Q:\GIS\PROJECTS\12636000s\12636323\GIS\Maps\Deliverables\202502_WaterBalance\12636323_003_ProposedConditions.mxd
Print date: 26 Feb 2025 - 15:55

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Appendices

Appendix A

Water balance results

ECCC Water Budget Data
Site-Specific Water Balance Analysis
10533 Keele Street, Vaughan, Ontario
Highside Companies

Richmond Hill			WATER BUDGET MEANS FOR THE PERIOD 1960 - 2024			DC20492
	LAT	43.88	WATER HOLDING CAPACITY	2 mm	HEAT INDEX	39.12
	LONG	79.45	LOWER ZONE	1 mm	A	1.116

DATE	TEMP	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
1-Jan	-6.4	63	22	19	1	1	0	40	42	2	279
1-Feb	-5.6	56	23	28	1	1	0	49	47	2	335
1-Mar	-0.6	60	39	56	9	9	0	87	12	2	396
1-Apr	6.5	74	71	15	34	33	0	53	0	2	470
1-May	13.3	76	76	0	79	64	-15	13	0	1	545
1-Jun	18.4	84	84	0	114	78	-37	7	0	0	630
1-Jul	21.1	84	84	0	135	80	-55	4	0	0	715
1-Aug	20.2	82	82	0	119	77	-42	5	0	0	797
1-Sep	16	75	75	0	80	62	-19	13	0	1	873
1-Oct	9.4	69	68	0	41	37	-4	31	0	2	69
1-Nov	3.2	75	68	6	13	13	0	60	1	2	144
1-Dec	-3	72	34	19	3	3	0	50	20	2	217
AVE	**7.6 TTL**	**871**	**726**	**143**	**629**	**458**	**-172**	**412**			

Richmond Hill			WATER BUDGET MEANS FOR THE PERIOD 1960 - 2024			DC20492
	LAT	43.88	WATER HOLDING CAPACITY	10 mm	HEAT INDEX	39.12
	LONG	79.45	LOWER ZONE	6 mm	A	1.116

DATE	TEMP	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC
1-Jan	-6.4	63	22	19	1	1	0	40	42	10	279
1-Feb	-5.6	56	23	28	1	1	0	49	47	10	335
1-Mar	-0.6	60	39	56	9	9	0	87	12	10	396
1-Apr	6.5	74	71	15	34	34	0	53	0	10	470
1-May	13.3	76	76	0	79	68	-11	13	0	5	545
1-Jun	18.4	84	84	0	114	81	-34	6	0	2	630
1-Jul	21.1	84	84	0	135	82	-53	3	0	1	715
1-Aug	20.2	82	82	0	119	78	-41	5	0	1	797
1-Sep	16	75	75	0	80	62	-18	11	0	3	873
1-Oct	9.4	69	68	0	41	37	-4	28	0	7	69
1-Nov	3.2	75	68	6	13	13	0	58	1	10	144
1-Dec	-3	72	34	19	3	3	0	50	20	10	217
AVE	**7.6 TTL**	**871**	**726**	**143**	**629**	**469**	**-161**	**403**			

Entered by: MR
Reviewed by: SA

ECCC Water Budget Data
Site-Specific Water Balance Analysis
10533 Keele Street, Vaughan, Ontario
Highside Companies

Richmond Hill		WATER BUDGET MEANS FOR THE PERIOD 1960 - 2024			DC20492
LAT	43.88	WATER HOLDING CAPACITY	125 mm	HEAT INDEX	39.12
LONG	79.45	LOWER ZONE	75 mm	A	1.116

DATE	TEMP	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC
1-Jan	-6.4	63	22	19	1	1	0	35	42	122	279
1-Feb	-5.6	56	23	28	1	1	0	46	47	124	335
1-Mar	-0.6	60	39	56	9	9	0	86	12	125	396
1-Apr	6.5	74	71	15	34	34	0	53	0	125	470
1-May	13.3	76	76	0	79	79	0	13	0	109	545
1-Jun	18.4	84	84	0	114	114	0	5	0	74	630
1-Jul	21.1	84	84	0	135	119	-16	2	0	38	715
1-Aug	20.2	82	82	0	119	91	-28	2	0	28	797
1-Sep	16	75	75	0	80	67	-13	3	0	33	873
1-Oct	9.4	69	68	0	41	38	-3	4	0	60	69
1-Nov	3.2	75	68	6	13	13	0	21	1	100	144
1-Dec	-3	72	34	19	3	3	0	33	20	117	217
AVE	**7.6 TTL**	**871**	**726**	**143**	**629**	**569**	**-60**	**303**			

Entered by: MR
Reviewed by: SA

Table A2

Land Type Parameters
Site-Specific Water Balance Analysis
10533 Keele Street, Vaughan, Ontario
Highside Companies

Existing Conditions

Land Use	WHC	Type of Land Use	Soil Type (HSG)	Infiltration Factor				Area (m^2)
				Topo	Soils	Cover	Total	
Landscaping Area	125 mm	Urban Lawns	Silt Loam (C)	0.15	0.20	0.10	0.45	496
Existing Commercial Building	2 mm	Impervious (Roofs)	N/A	0.0	0.00	0.00	0.00	189
Walkways / Parking Lot / Asphalt / Gravel	10 mm	Impervious (Paved)	N/A	0.0	0.00	0.00	0.00	1,608
						Total	**0.10**	**2,292**

Proposed (Uncontrolled) Conditions

Land Use	WHC	Type of Land Use	Soil Type (HSG)	Infiltration Factor				Area (m^2)
				Topo	Soils	Cover	Total	
Landscaping Area	125 mm	Urban Lawns	Silt Loam (C)	0.15	0.20	0.10	0.45	477
Existing / Proposed Industrial Buildings	2 mm	Impervious (Roofs)	N/A	0.00	0.00	0.00	0.00	909
Walkways / Parking Lot / Asphalt	10 mm	Impervious (Paved)	N/A	0.00	0.00	0.00	0.00	906
						Total	**0.09**	**2,292**

Proposed (Controlled) Conditions

Land Use	WHC	Type of Land Use	Soil Type (HSG)	Infiltration Factor				Area (m^2)
				Topo	Soils	Cover	Total	
Landscaping Area	125 mm	Urban Lawns	Silt Loam (C)	0.15	0.20	0.10	0.45	435
Existing / Proposed Industrial Buildings to CULTEC Storage Tank	2 mm	Impervious (Roofs) to LID	N/A	0.00	0.00	0.00	0.00	909
Walkways / Parking Lot / Asphalt	10 mm	Impervious (Paved)	N/A	0.00	0.00	0.00	0.00	755
Landscaping Area to CULTEC Storage Tank	125 mm	Urban Lawns - to LID	Silt Loam (C)	0.15	0.20	0.10	0.45	42
Parking Lot / Asphalt to CULTEC Storage Tank	10 mm	Impervious (Paved) - to LID	N/A	0.00	0.00	0.00	0.00	151
						Total	**0.09**	**2,292**

Table A3

Existing Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
10533 Keele Street, Vaughan, Ontario
Highside Companies

Existing Conditions

Total Area	0.23	ha

Site-Specific Water Balance Assessment

			Landscaping Area		***Existing Commercial Building***			***Walkways / Parking Lot / Asphalt / Gravel***			
			WHC	***125 mm***	***WHC***	***2 mm***		***WHC***	***10 mm***		
			Infiltration Factor	***0.45***	***Infiltration Factor***	***0.00***		***Infiltration Factor***	***0.00***		
			Area (m^2)	***496***	***Area (m^2)***	***189***		***Area (m^2)***	***1,608***		
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	(mm)	(mm)	(mm)	(mm)	(m^3)	(mm)	(mm)	(m^3)	(mm)	(mm)	(m^3)
January	63	1	1	35	17	1	40	8	1	40	64
February	56	1	1	46	23	1	49	9	1	49	79
March	60	9	9	86	43	9	87	16	9	87	140
April	74	34	34	53	26	33	53	10	34	53	85
May	76	79	79	13	6	64	13	2	68	13	21
June	84	114	114	5	2	78	7	1	81	6	10
July	84	135	119	2	1	80	4	1	82	3	5
August	82	119	91	2	1	77	5	1	78	5	8
September	75	80	67	3	1	62	13	2	62	11	18
October	69	41	38	4	2	37	31	6	37	28	45
November	75	13	13	21	10	13	60	11	13	58	93
December	72	3	3	33	16	3	50	9	3	50	80
Total	**871**	**629**	**569**	**303**	**150**	**458**	**412**	**78**	**469**	**403**	**648**

Entered by: MR
Reviewed by: SA

Table A3

Existing Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
10533 Keele Street, Vaughan, Ontario
Highside Companies

Existing Conditions

Total Area	0.23	ha

Site-Specific Water Balance Assessment

Month	*Precipitation*	*Potential Evap.*	*Precip. Volume*	*Actual Evap. Volume*	*Surplus Volume*	*Infiltration Volume*	*Surface Runoff Volume*
(-)	(mm)	(mm)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)
January	63	1	144	2	89	8	81
February	56	1	128	2	111	10	101
March	60	9	138	21	199	19	180
April	74	34	170	78	121	12	110
May	76	79	174	161	30	3	27
June	84	114	193	201	13	1	12
July	84	135	193	206	7	0	6
August	82	119	188	185	10	0	10
September	75	80	172	145	22	1	21
October	69	41	158	85	53	1	52
November	75	13	172	30	115	5	110
December	72	3	165	7	106	7	99
Total	**871**	**629**	**1,994**	**1,122**	**876**	**68**	**808**

Table A4

Proposed (Uncontrolled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
10533 Keele Street, Vaughan, Ontario
Highside Companies

Proposed (Uncontrolled) Conditions

Total Area	0.23	ha

Site-Specific Water Balance Assessment

			Landscaping Area			***Existing / Proposed Industrial Buildings***			***Walkways / Parking Lot / Asphalt***		
			WHC	***125 mm***		***WHC***	***2 mm***		***WHC***	***10 mm***	
			Infiltration Factor	***0.45***		***Infiltration Factor***	***0.00***		***Infiltration Factor***	***0.00***	
			Area (m^2)	***477***		***Area (m^2)***	***909***		***Area (m^2)***	***906***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	63	1	1	35	17	1	40	36	1	40	36
February	56	1	1	46	22	1	49	45	1	49	44
March	60	9	9	86	41	9	87	79	9	87	79
April	74	34	34	53	25	33	53	48	34	53	48
May	76	79	79	13	6	64	13	12	68	13	12
June	84	114	114	5	2	78	7	6	81	6	5
July	84	135	119	2	1	80	4	4	82	3	3
August	82	119	91	2	1	77	5	5	78	5	5
September	75	80	67	3	1	62	13	12	62	11	10
October	69	41	38	4	2	37	31	28	37	28	25
November	75	13	13	21	10	13	60	55	13	58	53
December	72	3	3	33	16	3	50	45	3	50	45
Total	**871**	**629**	**569**	**303**	**145**	**458**	**412**	**375**	**469**	**403**	**365**

Entered by: MR
Reviewed by: SA

Table A4

Proposed (Uncontrolled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
10533 Keele Street, Vaughan, Ontario
Highside Companies

Proposed (Uncontrolled) Conditions

Total Area	0.23	ha

Site-Specific Water Balance Assessment

Month	*Precipitation*	*Potential Evap.*	*Precip. Volume*	*Actual Evap. Volume*	*Surplus Volume*	*Infiltration Volume*	*Surface Runoff Volume*
(-)	(mm)	(mm)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)
January	63	1	144	2	89	8	82
February	56	1	128	2	111	10	101
March	60	9	138	21	199	18	180
April	74	34	170	77	121	11	110
May	76	79	174	157	30	3	27
June	84	114	193	199	14	1	13
July	84	135	193	204	7	0	7
August	82	119	188	184	10	0	10
September	75	80	172	144	23	1	23
October	69	41	158	85	55	1	55
November	75	13	172	30	117	5	113
December	72	3	165	7	106	7	99
Total	**871**	**629**	**1,994**	**1,113**	**884**	**65**	**819**

Entered by: MR
Reviewed by: SA

Table A5

Proposed (Controlled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
10533 Keele Street, Vaughan, Ontario
Highside Companies

Proposed (Controlled) Conditions

Total Area	0.23	ha

Site-Specific Water Balance Assessment

			Landscaping Area		***Existing / Proposed Industrial Buildings to CULTEC Storage Tank***		***Walkways / Parking Lot / Asphalt***	
			WHC	***125 mm***	***WHC***	***2 mm***	***WHC***	***10 mm***
			Infiltration Factor	***0.45***	***Infiltration Factor***	***0.00***	***Infiltration Factor***	***0.00***
			Area (m^2)	***435***	***Area (m^2)***	***909***	***Area (m^2)***	***755***
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	63	1	1	35	15	1	40	36	1	40	30
February	56	1	1	46	20	1	49	45	1	49	37
March	60	9	9	86	37	9	87	79	9	87	66
April	74	34	34	53	23	33	53	48	34	53	40
May	76	79	79	13	6	64	13	12	68	13	10
June	84	114	114	5	2	78	7	6	81	6	5
July	84	135	119	2	1	80	4	4	82	3	2
August	82	119	91	2	1	77	5	5	78	5	4
September	75	80	67	3	1	62	13	12	62	11	8
October	69	41	38	4	2	37	31	28	37	28	21
November	75	13	13	21	9	13	60	55	13	58	44
December	72	3	3	33	14	3	50	45	3	50	38
Total	**871**	**629**	**569**	**303**	**132**	**458**	**412**	**375**	**469**	**403**	**304**

Table A5

Proposed (Controlled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
10533 Keele Street, Vaughan, Ontario
Highside Companies

Proposed (Controlled) Conditions

Total Area	0.23	ha

Site-Specific Water Balance Assessment

			Landscaping Area to CULTEC Storage Tank			***Parking Lot / Asphalt to CULTEC Storage Tank***							
			WHC	***125 mm***		***WHC***	***10 mm***						
			Infiltration Factor	***0.45***		***Infiltration Factor***	***0.00***						
			Area (m^2)	***42***		***Area (m^2)***	***151***						
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***		***Precip. Volume***	***Actual Evap. Volume***	***Surplus Volume***	***Infiltration Volume***	***Surface Runoff Volume***
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**
January	63	1	1	35	1	1	40	6	144	2	89	8	82
February	56	1	1	46	2	1	49	7	128	2	111	10	101
March	60	9	9	86	4	9	87	13	138	21	199	18	180
April	74	34	34	53	2	34	53	8	170	77	121	11	110
May	76	79	79	13	1	68	13	2	174	157	30	3	27
June	84	114	114	5	0	81	6	1	193	199	14	1	13
July	84	135	119	2	0	82	3	0	193	204	7	0	7
August	82	119	91	2	0	78	5	1	188	184	10	0	10
September	75	80	67	3	0	62	11	2	172	144	23	1	23
October	69	41	38	4	0	37	28	4	158	85	55	1	55
November	75	13	13	21	1	13	58	9	172	30	117	5	113
December	72	3	3	33	1	3	50	8	165	7	106	7	99
Total	**871**	**629**	**569**	**303**	**13**	**469**	**403**	**61**	**1,994**	**1,113**	**884**	**65**	**819**

Summary of Calculations - Annual
Site-Specific Water Balance Analysis
10533 Keele Street, Vaughan, Ontario
Highside Companies

Existing Conditions											
Land Use	***Area***	***Precipitation***		***Evapotranspiration***		***Surplus/Deficit***		***Infiltration***		***Runoff***	
	(ha)	***(m^3)***	***(mm)***	***(m^3)***	***(mm)***	***(m^3)***	***(mm)***	***(m^3)***	***(mm)***	***(m^3)***	***(mm)***
Landscaping Area	0.05	430	871	280	565	150	302	70	141	80	161
Existing Commercial Building	0.02	165	871	85	451	80	424	-	-	80	424
Walkways / Parking Lot / Asphalt / Gravel	0.16	1,400	871	755	470	650	404	-	-	650	404
Total	**0.23**	**1,995**	**871**	**1,120**	**489**	**880**	**384**	**70**	**31**	**810**	**353**

Proposed (Uncontrolled) Conditions											
Land Use	***Area***	***Precipitation***		***Evapotranspiration***		***Surplus/Deficit***		***Infiltration***		***Runoff***	
	(ha)	***(m^3)***	***(mm)***	***(m^3)***	***(mm)***	***(m^3)***	***(mm)***	***(m^3)***	***(mm)***	***(m^3)***	***(mm)***
Landscaping Area	0.05	415	871	270	566	145	304	65	136	80	168
Existing / Proposed Industrial Buildings	0.09	790	871	415	457	375	413	-	-	375	413
Walkways / Parking Lot / Asphalt	0.09	790	871	425	469	365	403	-	-	365	403
Total	**0.23**	**1,995**	**871**	**1,110**	**484**	**885**	**386**	**65**	**28**	**820**	**358**

Proposed (Controlled) Conditions											
Land Use	***Area***	***Precipitation***		***Evapotranspiration***		***Surplus/Deficit***		***Infiltration***		***Runoff***	
	(ha)	***(m^3)***	***(mm)***	***(m^3)***	***(mm)***	***(m^3)***	***(mm)***	***(m^3)***	***(mm)***	***(m^3)***	***(mm)***
Landscaping Area	0.04	380	871	250	575	130	299	60	138	70	161
Existing / Proposed Industrial Buildings to CULTEC Storage	0.09	790	871	415	457	375	413	-	-	375	413
Walkways / Parking Lot / Asphalt	0.076	660	871	355	470	305	404	-	-	305	404
Landscaping Area to CULTEC Storage Tank	0.004	35	871	20	476	15	357	5	119	10	238
Parking Lot / Asphalt to CULTEC Storage Tank	0.02	130	871	70	464	60	397	-	-	60	397
Total	**0.23**	**1,995**	**871**	**1,110**	**484**	**885**	**386**	**65**	**28**	**820**	**358**

Annual Summary											
Existing Conditions	0.23	1,995	871	1,120	489	880	384	70	31	810	353
Proposed (Uncontrolled) Conditions	0.23	1,995	871	1,110	484	885	386	65	28	820	358
Proposed (Controlled) Conditions	0.23	1,995	871	1,110	484	885	386	65	28	820	358
Runoff Retention Measures											
CULTEC Storage Tank	0.11	-	-	-	-	-	-	-	-	445	194
Existing to Proposed Difference											
Proposed (Controlled) Conditions	-	-	-	(10)	(4)	5	2	(5)	(2)	10	4
Percentage Change	0%	0%	0%	-1%	-1%	1%	1%	-7%	-7%	1%	1%

Notes:
Values are rounded for reporting purposes.
Positive value for infiltration difference is a surplus and a negative value is a deficit.
Positive value for runoff difference is an increase in runoff and a negative value is a decrease in runoff.

Entered by: MR
Reviewed by: SA