Transport Truck/Trailer Parking
12434 Dixie Road
Town of Caledon

Stormwater Management Report

February 2021

MAEL Project 2020-034

Stormwater Management Report

Transport Truck/Trailer Parking
12434 Dixie Road
Town of Caledon

For

8181926 Canada Inc.

February 2021

Prepared by:

MASONGSONG ASSOCIATES ENGINEERING LIMITED
7800 Kennedy Road, Suite #201
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Project No: MAEL 2020-034

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1. NTRODUCTION

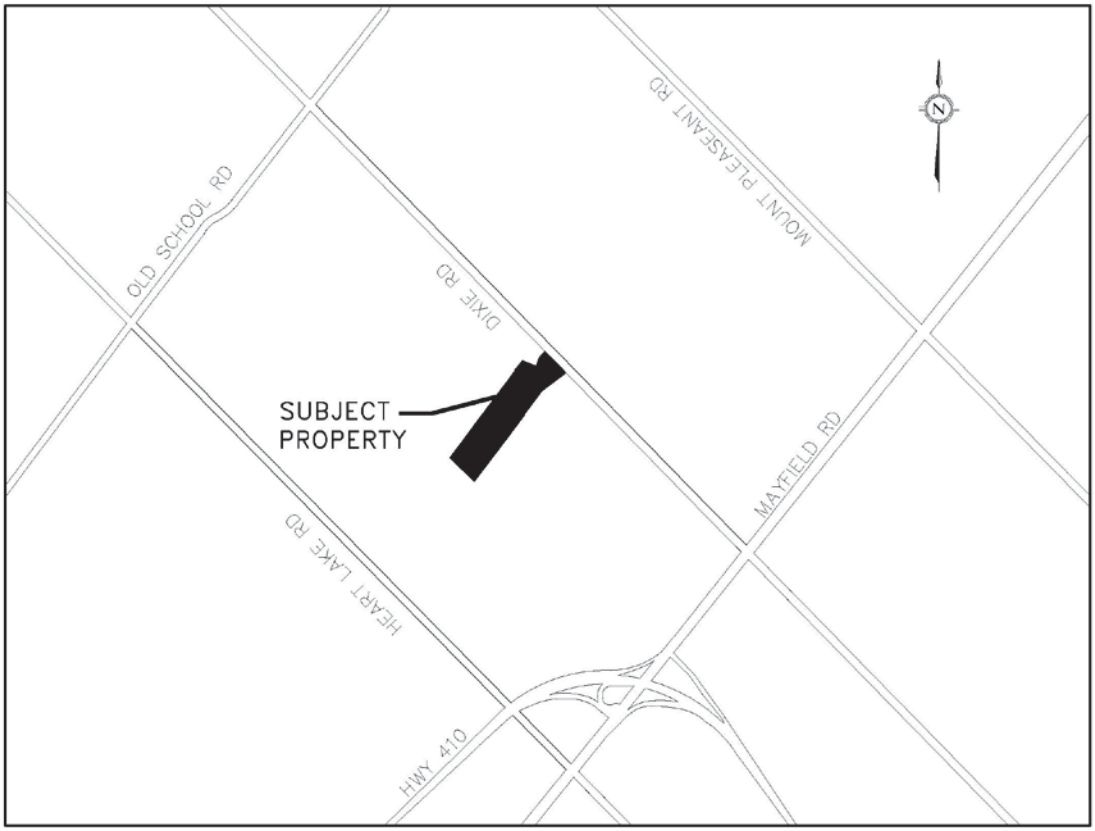
Masongsong Associates Engineering limited has been retained by 8181926 Canada Inc. to prepare this Stormwater Management Report in support of development application for Transport Truck/Trailer Parking facility, in the Town of Caledon, Regional Municipality of Peel.

The purpose of this report is to identify the requirements for storm servicing/stormwater management and to demonstrate how the subject site will function within the framework of existing and proposed infrastructures.

1.1 Background

The subject site is 10.7 ha and located at 12434 Dixie Road, Town of Caledon, situated south of Old School Road between Health Lake and Mount Pleasant roads. The current use of property is mainly as agricultural field. The site is abutted by existing commercial and agricultural fields.

Refer to below key map for proposed site location plan:



1.2 Proposed Development

The subject development as illustrated in site conceptual plan prepared by MGP planning is a proposed temporary transport truck trailer parking. A Temporary Use Zoning Bylaw Amendment is being submitted to facilitate the development proposal.

Refer to Appendix-A for proposed conceptual site plan prepared by MGP Planning dated January 06, 2021.

Main development works will be construction of a temporary gravel parking lot and installation of private storm sewer system.

1.3 Existing Grading and Landform

From the topographic survey observation, the subject land terrain generally remains undisturbed at natural state and slopes towards the existing pond located at the north-east corner of the site. The existing landform feature ranges from 1 to 2 percent slopes. Existing pond concludes key feature found within the subject site.

1.4 Existing Infrastructures

The key existing infrastructures reviewed in support of the subject lands include:

Water A 150 mm diameter municipal watermain within Dixie Road.

Sanitary No municipal sanitary sewer system is available in this part of the Town and all existing adjacent residential lots are provided with individual septic system.

Storm The proposed development is located within rural part of the Town with municipal storm sewer system provided for road drainage only. Existing creek as receiving drainage system and roadside ditches as drainage conveyance system along with drainage culverts are considered existing stormwater drainage features within the vicinity of the subject site.

Refer to Appendix-C for Dixie Road plan and profile drawings for existing services.

1.5 Proposed Services

There are a few existing dwellings/structures at the site that will remain as part this current development proposal. The existing dwellings should have municipal water service. The record obtained from Town/Region does not show any sanitary sewer within Dixie Road.

The proposed site is temporary gravel parking lot development and as such no sanitary or additional water service connections are proposed.

This report will describe storm service and stormwater management aspect of the site in context of temporary gravel parking lot development in accordance with the Town of Caledon and Region of Peel standard criteria. This report will also identify any potential constraints that may affect the serviceability of the site.

2 STORMWATER MANAGEMENT

2.1 Water Quantity

Proposed temporary gravel parking lot is considered main change to existing landform. This disturbance to existing landform and increase to less permeable surface (gravel) will not result in a significant increase to post-development runoffs. This is due to make up of proposed temporary gravel parking lot surface in comparison to predevelopment condition as vegetated surface.

2.1.1 Maximum Allowable Release Rate

The existing creek is considered downstream receiving system for site drainage. The maximum allowable release rate to the existing creek is determined to be to 100-year major flows at 0.25 runoff coefficient. In addition, certain part of the subject site is situated within a sensitive environmental area (greenbelt) and will remain undisturbed. Also, drainage from this area due to grading constraints is considered uncontrolled will be sheet draining to existing pond/creek at predevelopment rates.

Refer to Appendix-Am for pre and post drainage plan which also illustrates the controlled and uncontrolled drainage areas.

Based on noted parameters, site maximum allowable release rate is calculated as follows:

Q = 0.0028 CIA
Where:

Q= Flow in cubic metres per second (m^3/s)
A= Area in hectares
C= Run-off coefficient
I= Intensity in mm/hr

C = 0.25
A = 7.23 ha (controlled drainage area)
I = $a/ (t+c)^b$ (a=4688, b=0.9624, c=17)
t = 10 min

I = $4688/ (10+17)^{0.9624}$
=196.54 mm/hour

Q (100-y) = 0.0028 (0.25) x (196.54) x (7.23)
=0.99 m^3/s

2.1.2 Uncontrolled Release Rate

As stated, drainage from certain part of the subject site due to grading constraints cannot be controlled and will let to flow uncontrolled. The proposed onsite retention system will be overcontrolled to account for uncontrolled drainage areas. Uncontrolled flow from this rea is calculated as follows:

Q = 0.0028 CIA
Where:

Q= Flow in cubic metres per second (m^3/s)
A= Area in hectares
C= Run-off coefficient
I= Intensity in mm/hr

C = 0.25
A = 2.97 ha (10.20-7.23 ha-Uncontrolled drainage area)
I = $a/ (t+c)^b$ (a=4688, b=0.9624, c=17)
t = 10 min

I = $4688/ (10+17)^{0.9624}$
= 196.54 mm/hour

Q (100-y) = 0.0028 (0.25) x (196.54) x (2.97)
= 0.41 m^3/s

The net maximum allowable rate is therefore calculated to be 0.58 m^3/s (0.99-0.41).

Onsite storage is required to attenuate the flows and release it to a net maximum allowable rate of 0.58 m^3/s.

2.1.3 Pre and Post Development Runoff Coefficient

As noted, predevelopment runoff coefficient is selected 0.25 for mainly grassed/vegetated surface for a conservative approach.

Post development runoff coefficients is evaluated to determine on-site retention peak volume. The runoff coefficient for post development condition is calculated to be 0.33.

Refer to Appendix-A, for proposed development pre & post development drainage plan.

Below Tables 4.1 shows post development runoff coefficient calculations:

Table 4.1 Post Development Runoff Coefficient

Surface Area Component	Total Area	'R'	Total Area
Gravel Parking	6.79	0.35	2.38
Landscape	3.71	0.25	0.93
Roof	0.20	0.9	0.18
Total	10.7		3.49

Composite 'R' = 3.49/10.70 = 0.33

2.1.4 Peak Storage Volume

Containment of the 100-year post development storm event will be required. On-site control is to be provided to limit the flow from proposed site to predevelopment level.

Peak storage volume is calculated as follows:

Controlled Drainage Area (A) =7.23 ha (10.7-2.97)

Post development Composite (R) =0.33

Orifice Release Rate (Q) =0.55 m^3/s (400 mm orifice)

Table 4.2 Peak Storage Volumes

t_c (min)	i_{100} (mm/hr)	Q_{100} (m^3/s)	Q_{stored} (m^3/s)	Peak Volume (m^3)
23	134.637	0.899	0.352	486.11
24	131.475	0.878	0.331	476.83
25	128.461	0.858	0.311	**466.50**
26	125.585	0.839	0.292	455.18
27	122.837	0.821	0.273	442.95

Based on the above calculations, the peak storage volume is 466.50 m^3. This volume can be accommodated in the proposed site storm sewer system. The total storage volume provided in the storm sewer system is 467.50 m^3 and the details are provided in the following Table 4.3:

Table 4.3 Storm Sewer System Storage Volume

Storm Sewer System Components	Diam (mm)	Area (m^2)	Length or Height (m)	Volume Provided (m^3)
Pipe	1,050	0.866	370.80	321.08
Pipe	525	0.216	519.50	112.46
Pipe	250	0.049	230.00	11.29
CB (24)	600x600	0.360	1.00	8.64
MH (8)	1,500	1.767	1.00	14.14
Total Storage Provided				467.60

Refer to Appendix-B, for detailed onsite control calculations.

In addition to above, for post development peak runoff reduction, the Low Impact Development (LID) measure considered as lot-level infiltration-based controls for the subject site (as outlined in MECP Stormwater Management Planning and Design Manual) to include the followings:

- reduced grading to allow greater ponding of stormwater and natural infiltration;
- infiltration trenches;
- grassed swales;
- pervious pipe systems;
- vegetated filter strips; and

The above LIDs have been evaluated and there is a limited opportunity to design and implement grassed swales along the perimeter of the site which helps in further reduction of site runoff by infiltration. The grass swales can convey the flows to existing receiving system in this case existing pond and also has quality control benefit.

Design and Implementation of the above lot-level quantity controls will be applicable during detailed design stages.

Refer to Drawing SGR1 enclosed in Appendix-A, for illustration proposed development drainage scheme.

Furthermore, from the topographical survey contours observation, it is evident that the proposed development receives external drainage from upstream lands to the south-west of the subject site. Proposed site grading and sewer system is designed in manner to safely convey the external drainage to existing pond located to the northeast corner of the subject site consistent with predevelopment drainage pattern.

2.2 Water Quality

It is proposed to install an offline Jellyfish (Model JF8-8-2) treatment system to achieve water quality targets for the development site. The treatment unit is designed to provide a minimum 80% Total Suspended Solid Removal (T.S.S.R.). The treatment unit is to be installed at the downstream end of the proposed storm sewer storage system. The unit will provide the required quality treatment for flows prior to discharge to existing pond.

Details of proposed offline Jellyfish (Model JF8-8-2) with TSS removal calculations are enclosed in Appendix -C for reference.

Proposed enhanced grass swale not only convey stormwater runoff, but it also provides effective quality control functionality. As such, the proposed enhanced grass swale along the perimeter of the temporary gravel parking lot provides additional quality treatment for site runoff.

Design of enhanced grass swale will be provided at detailed design stages.

TRCA standard Enhanced Grass Swale detail is enclosed in Appendix-C for reference.

2.3 Water Balance

No significant changes to overall water balance essential components are expected due to proposed development. As such, the impact of proposed lot development on water balance is considered minor in nature. Nonetheless, the recommended enhanced grass swale LID mitigation measure promotes natural infiltration of site runoff. This will offset the loss of infiltration from temporary gravel parking lot area to a significant level.

2.4 Sedimentation and Erosion Control During Construction

On-site erosion and sediment control should be implemented for all construction activities within the subject site, and for each consecutive stages of construction, including earthworks, and servicing activities. Erosion and sedimentation control plan is designed in accordance with TRCA Sedimentation Control Guidelines for Urban Construction (2006).

The basic principles to be considered for minimizing erosion, sedimentation, and resultant negative environmental impacts include:

- Minimize local disturbance activities (e.g. grading);
- Expose the smallest possible land area to erosion for the shortest possible time;
- Implement erosion and sediment control measures before the outset of construction activities; and,

- Carry out regular inspections of erosion and sediment control measures and repair or maintain as necessary;
- Erect sediment control fence around site perimeters;
- Install sediment control fence around site perimeters existing wetlands;
- Provide sediment traps (e.g. rock check dams, straw bales, scour basins) along interceptor swales and points of swale discharge;
- Provide gravel "mud mats" at construction vehicle access points to minimize off-site tracking of sediments; and,
- Confine refueling/servicing equipment to areas well away from inlets to the minor system or major system elements.
- Remove erosion and sediment controls once construction is completed and sediment run-off from the construction activities has stabilized.

Refer to Appendix-A, Drawing EC1 for Erosion and Sedimentation Control plan.

3 LANDFORM AND GRADING

Effort is made to preserves the existing landform and grades to the extent possible. To achieve this, proposed site corner grades match existing grades minimizing any grading disturbances along proposed site boundaries.

The proposed temporary gravel parking lot is graded in a manner to safely convey and bypass the external flow through the site to existing creek receiving system.

Refer to Drawing SGR1 enclosed in Appendix-A for grading plan.

4 SUMMARY AND RECOMMENDATIONS

This report has demonstrated that the subject development can be serviced by existing and proposed servicing infrastructures. More specifically, storm servicing and SWM design analysis for proposed development are summarized as follows:

Storm

Quantity Control

Quantity control is required for subject site. Peak storage volume is to be provided by site storm sewer system. In addition, as part of Low Impact Development (LID) measures, on site enhanced grass swale is also proposed to further reduce peak post development runoff.

Quality Control

An offline Jellyfish treatment system is proposed to provide water quality treatment for site flows prior to discharging to existing receiving system. Enhanced grass swale is proposed which also provide additional at source quality treatment of the site drainage.

Water Balance

As noted, site water balance essential components do not experience significant changes due to proposed development. Nonetheless, proposed enhanced grass swale provides infiltration as mitigation measure to offset losses in infiltration.

We trust you will find this submission complete and in order. Should you have any questions, please contact the undersigned.

Respectfully Submitted,
MASONGSONG ASSOCIATES ENGINEERING LIMITED

Mansoor Nooristani, C.E.T.
Senior Project Technologist

Andrew Ip, P.Eng
Principal

Appendix A

- Subject Lands - 10.7 ha
- Limit of Greenbelt
- Waterbody
- Wetland +30m
- Meanderbelt
- Meanderbelt +30m
- Staked Valleyland 10m Buffer
- Woodland 10m Buffer

Schedule of Land Use

Parking Area	6.79 ha
Landscaped Area	2.15 ha
Environmental Area	1.76 ha
Total Area	10.70 ha

Scale:

0 20 40 60 80 100m

CONCEPTUAL TRANSPORT TRUCK / TRAILER PARKING LAYOUT

12434 DIXIE ROAD

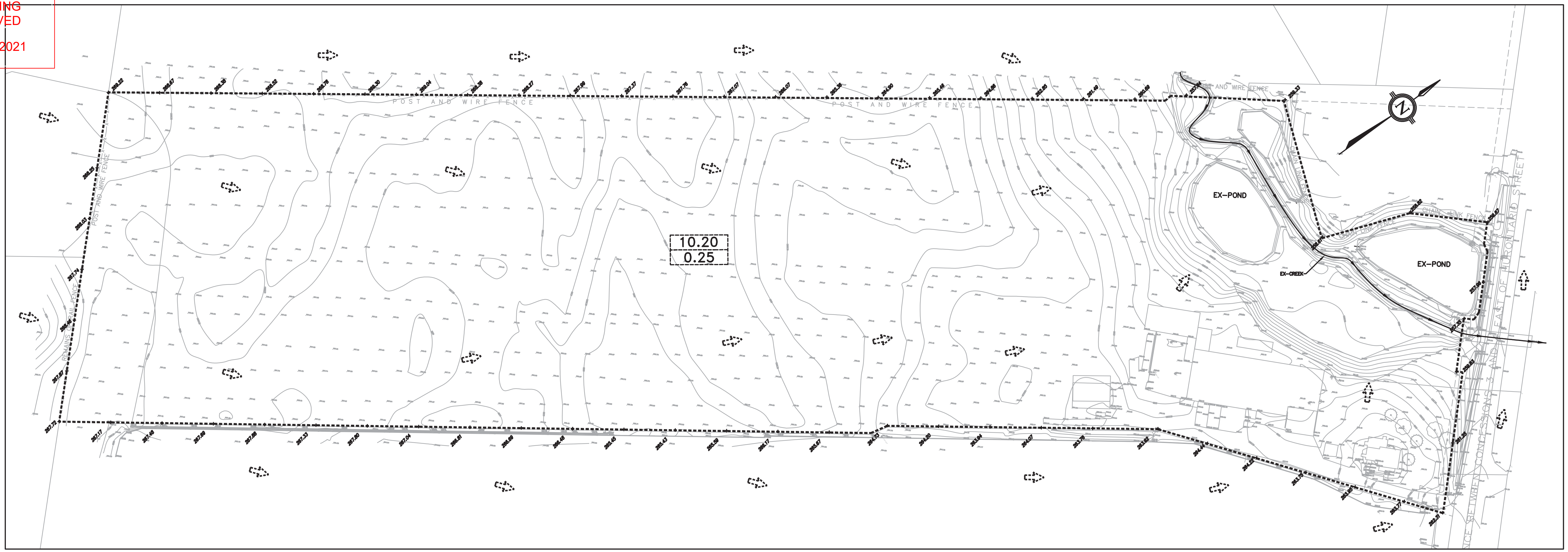
Town of Caledon
Regional Municipality of Peel

Date	Revision	By
Jan 6 / 21		

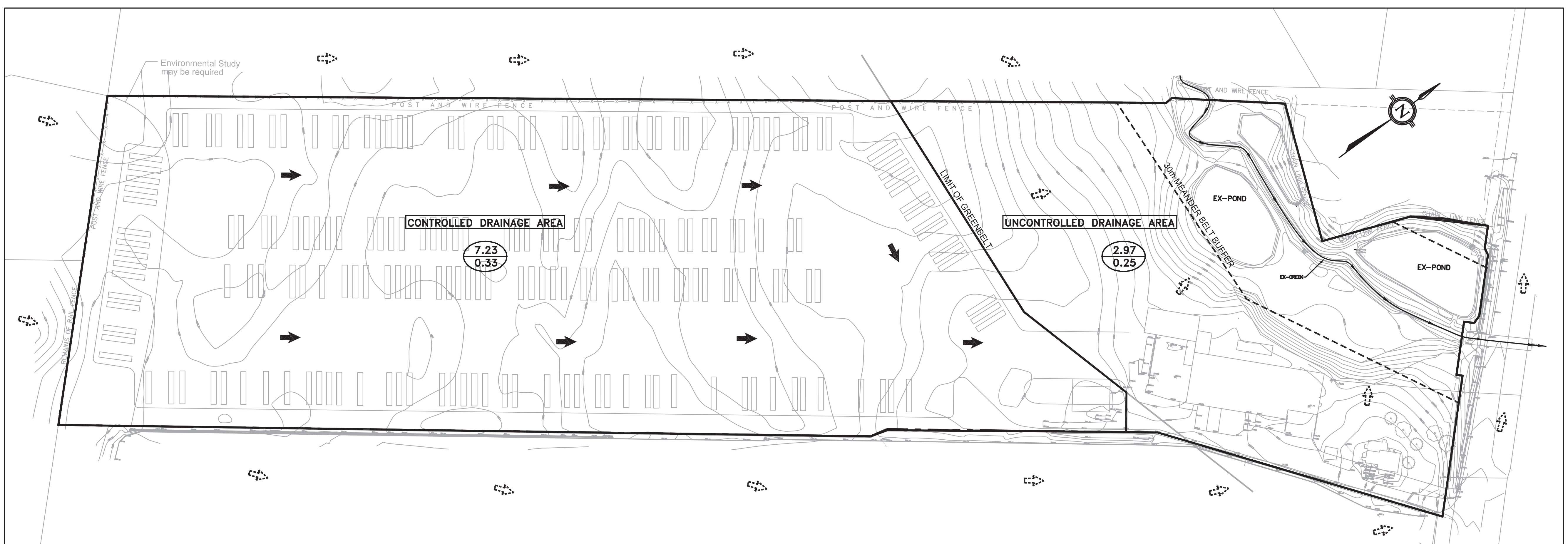
Prepared For:

MGP File: 19-2852

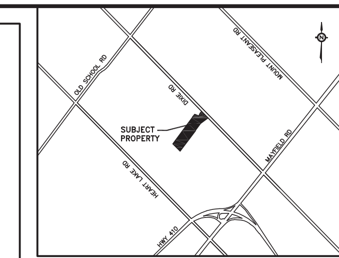
MGP Malone Given Parsons.
140 Renfrew Drive, Suite 201 | Markham, ON | L3R 6B3
905 513 0170 | mgp.ca



PRE DEVELOPMENT DRAINAGE PLAN



POST DEVELOPMENT DRAING PLAN



LEGEND:

- 0.40 — CONTROLLED DRAINAGE AREA (ha)
- 0.75 — RUNOFF COEFFICIENT
- 15.10 — UNCONTROLLED DRAINAGE AREA (ha)
- 0.25 — RUNOFF COEFFICIENT
- PROPOSED OVERLAND FLOW DIRECTION
- EXISTING OVERLAND FLOW
- PROPOSED DRAINAGE AREA
- EXISTING DRAINAGE AREA
- EXTERNAL DRAINAGE AREA
- PROPOSED ENHANCED GRASS SWALE

PROJECT:
TRANSPORT TRUCK/TRAILER PARKING
12434 DIXIE ROAD
TOWN OF CALEDAON

CONSULTANT:
MASONGSONG ASSOCIATES
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MARKHAM, ONTARIO
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T: (905) 944-0162
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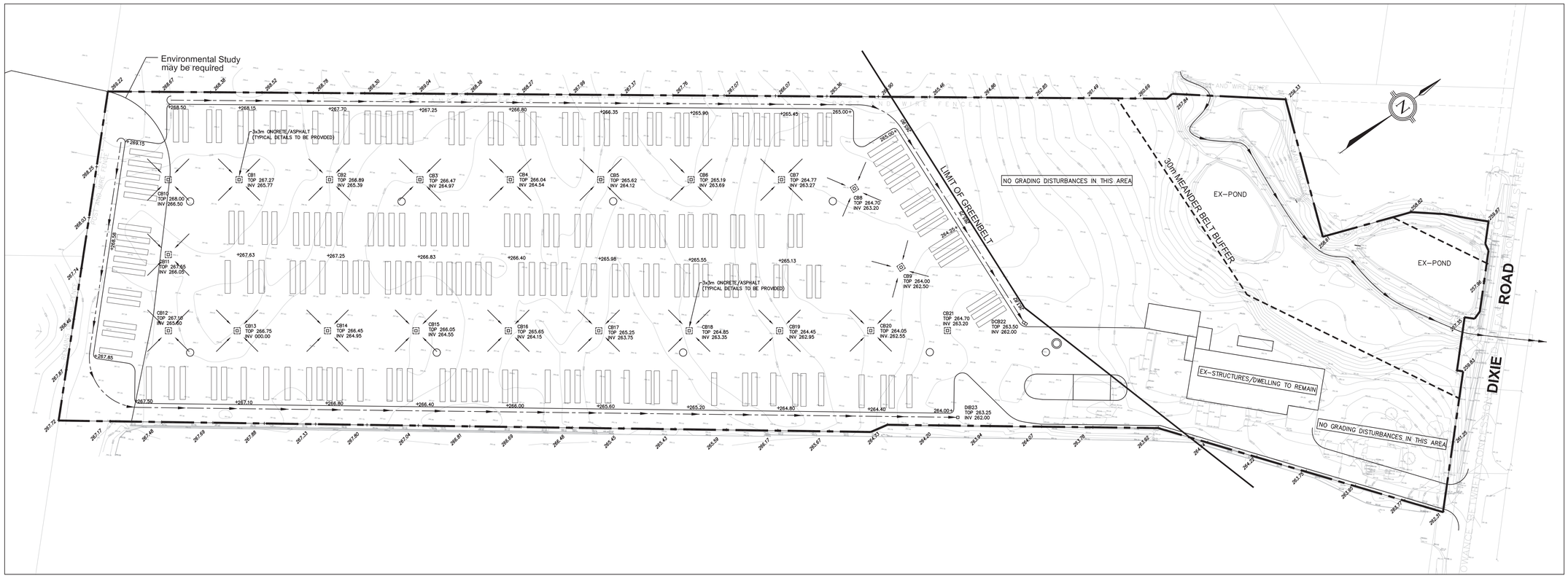
Region of Peel
Working for you

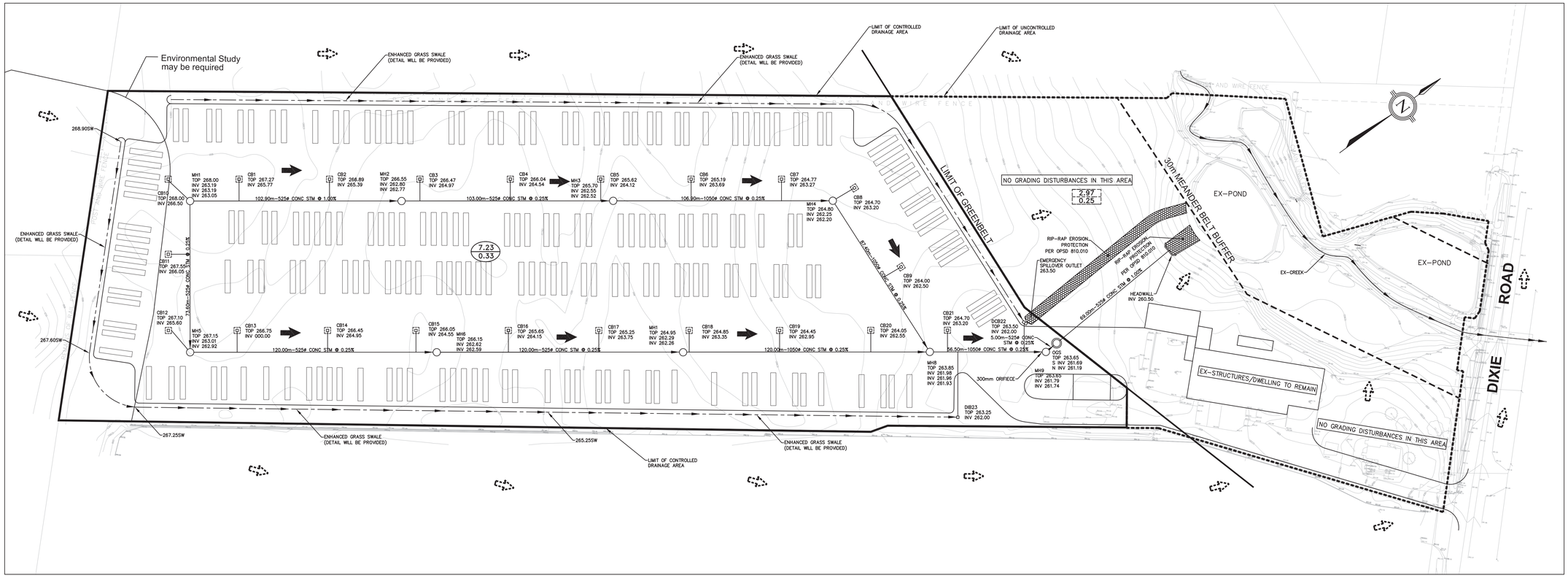
TOWN OF CALEDON

TITLE:
PRE & POST DRAINAGE PLAN

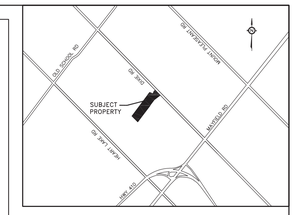
SCALE: NTS		PROJECT No. 20-034
DESIGNED BY: M.N.	DRAWN BY: MAEL CAD	PLAN No. PPD-1
CHECKED BY: A.I.	DATE: JANUARY 2021	



GRADING PLAN



STORM SERVICING PLAN



LEGEND:

- EXISTING CATCHBASIN
- EXISTING SANITARY MANHOLE
- EXISTING STORM MANHOLE
- EXISTING HYDRANT
- PROPOSED SANITARY MANHOLE
- PROPOSED STORM MANHOLE
- PROPOSED CATCHBASIN
- VALVE & CHAMBER
- HYDRANT & VALVE
- 0.40 / 0.75 — CONTROLLED DRAINAGE AREA (ha) / RUNOFF COEFFICIENT
- 15.10 / 0.25 — UNCONTROLLED DRAINAGE AREA (ha) / RUNOFF COEFFICIENT
- PROPOSED OVERLAND FLOW DIRECTION
- EXISTING OVERLAND FLOW
- PROPOSED DRAINAGE AREA
- EXISTING DRAINAGE AREA
- EXTERNAL DRAINAGE AREA
- PROPOSED ENHANCED GRASS SWALE

REVISIONS

No.	BY	DATE	REVISION	CONS. CHECKED	TOWN APP'D
1	--	----			

APPROVED FOR CONSTRUCTION

THIS APPROVAL CONSTITUTES A GENERAL REVIEW AND DOES NOT CERTIFY DIMENSIONAL ACCURACY.

THIS APPROVAL IS SUBJECT TO THE FURTHER CERTIFICATION OF THE "AS CONSTRUCTED" WORKS BY A REGISTERED PROFESSIONAL ENGINEER OF THE PROVINCE OF ONTARIO.

DATE:_____ APPROVED BY:_____
H. MUNTZ, P.ENG.
Town Engineer

ELEVATION NOTES

ELEVATION SHOWN HEREON ARE GEODETIC AND DERIVED FROM THE TOWN OF CALEDON BENCHMARKS.

LOCAL BENCHMARK

NO. 00819755B066 ELEVATION = 277.870 METRES AND NO. 00819778416 ELEVATION = 318.849 METRES

DESIGNED BY: LICENSED PROFESSIONAL ENGINEER W. C. IP FEB 22, 21 PROVINCE OF ONTARIO

APPROVED BY

PROJECT:
TRANSPORT TRUCK/TRAILER PARKING
12434 DIXIE ROAD
TOWN OF CALEDAON

CONSULTANT:
MASONGSONG ASSOCIATES
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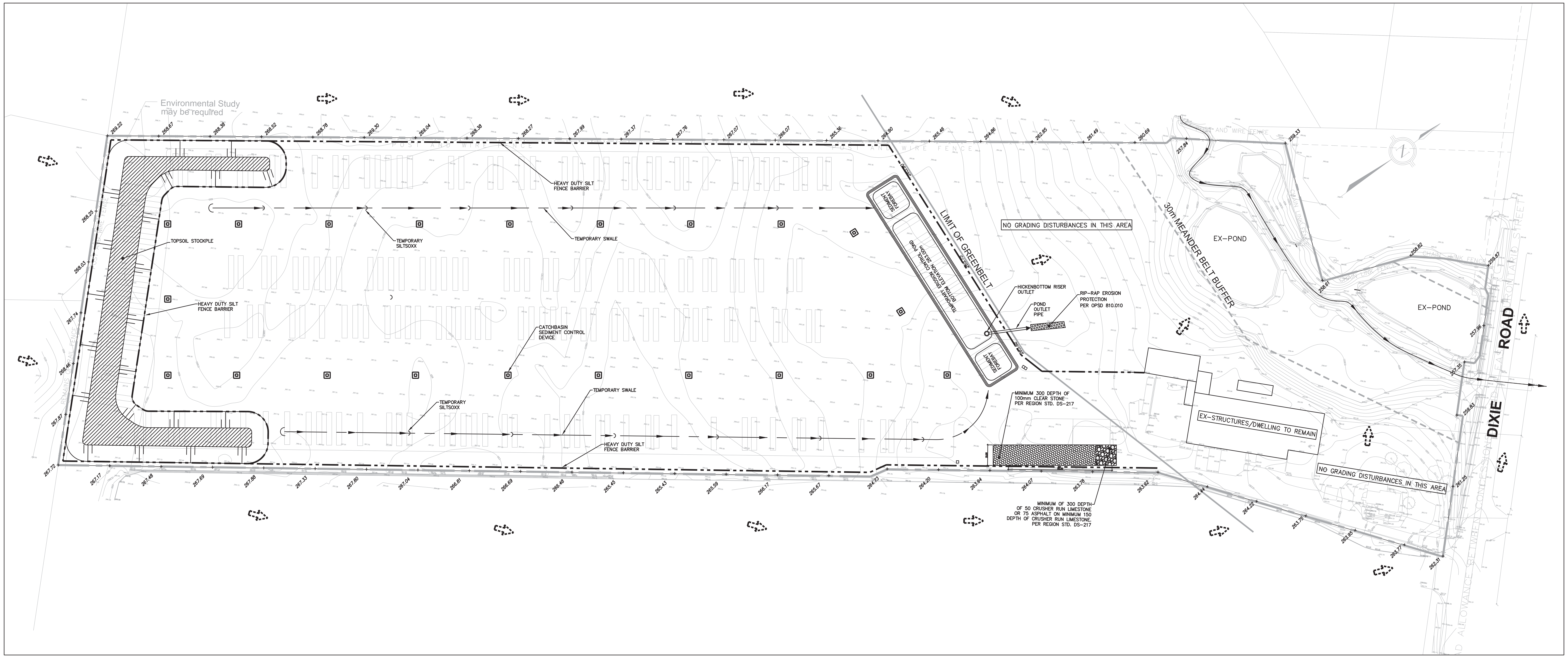
Region of Peel
Working for you

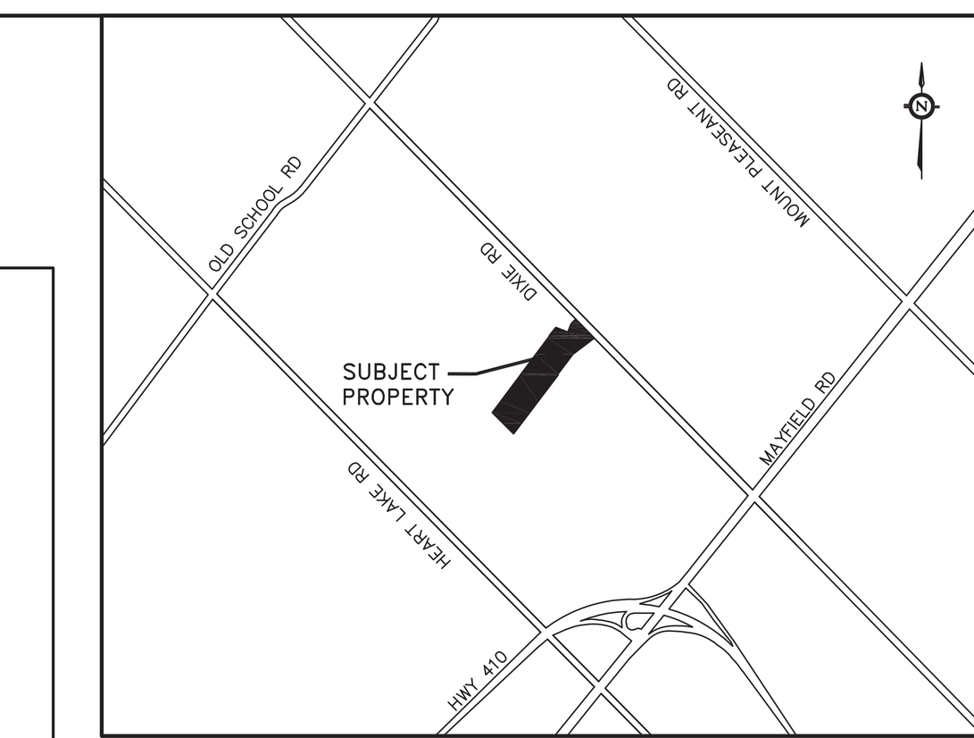
TOWN OF CALEDON

TITLE:
SERVICING & GRADING PLAN

SCALE: 1:750		PROJECT No.	20-034
DESIGNED BY: M.N.	DRAWN BY: MAEL CAD	PLAN No.	SGR-1
CHECKED BY: A.I.	DATE: JANUARY 2021		



PHASE-1& 2: TOPSOIL STRIPPING AND AREA GRADING & SERVICING CONSTRUCTION



LEGEND:

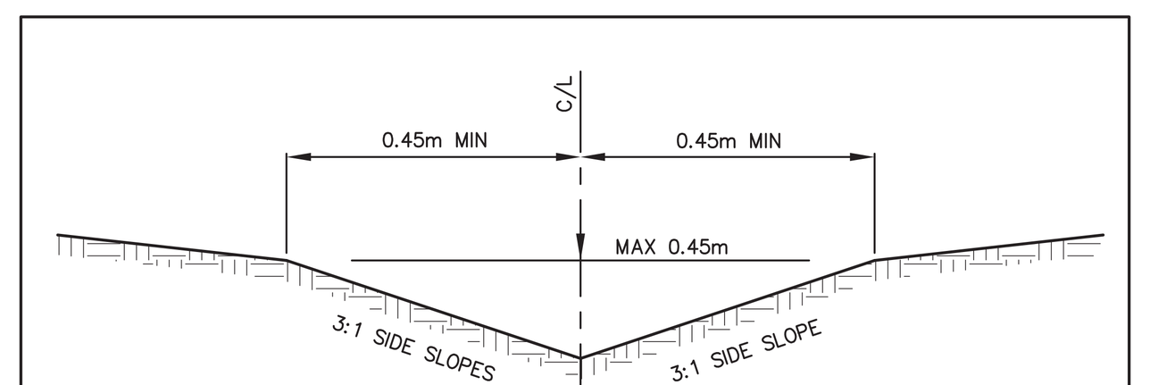
- EXISTING CATCHBASIN
- EXISTING SANITARY MANHOLE
- EXISTING STORM MANHOLE
- EXISTING HYDRANT
- PROPOSED SANITARY MANHOLE
- PROPOSED STORM MANHOLE
- PROPOSED CATCHBASIN
- VALVE & CHAMBER
- HYDRANT & VALVE

TOPSOIL STOCKPILE

STRIPPED	=7.231ha
DEPTH	=0.30m
VOLUME	=0.30x7.23x10,000 =21,690.00m³
STOCKPILE FOOTPRINT AREA	=7,485.00m²
MAXIMUM HEIGHT	=4.00m
SLOPE	=2:1

TEMPORARY SEDIMENTATION CONTROL POND

CONTRIBUTING AREA	=7.23ha
REQUIRED ACTIVE POOL VOLUME	$=125m^3/ha x 7.23ha = 903.75m^3$
REQUIRED PERMANENT POOL VOLUME	$=125m^3/ha x 7.23ha = 903.75m^3$
PROVIDED ACTIVE POOL VOLUME	$=993.00m^3$ (0.50m DEEP)
PROVIDED PERMANENT POOL VOLUME	$=930.00m^3$ (0.50m DEEP)
TOTAL PROVIDED VOLUME	$=1,923.00^3$



TEMPORARY SWALE CROSS-SECTION
N.T.S

DECOMMISSIONING OF TEMPORARY SEDIMENT CONTROL BASINS

1. AS DIRECTED BY THE CONSULTANT, REMOVE THE TEMPORARY HEADWALL STRUCTURE, MANHOLES, RIP RAP, FILTER FABRIC AND ANY CLEAR STONE AT THE BOTTOM OF THE TEMPORARY SEDIMENT CONTROL BASINS AND DISPOSE OFF-SITE.
2. EXCAVATE AND REMOVE ALL MATERIAL 0.60 METRE (MIN) BELOW BOTTOM OF THE TEMPORARY SWM POND OR MORE AS DIRECTED BY THE GEOTECHNICAL CONSULTANT. ALL EXCAVATED MATERIAL TO BE DISPOSED OFF-SITE.
3. ONCE THE TEMPORARY TEMPORARY SEDIMENT CONTROL BASINS HAVE BEEN REMOVED, THE LAND IS TO BE ENGINEERED FILLED. ALL FILLING IS TO BE COMPACTED TO 98% STANDARD PROCTOR DENSITY, OR AS APPROVED BY THE GEOTECHNICAL CONSULTANT.
4. IF DISCHARGING THE WATER THROUGH A FILTER BAG THE LOCATION OF THE DISCHARGE POINT MUST BE 30m AWAY FROM THE WATERCOURSE

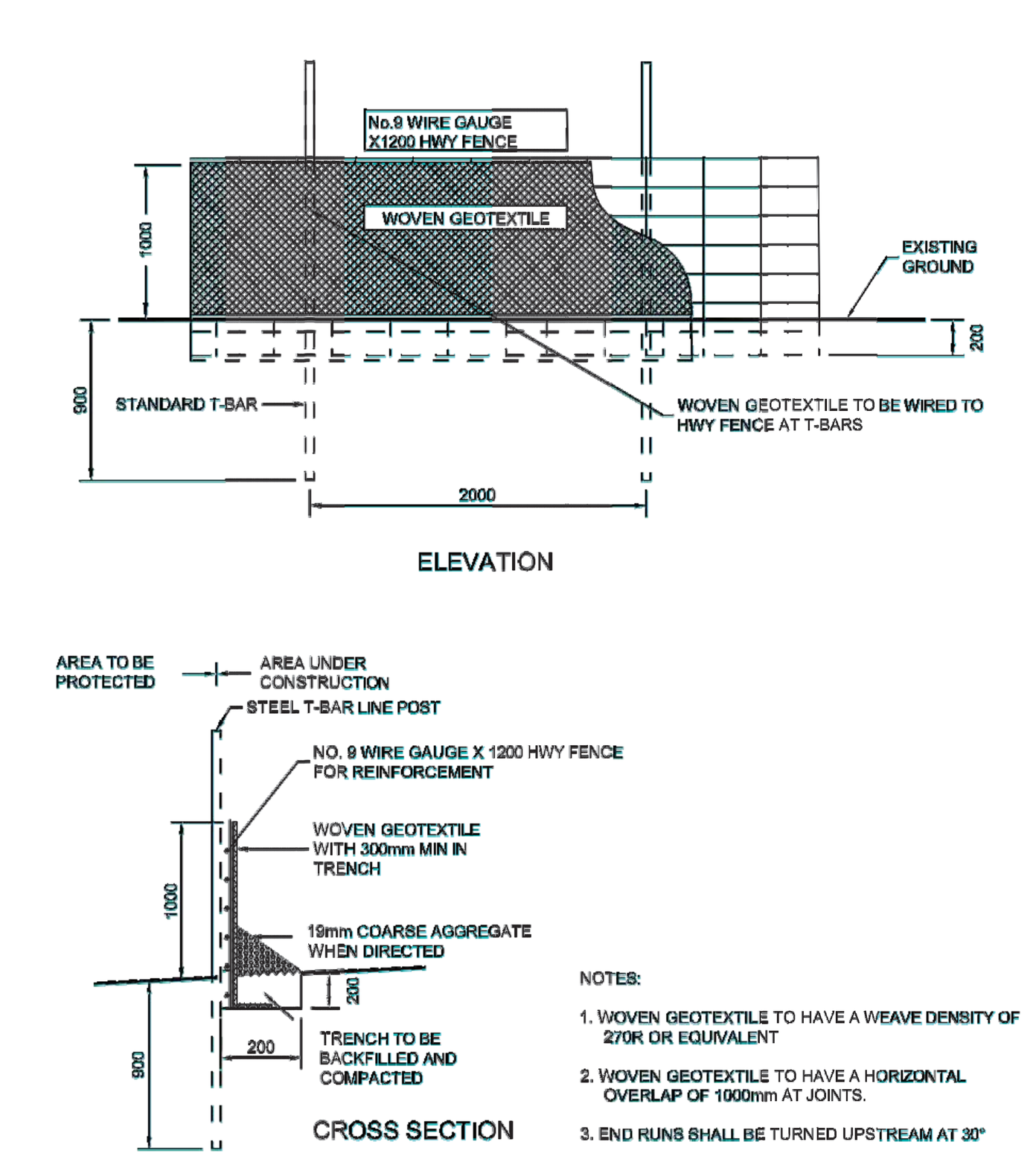
DEWATERING NOTES:

1-LAY FILTER FABRIC
2-PLACE SEDIMENT BAG ON FILTER FABRIC
3-PLACE SILT SOXX ALONG THE PARAMETER OF FILTER FABRIC
4-PUMP SEDIMENT LADEN WATER FROM EROSION POND TO THE SEDIMENT BAG
5-TREATED WATER TO DISCHARGE TO CATCHBASIN
6-USE THE SAME METHOD FOR DEWATERING OF SEDIMENT TRAPS

LEGEND:

- INTERCEPTOR SWALE
- CATCHBASIN SEDIMENT CONTROL DEVICE
- TEMPORARY SILTSOXX
- HEAVY DUTY SILT FENCE BARRIER
- MUD-MAT FOR TEMPORARY CONSTRUCTION ACCESS

ESC MEASURE	TIMING OF INSTALLATION	INSPECTION/MAINTENANCE REQUIREMENTS	TIMING FOR REMOVAL
PHASE 1 – TOPSOIL STRIPPING AND AREA GRADING			
1. SILTATION CONTROL FENCE (OPSD 219.130) 2. CONSTRUCTION MUD MAT (DETAILED ON ESC DRAWING) 3. DRAINAGE/INTERCEPTOR SWALES (ILLUSTRATED ON ESC DRAWING) 4. SILTSOXX (CATCHBASIN SEDIMENT CONTROL DEVICE) 5. SEDIMENT CONTROL FACILITY (ILLUSTRATED ON ESC DRAWING) 6. OTHERS AS REQUIRED	PRIOR TO TOPSOIL STRIPPING PRIOR TO TOPSOIL STRIPPING DURING PRE-GRADING WORKS. DURING PRE-GRADING WORKS. DURING TOPSOIL STRIPPING. PRIOR TO TOPSOIL STRIPPING. DURING PRE-GRADING WORKS.	CONSULTANT TO ARRANGE INSPECTION WITH CITY STAFF ONCE INSTALLATION IS COMPLETE. CONSULTANT TO UNDERTAKE WEEKLY INSPECTIONS AND AFTER EACH RAINFALL EVENT, INCLUDING WEEKLY REPORTING. REGULAR MAINTENANCE TO REMOVE ACCUMULATED SEDIMENT ONCE 50% OF CAPACITY IS EXCEEDED AND REPAIR ESC MEASURES AS REQUIRED.	JUST PRIOR TO FINAL GRADING, REPLACEMENT WITH PHASE 2 MEASURES, OR CONSTRUCTION OF MUNICIPAL SERVICES.
PHASE 2 – MUNICIPAL SERVICING CONSTRUCTION			
1. GRASS VEGETATION HYDROSEEDING OF RESTORATION AREAS 2. SEDIMENT TRAPS (DETAILED ON ESC DRAWING) 3. DRAINAGE/INTERCEPTOR SWALES (ILLUSTRATED ON ESC DRAWING) 4. TEMPORARY CONNECTIONS TO STORM SEWER (ILLUSTRATED ON ESC DRAWING) 5. STORM DRAIN INLET PROTECTION, SILT SACK (DETAILED ON ESC DRAWING) 6. OTHERS AS REQUIRED BY CITY OR TRCA	GRADED AREAS TO BE SEEDED WITHIN 2 WEEKS AFTER GRADING AND INSTALLATION OF STORM DRAINAGE STSTEM IS COMPLETE.	CONSULTANT TO UNDERTAKE WEEKLY INSPECTIONS AND AFTER EACH RAINFALL EVENT, INCLUDING WEEKLY REPORTING. REGULAR MAINTENANCE TO REMOVE ACCUMULATED SEDIMENT ONCE 50% OF CAPACITY IS EXCEEDED AND REPAIR ESC MEASURES AS REQUIRED. RELOCATION OF THE ON-SITE SEDIMENTATION CONTROLS ARE REQUIRED AS BUILDING PROGRESSES.	JUST PRIOR TO FINAL GRADING OR BUILDING CONSTRUCTION
PHASE 3 – BUILDING CONSTRUCTION			
1. MAINTENANCE AND REPAIRS TO ALL REMAINING ESC MEASURES AS PER DETAILED INSPECTION WITH CITY INSPECTOR 2. REMOVAL OF IDENTIFIED PHASE 1 OR 2 MEASURES	PRIOR TO BUILDING CONSTRUCTION, ESC MEASURES TO BE REPAIRED AS PER CITY DEFICIENCY LIST.	DETAILED INSPECTION OF ALL REMAINING ESC MEASURES WITH CITY INSPECTOR. CONSULTANT TO UNDERTAKE WEEKLY INSPECTIONS AND AFTER EACH RAINFALL EVENT, INCLUDING WEEKLY REPORTING. REGULAR MAINTENANCE TO REMOVE ACCUMULATED SEDIMENT ONCE 50% OF CAPACITY IS EXCEEDED AND REPAIR ESC MEASURES AS REQUIRED.	JUST PRIOR TO FINAL GRADING AND SODDING OF LOT/BLOCK AREAS.



NOTES:

1. WOVEN GEOTEXTILE TO HAVE A WEAVE DENSITY OF 270R OR EQUIVALENT
2. WOVEN GEOTEXTILE TO HAVE A HORIZONTAL OVERLAP OF 1000mm AT JOINTS.
3. END RUNS SHALL BE TURNED UPSTREAM AT 30°

NO.	REVISION	APR'D	DATE
2	NAME CHANGED, STANDARD No. 325.01 NOW 304		JUNE 08
1	SUPPORT FENCING CHANGED TO HWY FENCE		Oct 02

TOWN OF CALEDON — APR'D: C.C. — DATE: APRIL 2000 — DRAWN: BJM — SCALE: N.T.S.

SEDIMENT CONTROL FENCE — STANDARD No. 304

EROSION AND SEDIMENT CONTROL GENERAL NOTES

1. THE OWNER IS RESPONSIBLE FOR OBTAINING ALL NECESSARY APPROVAL FROM THE TOWN AND EXTERNAL AGENCIES PRIOR TO ANY SITE ALTERATION ACTIVITY.
2. PRIOR TO COMMENCEMENT OF ANY ON-SITE/TOPSOIL STRIPPING, EROSION & SEDIMENT CONTROL (ESC) MEASURES, AS PER APPROVED SITE ALTERATION PLAN, MUST BE INSTALLED AND APPROVED BY THE DIRECTOR OF ENGINEERING. ADDITIONAL ESC MEASURES, IF REQUIRED, SHALL BE INSTALLED AS DIRECTED BY THE DIRECTOR OF ENGINEERING. THE ESC MEASURES SHALL REMAIN IN PLACE UNTIL DIRECTED BY THE DIRECTOR OF ENGINEERING FOR THEIR REMOVAL.
3. TREES ARE TO BE RESERVED AS PER THE APPROVED TREE PRESERVATION PLAN.
4. NO CONSTRUCTION ACTIVITY OR MACHINERY SHALL BE ALLOWED BEYOND THE SILT/SNOW FENCE OR LIMITS OF THE SUBDIVISION.
5. THE CONTRACTOR IS RESPONSIBLE TO IMPLEMENT DUST CONTROL MEASURES AND CONSTRUCTION PRACTICE GUIDELINES AS APPROVED BY TOWN/TRCA.
6. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING ALL ESC MEASURES IN WORKING CONDITIONS AT ALL TIMES TO THE SATISFACTION OF THE DIRECTOR OF ENGINEERING. THE CONTRACTOR SHALL ROUTINELY INSPECT ALL ESC DEVICES MINIMUM ONCE A WEEK AND AFTER EACH RAINFALL EVENT GREATER THAN 10mm TO ENSURE THAT ESC MEASURES ARE IN PROPER WORKING CONDITIONS. ANY DAMAGES MUST BE REPAIRED WITHIN 24 HOURS.
7. ALL CONSTRUCTION VEHICLES MUST ENTER AND EXIT THE SITE ONLY FROM THE APPROVED ACCESS ROUTE(S) AS SHOWN ON THE PLAN.
8. CATCHBASIN SEDIMENT CONTROL DEVICES ARE TO BE INSTALLED IMMEDIATELY AFTER BASE ASPHALT.
9. SEDIMENTS COLLECTED IN THE SEDIMENT CONTROL PONDS SHALL BE REMOVED WHEN 50% OF THE STORAGE CAPACITY IS FILLED. THE POND SHALL BE KEPT IN OPERATION UNTIL SODDING OF DISTURBED AREAS IS COMPLETED TO THE SATISFACTION OF THE DIRECTOR OF ENGINEERING.
10. ALL DISTURBED GROUND LEFT INACTIVE FOR OVER 30 DAYS SHALL BE VEGETATED, SUBJECT TO WEATHER CONDITIONS, BY SEEDING OR APPROVED EQUIVALENT TO THE SATISFACTION OF THE DIRECTOR OF ENGINEERING.
11. ALL TOPSOIL STOCKPILES IF REMAIN ON SITE FOR MORE THAT 30 DAYS SHALL BE VEGETATED. SUBJECT TO WEATHER CONDITIONS, BY SEEDING OR APPROVED EQUIVALENT TO THE SATISFACTION OF THE DIRECTOR OF ENGINEERING.
12. STREET SWEEPING/CATCHBASIN CLEANING PROGRAM TO BE IMPLEMENTED UPON COMPLETION OF BASE ASPHALT TO THE SATISFACTION OF THE DIRECTOR OF ENGINEERING.
13. ALL TOPSOIL STOCKPILES SHALL BE SURROUNDED WITH SEDIMENT CONTROL FENCE. THE MAXIMUM SIDESLOPES FOR STOCKPILES SHALL BE 1.5 (H) TO 1.0 (V). THE MAXIMUM HEIGHT OF STOCKPILE SHOULD NOT EXCEED 5.0 METRES.
14. THE EROSION AND SEDIMENT CONTROL STRATEGIES OUTLINED ON THE PLANS ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO MINIMIZE SEDIMENT LADEN RUNOFF FROM LEAVING THE WORK AREAS. IF THE PRESCRIBED MEASURES ON THE PLANS ARE NOT EFFECTIVE IN PREVENTING THE RELEASE OF A DELETERIOUS SUBSTANCE, INCLUDING SEDIMENT,THEN ALTERNATIVE MEASURES MUST BE IMPLEMENTED IMMEDIATELY TO MINIMIZE POTENTIAL ECOLOGICAL IMPACTS. TRCA ENFORCEMENT OFFICER (BEN KRUL, TELEPHONE : 416-661-6600 EXT. 5769) SHOULD BE IMMEDIATELY CONTACTED. ADDITIONAL ESC MEASURES TO BE KEPT ON SITE AND USED AS NECESSARY.
15. THE CONTRACTOR SHALL ENDEAVOUR TO PREVENT MUD TRUCKING ONTO EXISTING RIGHT-OF-WAY AND SHALL PROVIDE FOR CLEANUP AT HIS/HER OWN EXPENSE AS DIRECTED BY ENGINEER.
16. THE CONTRACTOR SHALL CARE AND CONTROL SPILLS, FLUIDS, AND MATERIALS DURING CONSTRUCTION TO MINIMIZE RISK TO ENVIRONMENT.
17. EROSION AND SEDIMENT CONTROL (ESC) MEASURES WILL BE IMPLEMENTED PRIOR TO, AND MAINTAINED DURING THE CONSTRUCTION PHASES, TO PREVENT ENTRY OF SEDIMENT INTO THE WATER .ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF THE INSPECTION

REVISIONS

No.	BY	DATE	REVISION	CONS. CHECKED	TOWN APPR'D
1	--	----			

APPROVED FOR CONSTRUCTION

THIS APPROVAL CONSTITUTES A GENERAL REVIEW AND DOES NOT CERTIFY DIMENSIONAL ACCURACY.

THIS APPROVAL IS SUBJECT TO THE FURTHER CERTIFICATION OF THE "AS CONSTRUCTED" WORKS BY A REGISTERED PROFESSIONAL ENGINEER OF THE PROVINCE OF ONTARIO.

DATE:________________ APPROVED BY:____________________
H. MUNTZ, P.ENG.
Town Engineer

ELEVATION NOTES

ELEVATION SHOWN HEREON ARE GEODETIC AND DERIVED FROM THE TOWN OF CALEDON BENCHMARKS.

LOCAL BENCHMARK

NO. 008197558066 ELEVATION = 277.870 METRES AND NO. 00819778416 ELEVATION = 318.849 METRES

DESIGNED BY: LICENSED PROFESSIONAL ENGINEER — W. C. IP — FEB 22, 21 — PROVINCE OF ONTARIO

APPROVED BY

PROJECT:
TRANSPORT TRUCK/TRAILER PARKING
12434 DIXIE ROAD
TOWN OF CALEDAON

CONSULTANT:
MASONGSONG ASSOCIATES
7800 KENNEDY ROAD
SUITE 201
MARKHAM, ONTARIO
L3R 2C7
T: (905) 944-0162
www.maeng.ca

Region of Peel
Working for you

TOWN OF CALEDON

TITLE:
EROSION AND SEDIMENT CONTROL PLAN

SCALE: 1:750		PROJECT No. 20-034	
DESIGNED BY: M.N.	DRAWN BY: MAEL CAD	PLAN No. EC-1	
CHECKED BY: A.I.	DATE: JANUARY 2021		

Appendix B

Table 101

On-Site Storage Calculator

Project: 12434 Dixie Road
Project No.: 20-034
By: M.N.
Date: 10-Jan-21

$$i_{100} = 4688 * (t_{c+17})^{0.9624}$$

A = 7.230 ha
Composite C = 0.330
Q_{ACTUAL} = 0.55 m^3/s $Q_{ALLOWABLE}$ = 0.58 m^3/s

t_c (min)	i_{100} (mm/hr)	Q_{100} (m^3/s)	Q_{stored} (m^3/s)	Peak Volume (m^3)	
5	239.354	1.599	1.052	315.545	
6	229.330	1.532	0.985	354.547	
7	220.126	1.471	0.923	387.815	
8	211.646	1.414	0.867	416.024	
9	203.806	1.362	0.814	439.744	
10	196.536	1.313	0.766	459.466	
11	189.777	1.268	0.721	475.607	
12	183.475	1.226	0.679	488.531	
13	177.585	1.186	0.639	498.553	
14	172.068	1.150	0.602	505.946	
15	166.890	1.115	0.568	510.952	
16	162.020	1.082	0.535	513.784	
17	157.432	1.052	0.505	514.627	
18	153.100	1.023	0.476	513.649	
19	149.005	0.995	0.448	510.998	
20	145.128	0.970	0.422	506.807	
21	141.450	0.945	0.398	501.193	
22	137.958	0.922	0.374	494.263	
23	134.637	0.899	0.352	486.115	
24	131.475	0.878	0.331	476.833	
25	128.461	0.858	0.311	466.499	***
26	125.585	0.839	0.292	455.182	
27	122.837	0.821	0.273	442.948	
28	120.209	0.803	0.256	429.857	
29	117.693	0.786	0.239	415.962	

TABLE 102

Orifice Sizing Calculator

Project: 12434 Dixie Road
Project No.: 20-034
By: M.N
Date: 10-Jan-21

Diam (mm)	Area (m^2)	C	h (m)	$Q_{release}$	
400	0.126	0.80	1.51	0.5472	m^3/s
				547.19	L/s

Total Actual Release= 0.55

Total Allowable Release= 0.58

TABLE 103

Storage Sizing Calculator

Project: 459.4656739
Project No.: 475.6071765
By: M.N
Date: 10-Jan-21

Sewer Component	Diam (mm)	Area (m^2)	Length or Height (m)	Vol. (Provided)	Vol. (Required)
Pipe	1,050	0.866	370.80	321.08	
Pipe	525	0.216	519.50	112.46	
Pipe	250	0.049	230.00	11.29	
CB (24)	600x600	0.360	1.00	8.64	
MH (8)	1,500	1.767	1.00	14.14	
Total				467.60	466.50

Appendix C

SEE PLAN No. 20123-D

SEE PLAN No. 20121-D

8+160

7+860

SEDIMENT TRAP

PROP. FARM FENCE — SEE NOTE A (TYP)

20x10 TEMPORARY EASEMENT

SILT FENCE

SEE NOTE D (TYP)

SENTRE SYSTEM GUIDE RAIL END TREATMENT

PROP NEW HYD

EX. 300 WM

EX. CB

GUIDE RAILS AS PER OPSD 902.03

EX. 450 STM

EX. 75 LEACHATE

GUIDE RAIL LEAVING END TREATMENT AS PER OPSD 902.05

SILT FENCE

20x5 TEMP EASEMENT

EX. BOX CULVERT

PERMISSION TO ENTER TO REGRADE DRIVEWAY

PERMISSION TO ENTER TO REGRADE DRIVEWAY

MATCH LINE

MATCH LINE

22.0m x 450 x 1.6 CSP

10.0m x 400 x 1.6 CSP

REPLACE EX. TWIN 600 CSP'S WITH 21.0m x 900 x 2 CSP

SEDIMENT TRAP SILT FENCE

INV. 260.70

INV. 261.00

33.0m x 450 x 1.6 CSP

PROP. FARM FENCE SEE NOTE A (TYP)

℄ OF DITCH

℄ OF DITCH

LOT 19, CONC. IV

LOT 20, CONC. IV

LOT 19, CONC. III

LOT 20, CONC. III

D.I.C.B (FLAT GRATE) TOP EL. 262.60

17.0m x 400 x 1.8 CSP

16.0m x 450 x 1.6 CSP

36.0m x 450 x 1.6 CSP

15.0m x 450 x 1.6 CSP

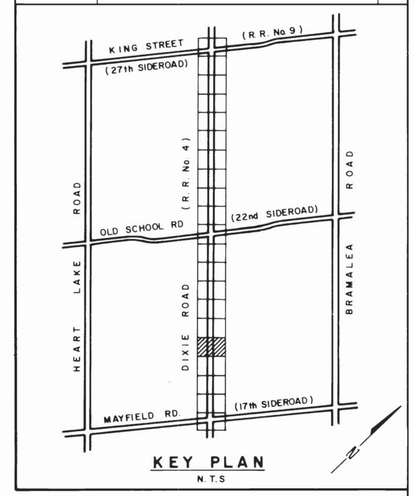
2.5Sh
3.75
3.75
2.5Sh

PT 18 43R-20345 K.T. SPIERS
— TEMP EASEMENT TO COMMENCE UPON 5 DAYS NOTICE BY REGION FOR 2 YEARS TERM.
— BUILD GABION WALL AT POND AND PROVIDE STD. HIGHWAY FENCE BETWEEN GABION WALL AND DIXIE ROAD - TO BE RESPONSIBILITY OF REGION TO MAINTAIN. INSTALL EXISTING GATES ONTO NEW FENCE.
— REPLACE ANY EXISTING FARM FENCE WITH NEW FARM FENCE AND INSTALL EXISTING GATES.

PT 16 43R-20345 J.A. SPIERS
— NO SPECIAL CLAUSES

- SEE PLAN No 20118-D FOR NOTES.

REVISIONS		
DATE	DETAILS	INIT.
SEPT. 1997	AS CONSTRUCTED	



KEY PLAN
N.T.S

GRADIENT - 2.18 %

GRADIENT - 1.05 %

K = 90
L = 101.90
P.I. (8+040, 262.50)

BVC 8+099.60
EVC 8+090.95
BVC 7+989.05
PROP. D.I.C.B.
EVC 7+944.85
PROP. CB
DITCH GRADE (W)
DITCH GRADE (E)
400 CSP (W)
400 CSP (E)
450 CSP (W)
450 CSP (W)
PROP. 900 CSP
EX. 600 CSP
EX. 75 LEACHATE
EX. 150 WM
PROP. RD GRADE
EX. RD GRADE
EX. BOX CULVERT
EX 400 STM (E&W)
EX 450 STM
EX 450 STM
EX 300 STM
EX 75 PVC LEACHATE
EX 150 PVC WM

264 263 262 261 260 259 258 257 256 255 254 253

General Notes

- All Driveways Gravel Unless Otherwise Noted.
- All Service Locations Are Approximate And Must Be Located Accurately In Field.
- Denotes Building - Not Located
- Denotes Building Located
- Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. N° Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by chkd.

Approved by

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL TELEPHONE COMPANY
CONSUMERS GAS COMPANY
MINISTRY OF TRANSPORTATION
MINISTRY OF ENVIRONMENT
HYDRO ELECTRIC POWER COMM. OF ONTARIO
HYDRO ELECTRIC COMM. CITY OF MISSISSAUGA
HYDRO ELECTRIC COMM. CITY OF BRAMPTON
HYDRO ELECTRIC COMM. PORT CREDIT
HYDRO ELECTRIC COMM. STREETSVILLE
CABLE TELEVISION

Region of Peel

Department of Public Works

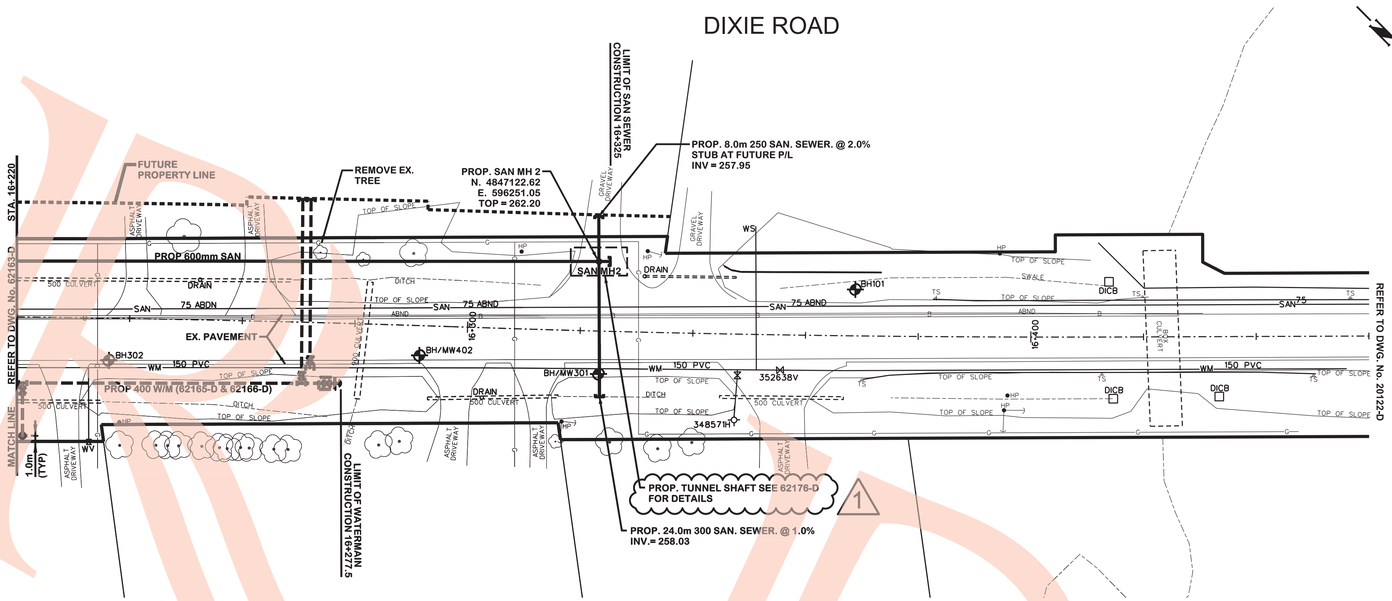
DIXIE ROAD RECONSTRUCTION
(FROM MAYFIELD ROAD TO KING STREET)
GRADING & PAVEMENT
Sta. 7+860 To Sta. 8+160

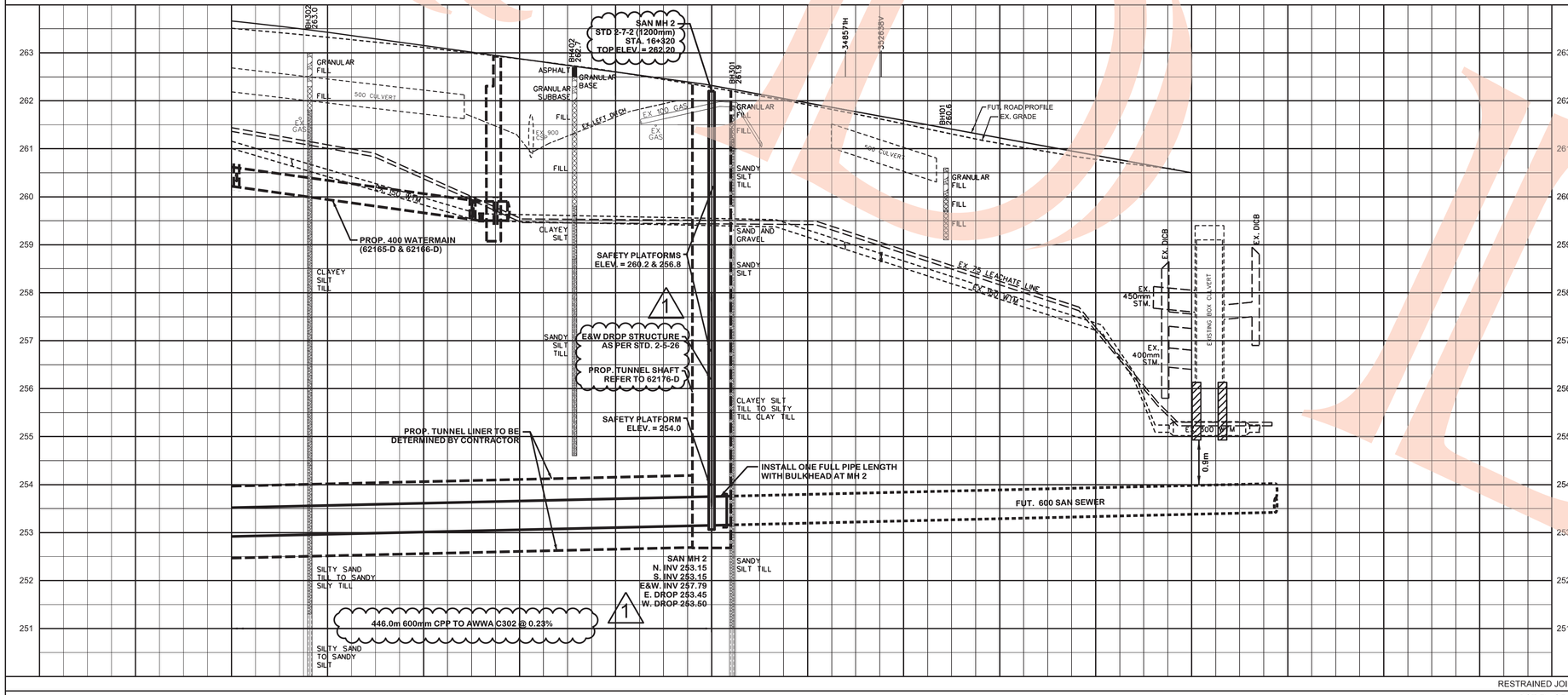
260.330	260.520	260.800	261.190	261.620	262.010	262.360	262.680	262.920	263.130	263.340	263.372	263.720	263.810	263.840	263.800	PROP. RD GRADE
259.810	259.950	260.249	260.725	261.417	261.918	262.316	262.434	262.577	262.820	263.090	263.372	263.573	263.758	263.745	263.732	EX. RD GRADE
8+160	8+140	8+120	8+100	8+080	8+060	8+040	8+020	8+000	7+980	7+960	7+940	7+920	7+900	7+880	7+860	CHAINAGE

Lots	Area C-6	Project No. 96-4090	
Scale Hor. 1:500 Ver. 1:50	Drawn by A.B.	Checked by	
Date MAY 1993	Sheet 5 of 21	Plan No. 20122-D	

20122-D

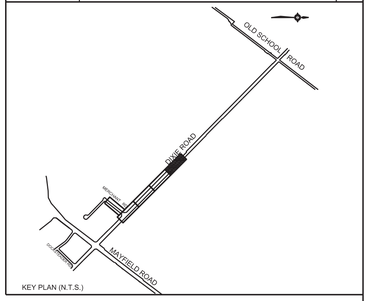
DIXIE ROAD





SERVICE DATA					
SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS	SEPT. 1, 16	A.M.	GAS MAINS	SEPT. 1, 16	A.M.
STORM SEWERS	SEPT. 1, 16	A.M.	BELL U/G CABLE	SEPT. 1, 16	A.M.
WATERMAINS	SEPT. 1, 16	A.M.	HYDRO U/G CABLE	SEPT. 1, 16	A.M.
TRANSIT			HYDRO ONE	SEPT. 1, 16	A.M.
PARKS & REC.			CTV	SEPT. 1, 16	A.M.
ONT. CLEAN WATER			COMMUNIC. CABLES	SEPT. 1, 16	A.M.

REVISIONS		
DATE	DETAILS	INIT.
SEPT. 01, 2017.	ISSUED FOR TENDER	C.S.
SEPT. 22, 2017.	REV. 1, SANITARY SEWER-ADDENDUM 4	C.S.
NOV. 22, 2017.	ISSUED FOR CONSTRUCTION	C.S.



NOTES:

1. FOR GENERAL NOTES, DETAILS AND LEGEND SEE DWG. 62158-D

Inspector's Drawings
Contractor: Technicore Underground
Date: January 31, 2020
Inspector: Mirgjen Arkaxhiu
Signature: M.A.

THIS DRAWING TO BE USED FOR SANITARY SEWER CONSTRUCTION ONLY

Stantec

General Notes

All Driveways Are ASPHALT Unless Otherwise Noted
All Water And Sanitary Service Locations Are Approximate And Must Be Located Accurately In The Field
All Horizontal And Vertical Bends Are In Degrees
All Pipes Size In mm
20C Existing Water Service, Size In mm
WS20 Proposed Water Service, Size In mm
B.M. No. Elev.
Description
Location

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction. Location Of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

LICENSED PROFESSIONAL ENGINEER
C.D.SCHWARTZENTRUBER
1000062829
NOV 22/17
PROVINCE OF ONTARIO

Designed by
Chkd.
Approved by

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m — HORIZONTAL SCALE
1m 0 1 2 3m — VERTICAL SCALE

Region of Peel
Working for you

DIXIE ROAD

(MERCHANT ROAD TO 1.3 KM NORTH OF MAYFIELD ROAD)

400mm WATERMAIN AND 600mm SANITARY SEWER

STA. 16+220 TO STA. 16+353

RESTRAINED JOINTS

CAD Area		Area	C-06
Checked by	C.S.	Drawn by	D.P.
Date	NOV. 22, 2017.	Sheet	8 of 34

Project No. 12-1183, 13-1392 11-2101
Plan No. **62164-D**

ENHANCED GRASS SWALES

CVC/TRCA LOW IMPACT DEVELOPMENT
PLANNING AND DESIGN GUIDE - FACT SHEET

GENERAL DESCRIPTION

Enhanced grass swales are vegetated open channels designed to convey, treat and attenuate stormwater runoff (also referred to as enhanced vegetated swales). Check dams and vegetation in the swale slows the water to allow sedimentation, filtration through the root zone and soil matrix, evapotranspiration, and infiltration into the underlying native soil. Simple grass channels or ditches have long been used for stormwater conveyance, particularly for roadway drainage. Enhanced grass swales incorporate design features such as modified geometry and check dams that improve the contaminant removal and runoff reduction functions of simple grass channel and roadside ditch designs.

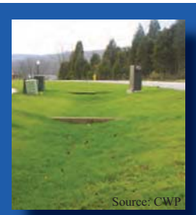
Where development density, topography and depth to water table permit, enhanced grass swales are a preferred alternative to both curb and gutter and storm drains as a stormwater conveyance system. When incorporated into a site design, they can reduce impervious cover, accent the natural landscape, and provide aesthetic benefits.


Source: Delaware Department of Transportation

Source: Seattle Public Utilities


Source: Thomas Engineering


Source: Sue Donaldson


Source: CWP

DESIGN GUIDANCE

GEOMETRY AND SITE LAYOUT

- Shape: Should be designed with a trapezoidal or parabolic cross section. Trapezoidal swales will generally evolve into parabolic swales over time, so the initial trapezoidal cross-section design should be checked for capacity and conveyance assuming it is a parabolic cross-section. Swale length between culverts should be 5 metres or greater.
- Bottom Width: Should be designed with a bottom width between 0.75 and 3.0 metres. Should allow for shallow flows and adequate water quality treatment, while preventing flows from concentrating and creating gullies.
- Longitudinal Slope: Slopes should be between 0.5% and 4%. Check dams should be incorporated on slopes greater than 3%.
- Length: When used to convey and treat road runoff, the length simply parallels the road, and therefore should be equal to, or greater than the contributing roadway length.
- Flow Depth: A maximum flow depth of 100 mm is recommended during a 4 hour, 25 mm Chicago storm event.
- Side Slopes: Should be as flat as possible to aid in providing pretreatment for lateral incoming flows and to maximize the swale filtering surface. Steeper side slopes are likely to have erosion gullying from incoming lateral flows. A maximum slope of 2.5:1 (H:V) is recommended and a 4:1 slope is preferred where space permits.

PRE-TREATMENT

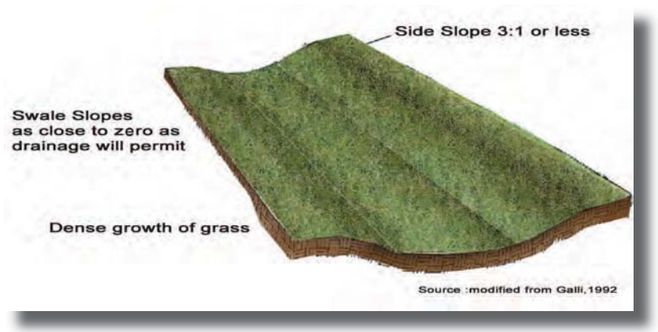
A pea gravel diaphragm located along the top of each bank can be used to provide pretreatment of any runoff entering the swale laterally along its length. Vegetated filter strips or mild side slopes (3:1) also provide pretreatment for any lateral sheet flow entering the swale. Sedimentation forebays at inlets to the swale are also a pretreatment option.

CONVEYANCE AND OVERFLOW

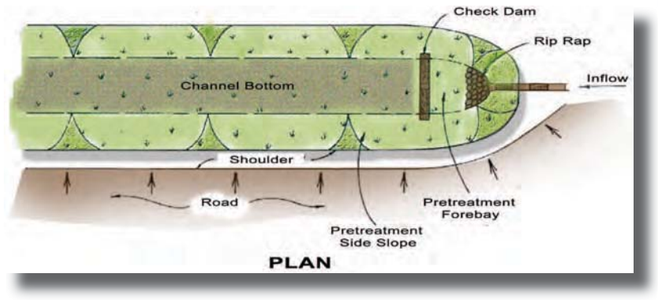
Grass swales must be designed for a maximum velocity of 0.5 m/s or less for the 4 hour 25 mm Chicago storm event. The swale should also convey the locally required design storm (usually the 10 year storm) at non-erosive velocities.

SOIL AMENDMENTS

If soils along the location of the swale are highly compacted, or of such low fertility that vegetation cannot become established, they should be tilled to a depth of 300 mm and amended with compost to achieve an organic content of 8 to 15% by weight or 30 to 40% by volume.



PLAN VIEW OF A GRASS SWALE



PLAN AND PROFILE VIEWS

ABILITY TO MEET SWM OBJECTIVES

BMP	Water Balance Benefit	Water Quality Improvement	Stream Channel Erosion Control Benefit
Enhanced Grass Swale	Partial - depends on soil infiltration rate	Yes, if design velocity is 0.5 m/s or less for a 4 hour, 25 mm Chicago storm	Partial - depends on soil infiltration rate

GENERAL SPECIFICATIONS

Component	Specification	Quantity
Check Dams	Constructed of a non-erosive material such as suitably sized aggregate, wood, gabions, riprap, or concrete. All check dams should be underlain with geotextile filter fabric. Wood used for check dams should consist of pressure treated logs or timbers, or water-resistant tree species such as cedar, hemlock, swamp oak or locust.	Spacing should be based on the longitudinal slope and desired ponding volume.
Gravel Diaphragm	Washed stone between 3 and 10 mm in diameter.	Minimum of 300 mm wide and 600 mm deep.

CONSTRUCTION CONSIDERATIONS

Grass swales should be clearly marked before site work begins to avoid disturbance during construction. No vehicular traffic, except that specifically used to construct the facility, should be allowed within the swale site. Any accumulation of sediment that does occur within the swale must be removed during the final stages of grading to achieve the design cross-section. Final grading and planting should not occur until the adjoining areas draining into the swale are stabilized. Flow should not be diverted into the swale until the banks are stabilized.

Preferably, the swale should be planted in the spring so that the vegetation can become established with minimal irrigation. Installation of erosion control matting or blanketing to stabilize soil during establishment of vegetation is highly recommended. If sod is used, it should be placed with staggered ends and secured by rolling the sod. This helps to prevent gullies.

OPERATION AND MAINTENANCE

Generally, routine maintenance will be the same as for any other landscaped area; weeding, pruning, and litter removal. Grassed swales should be mown at least twice yearly to maintain grass height between 75 and 150 mm. The lightest possible mowing equipment should be used to prevent soil compaction. Routine roadside ditch maintenance practices such as scraping and re-grading should be avoided. Regular watering may be required during the first two years until vegetation is established. Routine inspection is very important to ensure that dense vegetation cover is maintained and inlets and pretreatment devices are free of debris.

For the first two years following construction the swale should be inspected at least quarterly and after every major storm event (> 25 mm). Subsequently, inspections should be conducted in the spring and fall of each year and after major storm events. Inspect for vegetation density (at least 80% coverage), damage by foot or vehicular traffic, accumulation of debris, trash and sediment, and structural damage to pretreatment devices.

Trash and debris should be removed from pretreatment devices and the surface of the swale at least twice annually. Other maintenance activities include weeding, replacing dead vegetation, repairing eroded areas, dethatching and aerating as needed. Remove accumulated sediment on the swale surface when dry and exceeding 25 mm depth.

SITE CONSIDERATIONS

Available Space
Grass swales usually consume about 5 to 15% of their contributing drainage area. A width of at least 2 metres is needed.

Site Topography
Site topography constrains the application of grass swales. Longitudinal slopes between 0.5 and 6% are allowable. This prevents ponding while providing residence time and preventing erosion. On slopes steeper than 3%, check dams should be used.

Drainage Area & Runoff Volume
The conveyance capacity should match the drainage area. Sheet flow to the grass swale is preferable. If drainage areas are greater than 2 hectares, high discharge through the swale may not allow for filtering and infiltration, and may create erosive conditions. Typical ratios of impervious drainage area to treatment facility area range from 5:1 to 10:1.

Soil
Grass swales can be applied on sites with any type of soils.

Pollution Hot Spot Runoff
To protect groundwater from possible contamination, source areas where land uses or human activities have the potential to generate highly contaminated runoff (e.g., vehicle fueling, servicing and demolition areas, outdoor storage and handling areas for hazardous materials and some heavy industry sites) should not be treated by grass swales.

Proximity to Underground Utilities
Utilities running parallel to the grass swale should be offset from the centerline of the swale. Underground utilities below the bottom of the swale are not a problem.

Water Table
The bottom of the swale should be separated from the seasonally high water table or top of bedrock elevation by at least one (1) metre.

Setback from Buildings
Should be located a minimum of four (4) metres from building foundations to prevent water damage.

TORONTO AND REGION Conservation for The Living City
CVC CREDIT VALLEY CONSERVATION

FOR FURTHER DETAILS SEE SECTION 4.8 OF THE CVC/TRCA LID SWM GUIDE

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 PROJECT BID DATE OR AS DIRECTED BY THE ENGINEER OF RECORD.

JELLYFISH STRUCTURE & DESIGN NOTES:

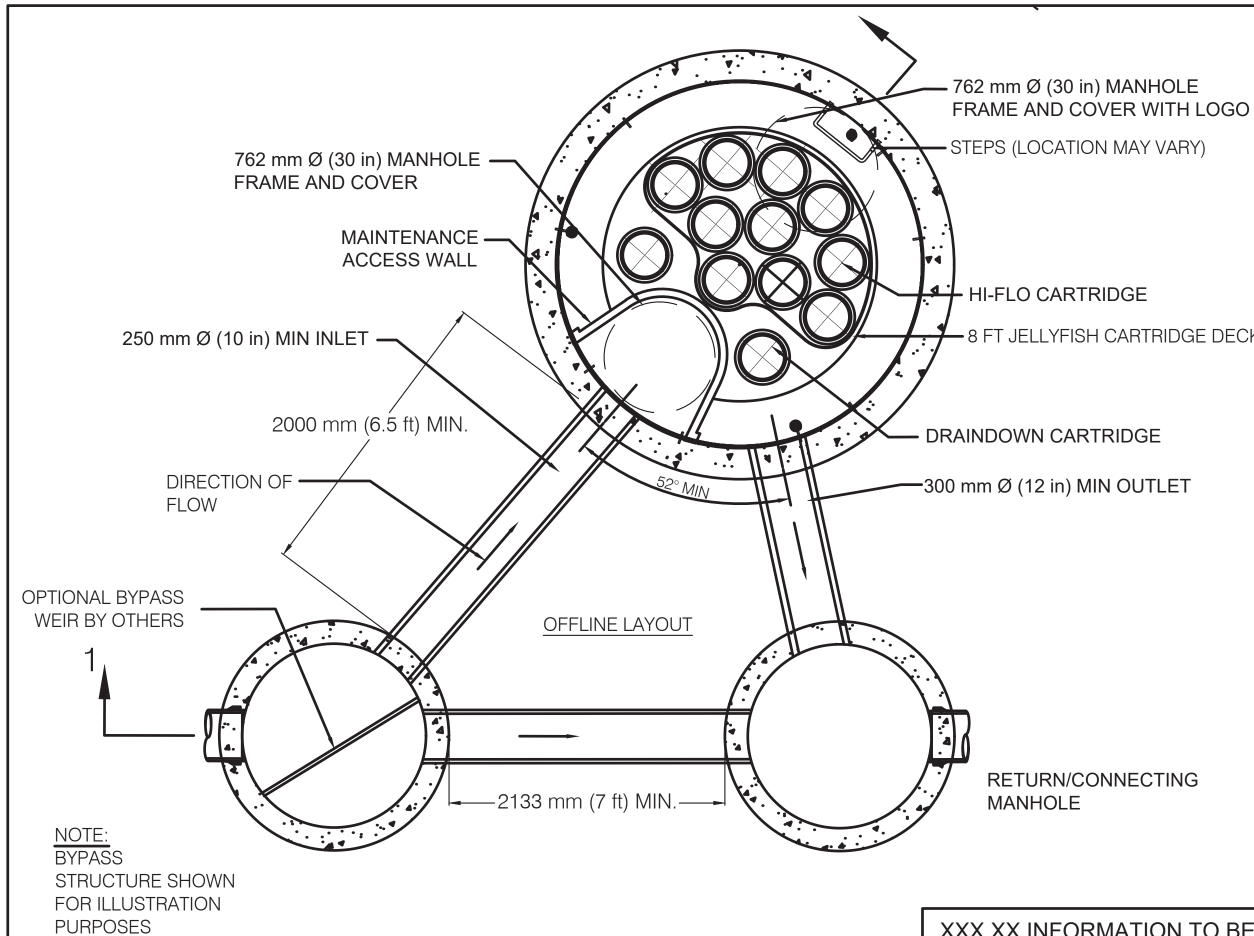
1. 762 MM Ø (30") MAINTENANCE ACCESS WALL TO BE USED FOR CLEANOUT AND ACCESS BELOW CARTRIDGE DECK.
2. CASTINGS OR DOORS OF THE JELLYFISH MANHOLE STRUCTURE TO EXTEND TO DESIGN FINISH GRADE. DEPTHS IN EXCESS OF 3.65 M (12') MAY REQUIRE THE DESIGN AND INSTALLATION OF INTERMEDIATE SAFETY GRATES OR OTHER 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.

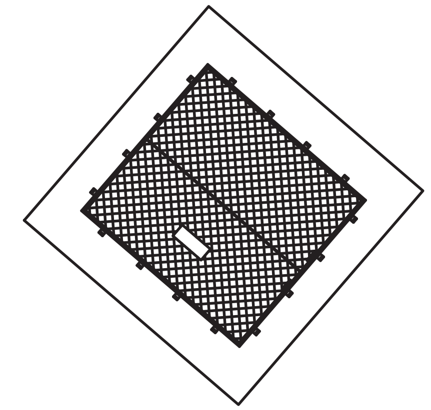
INSTALLATION NOTES

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			

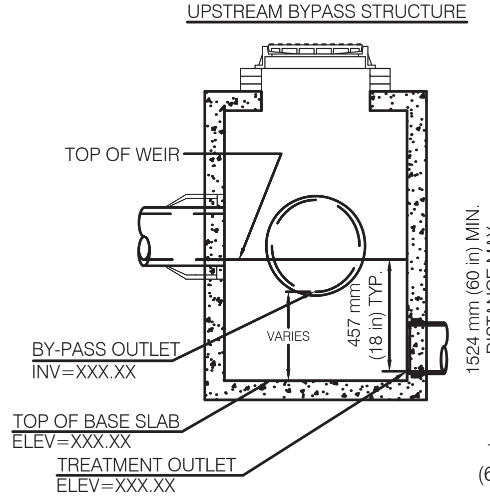
FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL JELLYFISH FILTER REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS.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

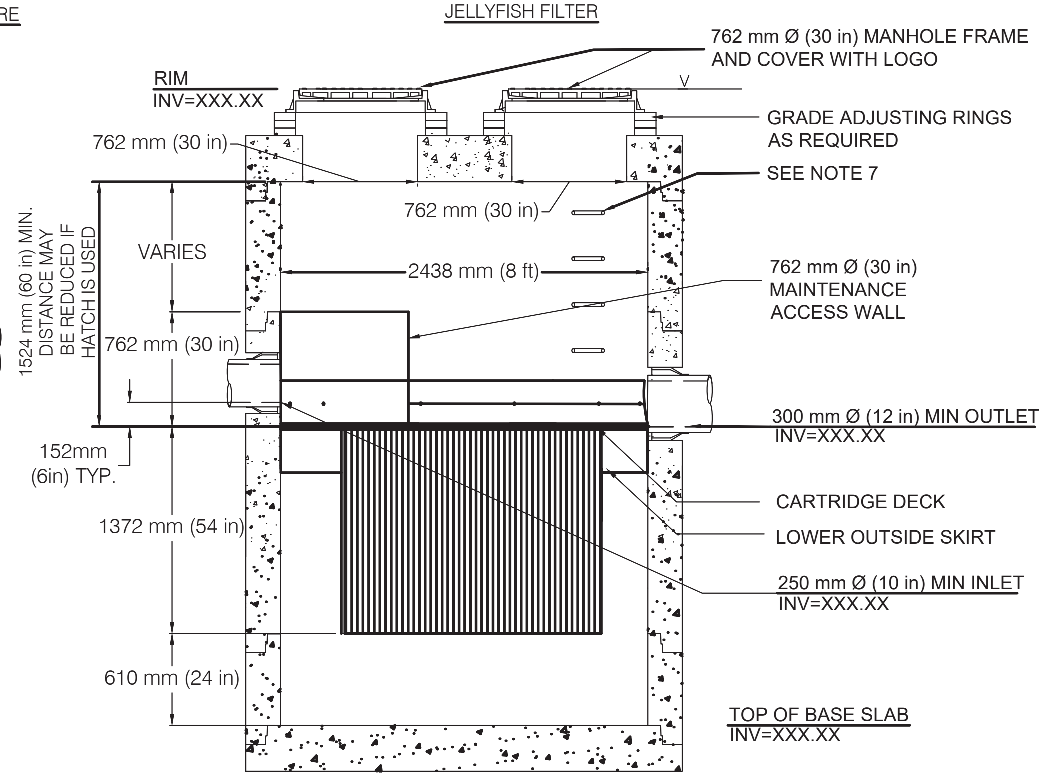




1829 mm x 1829 mm (72 in. x 72 in.)
OPTIONAL HATCH

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. Ø2438 mm (96") MANHOLE JELLYFISH PEAK TREATMENT CAPACITY IS 55.5 L/s (1.96 CFS). TREATMENT FLOW RATE IS BASED ON 457 MM (18") OF HEAD PRESSURE.

CARTRIDGE SELECTION	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	10 / 2			
MAX. SEDIMENT CAPACITY (kg)	626	462	308	176
MAX. TREATMENT (L/s)	55.5	41.6	27.7	15.3

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

Jellyfish®
JF8 STANDARD
Scale ~ 1:50

www.imbriumsystems.com
info@imbriumsystems.com

imbrium®
7037 Ridge Road, Suite 350, Hanover, MD 21076
USA 888-279-8826 CA 800-565-4801 INTL +1-416-960-9900

Jellyfish® Filter

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING: AUS NO. 2008/286748, U.S.A. NO. US 8,287,726, US 8,221,618, US 8,123,935, CA 2,696,482, CA, 2,834,542, KR 10-1287539, NZ 583461, NZ 604227, ZA 2010/01068; OTHER INTERNATIONAL PATENTS PENDING

DATE: 10/01/14	
DESIGNED:	DRAWN: BSF
CHECKED: BSF	APPROVED: SP
PROJECT #: #####	PROJECT NAME: #####
SHEET: 1 OF 2	

STANDARD OFFLINE
Jellyfish Filter Sizing Report

Project Information

Date	Friday, February 12, 2021
Project Name	Transport Truck/Trailer Parking
Project Number	20-034
Location	Caledon

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 JF8-8-2 is recommended to meet the water quality objective by treating a flow of 45.4 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 512 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)
JF8-8-2	8	2	2.4	45.4	512

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.

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

Performance

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

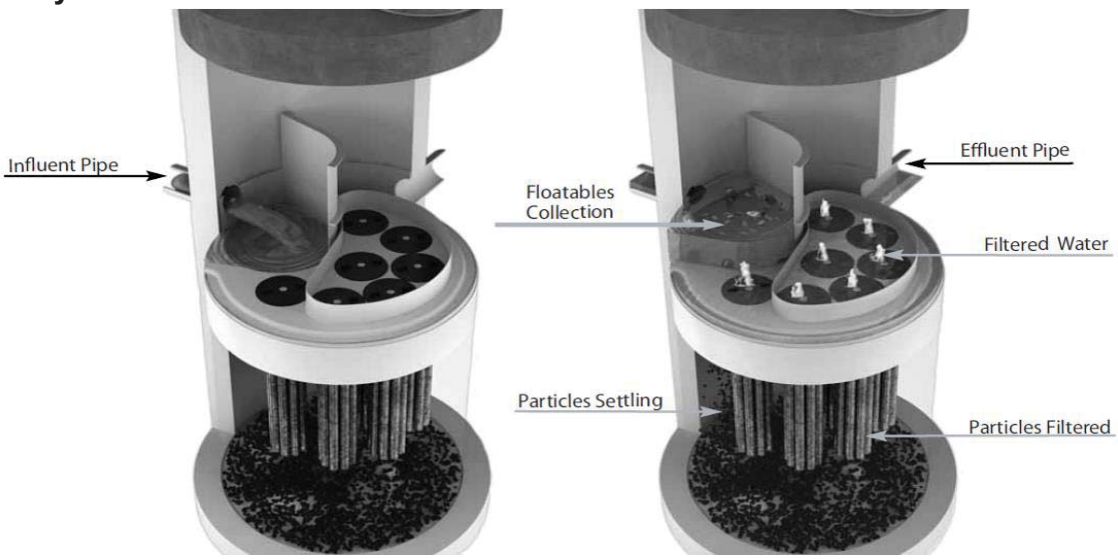
- ☑ 89% of the total suspended solids (TSS) load, including particles less than 5 microns
- ☑ 59% TP removal & 51% TN removal
- ☑ 90% Total Copper, 81% Total Lead, 70% Total Zinc
- ☑ Particulate-bound pollutants such as nutrients, toxic metals, hydrocarbons and bacteria
- ☑ Free oil, Floatable trash and debris

Field Proven Peformance

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

- A median TSS removal efficiency of 89%, 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 59%, and a median Total Nitrogen removal of 51%.

Jellyfish Filter Treatment Functions



Pre-treatment and Membrane Filtration

Jellyfish Filter

Project Information

Date:	Friday, February 12, 2021
Project Name:	Transport Truck/Trailer Parking
Project Number:	20-034
Location:	Caledon

Designer Information

Company:	Masongsong Associates Engineering Ltd.
Contact:	Mansoor Nooristani
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:	7.23 ha
Runoff Coefficient:	0.33

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:	**42.5 L/s**
Sediment Loading	Treating 90% of the average annual runoff volume, 8337 m³, with a suspended sediment concentration of 60 mg/L.	**500 kg**

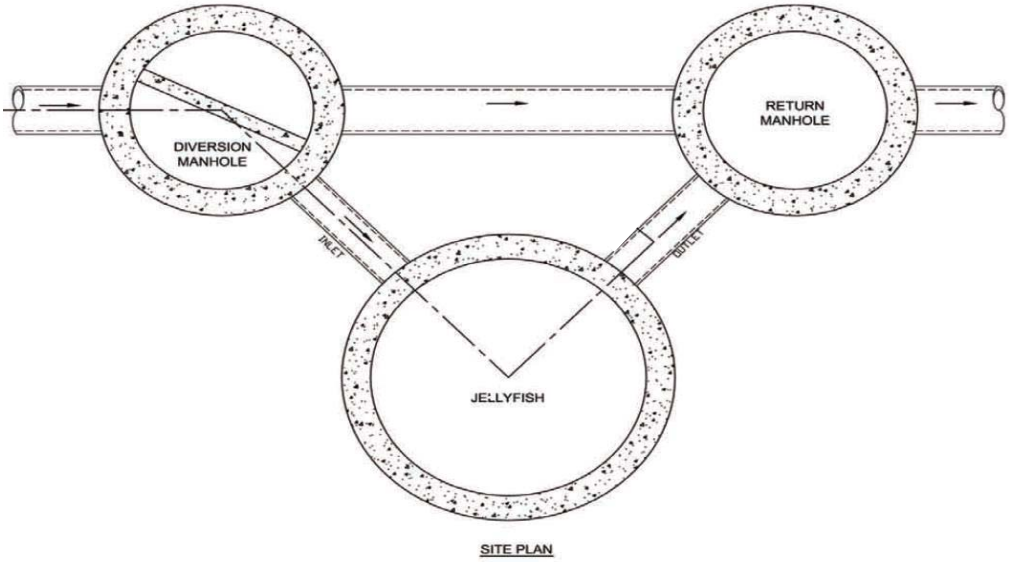
Recommendation

The Jellyfish Filter model JF8-8-2 is recommended to meet the water quality objective by treating a flow of 45.4 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 512 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

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

MARK	DATE	REVISION DESCRIPTION	BY
0	10/01/2014	INTIAL RELEASE	BSF
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JELLYFISH FILTER SPECIFICATIONS

Jellyfish

JF8 STANDARD

Scale = 1:50

www.imbriumsystems.com

info@imbriumsystems.com

imbrium

7037 Ridge Road, Suite 350, Hanover, MD 21076

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Jellyfish® Filter

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

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