ASTERISK
ENGINEERING CORPORATION

MUNICIPAL ENGINEERING
1480 Bath rd, Unit 201
Kingston, ON K7M 4X6
613-542-2040

May 16, 2022

Township of Leeds and The Thousand Islands
Planning Department
1233 Prince St., P.O. Box 280
Lansdowne, Ontario K0E 1L0

Attention: Tom Fehr M.PL – Associate Planner, Township of Leeds and The Thousand Islands

Re.: 479 Hwy 2, Township of Leeds and The Thousand Islands

Dear Mr. Fehr,

On behalf of Eco Tree Care, Asterisk Engineering has been retained to compile a Stormwater Management Brief, providing a stormwater management strategy, for the proposed development located at 479 Hwy 2 in the Township of Leeds and The Thousand Islands. Attached herein is the proposed SWM brief complete with the required drawings for the proposal.

Introduction

This proposal is for the development of the new Eco Tree Care Facility located between Hiscocks Road and Cunningham Road, on the south side of Hwy 2, north of the 401 in The Leeds and the Thousand Islands Township.

See Appendix A – Figure 01 – Key Plan for the location of the proposed development.

The proposed development of the new Eco Tree Care Facility will be constructed in 2 Phases; Phase 1 will include the construction of the proposed 581.7sq.m Eco Tree Care Office/Shop Building, Septic System, SWM facility, access to County Rd No 2 and a parking area for employees and clients. The proposed Eco Tree Care Office/Shop building will be comprised of two separate areas, including 2 stories of office space located on the north east side of the building, and a two story high Shop, with 2 bay doors, which will be used for vehicle and equipment maintenance, located on the south west side of the building. The parking area proposed as part of phase 1 will provide 30 regular parking spaces and 1 barrier free parking space.

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Phase 2 of the proposed development will encompass the expansion of Phase 1 to the south west. This includes the construction of the proposed 581.5sq.m coverall as well as 20 full size truck parking spots. Parking areas will be initially installed as gravel surface with the option to be paved at the discretion of Eco Tree Care.

See Appendix A - Figure 02 - Proposed Concept Plan

The stormwater management strategy presented herein has been prepared in accordance with general stormwater management practices in the Leeds and The Thousand Islands as well as the local Cataraqui Region Conservation Authority. The purpose of this report is to summarize the Stormwater Management Strategy, and the on-site detention design and calculations for the Eco Tree Care development.

Design Criteria

The Township of Leeds and The Thousand Islands and the Cataraqui Region Conservation Authority (CRCA) have requested that the quality and quantity controls for the stormwater be in accordance with CRCA and provincial guidelines; ensuring enhanced quality controls of 80% total suspended solids (TSS) and quantity control of the 100 post-development events to the 2 year pre-development level.

Existing Conditions Property

The existing conditions of the lands proposed for the new Eco Tree Care Facility have been based on the Topographic Survey completed by Hopkins Chitty Land Surveyors Inc., dated December 10, 2021.

The existing 22.7 Hectare property is currently vacant; comprised of a mix of farmland, woodland, marshland and the provincially significant wetland known as Legge's Creek wetland.

There are two existing 1.2m diameter, culverts located at the North East and North west Corners of the property. The existing culverts which cross Hwy 2, provide drainage routes for watersheds north of Hwy 2, directing flows toward the subject lands and in turn, Meadow Marsh which is located north, east and west of the proposed development area. Meadow Marsh is made up of marshland and a serries of small creeks that are used for drainage of the property and watersheds north of the subject lands. A 30m development setback applies to Meadow Marsh. Woodland is present east of the proposed development while Legge's Creek

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Wetland is located along the southern portion of the property, requiring a development setback of 120m.

An ESE was conducted on the property and it has been determined that the proposed development is a suitable distance from environmentally sensitive areas.
Existing conditions have been illustrated as part of Appendix A - Figure 03 – Survey

Pre-Development Flow area

The proposed development area has a tributary area of 1.32 Ha in size and is currently grassed land that drains to Meadow Marsh which is - located along the north-east, west and south-west boundaries of the development area; all of which are labeled as Meadow Marsh in the ESE and Site Plan. The Pre-Development tributary area takes into account, the existing ravine located south- east of the proposed development.

The Pre-Development flowrates of the development area has been calculated to be 43.63 l/s for the 2-Year pre-development event and 102.78 l/s for the 100-Year pre-development event. The calculations for pre-development flowrates have been presented in Appendix B – Storage and Orifice Calculations.

Uncontrolled Post-Development Flows

The proposed Eco Tree Care facility includes a 580 m2 office/shop building, a 580 m2 coverall, and 5690 m2 of driveway/parking spaces. Existing flow routes have been maintained, directing post-development flows to Meadow Marsh which is located along the north-east, west and south-west boundaries of the development area.

The proposed office/shop building will have a metal roof which will drain to the grasslands on the south-east side of the building, to a proposed swale. The coverall will not have any downspouts but with a pitched roof, will direct half of the roof surface flows towards the parking area and the other half towards the proposed enhanced grass swales located along the south and east side of the proposed Coverall.

The Post-Development flowrates have been calculated to be 102.60 l/s for the 2-Year post-development event and 241.67 l/s for the 100-Year post-development event. The calculations for post-development flowrates have been presented in Appendix B – Storage and Orifice Calculations.

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Quality and Quantity Control

Quantity Control

The drainage criteria of this development, requires quantity control of the 100 year post-development event to the 2 year pre-development level. In order to control the 100 year post-development flow rate to the 2 year pre-development level; onsite stormwater detention and outlet controls will be required.

As mentioned above, the 2 year pre-development flowrate was calculated to be 43.63 l/s while the 100 year post- development flowrate was calculated to be 241.67 l/s.

In order to control the post-development flowrate to pre-development levels, a diamond cut orifice has been proposed to meet the invert of the outlet pipe for the grassed storage area and restrict flows. The proposed 135mm x 135mm orifice plate has been sized to control the 100 year post development event to the 2 year pre-development flowrate of 46.72 l/s by providing storage for the difference. The proposed orifice will be installed on the inlet side of the proposed 250 mm diameter discharge pipe, having a min slope of 1.0% and an inlet invert of 81.41m and an outlet invert of 81.30m.

Using the modified rational method in combination with the proposed orifice to control the 100 year post-development flowrate to the 2 year pre-development level; the storage volume required, on-site, to control the 100 year post-development flowrate to the 2 year pre-development level was found to be 179.9m^3.

Enhanced grass swales have been proposed along the south to divert flows generated by the development into the proposed enhanced grassed storage area.

The enhanced grass storage area has been designed to hold a volume of 185.54m^3, having a bottom elevation of 81.31m and a proposed surface elevation of 81.81m, resulting in a maximum storage depth of 0.50m. The side slopes of the enhanced grass storage area will be 5:1 as per provincial requirements and a 0.10m Freeboard with emergency overflow will be installed at the south west edge of the storage area.

Figure F-05, Storage Cross Section D illustraites a cross section of the proposed discharge location for the proposed grassed storage area as well as proposed pipe slopes and inverts.

See Appendix A – Figure 03 for the Grading and Stormwater Plan and Appendix B for Storage and Orifice Calculations

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Quality Control

Quality control measures required for this development must be in accordance with CRCA and provincial guidelines. Due to the proximity of the proposed development to Legge's Creek, the proposed stormwater management strategy must provide enhanced quality controls of 80% total suspended solids (TSS).

In order to provide adequate quality control for the proposed development quality control has been addressed in the form of enhanced grass swales located along the south and east boundaries of the development as well as an enhanced grass storage area located at the south east boundary of the development. The proposed enhanced swales will collect all flows generated by the development and direct them into the enhanced grass storage area, where flows will be discharged at the 2 year pre-development flow rate.

In order to promote settling of suspended solids, several Rock Check Dams have been proposed along the enhanced grass swale to reduce flow velocities and prevent swale erosion and scouring. To allow for additional settlement, the discharge culvert for the enhanced grass storage area has been installed 0.10m above the elevation of the bottom of the enhanced grass storage area.

See Appendix A – Figure 04 - Grading and Stormwater Plan and Figure 05 – Enhanced Swale Cross Section

Sediment and Erosion Control

To reduce the possibility of sediment loads entering the storm sewer system during construction, a number of sediment and erosion control measures must be implemented. Before construction has begun, a silt fence shall be installed along the west and south boundaries of the development to control sediment loading to the marshlands. Once construction has begun on the enhanced grass storage area, a straw bale sediment trap should be placed at the outlet. Both the straw bales and the light duty silt fence shall remain in place until vegetation is established after construction.

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Conclusion

The environmentally sensitive areas downstream of the proposed development have been considered as part of the proposed Stormwater strategy and Sediment and Erosion Control measures, which are appropriate for this purpose.

The Landowner will be responsible for all maintenance associated with the stormwater management facilities on site which should be minimal. Based on the information provided, this brief presents a workable stormwater management and servicing strategy, which can accommodate the proposed development and maintain post-development flows to pre-development levels respectively.

Sincerely

Tiago Caldas, P.Eng. M.Eng
President – Owner

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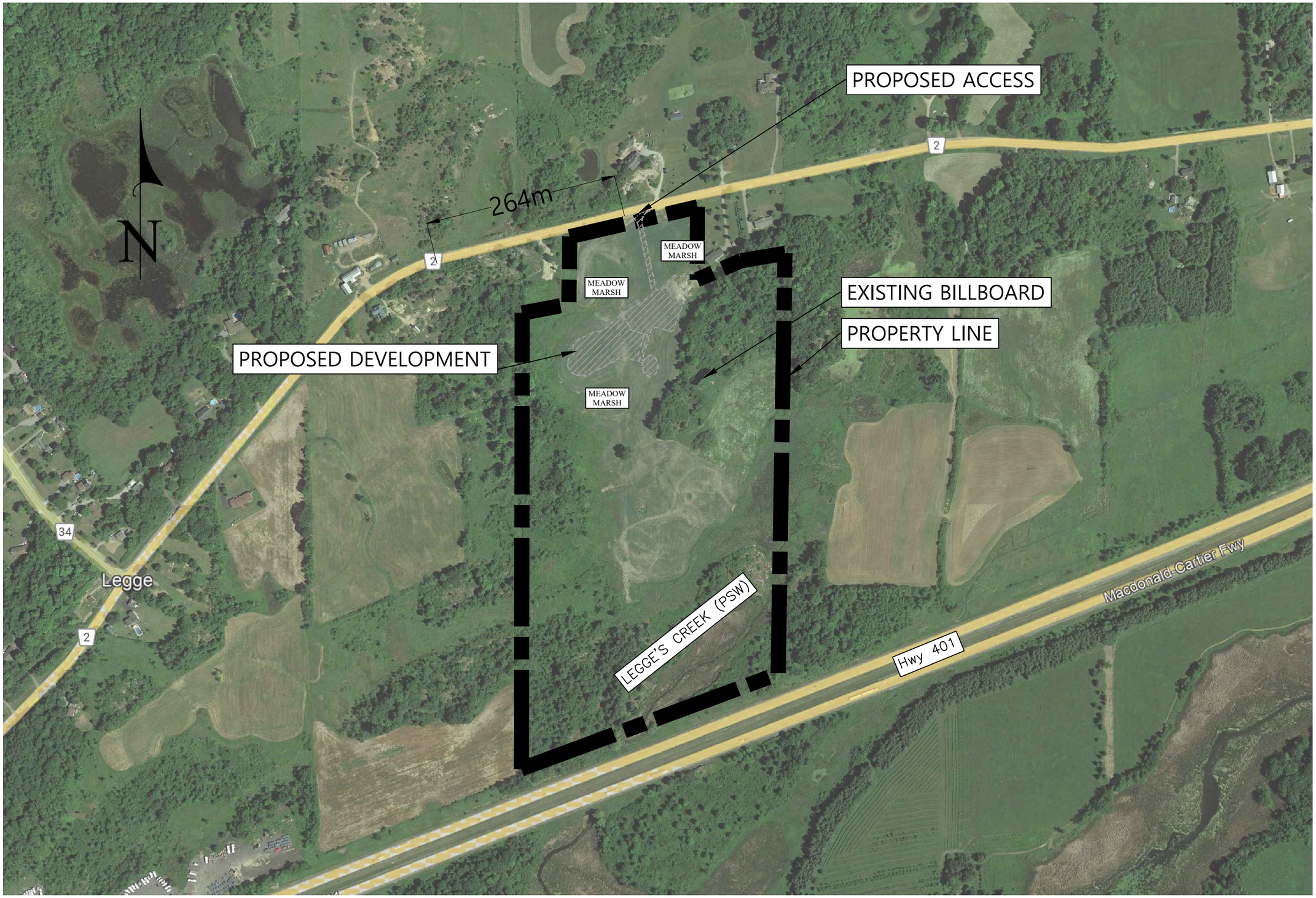
Appendix A



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Do not scale drawings. Refer to Architectural drawings for dimensions. All elevations /dimensions shall be verified with Architectural drawings and any discrepancy shall be reported inmediately to consultant. Read this drawing in conjunction with ALL applicable Architectural, Mechanical, electrical and other disciplines involved.
This drawings are "design drawings" only and are not intended to be used as shop drawings.

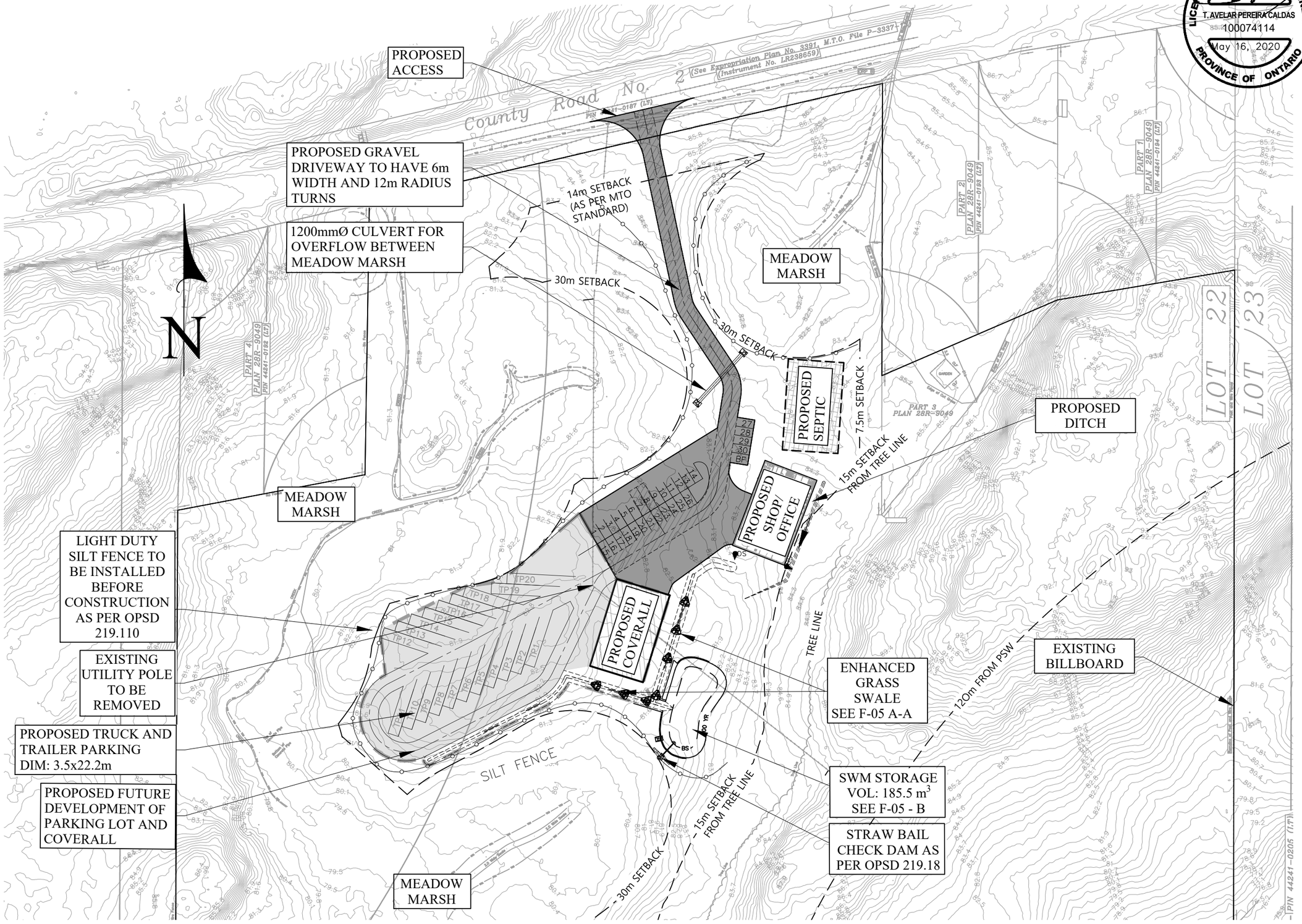
SCALE: 1:5000	UNITS: m, UNO	
DESIGNED: TC	CHECKED: TC	DRAWN: MT

DRAWING TITLE

KEY PLAN

PROJECT-DWG Nos: 21–109 F–01

DATE: May 16 2022



LICENCED PROFESSIONAL ENGINEER
T. AVELAR PEREIRA CALDAS
100074114
May 16, 2020
PROVINCE OF ONTARIO

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LEGEND

- PHASE 1 PROPOSED GR DRIVEWAY
- PHASE 2
- SETBACK
- PROPOSED SEPTIC
- PROPOSED ENHANCED GRASS SWALE
- PROPOSED COVERALL
- SILT FENCE

SCALE: 1:1250	UNITS: m, UNO	
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CONCEPT PLAN

PROJECT-DWG Nos: 21–109 F–02

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SURVEY

PROJECT-DWG Nos: 21–109 F–03

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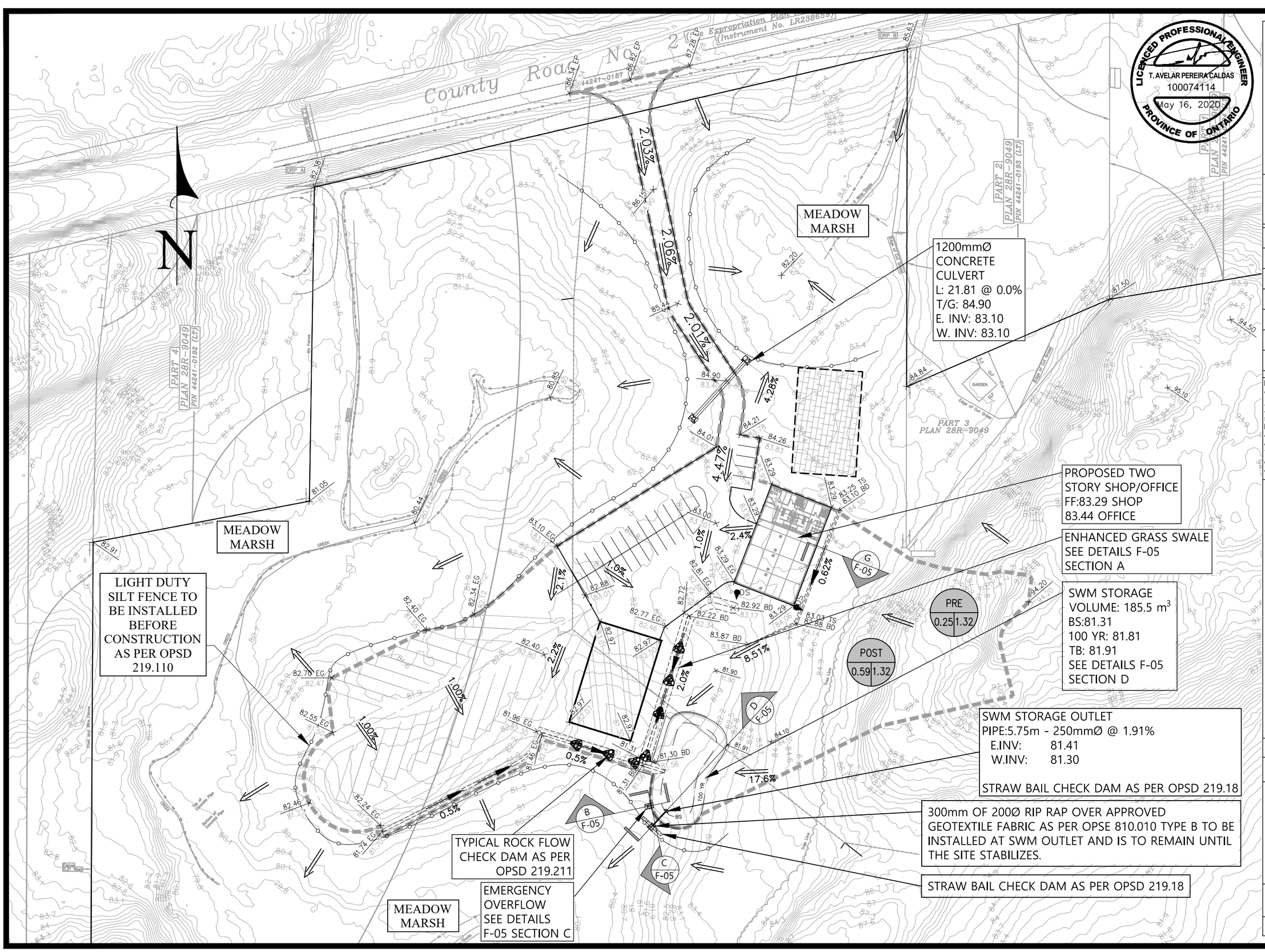

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LEGEND

- 100 YR FLOODLINE FOR SWM POND
- SILT FENCE
- ROCK/GRAVEL /RIP RAP
- STRAW BAILS
- PROPOSED GRADE / EXISTING GRADE — GRADING
- 8.51% — DRAINAGE
- 1 / 0.59 / 1.32 — AREA ID / RUNOFF COEF. / SIZE (Ha)

SCALE: 1:1000	UNITS: m, UNO
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DRAWN: MT	

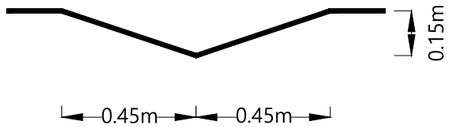
DRAWING TITLE

GRADING AND STORMWATER MANAGEMENT PLAN

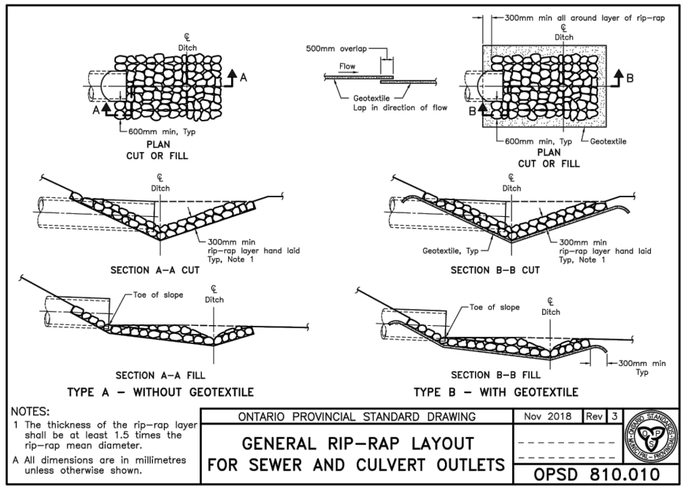
PROJECT-DWG Nos: 21–109

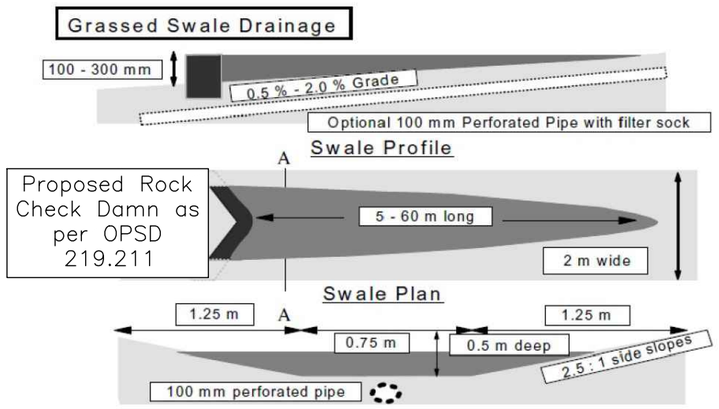
F–04

DATE: May 16 2022

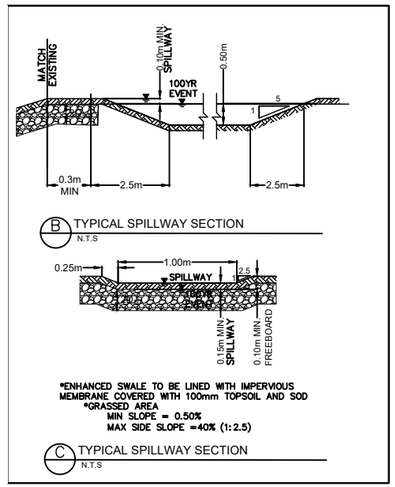


G TYPICAL SWALE CROSS SECTION



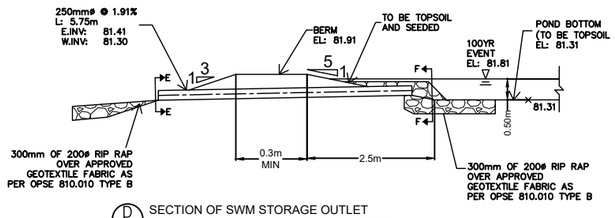


A DETAILS FOR GRASS STORAGE AREA CROSS SECTION
N.T.S

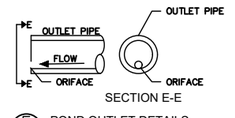


B TYPICAL SPILLWAY SECTION
N.T.S

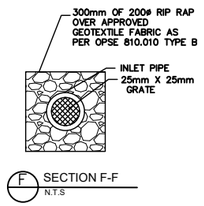
C TYPICAL SPILLWAY SECTION
N.T.S



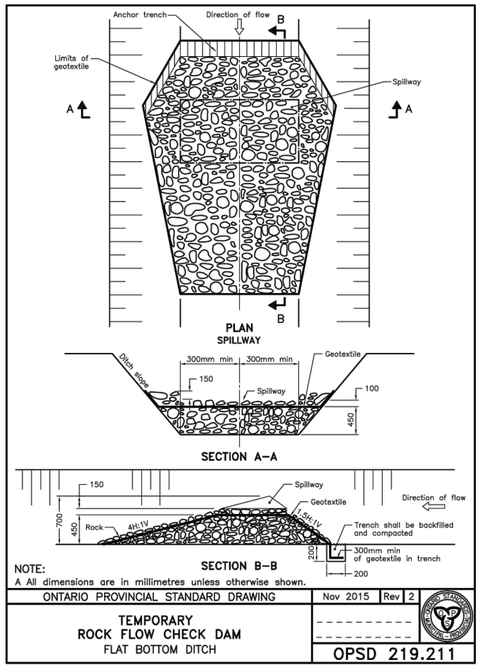
D SECTION OF SWM STORAGE OUTLET
N.T.S

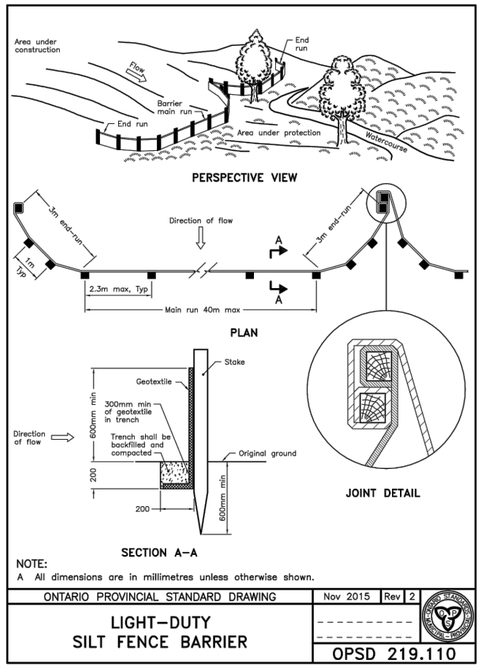


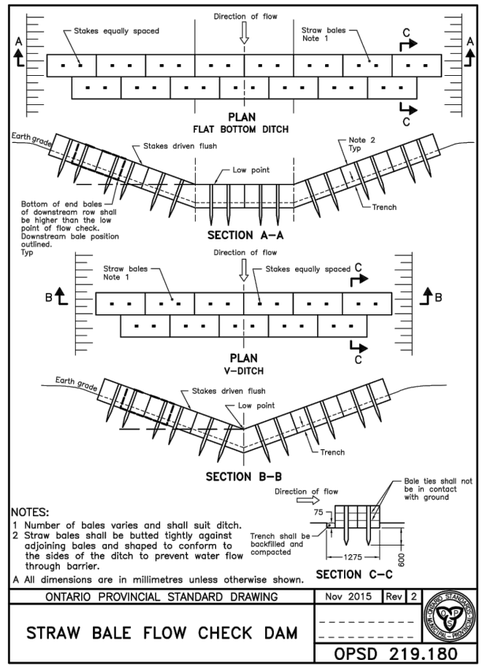
E POND OUTLET DETAILS
N.T.S



F SECTION F-F
N.T.S







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DETAILS

PROJECT-DWG Nos: 21–109 F–05

DATE: May 16 2022

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Appendix B

-- Pre Vs Post Development Flows: Storage and Orifice Calculations

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Eco Tree Care
Job No.: 479 Hwy 2, Leeds and the Thousand Isl

STORAGE AND ORIFICE CALCULATIONS

Rainfall Intensity (i_{2Yr})= $18.0(T_c)^{-0.702}$
Rainfall Intensity (i_{100Yr})= $40.9(T_c)^{-0.728}$

PRE-DEVELOPMENT FLOWS

2 Year Event - $Q_{Pre\text{-}2yr}$= 2.78*C*I*A

C_{pre}	A (Ha)	
0.25	1.318	Vacant Vegetation

C_{Pre}= 0.25
T_c= 15
i_{2Yr}= 47.63 mm/hr
A= 1.318 Ha

$Q_{Pre\text{-}2yr}$= 43.63 l/s*

100 Year Event - $Q_{Pre\text{-}100yr}$= 2.78*C*I*A

C_{pre}	A (Ha)	
0.25	1.318	Vacant Vegetation

CP_{re}= 0.25
T_c= 15
i_{100Yr}= 112.2 mm/hr
A= 1.318 Ha

$Q_{Pre\text{-}100yr}$= 102.78 l/s*

POST-DEVELOPMENT FLOWS

2 Year Event - $Q_{Post\text{-}2yr}$= 2.78*C*I*A

C_{Post}	A (Ha)	
0.9	0.569	Asphalt
0.9	0.116	Building/Sidewallk
0.25	0.633	Landscaping

C_{Post}= 0.59
T_c= 15
i_{2Yr}= 47.63 mm/hr
A= 1.318 Ha

$Q_{Post\text{-}2yr}$= 102.59 l/s*

100 Year Event - $Q_{Post\text{-}100yr}$= 2.78*C*I*A

C_{Post}	A (Ha)	
0.9	0.569	Asphalt
0.9	0.116	Building
0.25	0.633	Landscaping

C_{Post}= 0.59
T_c= 15
i_{100Yr}= 112.2 mm/hr
A= 1.318 Ha

$Q_{Post\text{-}100yr}$= 241.67 l/s*

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SQUARE ORIFICE SIZING CONTROL TO 2 YEAR PRE-DEVELOPMENT

Oriface Width (w) = 135 mm
Area ($A_{orifice}$) = 0.0182 m^2

ORIFICE	Velocity Coef. C_v	Approx. Net Hydraulic Slope, H (m)	Target Flow Q_t (l/s)	$A_{orifice}$ (m^2)	Actual Flow $Q_a=C_v*A_{orifice}*\sqrt{(2*g*H)}$ (l/s)	
						0.934008
1	0.61	0.9	43.63	0.0182	46.72	<=Orifice designed to be within 5% of 5year pre-development rate

SQUARE ORIFICE CHECK FOR 100 YEAR STORM RELEASE RATE

Width (w) = 135 mm
Area ($A_{orifice}$) = 0.0182 m^2

ORIFICE	Velocity Coef. C_v	Approx. Net Hydraulic Slope, H (m)	Target Flow Q_t (l/s)	$A_{orifice}$ (m^2)	Actual Flow $Q_a=C_v*A_{orifice}*\sqrt{(2*g*H)}$ (l/s)	
1	0.61	0.9	46.72	0.0182	46.72	<--Calculate Q_a, $Q_a=Q_t$

100YR POST DEVELOPMENT TO MEET PRE DEVELOPMENT

Tc (Min)	i_{100yr} (mm/hr)	$Q_{Post\text{-}100yr}$ (l/s)	$Q_{Pre\text{-}5yr}$ (l/s)	$Q_{Post\text{-}100yr}-Q_{Pre\text{-}5yr}$ (l/s)	Volume (m3)
5	249.7	537.7	46.7	491.0	147.3
10	150.7	324.7	46.7	277.9	166.8
15	112.2	241.7	46.7	195.0	175.5
20	91.0	196.0	46.7	149.3	179.2
25	77.4	166.6	46.7	119.9	179.9
30	67.7	145.9	46.7	99.2	178.5
35	60.6	130.4	46.7	83.7	175.8
40	54.9	118.3	46.7	71.6	171.9
45	50.4	108.6	46.7	61.9	**167.1**
50	46.7	100.6	46.7	53.9	161.6
55	43.6	93.9	46.7	47.1	155.5
60	40.9	88.1	46.7	41.4	148.9

REQUIRED VOLUME OF STORAGE = 179.9 m^3

PROPOSED STORAGE AREA

Area of the Base(A_B) = 271 m2
Footprint of 100yr = 478.6 m2
Storage Depth= 0.5 m

Total Storage Area= **185.54** m^3 > **179.9**