Amherst Island Wind Energy Project, Erosion and Sediment Control and Stormwater Management Plan Report, Phase 2

Prepared for:
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February 6, 2017

Sign-off Sheet

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LICENSED PROFESSIONAL ENGINEER
A.K. KRISTOFERSON
100170788
Feb 6/2017
PROVINCE OF ONTARIO

Prepared by ____
(signature)

Adam Kristoferson, P.Eng.

Reviewed by ____
(signature)

David Williams, P.Eng.

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1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by Windlectric Inc. (the Proponent) to assess and review the need for erosion and sediment control (ESC) and stormwater management (SWM) measures associated with the proposed development of the Amherst Island Wind Energy Project (herein referred to as the "Project"). This report is intended to address the requirements for SWM measures as described in Section H of the project's REA Approval (#7123-9W9NH2) and supplement the information included as part of the application for a Renewable Energy Approval (the REA Application).

Phase 2 of the Project includes the installation of temporary laydown area, referred to herein as the Central Staging Area (CSA) for stockpiling wind project components and construction materials, along with a concrete batch plant and a SWM facility and a substation. Previous SWM documentation for the project includes:

***Amherst Island Wind Energy Project, Stormwater Management Design Brief,* Stantec, 2015**

This brief includes SWM documentation for the construction of the Island and Mainland docks and associated access roads.

Amherst Island Wind Energy Project, Erosion and Sediment Control and Stormwater Management Plan Report, Phase 1

The Phase 1 report includes SWM documentation for the construction of the island dock laydown area for temporary aggregate stockpiling adjacent to the island dock access road, as well as the access road connecting the island dock access road which is north of Front Road, to the Central Staging Area south of Front Road.

This ESC/SWM Report summarizes the assessment of potential hydrologic impacts associated with the construction phase (i.e., ESC) and operational phase (i.e., SWM) of the Project. Potential hydrologic impacts assessed include changes to the quality and/or quantity discharged to the surface or sub-surface receiving systems. The objective of the report is to demonstrate that the Project design and proposed mitigation measures associated with the construction and operation phases of the Project, as described in the REA Application, detailed engineering design, and herein, are sufficient to minimize any potential impacts to environmental features within the Project area and, further, to provide details on the mitigation measures and control measures that will be implemented.

1.1 STUDY APPROACH

The study approach involved the following components:

- A qualitative assessment of existing hydrologic conditions of the area and receiving systems.

- A review of the proposed Project activities as described in the REA Application with an emphasis on assessing potential for impacts associated with changes in hydrology.
- Complete final design of SWM measures to control site runoff in a manner consistent with Ministry of Environment and Climate Change (MOECC) requirements
- Development of an erosion and sediment control (ESC) strategy outlining the anticipated approach to minimize of impacts related to construction.

1.2 BACKGROUND INFORMATION

A variety of sources have been referenced during the preparation of this ESC/SWM Report, including project-specific documentation, such as the various reports submitted in support of the REA application, and more general industry-standard design guidance documentation and/or literature references, as follows:

General Guidance Documentation / Literature

- *Low Impact Development Stormwater Management Planning and Design Guide*, Credit Valley Conservation and Toronto and Region Conservation, 2011
- *Erosion and Sediment Control Guideline for Urban Construction (ESC Guidelines)*, Greater Golden Horseshoe Conservation Authorities, Dec. 2006
- *Stormwater Management Planning and Design Manual (SWMPD Manual)*, Ontario Ministry of the Environment, March 2003
- *Guidelines for Evaluating Construction Activities on Water Resources*, Ontario Ministry of the Environment, January 1995

Project-Specific Consultation / Documentation

- *Hydrogeological Investigation – Proposed Amherst Island Wind Farm*, Stantec Consulting Ltd., January 2016
- *Amherst Island Wind Energy Project: Dock Construction Stormwater Management Brief*, Stantec Consulting Ltd., December 2015
- *Amherst Island Wind Energy Project: Culvert Sizing Design Brief*, Stantec Consulting Ltd., October 2015
- *Supplementary Geotechnical Investigation – Proposed Amherst Island Wind Farm,* Stantec Consulting Ltd., September 2015
- *Amherst Island Wind Energy Project: Invista Dock – Drainage Assessment,* Stantec Consulting Ltd., August 2015
- *Geophysical Investigation to Map bedrock in Amherst Island, Ontario,* Geophysics GPR International Inc., June 2015
- *Amherst Island Wind Energy Project: Water Assessment and Waterbody Report (WA/WR)*, Stantec Consulting Ltd., April 2013

- *Amherst Island Wind Energy Project: Design and Operations Report (DOR),* Stantec Consulting Ltd., December 2013
- *Amherst Island Wind Energy Project: Construction Plan Report,* Stantec Consulting Ltd., December 2013

2.0 ASSESSMENT OF HYDROLOGIC IMPACTS AND MITIGATION – OPERATIONAL PHASE (SWM)

2.1 EXISTING CONDITIONS

Under existing conditions the location of the CSA and substation are currently used for agricultural purposes. As shown in Figure 1, surface runoff drains to a drainage channel along Second Concession to a culvert under Second Concession southwest of the site. Site topography can be characterized as moderately sloped with slopes ranging from 1 to 4% draining from north to south. Previous studies have characterized site soils as silt tills and clays with bedrock depths in the range of 0.15 to 0.6 m below ground surface.

Delineation of existing drainage catchments is provided on Figure 1, and is summarized as follows:

Catchment 100 – 32 ha of agricultural land in the location of the proposed central staging area and substation

2.2 PROPOSED CONDITIONS

As described in the Construction Plan Report, the 13 ha Central Staging Area is proposed to be stripped of topsoil, graded, proof rolled and then a gravel layer applied. The CSA is a temporary construction feature and is scheduled to be rehabilitated to existing conditions following the completion of the construction of the project. The CSA will drain by sheet flow to a SWM dry pond facility, along the CSA southern limits, to provide SWM controls prior to discharging to the Second Concession Drainage Ditch. A berm along the north-central portion of the SWM facility directs flows to the east and west limits of the pond to minimize the potential for flows short circuiting through the facility. Erosion control berms along the east and west edges prevent runoff from the CSA from bypassing the proposed SWM facility in addition to directing flows from the adjacent agricultural lands around the site.

The 0.5 ha substation is proposed to be stripped of topsoil, graded, proof rolled and resurfaced with a well-drained coarse granular layer underlying electrical infrastructure. Site access is restricted with fencing and a singular locked access gate. A drainage swale along the south edge of the substation site collects sheet flow runoff from the substation, preventing it from flowing uncontrolled over adjacent agricultural land to the south and west. Detailed grading design of the substation site has not been completed, however, the substation was considered in the design of the proposed SWM measures, as it lies within the same culvert catchment area as the CSA.

3.0 ASSESSMENT OF POTENTIAL HYDROLOGIC IMPACTS AND MITIGATION – DURING-CONSTRUCTION PHASE (ESC)

An assessment of the erosion potential of the construction area was completed following the methodology outlined in the *ESC Guidelines* (GGHACA, 2006). The erosion potential is based on an assessment of three primary factors, namely slope gradient, slope length and soil texture (erodibility), with the resultant designation of either "low", "medium", or "high" erosion potential. The relative level of erosion potential dictates, to some extent, the comprehensiveness of the resultant ESC system design, monitoring, and maintenance program.

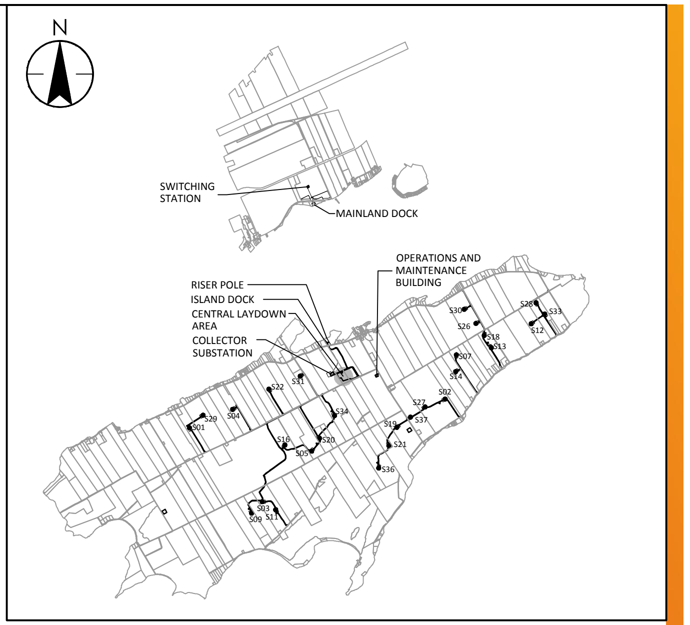
The existing and proposed (post-construction) condition gradients on the Project site can be classified as moderate (2 – 10% - Overland flow paths) to steep (>10% - Access road embankments), with predominantly long slopes (greater than 30 m). Site soils are comprised primarily of silt tills and clays, which are considered to represent a high erodibility potential (Table A1, ESC Guidelines). Therefore, based on this classification, the site has a "high" erosion potential.

The setbacks provided between the proposed project infrastructure and the surface water receiving features and the existing agricultural land uses surrounding the proposed infrastructure and the features, are such that the derivation of an ESC strategy in accordance with the "high" erosion potential assessment should satisfactorily address the potential impacts to the water features.

3.1 DURING CONSTRUCTION DEWATERING

As per the Construction Plan Report, it is not expected that the water table will be intercepted by any construction activities. Should dewatering be required, such would affect the local near-surface water table only for the period for construction (until concrete is hardened). Post-construction, the water table would return to pre-construction levels and the relatively small 'footprint' of the road base would not affect flow volumes or patterns, or the deep groundwater regime. Pumping rates are not anticipated to exceed 50,000 litres per day.

Any required dewatering operations will be completed such that discharge rates will not cause any flooding and erosion concerns for the downstream natural areas. In order to prevent sediment migration to the downstream areas dewatering discharges may be treated with a variety of measures including but not limited to filter socks, sediment traps, and "frog's foot" dissipaters at the discretion of the contractor. Dewatering discharges will be directed through the sediment control measures to a gently sloped vegetated area greater than 30 m from any watercourse or wetland feature.



KEY PLAN

N.T.S

Stantec

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Waterloo, ON, N2L 0A4
Tel. 519.579.4410
www.stantec.com

Legend

100	AREA NUMBER
A=31.72	CONTRIBUTING AREA (ha)
⇦	MAJOR OVERLAND FLOOD ROUTE
━	DRAINAGE BOUNDARY
⌒⌒⌒	EDGE OF TREELINE
— – – —	LIMIT OF CENTRAL LAYDOWN AREA

Client/Project

Windlectric Inc.

AMHERST ISLAND WIND PROJECT
75MW WIND FARM

Amherst Island, Loyalist Township, Ontario

Title

CENTRAL STAGING AREA
STORM WATER CATCHMENT AREA PLAN
EXISTING CONDITIONS

Project No.
1335 60100

Scale
1:3000

Figure No.
1

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2017/02/06 4:00 PM By: Walsh, Cedric

Delineation of proposed drainage catchments is provided on Figure 2, and is summarized as follows:

Catchment 201 – 0.5 ha of substation area draining uncontrolled to the Second Concession drainage ditch

Catchment 202 – 5.3 ha of agricultural land and access road draining overland towards the CSA

Catchment 203 – 14 ha of graveled CSA draining by sheet flow to the proposed SWM facility at the south limits of the site

Catchment 204 – 1.7 ha of agricultural land and Second Concession roadside ditch draining to the culvert under Second Concession southwest of the site

Catchment 205 – 10.3 ha of agricultural land west of the central staging area draining uncontrolled to the Second Concession drainage ditch

2.3 HYDROLOGIC MODELING

A hydrologic model was prepared to simulate drainage conditions for the subject development using the hydrologic modeling software package known as SWMHYMO (Stormwater Management Hydrologic Model). The models were used to predict flows for the existing and proposed development conditions and design SWM systems to ensure that proposed development peak flow rates at the second concession road culvert do not exceed existing flow rates. Storm event modeled included the 5-, 10- and 100-year SCS distribution storm events.

Soil Conservation Service (SCS) curve numbers (CNs) of 84 and 90 were used for crop covered and gravel covered areas respectively on silt tills / clays. Schematics of the SWMHYMO model and all input and output files are also attached.

2.4 STORMWATER MANAGEMENT STRATEGY

Stormwater runoff from the proposed CSA, will be attenuated using a dry-pond facility along the southern limits of the site (Drawing C105). A dry facility was selected due to the shallow depths to bedrock on site. The dry facility is primarily designed to provide quantity control, but also serves a quality control purpose, allowing for some settlement of suspended solids. The facility will be drained by two (2) 525mm outlet pipes to the roadside ditch north of the 2nd Concession Road. Stage-storage discharge characteristics for the pond were calculated using spreadsheet analysis and incorporated into the hydrologic model and is attached with this letter. Tables highlighting the details regarding the parameters and results are found below.

V:\01614\active\133560100\design\drawing\civil\sheet_files\SWM\133560100C-FIG-POST.dwg
2017/02/06 4:56 PM By: Walsh, Cedric

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Legend

100	AREA NUMBER
A=31.72	CONTRIBUTING AREA (ha)
⇦	MAJOR OVERLAND FLOOD ROUTE
▬	DRAINAGE BOUNDARY
— – – —	LIMIT OF CENTRAL LAYDOWN AREA

Client/Project

Windlectric Inc.

AMHERST ISLAND WIND PROJECT
75MW WIND FARM

Amherst Island, Loyalist Township, Ontario

Title

CENTRAL STAGING AREA
STORM WATER CATCHMENT AREA PLAN
PROPOSED CONDITIONS

Project No.
1335 60100

Scale
1:3000

Figure No.
2

Table 1 - SWM Facility Design Characteristics

Total Contributing Area	19.74 ha
Total Area Modelled	31.77 ha
Pond Elevations (Bottom/Top)	82.70 m / 83.75 m
Twinned Outlet Pipe Elevation / Diameter	82.65 m / 525 mm

Table 2: Stormwater Management Facility Operating Characteristics

Storm Event	5-year	10-year	100-year
Existing Flows to Second Concession (m^3/s)	1.56	1.94	3.19
Proposed Flows to Second Concession (m^3/s)	1.11	1.35	1.99
Proposed Flows to SWM Facility (m^3/s)	1.31	1.60	2.54
Proposed Flows from SWM Facility (m^3/s)	0.10	0.12	0.20
Maximum Storage Used (m^3)	2899	3608	6320
Maximum Ponding Depth (m)	0.48	0.60	0.85
Drawdown Time (hrs)	4	4.5	5

As illustrated in Table 2, above, water quantity control targets have been met as the post-development peak flow rates are less than the target discharges established using existing conditions modeling.

2.4.1 Water Quality Control

Water quality benefits of the proposed perimeter grassed swales and vegetated dry pond facility are achieved as a result of the runoff / vegetation interaction which slows the velocity of runoff, as compared to a piped system, thereby promoting the sedimentation of particulate matter. The vegetation also provides nutrient uptake benefits to help reduce biological pollutants such as nitrogen and phosphorous. Due to the temporary nature of the CSA and the shallow depth to bedrock, the proposed dry pond facility will provide adequate water quality control for the proposed works.

Under proposed conditions, the substation is covered by washed crushed stone and electrical infrastructure. The crushed stone areas will not be subjected to vehicular traffic and therefore, will be less susceptible to compaction and sediment build-up / wash-off cycles. Runoff from this portion of the substation is considered "clean" and does not require additional water quality control. Site access is gated and will be restricted to routine inspection and maintenance operations, minimizing opportunity for sediment build-up and wash-off. Impacts to water quality are considered to be negligible, with associated control proposed to be provided through the use of a grassed swale at the south end of the substation site and the existing downstream vegetated conveyance system.

2.4.2 Design Considerations

As the dry pond facility is proposed to be constructed in winter/spring 2017 additional measures have been included in the design of the CSA to minimize the potential for sediment to migrate offsite, prior to site vegetation becoming fully established. The perimeter berms around the CSA are to be covered by straw matting, while the swales on the interior side of the berm are to be covered by Anti-Wash Geojute to minimize erosion potential of designed features. The outlet of the dry pond facility will be protected by a double layer of light duty silt fencing. Light duty silt fencing was chosen for ease of installation and maintenance, as it can be manipulated without the assistance of machinery and limited access to the outlet structure.

The pond is proposed to be lined with an impervious liner to prevent migration of any deleterious substances into the subsurface soils bedrock below.

Due to the temporary nature of the CSA and to maximize the amount of working area, the dry pond facility has been sized to contain the 10-year rainfall event. Under larger storm events, ponding will occur onto the graveled area on the site. The 100-year ponding limit has been delineated on the attached drawings, and will be identified on site. Ponding depths on the graveled area of the site will not exceed 0.10 meters, which still allows for vehicle passage.

Detailed pumping records will be kept on site to ensure that maximum pumping rates are not exceeded.

3.2 EROSION AND SEDIMENTATION CONTROL PLAN

As described in the *Construction Plan Report*, the various construction activities required to develop the site include topsoil removal, minor grading activities, infrastructure installation, creation of granular access roads, and general construction traffic. If left unmitigated, these activities will result in impacts ranging from disturbance of at-surface soils and exposure of the native sub-soils to potential erosion and sediment transport to offsite locations.

Erosion control will be achieved primarily through the excavation-and-backfill methods of construction and by limiting the duration of exposure of disturbed sub-soils inherent in the construction process. For example, laydown area construction includes the removal of topsoil and sub-soils as necessary to achieve a competent base, followed by the placement of granular material back to proposed grade elevations (or marginally above); hence, the work areas are generally “self-contained” and protected from erosion and sediment transport by definition. Further, at any given location, these works will be completed in short order, providing little opportunity for sub-soils to be disturbed and entrained in storm runoff.

In addition to limiting the potential for erosion, sediment control measures will be implemented prior to any grading or servicing works commencing as shown on the accompanying plan (Drawing C105), and include, but not necessarily be limited to, the following items:

- Sediment and erosion control measures should be implemented prior to construction and maintained during the construction phase to prevent entry of sediment into the water:
    - Erect silt fence (per OPSD 219.110) on the downstream sides of disturbed areas within 30 m of the buffers to environmental features and around entirety of temporarily stockpiled soils;
    - Temporarily stockpiled materials will be covered with rolled erosion control products when the material is expected to be left in place in excess of 10 days
    - No equipment should be permitted to enter any natural areas beyond the silt fencing during construction;
    - Topsoil stockpiles should be sufficiently distant from watercourses to preclude sediment inputs due to erosion of stored soil materials;
    - Erosion control berms are to be stabilized with straw matting
    - Perimeter swales are to be stabilized with Antiwash Geojute
    - If the sediment and erosion control measures are not functioning properly, no further work should occur until the sediment and/or erosion problem is addressed;

- Complete work in and around watercourses when the features are at their driest. All in-water work should be completed within MNR timing windows to protect local fish populations during their spawning and egg incubation periods. A typical construction timing window for warmwater streams in the Peterborough District is July 1st to March 31st.
- All materials and equipment used for the purpose of site preparation and Project construction should be operated and stored in a manner that prevents any deleterious substance (e.g., petroleum products, silt, etc.) from entering nearby watercourses:
    - Any stockpiled materials should be stored and stabilized away from watercourses;
    - Refuelling and maintenance of construction equipment should occur in designated areas, a minimum of 100 m from a water body;
        - A refuelling zone has been designated on the attached sediment and erosion control plans
    - Spills should be reported to the MOE Spills Action Centre;
    - Any part of equipment entering water should be free of fluid leaks and externally cleaned/degreased to prevent any deleterious substance from entering the water; and
    - Only clean material, free of fine particulate matter should be placed in the water.
    - Two 525 mm PVC caps will be stored on-site to plug the upstream end of the SWM facility outlet pipes in the event of a spill
- Revegetate all disturbed areas where construction is not expected for 30 days with a minimum 50 mm of topsoil and hydro-seeding or other stabilizing vegetation / erosion protection measures (per OPSS 804). If, given seasonal restriction or other revegetation limiting factors, the disturbed area should be stabilized against erosion impacts by non-vegetated means such as erosion control blankets.

The ESC measures shall be maintained in good repair during the entire construction period, and removed as contributing drainage areas are restored and stabilized. ESC measures shall not be removed until a qualified inspector determines that the measures are no longer required and the risk of surface water and environmental impacts from construction activities are negligible. In addition, the condition of erosion control works, their overall performance, and any repairs replacement or modifications to the installed item shall be noted in logbooks to be kept on-site.

The proposed erosion and sediment control plan focuses on the CSA, however does not include details on the substation, as detailed design has not been completed for the substation site. Erosion and sediment control details for the substation site will be provided under separate cover.

3.3 EROSION AND SEDIMENTATION CONTROL MONITORING PLAN

In order to ensure the effectiveness of the various erosion and sediment control measures, a routine program should be implemented which includes the inspection of the erosion and sediment controls daily and after each significant rainfall event (10 mm), and immediate repair of any deficiencies. This program will consist of the following activities:

- Visual inspection of the ESC measures to ensure discharged flows are generally free of sediment and turbidity
- Inspection of vegetation protection and silt fencing to ensure that they are maintained in good repair
- Removal of construction debris that may accumulate
- Implementation of remedial measures including erosion stabilization, repair of damaged fencing and any other remediation, where required.

If the monitoring program outlined above indicates a persistent problem then the following process should be undertaken to determine appropriate mitigative measures:

- Analysis of the monitoring information and field visits as required, determine the cause of the problem, and develop a mitigation plan to address the issue.
- Convene a meeting with the appropriate review agencies to discuss the problem.
- Develop a consensus on a proposed plan of action to resolve the problem in consultation with agency staff.
- Implement additional mitigation measures and monitor the results.

3.4 LONG TERM EROSION AND SEDIMENT CONTROL

Per the *Construction Plan Report*, upon the completion of backfilling and the subsequent disposition of excess soil elsewhere within the properties by the property owners, replanting with native vegetation will be undertaken in areas where active agricultural is not anticipated.

One year after construction a survey will be undertaken to ensure that long-term erosion control measures have been effective. This will include an inspection of drainage facilities associated with the Project construction (e.g., culverts) for structural integrity and any excessive amount of silt collection. Seeded or replanted areas will be inspected to ensure that revegetation measures were successful and reseeding or replanting will occur where necessary.

If erosion control measures are found to be less than fully effective during this survey, reseeding or replanting of problem areas will take place. Should there be residual effects noted during post-construction monitoring, advice on contingency measures will be sought out and applied.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the preceding design report the following conclusions can be drawn:

- Water quality and quantity control for the CSA is provided using a dry pond facility at the southern limits of the site.
- No formal water quality control is required for the substation. Water quantity control for the substation is provided through the overcontrol of peak runoff rates from the CSA

Based on the findings of this report, the following recommendations are provided:

- The proposed SWM and ESC measures be implemented for the subject site.
- The Monitoring and Maintenance Program be undertaken to ensure that the proposed measures function appropriately.

ATTACHMENTS

TABLE OF CURVE NUMBERS (CN's)

Land Use		Hydrologic Soil Type							Source
		A	AB	B	BC	C	CD	D	
Meadow	"Good"	30	44	58	65	71	75	78	MTO
Woodlot	"Fair"	36	48	60	67	73	76	79	MTO
Lawns	"Good"	39	50	61	68	74	77	80	USDA
Pasture/Range		58	62	65	71	76	79	81	MTO
Crop		66	70	74	78	82	84	86	MTO
Gravel		76	81	85	87	89	90	91	MTO
Bare Soil (Fallow)		77	82	86	89	91	93	94	
Impervious		98	98	98	98	98	98	98	MTO

MTO - Ministry of Transportation Ontario Drainage Manual (1997), Design Chart 1.09-Soil/Land Use Curve Numbers

USDA - United States Department of Agriculture (2004), National Engineering Handbook, Part 630 Hydrology, Chapter 9 Hydrologic Soil Cover Compexes

SWMHYMO Parameters

Job:	Central Laydown SWM AIWEP
Job #	1609-60595
Eng:	AKK
Date:	2017-02-06

Catchment Number	SWMHYMO Command	Area (ha)	CN	Rise (m)	Length (m)	Catchment Slope (%)	Tc (hrs)	Tp (hrs)
Existing Conditions								
100	DESIGN NASHYD	31.72	84	4	405	0.99	0.77	0.46
Proposed Conditions								
201	DESIGN NASHYD	0.46	90	0.25	55	0.45	0.37	0.22
202	DESIGN NASHYD	5.33	84	1.5	150	1.00	0.47	0.28
203	DESIGN NASHYD	13.95	90	3	290	1.03	0.64	0.38
204	DESIGN NASHYD	1.77	84	3	290	1.03	0.64	0.38
205	DESIGN NASHYD	10.26	84	6.5	585	1.11	0.89	0.53
		31.77						

Notes:

Time of Concentration calculated using the Airport Method
(For areas less than 100 ha)

$Tc = [\ 3.26\ (1.1\text{-}C)\ L^{0.5}]\ /\ S^{0.33}$

Where: C = Runoff Coefficient = 0.4 for undeveloped areas
L = Length of Overland Flow (m)
S = Slope (%)

Time to Peak
CN is a weighed average for CALIB NASHYD

Tp = 0.6Tc

Stage-Storage-Discharge Caculations

Job: Central Laydown SWM AIWEP
Job # 1609-60595
Eng: AKK
Date: 2017-02-06

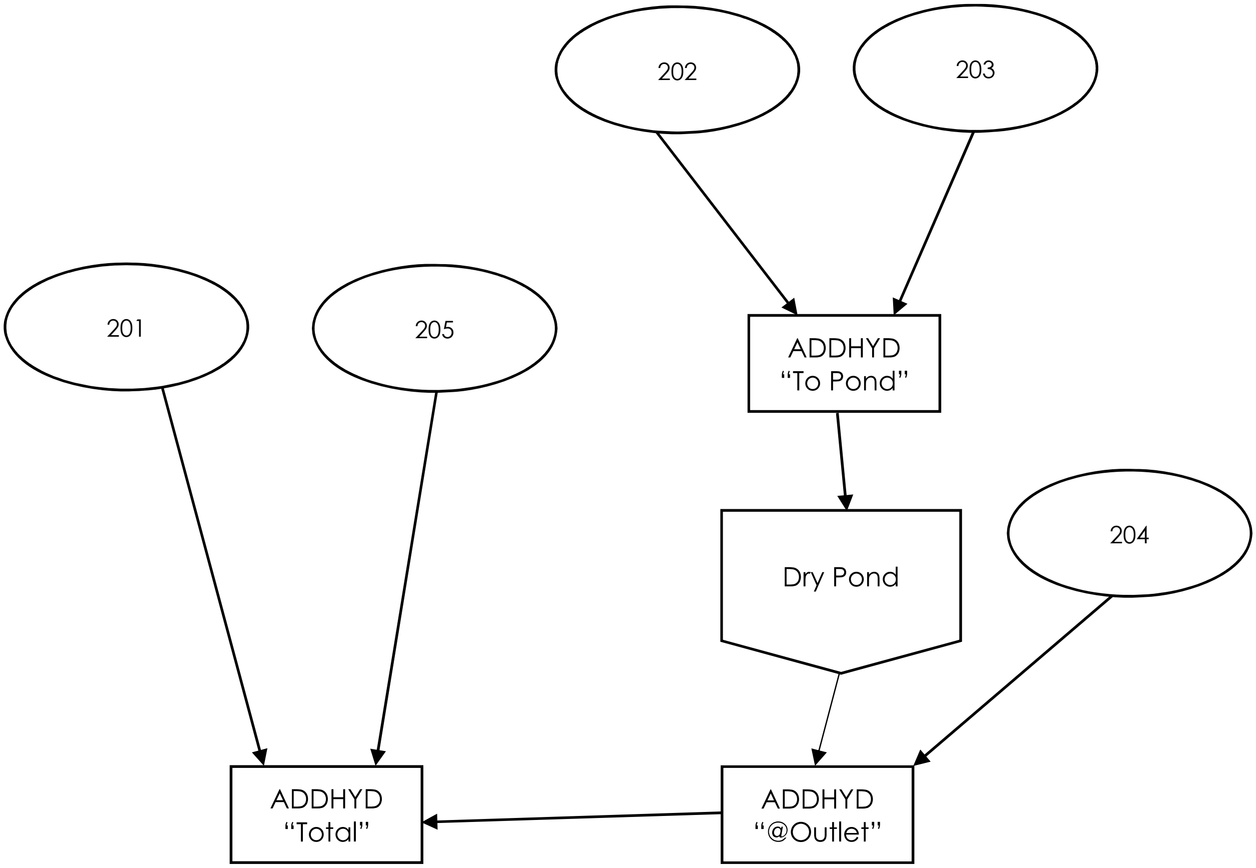
Orifice C: 0.6
Invert (m): 82.65
Diameter (mm): 525
Area (m²): 0.216
Q=CA(2gh)^0.5

Overflow Outlet Elevation: 83.70 m
Weir Coefficient: 1.60
Weir Width: 10 m
Q=CLH^1.5

Twin outlet orifice pipes

	Elevation (m)	Oriface Head (m)	Area (m²)	Incremental Volume (m³)	Total Volume (m³)	Orifice Discharge (m³/s)	Overflow Weir Discharge (m³/s)	Total Discharge (m³/s)	Incremental Drawdown Time (sec)	Cumulative Drawdown Time (Hrs)
Top of Storage Area	83.75	0.84	20244	961.9	9539.5	0.527	0.716	1.769	690	6.20
Bottom of Weir	83.70	0.79	18231	1621.8	8577.7	0.511	0.000	1.021	1642	6.01
100 Year Ponding Elevation (83.58)	83.60	0.69	14205	1283.1	6955.9	0.477		0.954	1398	5.55
	83.50	0.59	11457	1096.5	5672.8	0.441		0.882	1301	5.16
	83.40	0.49	10474	949.0	4576.2	0.402		0.803	1249	4.80
	83.30	0.39	8507	376.2	3627.2	0.358		0.716	543	4.46
	83.25	0.34	6540	324.1	3251.1	0.334		0.668	504	4.30
5 Year Ponding Elevation (83.21)	83.20	0.29	6426	631.1	2926.9	0.308		0.617	1132	4.16
	83.10	0.19	6197	608.3	2295.8	0.249		0.498	1451	3.85
	83.00	0.09	5968	585.4	1687.5	0.170		0.340	2010	3.45
	82.90		5739	562.5	1102.1	0.121		0.242	3008	2.89
	82.80		5511	539.6	539.6	0.066		0.132	7392	2.05
Bottom of Storage	82.70		5282	0.0	0.0	0.007		0.014		
Outlet Invert	82.65			0	0	0.000		0.000		

Proposed Conditions
SWMHYMO Schematic



```
2     Metric units
*#******************************************************************************
*#  Project Name: [AIWP Central Staging SWM] Project Number:[1609-60595]
*#  Date        : 02-06-2017
*#  Modeller    : [AKK]
*#  Company     : Stantec Consulting Ltd. (London)
*#  License #   :  4730904
*#******************************************************************************
*#
*#  This model represents the hydologic characteristics of the Amherst Island
*#  Catchment 15 proposed conditions.
*#  Storm events modeled are:
*#  5YR, 10YR and 100YR 24hr SCS STORMS (Amherst Island, ONT. IDF)
*#
*#******************************************************************************
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[5]
                    ["AI5SCS.24h"] <--storm filename, one per line for NSTORM time
*%-----------------|-----------------------------------------------------------|
READ STORM          STORM_FILENAME=["STORM.001"]
*%-----------------|-----------------------------------------------------------|
*# Existing Conditions
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD       ID=[1], NHYD=["100"], DT=[1]min, AREA=[31.72](ha),
                    DWF=[0](cms), CN/C=[84], TP=[0.46]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*# Proposed Conditions
*#-----------------|-----------------------------------------------------------|
DESIGN NASHYD       ID=[1], NHYD=["201"], DT=[1]min, AREA=[0.46](ha),
                    DWF=[0](cms), CN/C=[90], TP=[0.22]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*#-----------------|-----------------------------------------------------------|
DESIGN NASHYD       ID=[2], NHYD=["202"], DT=[1]min, AREA=[5.33](ha),
                    DWF=[0](cms), CN/C=[84], TP=[0.28]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*#-----------------|-----------------------------------------------------------|
DESIGN NASHYD       ID=[3], NHYD=["203"], DT=[1]min, AREA=[13.95](ha),
                    DWF=[0](cms), CN/C=[90], TP=[0.38]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*#-----------------|-----------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=["To Pond"], IDs to add=[2+3]
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD       ID=[5], NHYD=["204"], DT=[1]min, AREA=[1.77](ha),
                    DWF=[0](cms), CN/C=[84], TP=[0.38]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*#-----------------|-----------------------------------------------------------|
DESIGN NASHYD       ID=[6], NHYD=["205"], DT=[1]min, AREA=[10.26](ha),
                    DWF=[0](cms), CN/C=[84], TP=[0.53]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*# Twinned 525mm pipes outletting from the SWM
ROUTE RESERVOIR     IDout=[2],   NHYD=["SWM-525"],  IDin=[4],
                    RDT=[2](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                      (cms) - (ha-m)
                                    [   0.0 ,  0.0 ]
                                    [ 0.014 , 0.0001 ]
                                    [ 0.132 ,  0.054 ]
                                    [ 0.242 ,  0.110 ]
                                    [ 0.340 ,  0.169 ]
                                    [ 0.498 ,  0.230 ]
                                    [ 0.617 ,  0.293 ]
                                    [ 0.668 ,  0.325 ]
                                    [ 0.716 ,  0.363 ]
                                    [ 0.803 ,  0.458 ]
                                    [ 0.882 ,  0.567 ]
                                    [ 0.954 ,  0.696 ]
                                    [ 1.021 ,  0.858 ]
                                    [ 1.769 ,  0.954 ]
                                    [   -1  ,  -1  ]  (max twenty pts)
                          IDovf=[3], NHYDovf=["OV-SWM"]
*#-----------------|-----------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=["@Outlet"], IDs to add=[5+2+3]
*%-----------------|-----------------------------------------------------------|
ADD HYD             IDsum=[2], NHYD=["Total"], IDs to add=[4+1+6]
*%-----------------|-----------------------------------------------------------|
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[10]
                    ["AI10SCS.24h"] <--storm filename, one per line for NSTORM tim
*%-----------------|-----------------------------------------------------------|
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[100]
                    ["AI100SCS.24h"] <--storm filename, one per line for NSTORM ti
*%-----------------|-----------------------------------------------------------|
FINISH
```

```
================================================================================

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                        9   9  9   9   # 4730904
        StormWater Management HYdrologic Model           999    999    =========

 ******************************************************************************
 ***************************** SWMHYMO Ver/4.05 *****************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                  OTTHYMO-83 and OTTHYMO-89.                  *********
 ******************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884            *********
 *********                  Gatineau, Quebec: (819) 243-6858            *********
 *********                  E-Mail: swmhymo@jfsa.Com                    *********
 ******************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: Stantec Consulting Ltd. (Kitchener)         +++++++++
 +++++++++                Kitchener             SERIAL#:4730904       +++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ******************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++           *********
 *********           Maximum value for ID numbers  :     10            *********
 *********           Max. number of rainfall points: 105408            *********
 *********           Max. number of flow points    : 105408            *********
 ******************************************************************************

 ***** DESCRIPTION SUMMARY TABLE HEADERS (units depend on METOUT in START) *****
 *****-------------------------------------------------------------------*****
 *****    ID:  Hydrograph IDentification numbers, (1-10).                 *****
 *****  NHYD:  Hydrograph reference numbers, (6 digits or characters).    *****
 *****  AREA:  Drainage area associated with hydrograph, (ac.) or (ha.).  *****
 ***** QPEAK:  Peak flow of simulated hydrograph, (ft^3/s) or (m^3/s).    *****
 ***** TpeakDate_hh:mm is the date and time of the peak flow.             *****
 *****  R.V.:  Runoff Volume of simulated hydrograph, (in) or (mm).       *****
 *****  R.C.:  Runoff Coefficient of simulated hydrograph, (ratio).       *****
 *****     *:  see WARNING or NOTE message printed at end of run.         *****
 *****    **:  see  ERROR  message printed at end of run.                 *****
 ******************************************************************************
 ******************************************************************************

::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

 ******************************************************************************

 *********************   S U M M A R Y   O U T P U T   *********************
 ******************************************************************************
 *         DATE: 2017-02-06     TIME: 18:51:34     RUN COUNTER: 001421        *
 ******************************************************************************
 * Input   filename: C:\usr\_AIWEP\CLAt525o.dat                               *
 * Output  filename: C:\usr\_AIWEP\CLAt525o.out                               *
 * Summary filename: C:\usr\_AIWEP\CLAt525o.sum                               *
 * User comments:                                                             *
 * 1:_________________________________________________________________________*
 * 2:_________________________________________________________________________*
 * 3:_________________________________________________________________________*
 ******************************************************************************


#******************************************************************************
#  Project Name: [AIWP Central Staging SWM] Project Number:[1609-60595]
#  Date         : 02-06-2017
#  Modeller     : [AKK]
#  Company      : Stantec Consulting Ltd. (London)
#  License #    :  4730904
#******************************************************************************
#
#  This model represents the hydologic characteristics of the Amherst Island
#  Catchment 15 proposed conditions.
#  Storm events modeled are:
#  5YR, 10YR and 100YR 24hr SCS STORMS (Amherst Island, ONT. IDF)
#
#******************************************************************************
  ** END OF RUN :   4

*******************************************************************************





 RUN:COMMAND#
 005:0001-----------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   5 ]
#******************************************************************************
#  Project Name: [AIWP Central Staging SWM] Project Number:[1609-60595]
#  Date         : 02-06-2017
#  Modeller     : [AKK]
#  Company      : Stantec Consulting Ltd. (London)
#  License #    :  4730904
#******************************************************************************
#
#  This model represents the hydologic characteristics of the Amherst Island
#  Catchment 15 proposed conditions.
#  Storm events modeled are:
#  5YR, 10YR and 100YR 24hr SCS STORMS (Amherst Island, ONT. IDF)
#
#******************************************************************************
 005:0002-----------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  =
      [SDT=15.00:SDUR=  24.00:PTOT=  71.40]
# Existing Conditions
 005:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     DESIGN NASHYD      01:100           31.72    1.858 No_date   12:21   41.31 .5
      [CN= 84.0: N= 3.00]
      [Tp=  .46:DT= 1.00]
# Proposed Conditions
#-----------------|-----------------------------------------------------------|
 005:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     DESIGN NASHYD      01:201             .46     .054 No_date   12:06   49.79 .6
      [CN= 90.0: N= 3.00]
      [Tp=  .22:DT= 1.00]
#-----------------|-----------------------------------------------------------|
 005:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     DESIGN NASHYD      02:202            5.33     .440 No_date   12:10   41.31 .5
      [CN= 84.0: N= 3.00]
      [Tp=  .28:DT= 1.00]
#-----------------|-----------------------------------------------------------|
 005:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     DESIGN NASHYD      03:203           13.95    1.140 No_date   12:15   49.79 .6
      [CN= 90.0: N= 3.00]
      [Tp=  .38:DT= 1.00]
#-----------------|-----------------------------------------------------------|
 005:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     ADD HYD            02:202            5.33     .440 No_date   12:10   41.31  n
                     +  03:203           13.95    1.140 No_date   12:15   49.79  n
      [DT= 1.00]  SUM=  04:To Pond       19.28    1.562 No_date   12:13   47.45  n
 005:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     DESIGN NASHYD      05:204            1.77     .119 No_date   12:16   41.31 .5
      [CN= 84.0: N= 3.00]
      [Tp=  .38:DT= 1.00]
#-----------------|-----------------------------------------------------------|
 005:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     DESIGN NASHYD      06:205           10.26     .543 No_date   12:26   41.31 .5
      [CN= 84.0: N= 3.00]
      [Tp=  .53:DT= 1.00]
# Twinned 525mm pipes outletting from the SWM
 005:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     ROUTE RESERVOIR -> 04:To Pond       19.28    1.562 No_date   12:13   47.45  n
      [RDT= 1.00] out<- 02:SWM-525       19.28     .637 No_date   12:51   47.45  n
            overflow <= 03:OV-SWM          .00     .000 No_date    0:00     .00  n
     {MxStoUsed=.3058E+00, TotOvfVol=.0000E+00, N-Ovf=    0, TotDurOvf=    0.hrs}
#-----------------|-----------------------------------------------------------|
 005:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     ADD HYD            05:204            1.77     .119 No_date   12:16   41.31  n
                     +  02:SWM-525       19.28     .637 No_date   12:51   47.45  n
                     +  03:OV-SWM          .00     .000 No_date    0:00     .00  n
      [DT= 1.00]  SUM=  04:@Outlet       21.05     .701 No_date   12:43   46.93  n
 005:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     ADD HYD            04:@Outlet       21.05     .701 No_date   12:43   46.93  n
                     +  01:201             .46     .054 No_date   12:06   49.79  n
                     +  06:205           10.26     .543 No_date   12:26   41.31  n
      [DT= 1.00]  SUM=  02:Total         31.77    1.232 No_date   12:32   45.16  n
  ** END OF RUN :   9

*******************************************************************************





 RUN:COMMAND#
 010:0001-----------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =  10 ]
#******************************************************************************
#  Project Name: [AIWP Central Staging SWM] Project Number:[1609-60595]
#  Date         : 02-06-2017
#  Modeller     : [AKK]
#  Company      : Stantec Consulting Ltd. (London)
#  License #    :  4730904
#******************************************************************************
#
#  This model represents the hydologic characteristics of the Amherst Island
#  Catchment 15 proposed conditions.
#  Storm events modeled are:
#  5YR, 10YR and 100YR 24hr SCS STORMS (Amherst Island, ONT. IDF)
#
#******************************************************************************
 010:0002-----------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  =
      [SDT=15.00:SDUR=  24.00:PTOT=  83.00]
# Existing Conditions
 010:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     DESIGN NASHYD      01:100           31.72    2.308 No_date   12:21   51.14 .6
      [CN= 84.0: N= 3.00]
      [Tp=  .46:DT= 1.00]
# Proposed Conditions
#-----------------|-----------------------------------------------------------|
 010:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     DESIGN NASHYD      01:201             .46     .065 No_date   12:06   60.54 .7
      [CN= 90.0: N= 3.00]
      [Tp=  .22:DT= 1.00]
#-----------------|-----------------------------------------------------------|
 010:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     DESIGN NASHYD      02:202            5.33     .546 No_date   12:10   51.14 .6
      [CN= 84.0: N= 3.00]
      [Tp=  .28:DT= 1.00]
#-----------------|-----------------------------------------------------------|
 010:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     DESIGN NASHYD      03:203           13.95    1.385 No_date   12:15   60.54 .7
      [CN= 90.0: N= 3.00]
      [Tp=  .38:DT= 1.00]
#-----------------|-----------------------------------------------------------|
 010:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     ADD HYD            02:202            5.33     .546 No_date   12:10   51.14  n
                     +  03:203           13.95    1.385 No_date   12:15   60.54  n
      [DT= 1.00]  SUM=  04:To Pond       19.28    1.908 No_date   12:13   57.94  n
 010:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     DESIGN NASHYD      05:204            1.77     .147 No_date   12:16   51.14 .6
      [CN= 84.0: N= 3.00]
      [Tp=  .38:DT= 1.00]
#-----------------|-----------------------------------------------------------|
 010:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     DESIGN NASHYD      06:205           10.26     .675 No_date   12:26   51.14 .6
      [CN= 84.0: N= 3.00]
      [Tp=  .53:DT= 1.00]
# Twinned 525mm pipes outletting from the SWM
 010:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     ROUTE RESERVOIR -> 04:To Pond       19.28    1.908 No_date   12:13   57.94  n
      [RDT= 1.00] out<- 02:SWM-525       19.28     .733 No_date   12:53   57.94  n
            overflow <= 03:OV-SWM          .00     .000 No_date    0:00     .00  n
     {MxStoUsed=.3816E+00, TotOvfVol=.0000E+00, N-Ovf=    0, TotDurOvf=    0.hrs}
#-----------------|-----------------------------------------------------------|
 010:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     ADD HYD            05:204            1.77     .147 No_date   12:16   51.14  n
                     +  02:SWM-525       19.28     .733 No_date   12:53   57.94  n
                     +  03:OV-SWM          .00     .000 No_date    0:00     .00  n
      [DT= 1.00]  SUM=  04:@Outlet       21.05     .817 No_date   12:38   57.37  n
 010:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     ADD HYD            04:@Outlet       21.05     .817 No_date   12:38   57.37  n
                     +  01:201             .46     .065 No_date   12:06   60.54  n
                     +  06:205           10.26     .675 No_date   12:26   51.14  n
      [DT= 1.00]  SUM=  02:Total         31.77    1.494 No_date   12:29   55.40  n
  ** END OF RUN :  99

*******************************************************************************





 RUN:COMMAND#
 100:0001-----------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  = 100 ]
#******************************************************************************
```

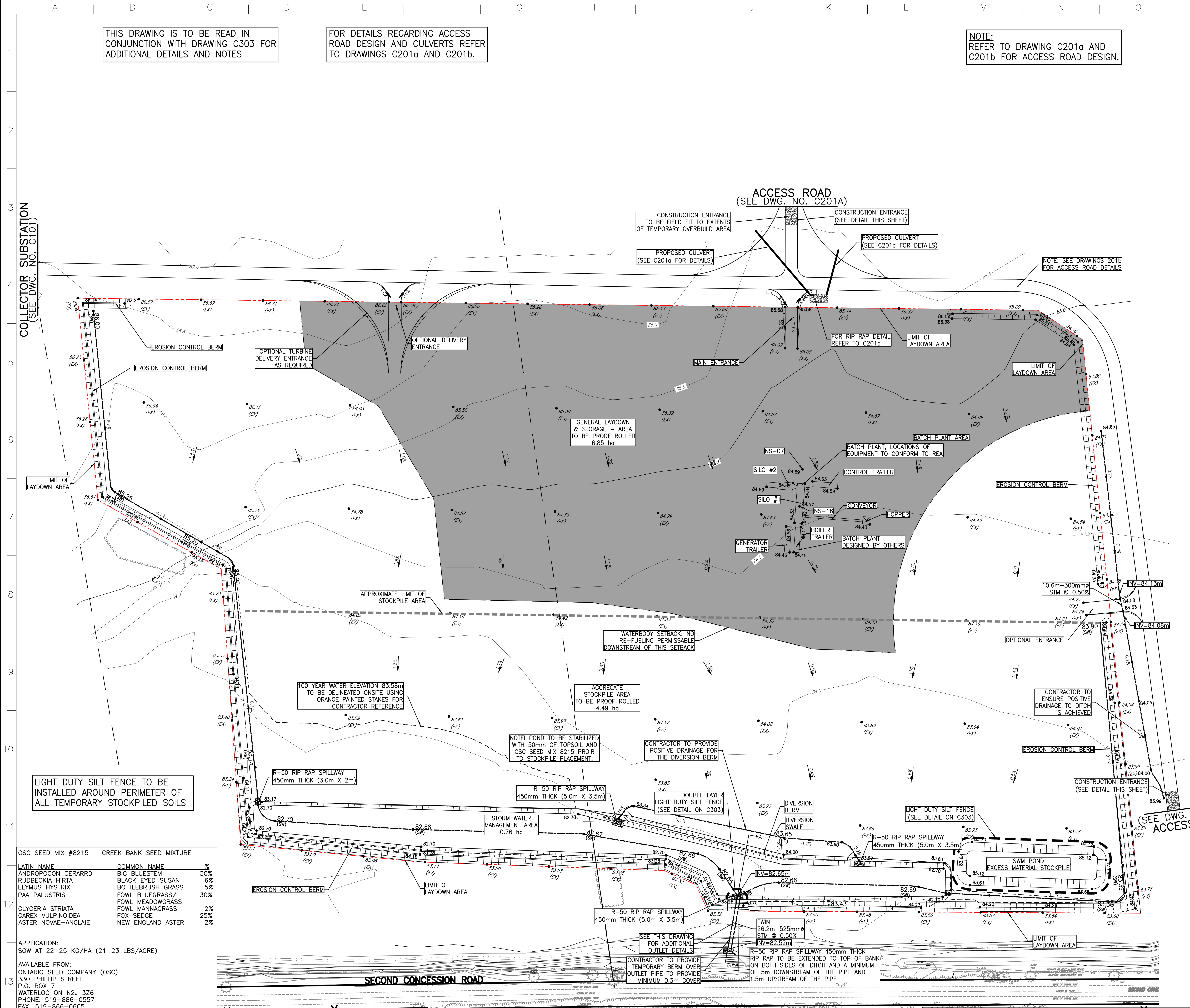
```
#  Project Name: [AIWP Central Staging SWM] Project Number:[1609-60595]
#  Date        : 02-06-2017
#  Modeller    : [AKK]
#  Company     : Stantec Consulting Ltd. (London)
#  License #   :  4730904
#*******************************************************************************
#
#  This model represents the hydologic characteristics of the Amherst Island
#  Catchment 15 proposed conditions.
#  Storm events modeled are:
#  5YR, 10YR and 100YR 24hr SCS STORMS (Amherst Island, ONT. IDF)
#
#*******************************************************************************
 100:0002-------------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  =
      [SDT=15.00:SDUR=  24.00:PTOT= 119.80]
# Existing Conditions
 100:0003---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     DESIGN NASHYD      01:100           31.72    3.804 No_date   12:20   83.96 .7
      [CN= 84.0: N= 3.00]
      [Tp=  .46:DT= 1.00]
# Proposed Conditions
#-----------------|------------------------------------------------------------|
 100:0004---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     DESIGN NASHYD      01:201             .46     .102 No_date   12:06   95.51 .7
      [CN= 90.0: N= 3.00]
      [Tp=  .22:DT= 1.00]
#-----------------|------------------------------------------------------------|
 100:0005---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     DESIGN NASHYD      02:202            5.33     .898 No_date   12:09   83.96 .7
      [CN= 84.0: N= 3.00]
      [Tp=  .28:DT= 1.00]
#-----------------|------------------------------------------------------------|
 100:0006---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     DESIGN NASHYD      03:203           13.95    2.170 No_date   12:15   95.52 .7
      [CN= 90.0: N= 3.00]
      [Tp=  .38:DT= 1.00]
#-----------------|------------------------------------------------------------|
 100:0007---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     ADD HYD            02:202            5.33     .898 No_date   12:09   83.96  n
                     +  03:203           13.95    2.170 No_date   12:15   95.52  n
      [DT= 1.00]  SUM=  04:To Pond       19.28    3.032 No_date   12:13   92.32  n
 100:0008---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     DESIGN NASHYD      05:204            1.77     .243 No_date   12:15   83.96 .7
      [CN= 84.0: N= 3.00]
      [Tp=  .38:DT= 1.00]
#-----------------|------------------------------------------------------------|
 100:0009---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     DESIGN NASHYD      06:205           10.26    1.113 No_date   12:25   83.96 .7
      [CN= 84.0: N= 3.00]
      [Tp=  .53:DT= 1.00]
# Twinned 525mm pipes outletting from the SWM
 100:0010---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     ROUTE RESERVOIR -> 04:To Pond       19.28    3.032 No_date   12:13   92.32  n
      [RDT= 1.00] out<- 02:SWM-525       19.28     .936 No_date   12:59   92.32  n
            overflow <= 03:OV-SWM          .00     .000 No_date    0:00     .00  n
     {MxStoUsed=.6643E+00, TotOvfVol=.0000E+00, N-Ovf=    0, TotDurOvf=    0.hrs}
#-----------------|------------------------------------------------------------|
 100:0011---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     ADD HYD            05:204            1.77     .243 No_date   12:15   83.96  n
                     +  02:SWM-525       19.28     .936 No_date   12:59   92.32  n
                     +  03:OV-SWM          .00     .000 No_date    0:00     .00  n
      [DT= 1.00]  SUM=  04:@Outlet       21.05    1.077 No_date   12:32   91.62  n
 100:0012---------------ID:NHYD-----------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.
     ADD HYD            04:@Outlet       21.05    1.077 No_date   12:32   91.62  n
                     +  01:201             .46     .102 No_date   12:06   95.51  n
                     +  06:205           10.26    1.113 No_date   12:25   83.96  n
      [DT= 1.00]  SUM=  02:Total         31.77    2.223 No_date   12:26   89.20  n
 100:0002-------------------------------------------------------------------------
      FINISH
----------------------------------------------------------------------------------
**********************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2017-02-06     at 18:51:35
==================================================================================


```

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH DRAWING C303 FOR ADDITIONAL DETAILS AND NOTES

FOR DETAILS REGARDING ACCESS ROAD DESIGN AND CULVERTS REFER TO DRAWINGS C201a AND C201b.

NOTE:
REFER TO DRAWING C201a AND C201b FOR ACCESS ROAD DESIGN.

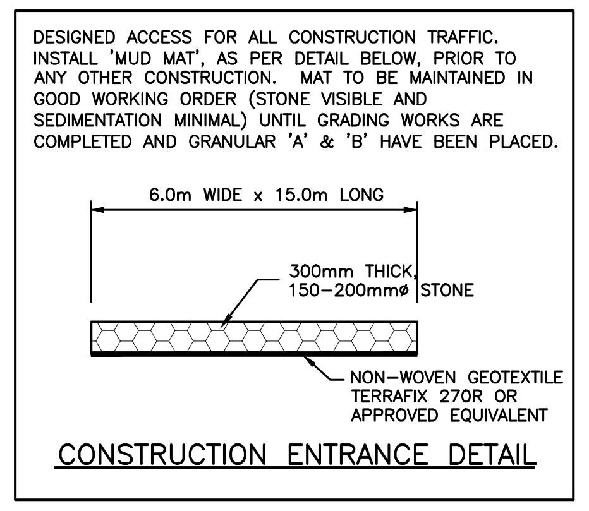


OSC SEED MIX #8215 – CREEK BANK SEED MIXTURE

LATIN NAME	COMMON NAME	%
ANDROPOGON GERARRDI	BIG BLUESTEM	30%
RUDBECKIA HIRTA	BLACK EYED SUSAN	6%
ELYMUS HYSTRIX	BOTTLEBRUSH GRASS	5%
PAA PALUSTRIS	FOWL BLUEGRASS/ FOWL MEADOWGRASS	30%
GLYCERIA STRIATA	FOWL MANNAGRASS	2%
CAREX VULPINOIDEA	FOX SEDGE	25%
ASTER NOVAE–ANGLAIE	NEW ENGLAND ASTER	2%

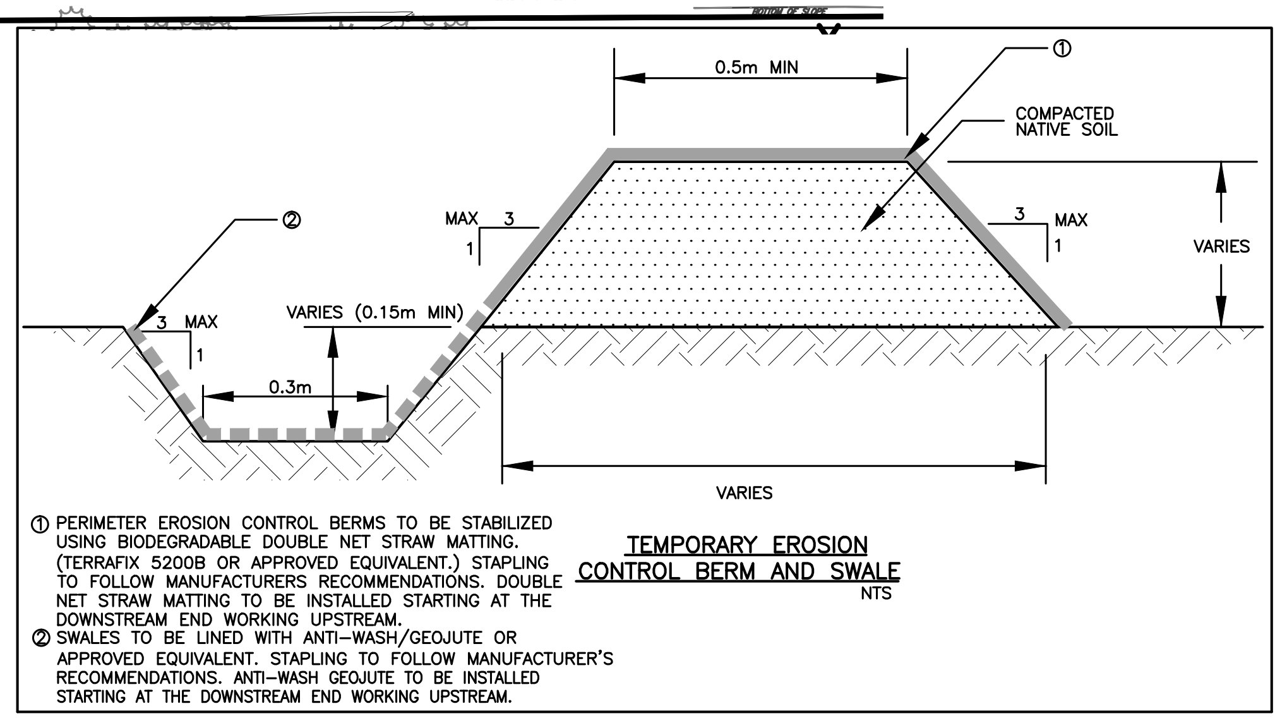
APPLICATION:
SOW AT 22–25 KG/HA (21–23 LBS/ACRE)

AVAILABLE FROM:
ONTARIO SEED COMPANY (OSC)
330 PHILLIP STREET
P.O. BOX 7
WATERLOO ON N2J 3Z6
PHONE: 519–886–0557
FAX: 519–866–0605



DESIGNED ACCESS FOR ALL CONSTRUCTION TRAFFIC. INSTALL 'MUD MAT', AS PER DETAIL BELOW, PRIOR TO ANY OTHER CONSTRUCTION. MAT TO BE MAINTAINED IN GOOD WORKING ORDER (STONE VISIBLE AND SEDIMENTATION MINIMAL) UNTIL GRADING WORKS ARE COMPLETED AND GRANULAR 'A' & 'B' HAVE BEEN PLACED.

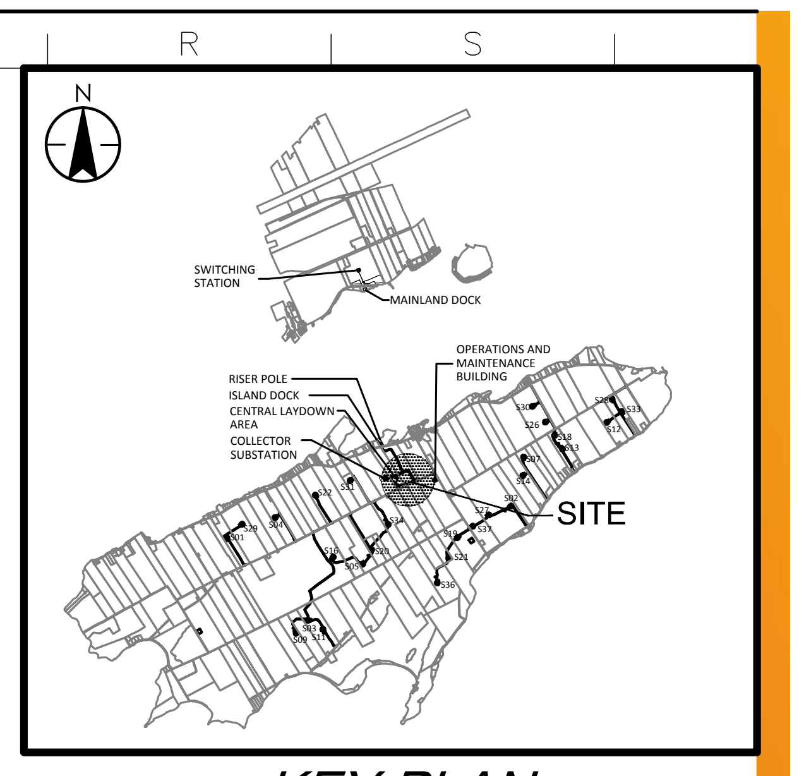
CONSTRUCTION ENTRANCE DETAIL



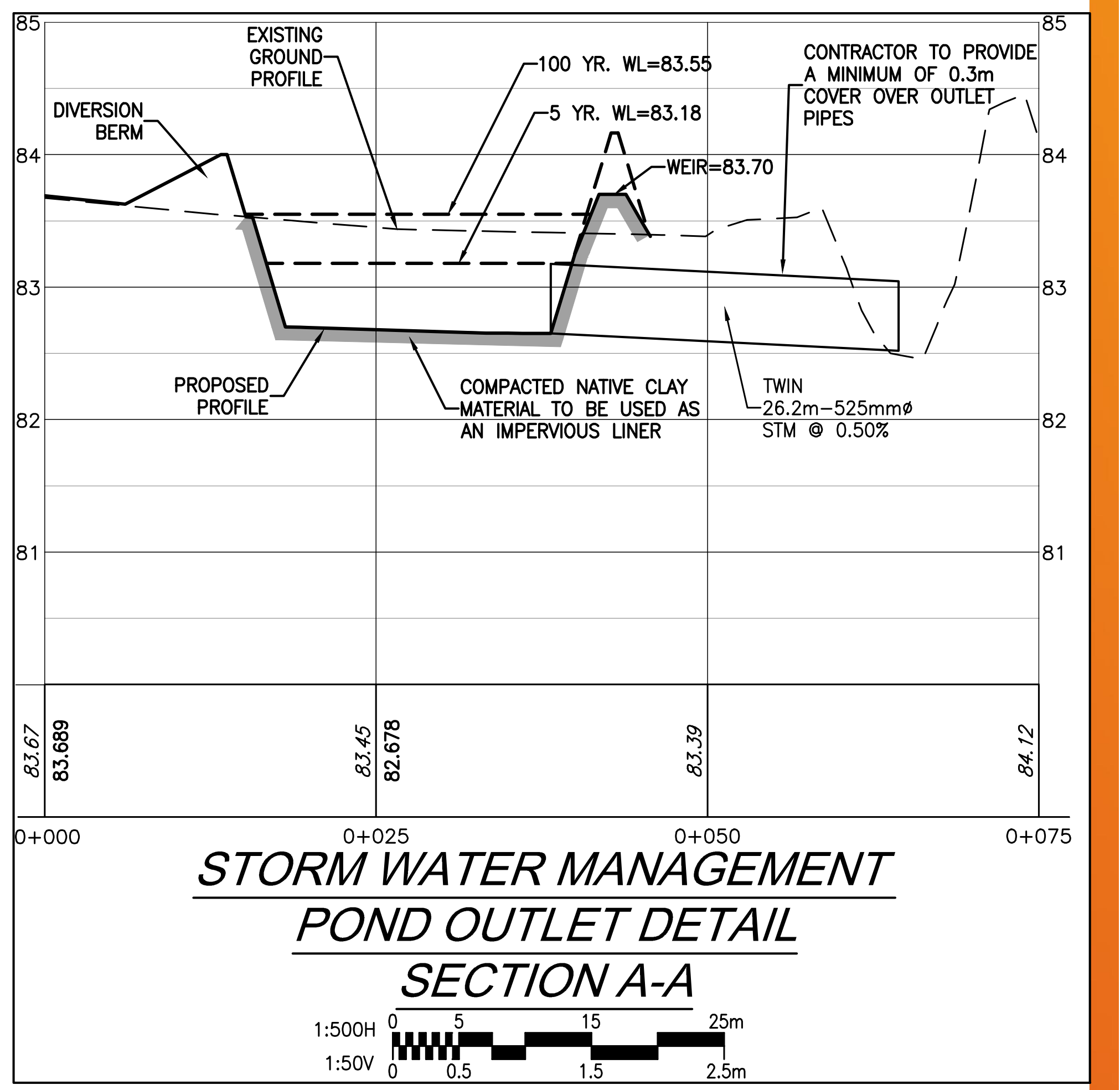
① PERIMETER EROSION CONTROL BERMS TO BE STABILIZED USING BIODEGRADABLE DOUBLE NET STRAW MATTING. (TERRAFIX 5200B OR APPROVED EQUIVALENT.) STAPLING TO FOLLOW MANUFACTURERS RECOMMENDATIONS. DOUBLE NET STRAW MATTING TO BE INSTALLED STARTING AT THE DOWNSTREAM END WORKING UPSTREAM.

② SWALES TO BE LINED WITH ANTI–WASH/GEOJUTE OR APPROVED EQUIVALENT. STAPLING TO FOLLOW MANUFACTURER'S RECOMMENDATIONS. ANTI–WASH GEOJUTE TO BE INSTALLED STARTING AT THE DOWNSTREAM END WORKING UPSTREAM.

TEMPORARY EROSION CONTROL BERM AND SWALE
NTS



KEY PLAN
N.T.S



STORM WATER MANAGEMENT POND OUTLET DETAIL SECTION A-A

Stantec

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Notes

1. TOPOGRAPHIC SURVEY COMPLETED BY McINTOSH PERRY CONSULTING ENGINEERS DATED 2015 (UTM ZONE 18 NAD83 (CRSR)1997.0). GEOTECHNICAL INFORMATION PROVIDED BY STANTEC MEMO, DATED JUNE 2015.
2. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS IN THIS SET PREPARED BY STANTEC CONSULTING LTD.
3. THE CONTRACTOR MUST CHECK AND VERIFY DIMENSIONS; OBTAIN ALL UTILITY LOCATES AND OBTAIN ALL REQUIRED PERMITS/LICENSES AND VERIFY ELEVATIONS OF EXISTING SERVICES BEFORE PROCEEDING WITH ANY WORK.
4. ALL CONSTRUCTION WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS (LATEST EDITION).
5. ENCROACHMENT ON NON–PARTICIPANTING PROPERTIES IS STRICTLY PROHIBITED. THE CONTRACTOR AND/OR THEIR REPRESENTATIVES ARE TO BE AWARE OF ALL PARTICIPATING LAND OWNERS ON THE PROJECT AND THE PROJECTS CONSTRUCTIBLE LIMITS. ALL CONSTRUCTION ACTIVITY BEYOND THE CONSTRUCTIBLE LIMITS IS STRICTLY PROHIBITED.
6. THE CONTRACTOR IS RESPONSIBLE FOR RESTORATION OF ALL DAMAGED AND/OR DISTURBED PROPERTY WITHIN THE MUNICIPAL RIGHT–OF–WAY TO THE CURRENT MUNICIPAL STANDARDS AND SHALL CONFORM TO ROAD USE AGREEMENT.
7. THE CONTRACTOR IS TO BE RESPONSIBLE FOR ALL DRAINAGE AND MEASURES TO CONTROL WATER. THE SITE IS TO BE FINE GRADED/LEVELED LEAVING THE SITE IN A NEAT APPEARANCE SUCH THAT POSITIVE DRAINAGE IS ACHIEVED.
8. CONSTRUCTION TURNING RADIUS LIMITS IDENTIFY AREAS WHERE ADDITIONAL ROAD WIDTH IS REQUIRED TO ALLOW FOR ADEQUATE CLEARANCE FOR CONSTRUCTION VEHICLES.
9. ALL DISTURBED AREAS WITHIN THE PROPOSED WORKS ARE TO BE RE–VEGETATED USING NATIVE TOPSOIL AND SEED AS PER REA. MIX AND APPLICATION RATE/METHOD TO BE APPROVED PRIOR TO IMPLEMENTATION.
10. CLEARING AND GRUBBING AND REMOVALS TO BE COMPLETED IN ACCORDANCE WITH OPSS 201. TEMPORARY EROSION CONTROL TO BE COMPLETED IN ACCORDANCE WITH OPSS 577.
11. GRADING TO BE COMPLETED IN ACCORDANCE WITH OPSS 206.
12. GRANULAR MATERIAL TO BE USED IN ACCORDANCE WITH OPSS 1010.
13. ALL CULVERTS TO BE CONSTRUCTED IN ACCORDANCE WITH OPSS 421 AND AS PER OPSD 802.010.

Legend

PROPOSED		EXISTING
←— – –	CULVERT	←— – –
┬┬┬	SLOPE (3:1 UNLESS NOTED OTHERWISE)	┬┬┬
• 84.01	ELEVATION	× 83.85 (EX)
— 84.5 —	CONTOUR	
←···—···—	SWALE	←···—···—
← 3.2%	GRADE	
▬ ▬ ▬	LIGHT DUTY SILT FENCE	
▨	RIP RAP	
——— – ———	WATER BODY SETBACK (NO REFUELING OR MAINTENANCE OF CONSTRUCTION EQUIPMENT WITHIN THIS SETBACK)	
– – – – –	100 YEAR FLOOD ELEVATION	
— – – — – –	LIMIT OF LAY DOWN	
— —— —	LOT LINE	
▨	DESIGNATED REFUELING AREA	

0	ISSUED FOR CONSTRUCTION	DS	DKS	17.02.06
Revision		By	Appd.	YY.MM.DD

File Name: 133560100C-GP.dwg	DS	DKS	DS	16.01.20
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

D.K. SCOTT
100119359
FEB 6 2017

*****For PHCL and Windlectric Use Only*****	
Review and/or accepted does not constitute approval of design details, calculations or methods. It is the responsibility of the consultant to ensure all information contained within the drawings are in full compliance with contractual obligations	
☐ Reviewed - Accepted and no comments	
☐ Reviewed - Incorporate comments and resubmit	
☐ Reviewed - Not accepted	
Reviewed By	Date (dd-mmm-yyyy)
Project Manager - PHCL	Date (dd-mmm-yyyy)
Project Manager - Windlectric	Date (dd-mmm-yyyy)
Owner:	

Client/Project

PENNECON HEAVY CIVIL

AMHERST ISLAND WIND PROJECT
75MW WIND FARM

Amherst Island, Loyalist Township, Ontario

Title

CENTRAL STAGING AREA GRADING AND SEDIMENT AND EROSION CONTROL PLAN

Project No. 133560100
Scale 1:1000 0 10 30 50m

Drawing No. C105
Sheet 1 of 1
Revision 0