Loyalist Solar Project – Substation
Stormwater Management and Erosion and Sediment Control Report

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November 21, 2017

Revision	Description	Author		Quality Check		Independent Review	
1	Draft to Client	DW	31/10/17	NE	31/10/17		
2	FINAL	DW	11/21/17	NE	11/21/17	SRB	11/21/17

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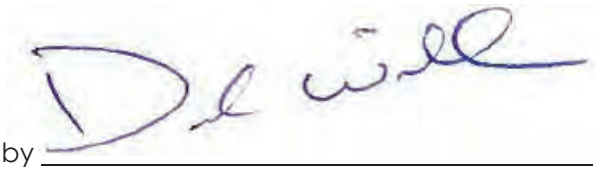
Prepared by 

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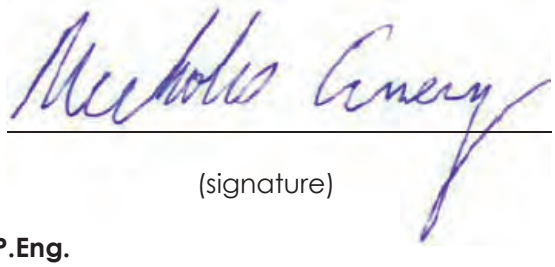
Reviewed by 

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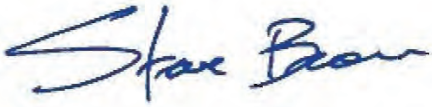
Approved by 

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Steve Brown, MBA, P.Eng.

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1.0 INTRODUCTION

Stantec has been retained by PCL Constructors Canada Inc. (PCL) to assist with final design engineering services related to the proposed development of the 54-megwatt (MW) Loyalist Solar Project (Project) in the Township of Stone Mills, County of Lennox & Addington, Ontario.

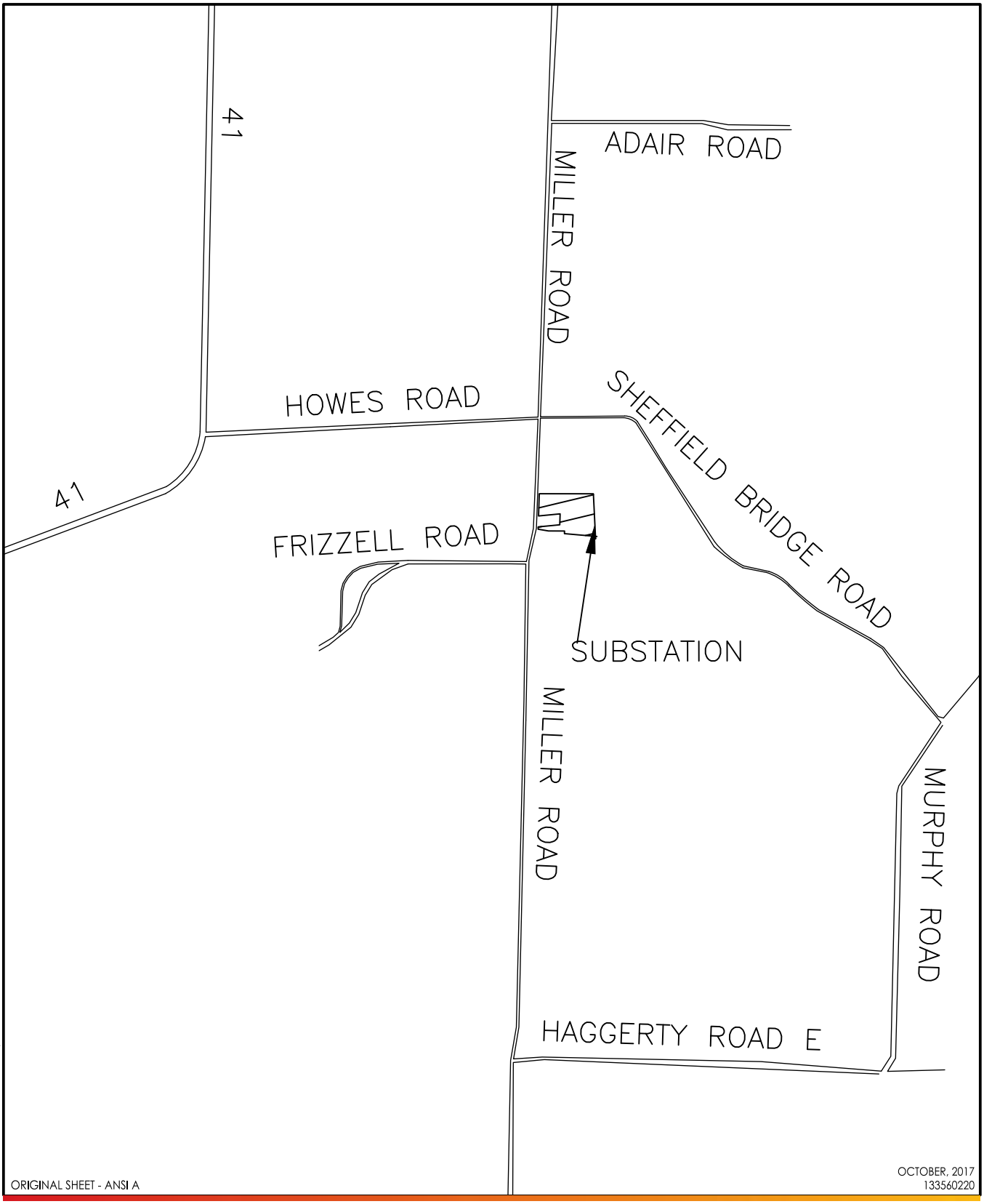
The substation portion of the project is located northeast of the intersection of Miller Road and Frizzell Road as shown on **Figure 1**. The site is bounded by Miller Road to the west, existing agricultural lands to the north and east and a Hydro One Networks Inc. (HONI) corridor and existing agricultural lands to the south.

This Stormwater Management (SWM) and Erosion and Sediment Control (ESC) 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 Renewable Energy Application (REA)Application, detailed engineering design, and herein, are sufficient to address 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 involves 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 the 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) and Quinte Conservation (QC) guidance; and
- Development of an ESC strategy outlining the anticipated approach to minimize impacts related to construction.



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Client/Project
LOYALIST SOLAR LP
LOYALIST SOLAR PROJECT
County of Lennox and Addington, ON

Figure No.
FIG 1

Title
SITE LOCATION PLAN

1.2 BACKGROUND INFORMATION

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

General Guidance Documentation / Literature

- *Hydrologic Response of Solar Farms article in the Journal of Hydrologic Engineering,* Cook and McCuen, May 2013
- *Quinte Conservation Stormwater Management Submission Guidelines*, Quinte Conservation, May 2012
- *Low Impact Development Stormwater Management Planning and Design Guide (LID Design Guide)*, Credit Valley Conservation Authority and Toronto Region Conservation, 2010
- *Erosion & Sediment Control Guideline for Urban Construction (ESC Guideline)*, Greater Golden Horseshoe Conservation Authorities (GGHCA), December 2006
- *Stormwater Management Planning and Design Manual (SWMPD Manual)*, Ontario Ministry of the Environment and Climate Change, March 2003
- *Control of Erosion – Fact Sheet,* Ontario Ministry of Food and Agriculture and Rural Affairs (OMAFRA), October 1986

Project-Specific Consultation / Documentation

- *Pre-consultation meeting with Quinte Conservation, Stantec, PCL and BlueEarth Renewables*, October 20, 2017 (minutes appended)
- *Draft Geotechnical Report – Loyalist Solar Project – 230 kV/34.5 kV Collector Station, Township of Stone Mills, ON*, Tulloch Engineering Inc., October 2017
- *Preliminary Stormwater Management and Erosion and Sediment Control Plan*, Tulloch Engineering Inc., March 2017
- *Loyalist Solar Project – Project Description Report,* Dillon Consulting Ltd., February 2017
- *Loyalist Solar Project – Construction Plan Report,* Dillon Consulting Ltd., February 2017
- *Loyalist Solar Project – Design and Operations Report,* Dillon Consulting Ltd., February 2017
- *Loyalist Solar Project – Water Body Report,* Dillon Consulting Ltd., February 2017

- *Loyalist Solar Project – Water Assessment Report,* Dillon Consulting Ltd., February 2017

1.3 STORMWATER MANAGEMENT CRITERIA

Based on the background information and pre-consultation noted above, the following SWM design criteria have been established for the Loyalist Solar Project:

- Water Quantity Control
    - Control post-development runoff rates to pre-development levels for the 2-year to 100-year storm events
    - Check the 25 mm storm for erosion protection.
    - Provide accommodation for future climate change scenarios by designing facilities with an additional 10% design storage capacity
- Water Quality Control
    - Provide MOECC Normal Protection Level (70% Total Suspended Solids (TSS) removal) water quality control
- Erosion and Sediment Control
    - Provide appropriate erosion and sediment control during construction/area grading to protect adjacent properties and downstream features/watercourses from potential siltation

2.0 EXISTING CONDITIONS

2.1 TOPOGRAPHY AND SURFACE DRAINAGE

The location of the proposed substation is currently agricultural lands draining as shallow overland flow, generally in a northwest direction. Ultimately, runoff from the site discharges to the Salmon River east of the site. The site topography is flat to undulating terrain with elevations ranging from 150.5 m in the south-central portion of the site to 147.0 m near the northwest and east site boundaries. Drainage catchments were delineated using a combination of topographical survey, Light Detection and Radar (LiDAR) survey, aerial imagery and observations made during site visits completed by Stantec on September 26 and 27, 2017. Catchments are shown on **Figure 2** and summarized as follows:

Catchment 100 – 1.0 ha of Miller Road, existing agricultural lands used for row crops, hedgerow and a residential dwelling located west of the proposed substation, draining northwest to the Miller Road roadside ditch, discharging west under Miller Road through an existing cross road culvert. The culvert discharges to Pennell's creek which generally flows east towards the Salmon River.

Catchment 110 – 1.2 ha of existing agricultural lands used for row crops, hedgerow and lawn area draining north as shallow overland flow towards adjacent agricultural lands

Catchment 120 – 2.3 ha of existing agricultural lands used for row crops and hedgerow draining northeast as shallow overland flow towards a woodlot and existing agricultural lands

Catchment 130 – 0.6 ha of existing agricultural lands used for row crops and hedgerow draining south towards adjacent agricultural lands

2.2 GEOTECHNICAL INFORMATION

A detailed geotechnical investigation was completed by Tulloch Engineering Inc. (Tulloch) in 2017. The investigation concluded that site soils consisted of topsoil overlaying clay and sands. Bedrock was encountered approximately 5 to 5.5 m below ground surface in all boreholes advanced on the property. No groundwater was encountered during the site investigation.

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Legend

100
A=31.72 — AREA NUMBER, CONTRIBUTING AREA (ha)

OVERLAND FLOW ROUTE

DRAINAGE BOUNDARY

EXISTING CULVERT

SITE BOUNDARY

Scale

1:1500 — 0 15 45 75m

Client/Project
LOYALIST SOLAR LP
LOYALIST SOLAR PROJECT
54MW GROUND-MOUNT SOLAR FARM

Figure No.
2

Title
SUBSTATION
PRE-DEVELOPMENT CATCHMENT PLAN

3.0 PROPOSED CONDITIONS

The proposed substation is located in the south-central portion of the site with an access road (6 m width) connection to Miller Road in the northwest portion of the site. As shown on the attached **Drawing C-400**, the substation site includes a small building containing electrical controls, a security fence, the substation, overhead and underground electrical infrastructure, a well-drained, coarse granular area underlying electrical infrastructure and graveled access road. The majority of the ground within the fenced area is proposed to be surfaced with 150 mm diameter washed crushed stone, underlain with a structural base (450 mm depth) composed of 150 mm granular 'A' and 300 mm granular 'B' material. The proposed access road is proposed to be constructed with 150 mm of granular 'A' atop 300 mm granular 'B' material (see **Drawing C-500**, attached).

Runoff from the majority of the substation is conveyed as overland flow to an enhanced grass swale on the south and west side of the proposed access road running in a north, then westerly direction to a proposed SWM dry pond facility, before outletting to the Miller Road roadside ditch. Small portions of the substation area drain to the north, northeast and south limits of the site, as described below. Delineation of proposed drainage catchments is provided on **Figure 3** and is summarized as follows:

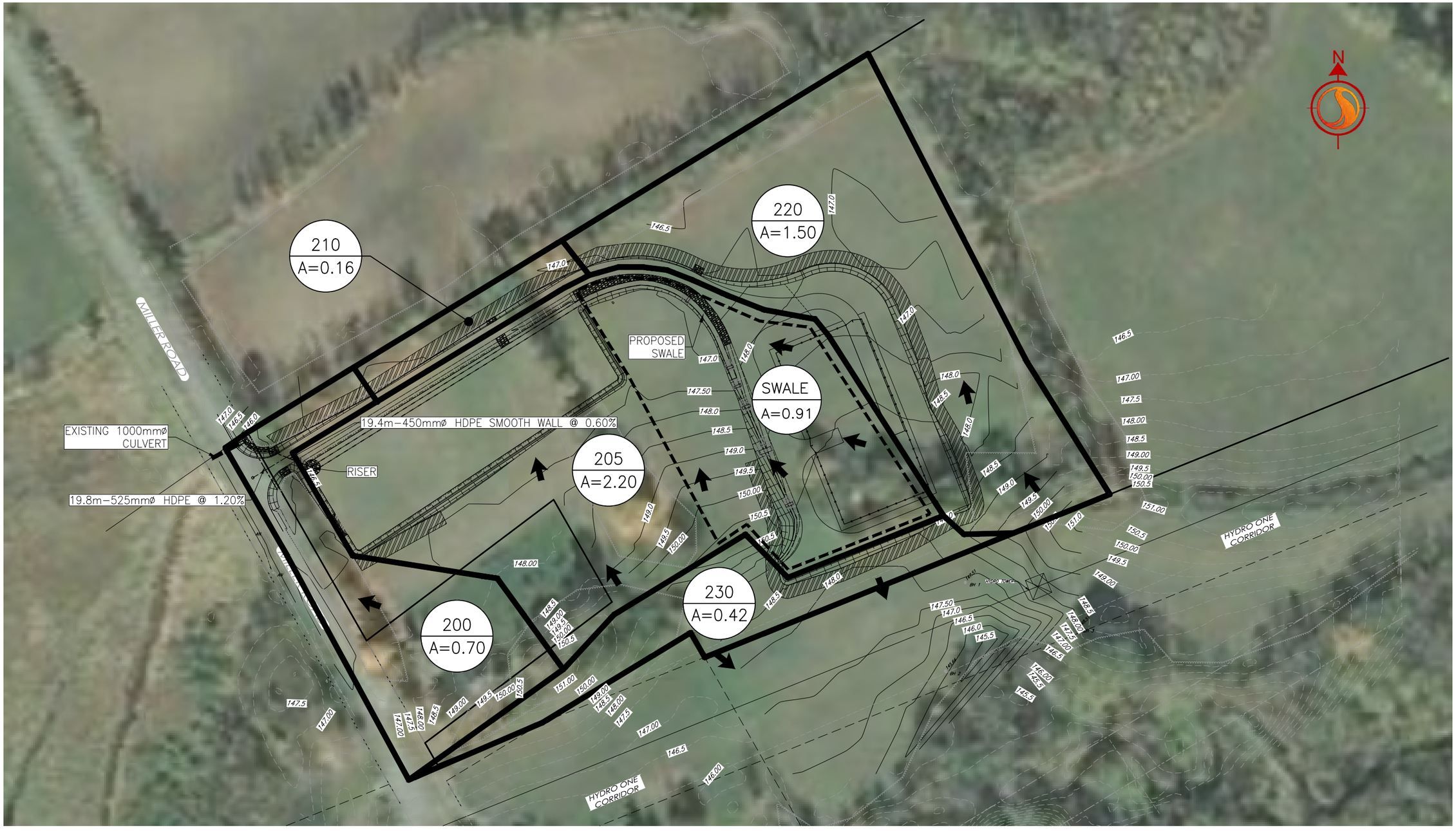
Catchment 200 – 0.7 ha of existing agricultural lands, vegetated filter strip and substation access road draining uncontrolled northwest to the Miller Road roadside ditch and existing Miller Road culvert. The culvert discharges to Pennell's creek which generally flows east towards the Salmon River.

Catchment 205 – 2.2 ha of proposed substation, substation access road, existing agricultural lands used for row crops, hedgerow and a residential dwelling located west of the proposed substation, draining northwest to the proposed SWM dry pond discharging under the site access road to the Miller Road roadside ditch and existing Miller Road culvert.

Catchment 210 – 0.2 ha of existing agricultural lands, vegetated filter strip and substation access road draining uncontrolled to the north as shallow overland flow to adjacent agricultural lands.

Catchment 220 – 1.5 ha of proposed substation, substation access road and existing agricultural lands draining northeast as shallow overland flow towards at woodlot and existing agricultural lands to the northeast of the site.

Catchment 230 – 0.4 ha of substation access road embankment and existing agricultural lands draining south towards adjacent agricultural lands.



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200
A=31.72 — AREA NUMBER, CONTRIBUTING AREA (ha)

OVERLAND FLOW ROUTE

DRAINAGE BOUNDARY

EXISTING CULVERT

SITE BOUNDARY

Scale

1:1500 — 0, 15, 45, 75m

Client/Project
LOYALIST SOLAR LP
LOYALIST SOLAR PROJECT
54MW GROUND-MOUNT SOLAR FARM

Figure No.
3

Title
SUBSTATION
POST-DEVELOPMENT CATCHMENT PLAN

4.0 STORMWATER MANAGEMENT DESIGN

4.1 HYDROLOGIC MODELING

A hydrologic model was prepared to simulate drainage conditions for the subject development. The Stormwater Management Hydrologic Model (SWMHYMO) was employed to predict peak flows for the existing and proposed development conditions and design SWM systems to achieve the site SWM criteria.

4.2 DESIGN STORMS AND ANTECEDENT MOISTURE CONDITIONS

In accordance with guidance provided by Quinte Conservation (QC), existing and proposed development conditions were modelled for the 2-, 5- and 100-year rainfall events. The Atmospheric Environment Service (AES) 30% 1-hour and 12-hour synthetic storm distributions were used for each rain event. The AES distribution was used in the *Preliminary Stormwater Management and Erosion and Sediment Control Plan* (Tulloch, 2017), and therefore was used in the detailed design for continuity. A 25 mm, 4-hour Chicago storm event was modeled to assess erosion protection for the site. Rainfall Intensity-Duration-Frequency (IDF) data was obtained from the Environment Canada Belleville station and is appended for reference. Antecedent Moisture Condition (AMC) II and III were considered in modeling at the request of QC and the MOECC. Soil Conservation Service (SCS) curve numbers and hydrologic parameters calculated for each catchment based on land use, slopes, lengths and soil type and are provided in **Appendix A**, while detailed modeling files are included in **Appendix B**. Separate modeling for during construction conditions was not completed, as hydrologic parameters for the during construction scenario fell within the existing and proposed conditions hydrologic parameter range (as shown in Appendix A).

4.3 STORMWATER MANAGEMENT DESIGN

Stormwater runoff from the proposed development areas, as described in the preceding sections, will be attenuated using an end-of-pipe SWM dry extended detention facility located in the northwest portion of the site, on the south side of the proposed access road. A dry facility was selected as the proposed drainage area is less than 5 hectares, which is the minimum MOECC guideline to sustain a permanent pool in a wet facility.

Quality control for reduction of TSS and nutrients will be provided through the use of vegetated filter strips, a vegetated swale, extended detention, and filtration through dry pond vegetation. Water quality benefits of the proposed vegetated filter strips, grassed swales and vegetated dry pond facility are achieved by the runoff / vegetation interaction which reduces 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. Quantity control will be achieved through controls at the outlet of the dry pond facility.

Detailed design of the on-site SWM controls is included on **Drawing C-400**, attached.

4.3.1 Water Quality Control – Vegetated Filter Strips

Vegetated filter strips are proposed to provide water quality control for shallow overland runoff from substation access roads draining to the north and east. As the access road is crowned, the filter strip provides controls for only half the road (3 m width). The vegetated filter strip is comprised of a 5 m wide swath of undisturbed grass draining via shallow overland flow to be retained through the during construction and operations phase of the project. Where the vegetated filter strip is in conflict with existing tree cover, tree retention will remain priority, however vegetated filter strip hydroseeding will occur below the canopy.

4.3.2 Water Quality Control – Vegetated Swale

The vegetated swale is sized to convey the 4-hour, 25-mm storm event at a velocity of 0.5 m/s at a depth of 100 mm (see calculations included in **Appendix A**) per the *LID Design Guide* (CVC, 2010) *and MOECC SWMPD Manual* (MOECC, 2003). The proposed vegetated swale will provide approximately 76% total suspended solids (TSS) removal, per the LID Design Guide (CVC, 2010). As the velocities within the swale remain below 1 m/s during a 25-mm storm event, it is not anticipated that significant erosion will occur within the swale.

4.3.3 Water Quality Control – Dry Pond

The dry, extended detention SWM facility has been designed per the MOECC SWMPD Manual (MOECC, 2003) to provide the MOECC Basic treatment level (or 60% TSS removal efficiency) and includes 297 m³ of extended detention storage to be drawn-down over approximately 34 hours, satisfying the recommended draw-down time of 24-48 hours.

The treatment train consisting of the vegetated swale and the dry extended detention SWM facility, will exceed the Normal level water quality control requirement established during pre-consultation. The majority of the substation constructed works flows through both the swale and the SWM facility.

The facility will be drained by a two-orifice outlet structure that discharges to the Miller Road roadside ditch downstream of the site entrance. As shown on the attached **Drawing C-400**, the outlet structure is a 1.2 m diameter perforated Corrugated Steel Pipe (CSP) riser with associated stone jacket. As water levels increase in the facility, water will flow through the jacket and riser. Low flows are directed through Orifice #1 (50 mm diameter) with less frequent events directed through Orifice #2 (125 mm diameter). An emergency overflow weir has been provided at the western limit of the facility in the event the outlet becomes plugged. Stage-storage-discharge characteristics for the pond were calculated using spreadsheet analysis and incorporated into

the hydrologic model. SWM facility design characteristics for the dry, extended facility are summarized in the following table.

Table 1: SWM Facility Characteristics

Parameter	SWM Characteristic
Total Contributing Area (ha) / % Impervious	2.20 / 50
Pond Bottom Elevation (m) / Pond Top Elevation (m)	146.10 / 147.10
TSS Removal Efficiency Required (%)	70
TSS Removal Efficiency Provided Grassed Swale (%) / Pond (%)	76 / 60
Extended Detention Required (m^3)/ Provided (m^3)	297 m^3 / 297 m^3
Extended Detention Drawdown Time Required / Provided (hrs)	24 / 34
Extended Detention Outlet Elevation (m) / Diameter (mm)	146.10 / 50
Water Quantity Outlet Elevation (m) / Diameter (mm)	146.50 / 125
Overflow Weir Elevation (m) / Length (m)	146.80 / 5

4.3.4 Water Quantity Control

Water quantity control for the majority of the site is provided by a SWM dry extended detention facility at the northwest corner of the development as described in previous sections. Flows are reduced to the remainder of the adjacent offsite receivers through reduction of drainage contribution area and retention or improvement of existing ground cover. **Table 2** and **Table 3** summarize the dry extended detention facility and peak offsite discharges, respectively.

Table 2: SWM Facility Operating Characteristics

Characteristic	25-mm	2-year		5-year		100-year	
	4-hr	1-hr	12-hr	1-hr	12-hr	1-hr	12-hr
AMC II							
Existing Peak Flows to Roadside Ditch (m^3/s)	**0.02**	**0.02**	**0.01**	**0.03**	**0.02**	**0.07**	**0.04**
Proposed Flows Uncontrolled to Roadside Ditch (m^3/s)	0.015	0.016	0.008	0.024	0.012	0.052	0.026
Proposed Flows to Facility (m^3/s)	0.084	0.063	0.031	0.095	0.047	0.206	0.095
Proposed Flows from Facility (m^3/s)	0.003	0.003	0.003	0.003	0.005	0.003	0.012
Proposed Peak Flows to Roadside Ditch (m^3/s)	**0.02**	**0.02**	**0.01**	**0.03**	**0.02**	**0.05**	**0.03**
Maximum Storage Volume (m^3)	217	190	450	276	676	539	1292
Maximum Ponding Elevation (m)	146.40	146.39	146.47	146.42	146.53	146.50	146.66
Maximum Ponding Depth (m)	0.30	0.29	0.37	0.32	0.43	0.40	0.56
Drawdown Time (hrs)	27	24	48	32	63	57	83
AMC III							
Existing Peak Flows to Roadside Ditch (m^3/s)	**0.04**	**0.04**	**0.02**	**0.06**	**0.03**	**0.10**	**0.05**
Proposed Flows Uncontrolled to Roadside Ditch (m^3/s)	0.030	0.030	0.012	0.043	0.019	0.082	0.039
Proposed Flows to Facility (m^3/s)	0.101	0.098	0.043	0.145	0.061	0.283	0.125
Proposed Flows from Facility (m^3/s)	0.003	0.003	0.004	0.003	0.007	0.005	0.016
Proposed Peak Flows to Roadside Ditch (m^3/s)	**0.03**	**0.03**	**0.02**	**0.05**	**0.02**	**0.09**	**0.04**
Maximum Storage Volume (m^3)	311	273	602	384	846	700	1516
Maximum Ponding Elevation (m)	146.43	146.42	146.51	146.45	146.56	146.53	146.70
Maximum Ponding Depth (m)	0.33	0.32	0.41	0.35	0.46	0.43	0.60
Drawdown Time (hrs)	35	32	60	42	70	64	88

Table 3: Peak Off-site Discharge Summary

Storm Frequency	Duration	Offsite Peak Discharge Rate (m^3/s)			
		100 / 200	110 / 210	120 / 220	130 / 230
		Miller Road	North	Northeast	South
AMC II					
2-Year	1-hour	0.02 / 0.02	0.03 / 0.01	0.05 / 0.04	0.01 / 0.01
	12-hour	0.01 / 0.01	0.01 / 0.02	0.02 / 0.02	0.01 / 0.01
5-Year	1-hour	0.03 / 0.02	0.04 / 0.01	0.08 / 0.05	0.02 / 0.02
	12-hour	0.02 / 0.02	0.02 / 0.01	0.04 / 0.03	0.01 / 0.01
100-Year	1-hour	0.07 / 0.05	0.09 / 0.01	0.17 / 0.11	0.04 / 0.03
	12-hour	0.04 / 0.03	0.04 / 0.01	0.08 / 0.06	0.02 / 0.02
25 mm	4-hour	0.02 / 0.01	0.03 / 0.01	0.05 / 0.03	0.02 / 0.01
AMC III					
2-Year	1-hour	0.04 / 0.03	0.05 / 0.01	0.10 / 0.06	0.02 / 0.02
	12-hour	0.02 / 0.02	0.02 / 0.01	0.04 / 0.03	0.01 / 0.01
5-Year	1-hour	0.06 / 0.04	0.07 / 0.01	0.14 / 0.09	0.04 / 0.03
	12-hour	0.03 / 0.02	0.03 / 0.01	0.06 / 0.04	0.01 / 0.01
100-Year	1-hour	0.10 / 0.08	0.14 / 0.02	0.27 / 0.17	0.07 / 0.05
	12-hour	0.05 / 0.04	0.07 / 0.01	0.12 / 0.08	0.03 / 0.02
25 mm	4-hour	0.04 / 0.03	0.05 / 0.01	0.10 / 0.06	0.03 / 0.02

As shown in **Table 3,** peak discharge rates to all offsite receivers are equal to or reduced under all storm events.

4.3.5 Access Road Entrance Culvert

The access road entrance culvert was sized to convey the proposed peak flows from Catchment 200 (entire contributing area to culvert) during the 100-year, 1-hour AMC II, storm event without overtopping. Culvert modeling has been included in **Appendix A** for reference.

4.3.6 Substation Spill Containment

The transformer pad and containment pit will be a custom engineered structural design provided to meet the loads of the transformer, including fire quenching stone and oil containment. The main substation power transformer will be installed on a cast in place concrete pad within the substation. Surrounding the transformer concrete pad will be a cast in place concrete containment pit. The containment pit will contain fire quenching stone (approximately 19-38 mm diameter washed crushed stone). The bottom (floor) of the containment pit where a drainage pipe will be provided and connected to a manhole (by

others) which locates a few meters from the pit. The manhole, means to provide an extra point of visual inspection, will also host oil detection and sump pump system. Water will be pump out of the manhole using an output pipe to drain to the proposed vegetated swale along the west edge of the substation.

The design of the Transformer spill containment volume will be based on the following guidelines:

1. Minimum volume equal the greater of 125% of the volume of transformer oil and lubricants, or 100% of the volume of transformer oil and lubricants plus the volume equivalent to contribution from a minimum 24-hour duration, 50-year return storm within the spill containment area around the transformer.

2. Containment with impervious concrete floor and walls sloped toward an outlet, maintaining a minimum freeboard of 0.3 m, and 0.3 m layer of crushed stone within.

3. The containment pad shall drain to an appropriately sized pit, from where only water will be pumped out.

4. The spill containment shall be equipped with a system to detect the level of water to be pumped out. If oil is detected, the pump will not operate and an emergency signal will be transmitted for the removal of the contaminated liquid for proper disposal.

5. The proposed system takes into account the fact that the transformer contains oil and that is not intended to discharge the containment oil/water mix to downstream receivers.

Under normal operation, the spill containment discharges water from the environment (i.e., storm water). The rain collects in the spill containment area where it flows to the manhole located adjacent to the spill containment. As the sump pump manhole fills up, the start (On) level float on the sump pump is activated and the water is pumped and discharged to the proposed vegetated swale west of the substation (only water is allowed to pass). The pump will continue in operation until the water level within the recessed sump drops to the stop (Off) level, stopping the pump.

Emergency operation occurs when oil is detected by the oil detecting sump pump. If oil is discharged from the transformer, the oil is contained in the spill containment area and flows along the same path as the storm water described above. The pump has an oil sensor above the suction inlet to detect oil before it enters into the pump. The sensor is a conductivity sensor and will shut down the pump unless only water is present. The pump will start up only when water is present at the oil sensor. The pump controller will show an alarm signal when oil is detected by the oil sensor. At this point the operation and maintenance personnel will be notified by an alarm and will travel to the site in order to investigate and properly dispose of the oil containing water as necessary.

Signals from each of these alarms are electrically wired to the substation automation system located on site. Alarms will be transmitted via the substation SCADA system to the contracted operations and maintenance provider's monitoring station which is manned 24/7. The monitoring station will contact and dispatch maintenance personnel as required to investigate the alarm.

The substation will undergo effluent monitoring on a quarterly basis as detailed in **Section 4.4.3**. Spill response kits will be stored on-site in the event of an emergency spill.

4.4 OPERATIONAL PHASE - STORMWATER MANAGEMENT MONITORING AND MAINTENANCE

4.4.1 Vegetated Swale (Ditch) Conveyance Systems

Grassed swale (ditch) conveyance systems represent a familiar, passive, and simple type of stormwater management practice, with operational and maintenance requirements to match. Generally speaking, the treatment benefits of a grassed swale are the result of the contact between the flows being conveyed and the vegetation within the swale. Given this, inspection, operational, and maintenance activities can be generally limited to:

- Routine observations as to the presence of trash/debris within the swale that could be conveyed downstream and/or affect the conveyance capacity of the system and removal of same as needed.
- A semi-annual walking inspection should be completed to identify areas of bare soil and/or the formation of erosive gullies. Remediation efforts would typically involve re-grading the area and/or re-vegetating with sod or appropriate seed mix, with fertilizer and water applied as necessary to ensure germination and stabilization.
- Concurrent with the walking inspections, a visual assessment of any areas of isolated ponding or sediment build-up should be identified. Minor areas of ponding can be resolved with re-grading / re-stabilization, if the magnitude of associated nuisance warrants such action. From a stormwater management perspective, there are no functional concerns associated with ponding and, therefore, remediation is not strictly required. Excessive sedimentation is an issue requiring attention if it remains in a non-vegetated condition (prone to re-suspension and transport downstream), if it creates an isolated ponding area as described above, or if it occurs to an extent that it affects the conveyance capacity of the swale. If any such condition occurs, the sediment should be removed and the area re-stabilized.
- Vegetation management is not a strict requirement in that excess growth will serve to improve water quality treatment benefits. If the density of vegetation reaches a level where conveyance capacity is impacted, a cutting operation should be undertaken. A minimum vegetation height of 0.25 m (10") should be maintained.

4.4.2 Stormwater Management Facility

Long-term operation and maintenance responsibilities at SWM facilities include regular facility inspections and the implementation of associated remediation actions. Inspections should be undertaken following each significant rainfall event (>15 mm depth, minimum 4 inspections / year) to verify that the facilities are functioning as designed. The types of information that operations staff should be recording and rectifying, if required, include questions such as:

- Is stormwater runoff remaining in the facility after the predicted extended detention drawdown times outlined herein? This situation could be indicative of outlet blockage by trash or sediment; visual inspection should be completed to confirm.
- Is there damage to facility structures including pipes, berms, overflow weirs, etc.? Maintenance requirements in this regard should be performed on an as-required basis.
- What are the visual characteristics of water in the facilities (i.e., oily sheen, frothy, colour, etc.)? Issues in this regard could be indicative of an upstream spill and the need for cleanup.
- Is the vegetation around the facilities unhealthy or dying? Deficiencies in this regard could be indicative of either poor species selection at design, or any number of chronic causes. Replanting should be undertaken to ensure sufficient vegetation densities.
- Is there evidence of significant sediment accumulation within the dry extended detention facility? If sediment accumulates to a point where flow through the facility becomes inhibited or inlets and outlets become blocked, sediment removal may be required. Owing to the increased sediment loadings anticipated during construction, the clean-out frequencies estimated during the design process might be reduced during the interval prior to complete stabilization of the upstream contributing drainage areas. In any event, the removal and disposal of sediment from all facilities should be completed by a qualified party and/or licensed contractor.
- Erosion around outlet structures or downstream areas requiring stabilization work. All noticeable erosion and damage within and immediately outside the basin should be repaired and stabilized as quickly as possible.

4.4.3 Substation Containment Pit

Per the *Loyalist Solar Project – Design and Operations Report* (Tulloch, 2017), effluent monitoring (and associated documentation) of the substation containment pit will occur quarterly to ensure that effluent discharge does not exceed 15 mg/L of Total Oil and Grease.

In the event of an exceedance of the maximum concentration objective of Total Oil and Grease, the owner shall increase the frequency of sampling to once per month (for each month that effluent discharge occurs) and provide the MOECC District Manager (on a monthly basis) with copies of monitoring documentation until the District Manager provides written direction that monthly sampling and reporting is no longer required.

5.0 ASSESSMENT OF 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 Guideline (GGHCA, 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 substation site can be classified as moderate (2-10%), with predominantly long slopes (greater than 30 m). Site soils are comprised primarily of silty clay with some sands which are considered to represent a moderate to low potential (*Table A, ESC Guidelines*). Therefore, based on this classification, this site has a "high" erodibility potential (*Table A2, ESC Guidelines*)

Beyond the three-parameter approach described by the *ESC Guidelines*, it is often also appropriate to account for additional factors that may result in potential sediment transport offsite during construction. In this particular case, construction is anticipated to commence January 2018, which would be prohibitive to the establishment of vegetative stabilization measures. It will be incumbent on the proponent and contractor to elevate the level of attention paid to protecting downstream receivers against construction related impacts.

5.1 DURING CONSTRUCTION DEWATERING

Since no significant excavation is proposed within the substation site, the proposed construction activities are not expected to intercept the groundwater table. However, if necessary, any required dewatering operations will be completed such that discharge rates will not adversely impact flooding or erosion conditions upstream or downstream of the substation site. To mitigate the risk of sediment migration to 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" dissipators at the discretion of the contractor. Dewatering measures will be directed through the sediment control measures to a gently sloped, vegetated area (when possible) greater than 30 m from any water course or wetland feature. Although an exceedance isn't expected, should anticipated pumping rates exceed 50,000 L/day an Environmental Activity Sector Registration (EASR) application is required. Should anticipated pumping rates exceed 400,000 L/day a Permit To Take Water (PTTW) application is required.

5.2 EROSION AND SEDIMENT CONTROL PLAN

The various construction activities required to construct the substation site include topsoil removal, minor grading activities and general construction traffic. If left unmitigated, these activities will result in impacts ranging from disturbance of at-surface soils and exposure of 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 soils inherent in the construction process. For example, access road 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; hence, the work areas are generally protected from erosion and sediment transport since they are lower than the surrounding ground surface. 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 Plans (**Drawings C-600 and C-650**), and include, but are not necessarily 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 as follows:
    - An Erosion Control Implementation Schedule has been included with the Detailed Erosion and Sediment Control Plan;
    - A 5 m wide vegetated filter strip will be provided on the downstream side of all disturbed areas;
    - A double layer heavy duty silt fence will be erected on the downstream side of disturbed areas, complete with a minimum 5 m vegetated filter strip beyond the silt fence;
    - Topsoil stockpiles expected to be left in place in excess of 30 days will be stabilized with vegetative cover (i.e., hydroseeding) or a rolled erosion control product in the event of unfavourable growing conditions (i.e., during the winter);
    - A construction entrance feature ("mud mat") will be provided at all site entrances to minimize the offsite transport of sediment via construction vehicles;
    - Miller Road will be cleaned daily of any sediment deposited by site construction traffic;
    - Swales constructed onsite will have rock check dams to help attenuate flows and encourage sediment deposition of suspended sediment where appropriate;

- No equipment should be permitted to enter any area beyond the silt fencing;
- Temporarily stockpiled excavated native materials and imported materials with a D_{50} less than 4.75 mm (typical D_{50} of Granular A) will be covered with rolled erosion control products when the material is expected to be left in place in excess of 30 days, while imported materials with a D_{50} of 4.75 mm or greater can remain uncovered. Granular A and B (Type II) gradation requirements allow up to 55% percent passing a 4.75 mm sieve (#4 sieve), and may be stockpiled without covering with rolled erosion control products. Uncovered stockpiles will be surrounded with a double layer of light duty silt fence (1 m separation between layers) to provide a secondary layer of protection from sediment migration;
- In the event of inclement weather for construction, construction best practices, such as temporary rig-mats may be used to prevent disruption of surface soils and vegetative cover by construction vehicles and equipment. As these measures are within the constructible areas of the project, it is not anticipated that offsite flows will increase from proposed conditions;
- Grassed swales and stormwater management vegetated swales are to be stabilized with double net straw matting and hydroseeding. Hydroseeding should be completed during appropriate growing seasons;
    - In cases where a vegetated grassed buffer is proposed for construction outside of the growing season, existing vegetation will be maintained and no equipment shall encroach on the area.
- Additional erosion and sediment controls may be required due to unforeseen circumstances, changing site conditions or if the proposed controls do not achieve their anticipated result. In these circumstances, additional controls may be installed consistent with GGHCA ESC Guidelines (GGHCA, 2006). The locations and application of the controls will be approved by a qualified erosion and sediment control inspector prior to their installation; and
- 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.

- 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 migrating to offsite receivers:
    - Refueling and maintenance of construction equipment should occur in designated areas, a minimum of 100 m from a water body;
    - All spills must be reported to the MOECC Spills Action Centre (1-800-268-6060); and

  - A 450 mm end cap and 50 mm and 125 mm diameter plugs will be stored on-site to plug the outlets of the SWM dry extended detention facility in the event of a spill.

- Re-vegetate 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 this is not possible due to 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 erosion and sediment control 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.

5.2.1 Temporary Sediment Basin

The proposed SWM facility will be used as a temporary sediment basin for the initial part of construction as construction is anticipated to be initiated during the winter months and vegetation won't be established to provide water quality control. The outlet structure will be modified under the temporary conditions to provide the required amount of dead and active storage volumes required in the GGHCA ESC Guidelines. The water quality outlet will remain capped during initial stages of construction. This provides 503 m³ of dead storage, exceeding the requirement of 407 m³. A 75 mm diameter orifice, at an elevation of 146.50 m, will be installed to drawdown the required active storage volume of 275 m³ in 26 hours. As the 75 mm diameter orifice is the minimum allowable orifice size required, the 48 hour drawdown target identified in the GGHCA ESC Guidelines (GGHCA, 2006) cannot be achieved. **Table 4,** below, summarizes the design characteristics of the temporary sediment basin.

Table 4: Temporary Sediment Basin Design Characteristics

Parameter	SWM Characteristic
Total Contributing Area (ha) / % Impervious	2.20 / 50
Pond Bottom Elevation (m) / Pond Top Elevation (m)	146.10 / 147.10
Unit Volume of Dead (m³/ha) / Active Storage (m³/ha) Required	185 / 125
Dead Storage Required (m³) / Provided (m³)	407 / 543
Active Storage Required (m³) / Provided (m³)	275 / 1,474
Temporary Sediment Basin Outlet Elevation (m) / Diameter	146.50 / 75
Active Storage Drawdown Time Required / Provided (hrs)	48 / 26

As the inlet swale is protected with several rock check dams upstream of the temporary sediment basin, a forebay has not been included in the design of the temporary sediment basin.

As construction moves into the spring, the temporary sediment basin will be drawn down, and the outlet controls for the proposed SWM facility will be installed. The basin will be restored to design elevations and vegetated with topsoil and seed. The conversion from temporary sediment basin to ultimate stormwater management facility will be completed no later than May 31.

5.3 CONTINGENCY PLAN

The purpose of the contingency plan is to help minimize the risk or consequence of failure of the erosion and sediment control works. Failure could result from insufficient measures, lack of maintenance, or severe weather conditions. The contingency plan includes two areas of consideration: the procedures that will be followed where a failure has occurred; and the contingency measures that will be implemented where there is potential for failure.

The Contractor shall be responsible for following the contingency plan, and will prepare the following items:

- The Contractor will create an emergency contact list for emergency situations.
- Workers shall be on call for emergency situations for all aspects of the emergency from design to construction of emergency sediment and erosion control measures. Any associated health and safety issues are the responsibility of the Contractor.
- Heavy duty silt fence, double-net straw matting erosion control blankets, straw bales and stakes, sandbags, appropriate sized rip-rap, and clean gravel fill shall be available on-site for emergency installation.
- Gas powered pumps, appropriate sized hoses, filtration hose socks, and filter cloth shall be available for emergency dewatering.
- Heavy equipment shall be on standby for emergency works.
- Fuel spill equipment shall be available on-site for emergency spills of deleterious substances.
- A contact list for any further required equipment or materials shall be prepared and made available for emergency use.

5.3.1 Contingency Measures in Case of Failure

In the event of a failure, the Contractor will cease all construction related work and focus on erosion and sediment control as required to effectively stabilize the site where a failure has occurred or is imminent. The work shall be completed to the satisfaction of the Contract Administrator and any regulatory agencies that have been consulted.

Any unexpected discharge of silt or sediment or other deleterious substance outside of the work limits must be reported to the MOECC spills action centre (1-800-268-6060). If significant long term damage to fish habitat or property is suspected, the contractor will develop a restoration

plan in consultation with the MOECC. Development of the initial restoration plan will begin within 24 hours of the discovery of sediment discharge, and will be implemented as soon as possible, following consultation and approval from the MOECC, QC, DFO (if necessary) and Township of Stone Mills.

The plan will address:

- Removal and disposal of sediment from outside the work limits;
- Restoration of the affected area; and
- Restoration of any areas disturbed through deposition or removal.

5.3.2 Contingency Measures where there is a High Risk of Failure

Conditions that may potentially cause failures can be identified through two methods: monitoring of the erosion and sediment control measures, and weather forecasts that anticipate severe weather conditions.

5.3.2.1 High Risk Identified Through Monitoring

Where monitoring has identified a high potential for failure, steps shall be immediately taken to reduce the risk. These measures may include repair to existing measures, modification of existing measures, and the addition of new measures.

The Contractor shall document the proposed approach and submit it to the Contract Administrator for immediate review and response. Where no response is forthcoming, the Contractor shall immediately proceed with implementation.

5.3.2.2 Severe Weather Anticipated

In cases where the weather forecast indicates that significant rainfall is expected within a 24 hour period, the Contractor shall immediately complete the following:

- Verify that all erosion and sediment control measures are secure and that there is no exposed soil that could erode and be deposited downstream;
- Verify that all other measures are in good working order;
- Monitor all measures during the rainfall event, and where a potential for failure is identified, take corrective measures.

The Contract Administrator shall document the status of the above-listed steps.

If unforeseen events cause the strategies set out in the contingency plan to be insufficient or inappropriate to meet the objective of containing sediment within the work limits, the Contractor, either independently or as directed by the Contract Administrator, will respond in a

timely manner with all reasonable measures consistent with safety, to prevent, counteract or remedy any effects on fish or fish habitat, human interest (i.e., safety, property value) and general watercourse slope stabilization.

5.4 EROSION AND SEDIMENT CONTROL MONITORING PROGRAM

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. Non-urgent erosion and sediment control repairs (i.e., no immediate risk of sediment discharges to the downstream environment) will be completed within 48 hours of identifying the deficiency, or prior to the next anticipated rainfall event, whichever is less. 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, erosion control blankets and silt fencing to ensure that they are maintained in good repair;
- Removal of construction debris that may accumulate; and
- Implementation of remedial measures including erosion stabilization, repair of damaged measures and any other remediation where required.

If the monitoring program outlined above indicates a persistent problem, then the following steps should be undertaken to determine appropriate mitigative measures (if step 1 does not resolve the issue, proceed to step 2):

1. Analysis of the monitoring information and field visits as required to determine the cause of the problem and develop a mitigation plan to address the issue in consultation with a certified ESC inspector.
    a. Implement additional mitigation measures and monitor the results.
2. Convene a meeting with the appropriate review agencies (i.e., MOECC, QC and/or Stone Mills Township, etc.,)
    a. Develop a consensus on a proposed plan of action to resolve the problem in consultation with agency staff.
    b. Implement additional mitigation measures and monitor the results.

The condition of erosion control works, their overall performance, water quality monitoring (as described in Section 5.5) and any repairs, replacement or modifications to the installed item shall be noted in weekly monitoring reports. ESC monitoring documentation will be kept on-site and made available to regulatory agencies upon request.

5.5 EROSION AND SEDIMENT CONTROL WATER QUALITY MONITORING

To monitor the effectiveness of the various erosion and sediment control measures during substation construction, a water quality monitoring program has been developed. Turbidity monitoring will be completed at the locations indicated on **Figure 4** and described below.

SUB 1 – Sample location within enhanced grass swale

SUB 2 – Inlet to Stormwater Management Facility / Temporary Sediment Basin

SUB 3 – Outlet of Stormwater Management Facility / Temporary Sediment Basin

SUB 4 – Upstream end of Site entrance culvert

SUB 5 – Miller Road roadside ditch north of Miller Road culvert (background sampling location)

SUB 6 – Downstream of Miller Road culvert

The water quality monitoring program will consist of the following activities

- For a minimum of two weeks prior to the commencement of construction, turbidity levels will be measured daily at locations S4, S5 and S6 to determine background levels prior to construction
- Turbidity levels are to be measured at each of the above locations, daily, until construction has been completed and the site is 90% stabilized, as determined by a qualified inspector.
    - If the average mean daily turbidity downstream of the site activity is greater than 8 NTU from background measurements (pre-construction monitoring or S5), the MOECC District Manager shall be notified and additional erosion control measures shall be implemented to reduce or mitigate sediment related impacts.
- Turbidity monitoring results will be recorded daily and included in weekly ESC reporting

ORIGINAL SHEET - ANSI B

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Legend

EXISTING CULVERT

SITE BOUNDARY

Scale

1:1500

0 15 45 75m

Client/Project

LOYALIST SOLAR LP

LOYALIST SOLAR PROJECT
54MW GROUND-MOUNT SOLAR FARM

Figure No.

4

Title

SUBSTATION MONITORING PLAN

5.6 LONG TERM EROSION AND SEDIMENT CONTROL

Approximately one (1) year after completion of construction, a survey will be taken to ensure that long-term erosion control measures have been effective. Seeded or replanted areas will be inspected to ensure that vegetation 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 and applied.

6.0 CONCLUSION AND RECOMMENDATIONS

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

- Normal (Level 2) water quality control will be provided for the site by an onsite treatment train consisting of vegetated swales and an end-of-pipe dry extended detention SWM facility.
- The proposed SWM facility will control post-development flows to target rates.

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

- The proposed SWM measures provided in this report be constructed as designed.
- The ESC measures documented herein be implemented during construction.
- The Stormwater Monitoring and Maintenance Program be carried out during and following construction.

APPENDIX A - CALCULATIONS

Curve Number Determination – Existing
Curve Number Determination – Proposed
SWMHYMO Parameters
Stormwater Quality Volumetric Requirements
Stormwater Management Facility Design Calculations
Belleville IDF Data
Mannings Equation Calculation for Open Flow in a Channel
Temporary Sediment Basin Design Calculations

Subject: **NRCS (SCS) Curve Number Determination - Existing Conditions**
Project: **Loyalist Solar Project**
Site: **Substation**
Project No.: **1335-60220**
Client: **Loyalist Solar LP**
Date: **November 21, 2017**

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	USDA
Woodlot	"Fair"	36	48	60	67	73	76	79	USDA
Lawns	"Good"	39	50	61	68	74	77	80	USDA
Pasture/Range		49	55	60	70	79	82	84	USDA
Crop - SR + CR	"Good"	64	70	75	79	82	84	85	USDA
Gravel		76	81	85	87	89	90	91	USDA
Bare Soil (Fallow)		77	82	86	89	91	93	94	USDA
Impervious		98	98	98	98	98	98	98	USDA

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

HYDROLOGIC SOIL TYPE (%) - Existing Conditions								
	Hydrologic Soil Type							
Catchment	A	AB	B	BC	C	CD	D	TOTAL
100					100			100
110					100			100
120					100			100
130					100			100

LAND USE (%) - Existing Conditions									
Catchment	Meadow	Woodlot	Lawns	Pasture Range	Crop	Gravel	Bare Soil	Impervious	Total
100		20	30		35	3		12	100
110		15	15		70				100
120		15			85				100
130		50			50				100

CURVE NUMBER (CN) - Existing Conditions										
Catchment	Meadow	Woodlot	Lawns	Pasture Range	Crop	Gravel	Bare Soil	Impervious	Weighted CN (AMC II)	Weighted CN (AMC III)
100		15	22		29	3		12	80	91
110		11	11		57				79	91
120		11			70				81	92
130		37			41				78	90

Notes: AMC II assumed - AMC III Conversion Per Soil Conservation Service Curve Number (SCS-CN) Methodology (Mishra, Surendra and Vijay P. Sing (2003))
Hydrological Soil Groups taken from MTO Drainage Manual

Subject: **NRCS (SCS) Curve Number Determination - During Construction Conditions**
Project: **Loyalist Solar Project**
Site: **Substation**
Project No.: **1335-60220**
Client: **Loyalist Solar LP**
Date: **November 21, 2017**

TABLE OF CURVE NUMBERS (CN's)									Source
Land Use		Hydrologic Soil Type							
		A	AB	B	BC	C	CD	D	
Meadow	"Good"	30	44	58	65	71	75	78	USDA
Woodlot	"Fair"	36	48	60	67	73	76	79	USDA
Lawns	"Good"	39	50	61	68	74	77	80	USDA
Pasture/Range		49	55	60	70	79	82	84	USDA
Crop		66	70	74	78	82	84	86	USDA
Gravel		76	81	85	87	89	90	91	USDA
Bare Soil (Fallow)		77	82	86	89	91	93	94	USDA
Impervious		98	98	98	98	98	98	98	USDA

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

HYDROLOGIC SOIL TYPE (%) - Proposed Conditions								
	Hydrologic Soil Type							
Catchment	A	AB	B	BC	C	CD	D	TOTAL
200					100			100
205					100			100
210					100			100
220					100			100
230					100			100
240					100			100

LAND USE (%) - Proposed Conditions									
Catchment	Meadow	Woodlot	Lawns	Pasture Range	Crop	Gravel	Bare Soil	Impervious	Total
200		25	15		40		20		100
205		10	5		35		50		100
210		55			30		15		100
220		15			70		15		100
230		50			50				100

CURVE NUMBER (CN) - Proposed Conditions										
Catchment	Meadow	Woodlot	Lawns	Pasture Range	Crop	Gravel	Bare Soil	Impervious	Weighted CN (AMC II)	Weighted CN (AMC III)
200		18	11		33		18		80	91
205		7	4		29		46		85	94
210		40			25		14		78	90
220		11			57		14		82	92
230		37			41				78	90

Notes: AMC II assumed - AMC III Conversion Per Soil Conservation Service Curve Number (SCS-CN) Methodology (Mishra
Hydrological Soil Groups taken from MTO Drainage Manual
The weighted CN for Catchment 205 is for pervious areas only.

ı, Surendra and Vijay P. Sing (2003))

Subject: **NRCS (SCS) Curve Number Determination - Proposed Conditions**
Project: **Loyalist Solar Project**
Site: **Substation**
Project No.: **1335-60220**
Client: **Loyalist Solar LP**
Date: **November 21, 2017**

TABLE OF CURVE NUMBERS (CN's)									Source
Land Use		Hydrologic Soil Type							
		A	AB	B	BC	C	CD	D	
Meadow	"Good"	30	44	58	65	71	75	78	USDA
Woodlot	"Fair"	36	48	60	67	73	76	79	USDA
Lawns	"Good"	39	50	61	68	74	77	80	USDA
Pasture/Range		49	55	60	70	79	82	84	USDA
Crop		66	70	74	78	82	84	86	USDA
Gravel		76	81	85	87	89	90	91	USDA
Bare Soil (Fallow)		77	82	86	89	91	93	94	USDA
Impervious		98	98	98	98	98	98	98	USDA

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

HYDROLOGIC SOIL TYPE (%) - Proposed Conditions								
	Hydrologic Soil Type							
Catchment	A	AB	B	BC	C	CD	D	TOTAL
200					100			100
205					100			100
210					100			100
220					100			100
230					100			100
240					100			100

%) - Proposed Conditions									
Catchment	Meadow	Woodlot	Lawns	Pasture Range	Crop	Gravel	Bare Soil	Impervious	Total
200		25	15		40	5		15	100
205		10	5		35	15		35	100
210		55			30			15	100
220		15			70	2		13	100
230		50			50				100

R (CN) - Proposed Conditions										
Catchment	Meadow	Woodlot	Lawns	Pasture Range	Crop	Gravel	Bare Soil	Impervious	Weighted CN (AMC II)	Weighted CN (AMC III)
200		18	11		33	4		15	81	92
205		7	4		29	13		34	82	92
210		40			25			15	79	91
220		11			57	2		13	83	93
230		37			41				78	90

Notes: AMC II assumed - AMC III Conversion Per Soil Conservation Service Curve Number (SCS-CN) Methodology (Mishr
Hydrological Soil Groups taken from MTO Drainage Manual
The weighted CN for Catchment 205 is for pervious areas only.

·a, Surendra and Vijay P. Sing (2003))

Subject: SWMHYMO Parameters
Project: Loyalist Solar Project
Site: Substation
Project No.: 1335-60220
Client: Loyalist Solar LP
Date: November 21, 2017

Existing Conditions

Catchment Number	SWMHYMO Command	Area	CN (AMC II)	CN (AMC III)	TIMP	XIMP	Rise	Length	Catchment Slope	Tc	Tp
		(ha)					(m)	(m)	(%)	(hrs)	(hrs)
100	DESIGN NASHYD	0.97	80	91	-	-	3.0	120	2.5	0.33	0.20
110	DESIGN NASHYD	1.20	79	91	-	-	3.0	90	3.3	0.26	0.16
120	DESIGN NASHYD	2.26	81	92	-	-	3.5	120	2.9	0.31	0.19
130	DESIGN NASHYD	0.55	78	90	-	-	2.0	40	5.0	0.15	0.09
		4.98									

During Construction

Catchment Number	SWMHYMO Command	Area	CN (AMC II)	CN (AMC III)	TIMP	XIMP	Rise	Length	Catchment Slope	Tc	Tp
		(ha)					(m)	(m)	(%)	(hrs)	(hrs)
200	DESIGN NASHYD	0.70	80	91	-	-	3.0	120	2.5	0.33	0.20
205	DESIGN NASHYD	2.20	85	94	-	-	3.0	200	1.5	0.50	0.30
210	DESIGN NASHYD	0.16	78	90	-	-	1.0	30	3.3	0.15	0.09
220	DESIGN NASHYD	1.50	82	92	-	-	3.5	120	2.9	0.31	0.19
230	DESIGN NASHYD	0.42	78	90	-	-	2.00	40	5.0	0.15	0.09
		4.98									

Proposed Conditions

Catchment Number	SWMHYMO Command	Area	CN (AMC II)	CN (AMC III)	TIMP	XIMP	Rise	Length	Catchment Slope	Tc	Tp
		(ha)					(m)	(m)	(%)	(hrs)	(hrs)
200	DESIGN NASHYD	0.70	81	92	-	-	3.0	120	2.5	0.33	0.20
205	DESIGN STANDHYD	2.20	82	92	35	20	3.0	200	1.5		
210	DESIGN NASHYD	0.16	79	91	-	-	1.0	30	3.3	0.15	0.09
220	DESIGN NASHYD	1.50	83	93	-	-	3.5	120	2.9	0.31	0.19
230	DESIGN NASHYD	0.42	78	90	-	-	2.00	40	5.0	0.15	0.09
		4.98									

Notes:

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

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

Where: C = Runoff Coefficient = 0.35 (Flat Cultivated Areas)
L = Length of Overland Flow (m)
S = Slope (%)

TIMP — Total percent impervious (DESIGN STANDHYD)

XIMP — Total directly connected percent impervious (DESIGN STANDHYD)

Time to Peak — $Tp = 0.6Tc$

CN calculated for pervious areas only for DESIGN STANDHYD. CN is a weighed average for DESIGN NASHYD

Subject: **Stormwater Quality Volumetric Requirements**
Project: **Loyalist Solar Project**
Site: **Substation**
Project No.: **1335-60220**
Client: **Loyalist Solar LP**
Date: **November 21, 2017**

Stormwater Quality Volumetric Requirements						
					Water Quality Unit Volume Requirements [1]	
Facility	Drainage Area (ha)[2]	Total % Imp.	Level	Facility Type	Total Unit Volume (m^3/ha)	Total MOE Volume (m^3/ha)
Dry Pond	2.20	50	Basic	Dry Pond	135	297

[1] Water quality unit volume requirements based on Table 3.2, Stormwater Management Planning & Design Manual (MOE 2003), Protection Level "Basic"

[2] Drainage Area for Quality control represents total storm drainage area to SWM Facility and includes the area of the SWM facility itself

V:\01614\active\133560220\design\analysis\SWM\Substation\[20171022_133560220_Substation_PondDesign_DW.xlsx]SSD

Subject: **Stormwater Management Facility Design Calculations**
Project: **Loyalist Solar Project**
Site: **Substation**
Project No.: **1335-60220**
Client: **Loyalist Solar LP**
Date: **November 19, 2017**

	Rating Curve			Estimated	Volume Estimation					Outlet Structure Controls			
	Elevation (m)	Discharge (m^3/s)	Storage Active (m^3)	Detention Time (hrs)	Elevation (m)	Area	Volume	Depth (m)	Elevation (m)	Quality Outlet # 1 (m^3/s)	Orifice #2 (m^3/s)	Overflow Weir (m^3/s)	Parameters
Orifice #1 Elev.	146.10				146.10				146.10				Quality Outlet #1
	146.20	0.001	7	1.4	146.20	139	7	0.10	146.20	0.001			Outlet #1 Elev (m) 146.10 / Orifice Coeff. 0.60 / Outlet #1-Midpoint (mm) 146.13 / Perimeter (m) 0.16 / Outlet Diameter (mm) 50 / Area (m^2) 0.002 / Weir Coeff. (semi-circular) 1.62 / Orientation Vertical
	146.30	0.002	52	8.3	146.30	768	52	0.20	146.30	0.002			
	146.40	0.003	201	25.1	146.40	2211	201	0.30	146.40	0.003			
Orifice #2 Elev	146.50	0.003	543	57.2	146.50	4627	543	0.40	146.50	0.003			
	146.60	0.010	1,016	77.2	146.60	4821	1016	0.50	146.60	0.004	0.006		
	146.70	0.016	1,507	87.7	146.70	5018	1507	0.60	146.70	0.004	0.012		
Overflow Weir Elev	146.80	0.020	2,017	95.5	146.80	5180	2017	0.70	146.80	0.004	0.016		
	146.90	0.305	2,544	96.4	146.90	5344	2544	0.80	146.90	0.005	0.019	0.281	
	147.00	0.856	3,103	96.7	147.00	5840	3103	0.90	147.00	0.005	0.022	0.830	
	147.10	1.618	3,695	96.8	147.10	6000	3695	1.00	147.10	0.005	0.024	1.589	
													Orifice #2
													Outlet #2 Elev (m) 146.50 / Orifice Coeff. 0.60 / Outlet #2-Midpoint (mm) 146.56 / Perimeter (m) 0.39 / Outlet Diameter (mm) 125 / Area (m^2) 0.012 / Weir Coeff. (semi-circular) 1.62 / Orientation Vertical
													Overflow Weir
													Spillway Invert (m) 146.80 / Top of Berm (m) 147.10 / Spillway Length @ Invert (m) 5 / Max. Flow Depth (m) 0.30 / Left Side Slope 3 / Right Side Slope 3 / Weir Coefficient (Rectangle) 1.7 / Topwidth 6.8 / Weir Coefficient (Triangle) 1.3

Drawdown Time Calculations

Greater than 0.1 m above the permanent pool

$T=[v_2-v_1]/[(Q_2+Q_1)/2]/3600$

where

T=drawdown time in hours

v_2=starting pond volume

v_2=ending pond volume

Q_2=starting flow

Q_1=ending flow

From 0.0 to 0.1 m above the permanent pool

$T=[v_2-v_1]/[(Q_2)]/3600$

where

T=drawdown time in hours

v_2=starting pond volume

v_2=ending pond volume

Q_2=starting flow

Orifice Flow Calculations:

Orifice flow equation

$Q = C \cdot A \cdot (2 \cdot g \cdot H)^{0.5}$

where

C = orifice coefficient

A = area of orifice

g = acceleration due to gravity

H = head above centre line of orifice

Note: used when water elevation is above 3/4 of the orifice diameter

Sharp crested semi-circular weir equation

$Q=C*D^{2.5}*(H/D)^{1.88}$

where

C = sharp crested semi-circular weir coefficient

D = diameter of orifice

H = head above orifice invert

Note: used when water elevation is below 3/4 of the orifice diameter

Broad Crested Weir Equation:

$Q = C_{wb}*L*H^{1.5} + C_{wt}*S*H^{2.5}$

where

L = bottom width of spillway

H = head above weir invert

S = side slopes (ratio of H:V)

C_{wt} = broad-crested triangular weir coefficient

C_{wb} = broad-crested rectangular weir coefficient

Environment Canada/Environnement Canada

Short Duration Rainfall Intensity-Duration-Frequency Data
Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée

Gumbel - Method of moments/Méthode des moments

2014/12/21

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BELLEVILLE ON 6150689
(composite)
Latitude: 44 9'N Longitude: 77 23'W Elevation/Altitude: 76 m

Years/Années : 1960 - 2006 # Years/Années : 37

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Table 1 : Annual Maximum (mm)/Maximum annuel (mm)

****

Year / Année	5 min	10 min	15 min	30 min	1 h	2 h	6 h	12 h	24 h
1960	6.3	9.1	12.4	23.4	25.4	35.1	53.8	55.1	55.9
1961	6.1	7.9	8.9	12.2	18.0	18.8	23.9	34.0	36.3
1963	12.4	19.0	23.1	28.4	30.7	31.0	31.0	31.7	44.4
1964	4.3	5.6	7.4	12.2	12.4	20.6	45.2	45.7	45.7
1966	6.3	8.9	10.4	11.9	13.2	16.0	32.8	37.8	38.1
1967	7.4	9.9	10.4	10.4	11.9	13.2	26.4	42.4	58.7
1968	7.9	11.9	13.7	18.5	21.8	27.2	43.9	57.1	57.1
1969	5.8	9.7	13.0	17.5	24.4	31.0	37.8	43.2	62.2
1971	7.4	11.4	13.0	23.9	25.1	25.4	25.7	25.7	32.5
1972	9.4	10.7	11.7	12.4	14.7	20.6	28.2	33.5	50.5
1973	7.4	10.7	11.9	18.0	21.3	21.8	37.3	45.5	48.0
1974	10.9	15.2	17.8	25.4	25.4	25.4	34.3	42.7	42.7
1977	4.8	8.1	9.9	14.7	25.1	30.2	60.5	66.0	66.0
1980	13.2	16.9	19.0	20.5	20.5	34.6	46.9	47.6	59.6
1981	-99.9	-99.9	13.3	25.5	29.4	34.6	46.2	49.2	57.4
1982	4.6	8.5	10.1	14.2	18.3	24.7	39.8	45.0	45.0
1983	6.5	8.9	10.5	18.4	22.2	30.7	39.6	39.6	50.3
1984	5.1	8.1	10.1	11.3	19.7	23.7	33.4	51.4	55.1
1985	10.5	16.2	20.0	27.0	27.4	42.3	42.3	44.5	44.5
1986	9.1	14.4	16.4	23.2	25.2	35.0	59.2	68.8	78.9
1987	4.3	6.6	9.3	14.2	24.7	37.1	39.2	39.2	39.2
1988	3.7	6.2	7.4	8.6	9.2	10.6	20.8	22.2	28.2
1989	14.5	16.7	17.9	18.4	24.2	24.2	27.7	27.7	37.7
1990	6.9	8.3	10.0	12.3	13.6	20.8	29.7	34.8	38.7
1991	8.5	13.8	18.5	18.8	32.0	32.4	32.4	32.4	32.7
1992	6.3	7.6	8.4	13.2	18.8	21.9	38.2	48.3	50.1
1993	8.2	15.8	23.6	28.3	28.3	28.3	-99.9	-99.9	69.6
1994	8.8	10.2	14.5	18.3	23.6	25.5	38.2	49.2	52.8
1995	8.0	12.9	14.9	19.3	27.5	31.5	48.5	58.5	67.3
1996	6.9	10.4	13.4	19.2	25.1	41.3	41.5	53.8	53.8
1997	10.3	16.8	20.9	25.5	42.8	50.0	56.0	56.0	56.0

1998	9.5	12.1	15.1	22.1	25.0	32.6	38.6	38.6	50.2
1999	9.6	13.1	17.9	23.2	29.4	36.9	42.8	72.7	72.7
2000	10.4	13.4	14.7	16.8	29.0	39.8	52.0	52.4	53.0
2001	7.4	10.1	11.0	11.8	16.7	17.4	21.2	31.6	39.8
2002	7.1	9.4	14.0	21.0	22.4	26.0	39.4	44.2	49.8
2003	7.6	13.5	20.1	26.2	27.0	27.0	31.1	-99.9	56.2
2004	14.4	22.1	28.8	33.3	33.3	49.0	89.9	114.4	124.5
2006	9.0	14.7	18.8	19.5	19.5	19.5	37.3	42.7	59.8
# Yrs. Années	38	38	39	39	39	39	38	37	39
Mean Moyenne	8.1	11.7	14.4	18.9	23.2	28.6	39.8	46.6	52.8
Std. Dev. Écart-type	2.7	3.8	4.9	6.0	6.7	9.0	13.0	16.3	16.4
Skew. Dissymétrie	0.69	0.66	0.83	0.29	0.20	0.37	1.60	2.08	2.19
Kurtosis	3.44	3.23	3.63	2.58	4.05	3.21	7.90	10.48	11.56

*-99.9 Indicates Missing Data/Données manquantes

Warning: annual maximum amount greater than 100-yr return period amount
Avertissement : la quantité maximale annuelle excède la quantité pour une période de retour de 100 ans

Year/Année	Duration/Durée	Data/Données	100-yr/ans
2004	6 h	89.9	80.5
2004	12 h	114.4	97.6
2004	24 h	124.5	104.4

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Table 2a : Return Period Rainfall Amounts (mm)
Quantité de pluie (mm) par période de retour

****

Duration/Durée	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
5 min	7.6	10.0	11.6	13.5	15.0	16.5	38
10 min	11.1	14.4	16.7	19.5	21.6	23.6	38
15 min	13.6	18.0	20.8	24.5	27.2	29.9	39
30 min	18.0	23.2	26.7	31.1	34.4	37.6	39
1 h	22.1	28.0	31.9	36.8	40.5	44.1	39
2 h	27.1	35.1	40.4	47.0	52.0	56.9	39
6 h	37.7	49.1	56.7	66.3	73.4	80.5	38
12 h	44.0	58.3	67.8	79.9	88.8	97.6	37
24 h	50.1	64.7	74.3	86.5	95.5	104.4	39

****

Table 2b :

Return Period Rainfall Rates (mm/h) - 95% Confidence limits
Intensité de la pluie (mm/h) par période de retour - Limites de confiance de 95%

****

Duration/Durée	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
5 min	91.6	120.0	138.8	162.6	180.2	197.7	38

	+/- 9.4	+/- 15.8	+/- 21.3	+/- 28.8	+/- 34.4	+/- 40.1	38
10 min	66.5	86.6	100.0	116.9	129.4	141.8	38
	+/- 6.7	+/- 11.2	+/- 15.1	+/- 20.4	+/- 24.4	+/- 28.5	38
15 min	54.4	71.8	83.4	97.9	108.7	119.5	39
	+/- 5.7	+/- 9.6	+/- 12.9	+/- 17.4	+/- 20.8	+/- 24.3	39
30 min	35.9	46.5	53.4	62.2	68.8	75.3	39
	+/- 3.4	+/- 5.8	+/- 7.8	+/- 10.5	+/- 12.6	+/- 14.7	39
1 h	22.1	28.0	31.9	36.8	40.5	44.1	39
	+/- 1.9	+/- 3.2	+/- 4.4	+/- 5.9	+/- 7.1	+/- 8.2	39
2 h	13.5	17.5	20.2	23.5	26.0	28.5	39
	+/- 1.3	+/- 2.2	+/- 3.0	+/- 4.0	+/- 4.8	+/- 5.6	39
6 h	6.3	8.2	9.5	11.1	12.2	13.4	38
	+/- 0.6	+/- 1.1	+/- 1.4	+/- 1.9	+/- 2.3	+/- 2.7	38
12 h	3.7	4.9	5.7	6.7	7.4	8.1	37
	+/- 0.4	+/- 0.7	+/- 0.9	+/- 1.2	+/- 1.5	+/- 1.7	37
24 h	2.1	2.7	3.1	3.6	4.0	4.4	39
	+/- 0.2	+/- 0.3	+/- 0.4	+/- 0.6	+/- 0.7	+/- 0.8	39

****

Table 3 : Interpolation Equation / Équation d'interpolation: R = A*T^B

R = Interpolated Rainfall rate (mm/h)/Intensité interpolée de la pluie (mm/h)
RR = Rainfall rate (mm/h) / Intensité de la pluie (mm/h)
T = Rainfall duration (h) / Durée de la pluie (h)

****

Statistics/Statistiques	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans
Mean of RR/Moyenne de RR	32.9	42.9	49.5	57.9	64.1	70.3
Std. Dev. /Écart-type (RR)	31.7	41.6	48.1	56.4	62.5	68.6
Std. Error/Erreur-type	6.8	8.7	9.9	11.4	12.6	13.7
Coefficient (A)	20.3	26.4	30.4	35.5	39.3	43.0
Exponent/Exposant (B)	-0.677	-0.677	-0.678	-0.678	-0.678	-0.678
Mean % Error/% erreur moyenne	7.8	7.4	7.2	7.2	7.2	7.2

Subject: Manning's Equation Calculation For Open Flow in a Channel
Project: Loyalist Solar Project
Site: Substation
Project No.: 1335-60220
Client: Loyalist Solar LP
Date: November 21, 2017

Manning's Equation Calculation For Open Flow in a Channel

Section: Substation Swale - North Section

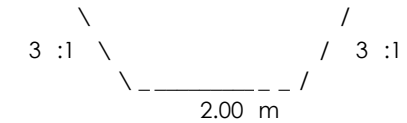
Input Data:

Flow =	0.04 m^3/s	0.101 m3/s x 0.91 ha / 2.20 ha
Manning's 'n' =	0.05	
Channel Slope =	0.3%	
Side Slope =	3 m/m	[3 means 3:1]
Side Slope =	3 m/m	[3 means 3:1]
Bottom Width =	2 m	[0 = triangular, +ve = trapezoidal]

Calculated Values:

Velocity =	0.20	m/s
Area=	0.206	m^2
Wetted Perimeter =	2.573	m
Hydraulic Radius (R) =	0.080	m

Configuration:



Depth Estimate:
Estimated Flow Depth = **0.09 m** lhs-rhs = -9E-05
Note: Calculations are correct when lhs-rhs = 0

Section: Substation Swale - South Section

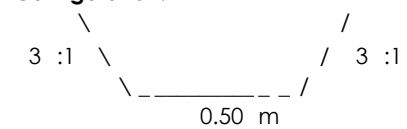
Input Data:

Flow =	0.04 m^3/s	0.101 m3/s x 0.91 ha / 2.20 ha
Manning's 'n' =	0.05	
Channel Slope =	2.5%	
Side Slope =	3 m/m	[3 means 3:1]
Side Slope =	3 m/m	[3 means 3:1]
Bottom Width =	0.5 m	[0 = triangular, +ve = trapezoidal]

Calculated Values:

Velocity =	0.53	m/s
Area=	0.078	m^2
Wetted Perimeter =	1.122	m
Hydraulic Radius (R) =	0.070	m

Configuration:



Depth Estimate:
Estimated Flow Depth = **0.10 m** lhs-rhs = -7E-05
Note: Calculations are correct when lhs-rhs = 0

Culvert Analysis Report
Substation Entrance Culvert - Catchment 200

Analysis Component			
Storm Event	Design	Discharge	0.0820 m³/s

Peak Discharge Method: User-Specified			
Design Discharge	0.0820 m³/s	Check Discharge	0.0000 m³/s

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	146.12 m

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-525 mm Circular	0.0820 m³/s	146.36 m	0.60 m/s
Weir	Roadway (Constant Elevation)	0.0000 m³/s	146.36 m	N/A
Total	----------	0.0820 m³/s	146.36 m	N/A

Culvert Analysis Report
Substation Entrance Culvert - Catchment 200

Component:Culvert-1

Culvert Summary					
Computed Headwater Elevation	146.36	m	Discharge	0.0820	m³/s
Inlet Control HW Elev.	146.30	m	Tailwater Elevation	146.12	m
Outlet Control HW Elev.	146.36	m	Control Type	Entrance Control	
Headwater Depth/Height	0.60				

Grades					
Upstream Invert	146.04	m	Downstream Invert	145.80	m
Length	19.80	m	Constructed Slope	0.012121	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.31	m
Slope Type	Steep		Normal Depth	0.14	m
Flow Regime	N/A		Critical Depth	0.19	m
Velocity Downstream	0.60	m/s	Critical Slope	0.003999	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	Corrugated HDPE (Smooth Interior)		Span	0.53	m
Section Size	525 mm		Rise	0.53	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	146.36	m	Upstream Velocity Head	0.07	m
Ke	0.90		Entrance Loss	0.06	m

Inlet Control Properties					
Inlet Control HW Elev.	146.30	m	Flow Control	Unsubmerged	
Inlet Type	Groove end projecting		Area Full	0.2	m²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Analysis Report
Substation Entrance Culvert - Catchment 200

Component:Weir

Hydraulic Component(s): Roadway (Constant Elevation)					
Discharge	0.0000	m³/s	Allowable HW Elevation	146.36	m
Roadway Width	10.00	m	Overtopping Coefficient	1.38	SI
Length	50.00	m	Crest Elevation	147.15	m
Headwater Elevation	N/A	m	Discharge Coefficient (Cr)	2.50	
Submergence Factor (Kt)	1.00				

Sta (m)	Elev. (m)
0.00	147.15
50.00	147.15

Subject: **Temporary Sediment Basin Design Calculations**
Project: **Loyalist Solar Project**
Site: **Substation**
Project No.: **1335-60220**
Client: **Loyalist Solar LP**
Date: **November 19, 2017**

	Rating Curve				Estimated Detention Time (hrs)	Volume Estimation				Elevation (m)	Outlet Structure Controls		
			Storage								Quality Outlet # 1 (m^3/s)	Overflow Weir (m^3/s)	Parameters
	Elevation (m)	Discharge (m^3/s)	Toal (m^3)	Active (m^3)		Elevation (m)	Area	Volume	Depth (m)				
	146.10					146.10				146.10			Quality Outlet
	146.20		7			146.20	139	7		146.20			Outlet #1 Elev (m) 146.50 / Orifice Coeff. 0.60
	146.30		52			146.30	768	52		146.30			Outlet #1-Midpoint (mm) 146.54 / Perimeter (m) 0.24
	146.40		201			146.40	2211	201		146.40			
Dead Storage	146.50		543			146.50	4627	543		146.50			Outlet Diameter (mm) 75 / Area (m^2) 0.004
Active Storage	146.60	0.003	1,016	472	44.7	146.60	4821	1016	0.10	146.60	0.003		Weir Coeff. (semi-circular) 1.62 / Orientation Vertical
	146.70	0.005	1,507	964	80.3	146.70	5018	1507	0.20	146.70	0.005		
	146.80	0.006	2,017	1,474	106.7	146.80	5180	2017	0.30	146.80	0.006		
	146.90	0.288	2,544	2,000	107.7	146.90	5344	2544	0.40	146.90	0.007	0.281	
	147.00	0.838	3,103	2,560	108.0	147.00	5840	3103	0.50	147.00	0.008	0.830	
	147.10	1.598	3,695	3,152	108.1	147.10	6000	3695	0.60	147.10	0.009	1.589	Outlet #2 Elev (m) / Orifice Coeff.
													Overflow Weir
													Spillway Invert (m) 146.80 / Top of Berm (m) 147.10
													Spillway Length @ Invert (m) 5 / Max. Flow Depth (m) 0.30
													Left Side Slope 3 / Right Side Slope 3
													Weir Coefficient (Rectangle) 1.7 / Topwidth 6.8
													Weir Coefficient (Triangle) 1.3

Drawdown Time Calculations

Greater than 0.1 m above the permanent pool

$T=[v_2-v_1]/[(Q_2+Q_1)/2]/3600$

where

T=drawdown time in hours

v_2=starting pond volume

v_2=ending pond volume

Q_2=starting flow

Q_1=ending flow

From 0.0 to 0.1 m above the permanent pool

$T=[v_2-v_1]/[(Q_2)]/3600$

where

T=drawdown time in hours

v_2=starting pond volume

v_2=ending pond volume

Q_2=starting flow

Orifice Flow Calculations:

Orifice flow equation

$Q = C_o A_o (2 g H)^{0.5}$

where

C = orifice coefficient

A = area of orifice

g = acceleration due to gravity

H = head above centre line of orifice

Note: used when water elevation is above 3/4 of the orifice diameter

Sharp crested semi-circular weir equation

$Q=C*D^{2.5}*(H/D)^{1.88}$

where

C = sharp crested semi-circular weir coefficient

D = diameter of orifice

H = head above orifice invert

Note: used when water elevation is below 3/4 of the orifice diameter

Broad Crested Weir Equation:

$Q = C_{wb}*L*H^{1.5} + C_{wt}*S*H^{2.5}$

where

L = bottom width of spillway

H = head above weir invert

S = side slopes (ratio of H:V)

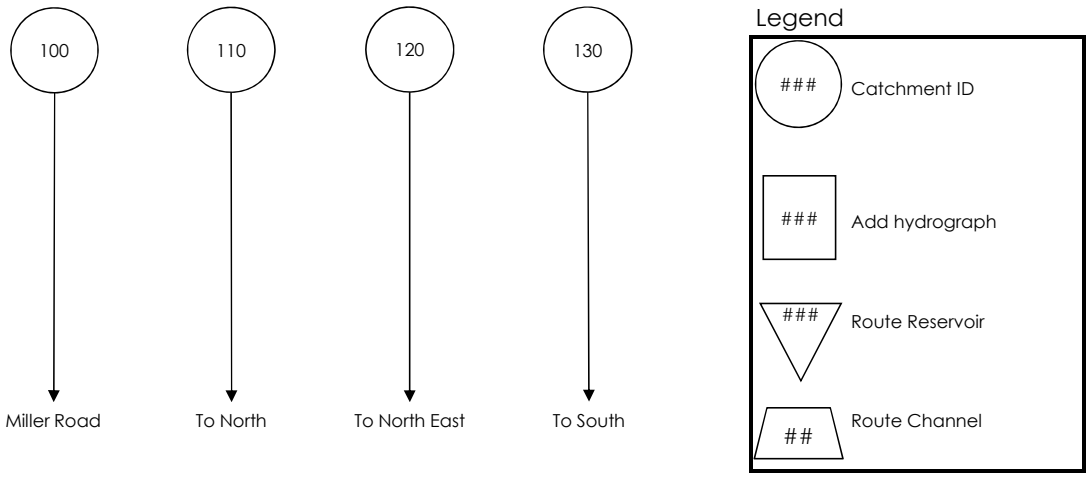
C_{wt} = broad-crested triangular weir coefficient

C_{wb} = broad-crested rectangular weir coefficient

APPENDIX B - SWMHYMO MODELING

Existing Schematic
Existing Input
Existing Output
Proposed Schematic
Proposed Input
Proposed Output

Subject: **Existing Schematic**
Project: **Loyalist Solar Project**
Site: **Substation**
Project No.: **1335-60220**
Client: **Loyalist Solar LP**
Date: **November 19, 2017**



```
00001> 2     Metric units
00002> *#*****************************************************************************
00003> *#  Project Name: [Loyalist Solar]    Project Number: [133560220]
00004> *#  Date        : 11-19-2017
00005> *#  Modeller    : [D. Williams]
00006> *#  Company     : Stantec Consulting Ltd. (Kitchener)
00007> *#  License #   :  4730904
00008> *#*****************************************************************************
00009> *#*****************************************************************************
00010> *#
00011> *#                     SUBSTATION - EXISTING CONDITIONS
00012> *#
00013> *#*****************************************************************************
00014> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
00015> *%                  ["LYA2.1hr"] <--storm filename, one per line for NSTORM time
00016> *%-----------------|-----------------------------------------------------------|
00017> READ STORM          STORM_FILENAME=["STORM.001"]
00018> *%-----------------|-----------------------------------------------------------|
00019> *#*****************************************************************************
00020> *#
00021> *#                               AMC II Conditions
00022> *#
00023> *#*****************************************************************************
00024> DESIGN NASHYD       ID=[1], NHYD=["100"], DT=[1]min, AREA=[0.97](ha),
00025>                     DWF=[0](cms), CN/C=[80], TP=[0.20]hrs,
00026>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00027> *%-----------------|-----------------------------------------------------------|
00028> DESIGN NASHYD       ID=[1], NHYD=["110"], DT=[1]min, AREA=[1.20](ha),
00029>                     DWF=[0](cms), CN/C=[79], TP=[0.16]hrs,
00030>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00031> *%-----------------|-----------------------------------------------------------|
00032> DESIGN NASHYD       ID=[1], NHYD=["120"], DT=[1]min, AREA=[2.22](ha),
00033>                     DWF=[0](cms), CN/C=[81], TP=[0.19]hrs,
00034>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00035> *%-----------------|-----------------------------------------------------------|
00036> DESIGN NASHYD       ID=[1], NHYD=["130"], DT=[1]min, AREA=[0.55](ha),
00037>                     DWF=[0](cms), CN/C=[78], TP=[0.09]hrs,
00038>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00039> *%-----------------|-----------------------------------------------------------|
00040> *#*****************************************************************************
00041> *#
00042> *#                               AMC III Conditions
00043> *#
00044> *#*****************************************************************************
00045> DESIGN NASHYD       ID=[1], NHYD=["100"], DT=[1]min, AREA=[0.97](ha),
00046>                     DWF=[0](cms), CN/C=[91], TP=[0.20]hrs,
00047>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00048> *%-----------------|-----------------------------------------------------------|
00049> DESIGN NASHYD       ID=[1], NHYD=["110"], DT=[1]min, AREA=[1.20](ha),
00050>                     DWF=[0](cms), CN/C=[91], TP=[0.16]hrs,
00051>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00052> *%-----------------|-----------------------------------------------------------|
00053> DESIGN NASHYD       ID=[1], NHYD=["120"], DT=[1]min, AREA=[2.22](ha),
00054>                     DWF=[0](cms), CN/C=[92], TP=[0.19]hrs,
00055>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00056> *%-----------------|-----------------------------------------------------------|
00057> DESIGN NASHYD       ID=[1], NHYD=["130"], DT=[1]min, AREA=[0.55](ha),
00058>                     DWF=[0](cms), CN/C=[90], TP=[0.09]hrs,
00059>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00060> *%-----------------|-----------------------------------------------------------|
00061> *%-----------------|-----------------------------------------------------------|
00062> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[2]
00063> *%                  ["LYA2.12h"] <--storm filename, one per line for NSTORM time
00064> *%-----------------|-----------------------------------------------------------|
00065> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[3]
00066> *%                  ["LYA5.1hr"] <--storm filename, one per line for NSTORM time
00067> *%-----------------|-----------------------------------------------------------|
00068> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[4]
00069> *%                  ["LYA5.12h"] <--storm filename, one per line for NSTORM time
00070> *%-----------------|-----------------------------------------------------------|
00071> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[5]
00072> *%                  ["LYA100.1hr"] <--storm filename, one per line for NSTORM time
00073> *%-----------------|-----------------------------------------------------------|
```

```
00074> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[6]
00075> *%                  ["LYA100.12h"] <--storm filename, one per line for NSTORM time
00076> *%-----------------|-----------------------------------------------------------|
00077> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[7]
00078> *%                  ["25mm.4hr"] <--storm filename, one per line for NSTORM time
00079> *%-----------------|-----------------------------------------------------------|
00080> FINISH
00081>
00082>
00083>
00084>
00085>
00086>
00087>
00088>
00089>
00090>
00091>
```

```
00001> ================================================================================
00002>
00003>    SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
00004>    S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>    SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
00006>        S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
00007>    SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
00008>                                                          9   9  9   9   # 4730904
00009>         StormWater Management HYdrologic Model            999    999    =========
00010>
00011>  ***************************************************************************
00012>  ***************************** SWMHYMO Ver/4.05  *****************************
00013>  *********  A single event and continuous hydrologic simulation model  *********
00014>  *********     based on the principles of HYMO and its successors      *********
00015>  *********                 OTTHYMO-83 and OTTHYMO-89.                  *********
00016>  ***************************************************************************
00017>  ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
00018>  *********                  Ottawa,  Ontario: (613) 836-3884           *********
00019>  *********                  Gatineau, Quebec: (819) 243-6858           *********
00020>  *********                  E-Mail: swmhymo@jfsa.com                   *********
00021>  ***************************************************************************
00022>
00023>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++++ Licensed user: Stantec Consulting Ltd. (Kitchener)          +++++++++
00025>  +++++++++                Kitchener             SERIAL#:4730904       +++++++++
00026>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028>  ***************************************************************************
00029>  *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
00030>  *********           Maximum value for ID numbers  :     10            *********
00031>  *********           Max. number of rainfall points: 105408            *********
00032>  *********           Max. number of flow points    : 105408            *********
00033>  ***************************************************************************
00034>
00035>
00036>  *********************   D E T A I L E D   O U T P U T   **********************
00037>  ***************************************************************************
00038>  *         DATE: 2017-11-21     TIME: 15:59:11     RUN COUNTER: 001621         *
00039>  ***************************************************************************
00040>  * Input   filename: C:\usr\_LOY\LYSBEX.dat                                  *
00041>  * Output  filename: C:\usr\_LOY\LYSBEX.out                                  *
00042>  * Summary filename: C:\usr\_LOY\LYSBEX.sum                                  *
00043>  * User comments:                                                           *
00044>  * 1:_____________________________________________________________________*
00045>  * 2:_____________________________________________________________________*
00046>  * 3:_____________________________________________________________________*
00047>  ***************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001--------------------------------------------------------------------------
00051> *#************************************************************************
00052> *#  Project Name: [Loyalist Solar]    Project Number: [133560220]
00053> *#  Date        : 11-19-2017
00054> *#  Modeller    : [D. Williams]
00055> *#  Company     : Stantec Consulting Ltd. (Kitchener)
00056> *#  License #   :  4730904
00057> *#************************************************************************
00058> *#************************************************************************
00059> *#
00060> *#                     SUBSTATION - EXISTING CONDITIONS
00061> *#
00062> *#************************************************************************
00063> --------------------
00064> | START            |  Project  dir.: C:\usr\_LOY\
00065> --------------------  Rainfall dir.: C:\usr\_LOY\
00066>     TZERO =   .00 hrs on        0
00067>     METOUT=   2 (output = METRIC)
00068>     NRUN  = 001
00069>     NSTORM=   1
00070>            #  1=LYA2.1hr
00071> --------------------------------------------------------------------------------
00072> 001:0002--------------------------------------------------------------------------
00073> --------------------
```

```
00074> | READ STORM       |    Filename: Belleville IDF (1-hr 30% AES - 2 Year)
00075> | Ptotal=  22.10 mm|    Comments: Belleville IDF (1-hr 30% AES - 2 Year)
00076> --------------------
00077>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00078>               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00079>               .08  23.868 |    .33  29.172 |    .58  26.520 |    .83   7.956
00080>               .17  37.128 |    .42  34.476 |    .67  13.260 |    .92   2.652
00081>               .25  55.692 |    .50  23.868 |    .75  10.608 |   1.00    .000
00082>
00083> ------------------------------------------------------------------------------
00084> 001:0003-------------------------------------------------------------------------
00085> *#*****************************************************************************
00086> *#
00087> *#                             AMC II Conditions
00088> *#
00089> *#*****************************************************************************
00090> ----------------------
00091> | DESIGN NASHYD      |   Area    (ha)=     .97   Curve Number   (CN)=80.00
00092> | 01:100    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00093> ----------------------   U.H. Tp(hrs)=    .200
00094>
00095>      Unit Hyd Qpeak  (cms)=     .185
00096>
00097>      PEAK FLOW       (cms)=     .021 (i)
00098>      TIME TO PEAK    (hrs)=     .683
00099>      RUNOFF VOLUME    (mm)=    5.046
00100>      TOTAL RAINFALL   (mm)=   22.100
00101>      RUNOFF COEFFICIENT   =     .228
00102>
00103>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00104>
00105> ------------------------------------------------------------------------------
00106> 001:0004-------------------------------------------------------------------------
00107> ----------------------
00108> | DESIGN NASHYD      |   Area    (ha)=    1.20   Curve Number   (CN)=79.00
00109> | 01:110    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00110> ----------------------   U.H. Tp(hrs)=    .160
00111>
00112>      Unit Hyd Qpeak  (cms)=     .286
00113>
00114>      PEAK FLOW       (cms)=     .027 (i)
00115>      TIME TO PEAK    (hrs)=     .633
00116>      RUNOFF VOLUME    (mm)=    4.816
00117>      TOTAL RAINFALL   (mm)=   22.100
00118>      RUNOFF COEFFICIENT   =     .218
00119>
00120>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00121>
00122> ------------------------------------------------------------------------------
00123> 001:0005-------------------------------------------------------------------------
00124> ----------------------
00125> | DESIGN NASHYD      |   Area    (ha)=    2.22   Curve Number   (CN)=81.00
00126> | 01:120    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00127> ----------------------   U.H. Tp(hrs)=    .190
00128>
00129>      Unit Hyd Qpeak  (cms)=     .446
00130>
00131>      PEAK FLOW       (cms)=     .051 (i)
00132>      TIME TO PEAK    (hrs)=     .667
00133>      RUNOFF VOLUME    (mm)=    5.293
00134>      TOTAL RAINFALL   (mm)=   22.100
00135>      RUNOFF COEFFICIENT   =     .239
00136>
00137>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00138>
00139> ------------------------------------------------------------------------------
00140> 001:0006-------------------------------------------------------------------------
00141> ----------------------
00142> | DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=78.00
00143> | 01:130    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00144> ----------------------   U.H. Tp(hrs)=    .090
00145>
00146>      Unit Hyd Qpeak  (cms)=     .233
```

```
00147>
00148>      PEAK FLOW       (cms)=     .013 (i)
00149>      TIME TO PEAK    (hrs)=     .600
00150>      RUNOFF VOLUME    (mm)=    4.600
00151>      TOTAL RAINFALL   (mm)=   22.100
00152>      RUNOFF COEFFICIENT   =     .208
00153>
00154>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00155>
00156> ---------------------------------------------------------------------------------
00157> 001:0007-----------------------------------------------------------------------------
00158> *#*****************************************************************************
00159> *#
00160> *#                              AMC III Conditions
00161> *#
00162> *#*****************************************************************************
00163> ----------------------
00164> | DESIGN NASHYD      |   Area    (ha)=     .97   Curve Number   (CN)=91.00
00165> | 01:100    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00166> ----------------------   U.H. Tp(hrs)=    .200
00167>
00168>      Unit Hyd Qpeak  (cms)=     .185
00169>
00170>      PEAK FLOW       (cms)=     .038 (i)
00171>      TIME TO PEAK    (hrs)=     .667
00172>      RUNOFF VOLUME    (mm)=    9.281
00173>      TOTAL RAINFALL   (mm)=   22.100
00174>      RUNOFF COEFFICIENT   =     .420
00175>
00176>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00177>
00178> ---------------------------------------------------------------------------------
00179> 001:0008-----------------------------------------------------------------------------
00180> ----------------------
00181> | DESIGN NASHYD      |   Area    (ha)=    1.20   Curve Number   (CN)=91.00
00182> | 01:110    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00183> ----------------------   U.H. Tp(hrs)=    .160
00184>
00185>      Unit Hyd Qpeak  (cms)=     .286
00186>
00187>      PEAK FLOW       (cms)=     .051 (i)
00188>      TIME TO PEAK    (hrs)=     .617
00189>      RUNOFF VOLUME    (mm)=    9.281
00190>      TOTAL RAINFALL   (mm)=   22.100
00191>      RUNOFF COEFFICIENT   =     .420
00192>
00193>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00194>
00195> ---------------------------------------------------------------------------------
00196> 001:0009-----------------------------------------------------------------------------
00197> ----------------------
00198> | DESIGN NASHYD      |   Area    (ha)=    2.22   Curve Number   (CN)=92.00
00199> | 01:120    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00200> ----------------------   U.H. Tp(hrs)=    .190
00201>
00202>      Unit Hyd Qpeak  (cms)=     .446
00203>
00204>      PEAK FLOW       (cms)=     .096 (i)
00205>      TIME TO PEAK    (hrs)=     .650
00206>      RUNOFF VOLUME    (mm)=    9.941
00207>      TOTAL RAINFALL   (mm)=   22.100
00208>      RUNOFF COEFFICIENT   =     .450
00209>
00210>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00211>
00212> ---------------------------------------------------------------------------------
00213> 001:0010-----------------------------------------------------------------------------
00214> ----------------------
00215> | DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=90.00
00216> | 01:130    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00217> ----------------------   U.H. Tp(hrs)=    .090
00218>
00219>      Unit Hyd Qpeak  (cms)=     .233
```

```
00220>
00221>      PEAK FLOW       (cms)=     .023 (i)
00222>      TIME TO PEAK    (hrs)=     .467
00223>      RUNOFF VOLUME    (mm)=    8.692
00224>      TOTAL RAINFALL   (mm)=   22.100
00225>      RUNOFF COEFFICIENT   =     .393
00226>
00227>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00228>
00229> ---------------------------------------------------------------------------------------
00230> 001:0011-------------------------------------------------------------------------------
00231>   ** END OF RUN :   1
00232>
00233> ***************************************************************************
00234>
00235>
00236>
00237>
00238>
00239> --------------------
00240> | START            |  Project  dir.: C:\usr\_LOY\
00241> --------------------  Rainfall dir.: C:\usr\_LOY\
00242>     TZERO =   .00 hrs on        0
00243>     METOUT=   2 (output = METRIC)
00244>     NRUN  = 002
00245>     NSTORM=   1
00246>            #  1=LYA2.12h
00247> ---------------------------------------------------------------------------------------
00248> 002:0002-------------------------------------------------------------------------------
00249> *#************************************************************************
00250> *#  Project Name: [Loyalist Solar]    Project Number: [133560220]
00251> *#  Date        : 11-19-2017
00252> *#  Modeller    : [D. Williams]
00253> *#  Company     : Stantec Consulting Ltd. (Kitchener)
00254> *#  License #   :  4730904
00255> *#************************************************************************
00256> *#************************************************************************
00257> *#
00258> *#                     SUBSTATION - EXISTING CONDITIONS
00259> *#
00260> *#************************************************************************
00261> ---------------------------------------------------------------------------------------
00262> 002:0002-------------------------------------------------------------------------------
00263> --------------------
00264> | READ STORM       |    Filename: Belleville IDF (12-hr 30% AES - 2 Year)
00265> | Ptotal=  42.24 mm|    Comments: Belleville IDF (12-hr 30% AES - 2 Year)
00266> --------------------
00267>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00268>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00269>               1.00   3.960 |   4.00   6.600 |   7.00   1.320 |  10.00    .000
00270>               2.00  11.440 |   5.00   6.160 |   8.00    .440 |  11.00    .000
00271>               3.00   8.800 |   6.00   3.520 |   9.00    .000 |  12.00    .000
00272>
00273> ---------------------------------------------------------------------------------------
00274> 002:0003-------------------------------------------------------------------------------
00275> *#************************************************************************
00276> *#
00277> *#                              AMC II Conditions
00278> *#
00279> *#************************************************************************
00280> ----------------------
00281> | DESIGN NASHYD      |   Area    (ha)=     .97   Curve Number   (CN)=80.00
00282> | 01:100    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00283> ----------------------   U.H. Tp(hrs)=    .200
00284>
00285>      Unit Hyd Qpeak  (cms)=     .185
00286>
00287>      PEAK FLOW       (cms)=     .010 (i)
00288>      TIME TO PEAK    (hrs)=    3.050
00289>      RUNOFF VOLUME    (mm)=   15.922
00290>      TOTAL RAINFALL   (mm)=   42.240
00291>      RUNOFF COEFFICIENT   =     .377
00292>
```

```
00293>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00294>
00295> ------------------------------------------------------------------------------
00296> 002:0004-----------------------------------------------------------------------
00297> ----------------------
00298> | DESIGN NASHYD      |   Area    (ha)=    1.20   Curve Number   (CN)=79.00
00299> | 01:110    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00300> ----------------------   U.H. Tp(hrs)=    .160
00301>
00302>      Unit Hyd Qpeak  (cms)=     .286
00303>
00304>      PEAK FLOW       (cms)=     .012 (i)
00305>      TIME TO PEAK    (hrs)=    3.033
00306>      RUNOFF VOLUME    (mm)=   15.331
00307>      TOTAL RAINFALL   (mm)=   42.240
00308>      RUNOFF COEFFICIENT   =     .363
00309>
00310>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00311>
00312> ------------------------------------------------------------------------------
00313> 002:0005-----------------------------------------------------------------------
00314> ----------------------
00315> | DESIGN NASHYD      |   Area    (ha)=    2.22   Curve Number   (CN)=81.00
00316> | 01:120    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00317> ----------------------   U.H. Tp(hrs)=    .190
00318>
00319>      Unit Hyd Qpeak  (cms)=     .446
00320>
00321>      PEAK FLOW       (cms)=     .024 (i)
00322>      TIME TO PEAK    (hrs)=    3.050
00323>      RUNOFF VOLUME    (mm)=   16.545
00324>      TOTAL RAINFALL   (mm)=   42.240
00325>      RUNOFF COEFFICIENT   =     .392
00326>
00327>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00328>
00329> ------------------------------------------------------------------------------
00330> 002:0006-----------------------------------------------------------------------
00331> ----------------------
00332> | DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=78.00
00333> | 01:130    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00334> ----------------------   U.H. Tp(hrs)=    .090
00335>
00336>      Unit Hyd Qpeak  (cms)=     .233
00337>
00338>      PEAK FLOW       (cms)=     .006 (i)
00339>      TIME TO PEAK    (hrs)=    3.000
00340>      RUNOFF VOLUME    (mm)=   14.769
00341>      TOTAL RAINFALL   (mm)=   42.240
00342>      RUNOFF COEFFICIENT   =     .350
00343>
00344>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00345>
00346> ------------------------------------------------------------------------------
00347> 002:0007-----------------------------------------------------------------------
00348> *#*****************************************************************************
00349> *#
00350> *#                              AMC III Conditions
00351> *#
00352> *#*****************************************************************************
00353> ----------------------
00354> | DESIGN NASHYD      |   Area    (ha)=     .97   Curve Number   (CN)=91.00
00355> | 01:100    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00356> ----------------------   U.H. Tp(hrs)=    .200
00357>
00358>      Unit Hyd Qpeak  (cms)=     .185
00359>
00360>      PEAK FLOW       (cms)=     .016 (i)
00361>      TIME TO PEAK    (hrs)=    3.033
00362>      RUNOFF VOLUME    (mm)=   25.201
00363>      TOTAL RAINFALL   (mm)=   42.240
00364>      RUNOFF COEFFICIENT   =     .597
00365>
```

```
00366>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00367>
00368> ---------------------------------------------------------------------------------
00369> 002:0008-----------------------------------------------------------------------------
00370> ----------------------
00371> | DESIGN NASHYD      |   Area    (ha)=    1.20   Curve Number   (CN)=91.00
00372> | 01:110    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00373> ----------------------   U.H. Tp(hrs)=    .160
00374>
00375>      Unit Hyd Qpeak  (cms)=     .286
00376>
00377>      PEAK FLOW       (cms)=     .021 (i)
00378>      TIME TO PEAK    (hrs)=    3.017
00379>      RUNOFF VOLUME    (mm)=   25.201
00380>      TOTAL RAINFALL   (mm)=   42.240
00381>      RUNOFF COEFFICIENT   =     .597
00382>
00383>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00384>
00385> ---------------------------------------------------------------------------------
00386> 002:0009-----------------------------------------------------------------------------
00387> ----------------------
00388> | DESIGN NASHYD      |   Area    (ha)=    2.22   Curve Number   (CN)=92.00
00389> | 01:120    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00390> ----------------------   U.H. Tp(hrs)=    .190
00391>
00392>      Unit Hyd Qpeak  (cms)=     .446
00393>
00394>      PEAK FLOW       (cms)=     .040 (i)
00395>      TIME TO PEAK    (hrs)=    3.033
00396>      RUNOFF VOLUME    (mm)=   26.418
00397>      TOTAL RAINFALL   (mm)=   42.240
00398>      RUNOFF COEFFICIENT   =     .625
00399>
00400>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00401>
00402> ---------------------------------------------------------------------------------
00403> 002:0010-----------------------------------------------------------------------------
00404> ----------------------
00405> | DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=90.00
00406> | 01:130    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00407> ----------------------   U.H. Tp(hrs)=    .090
00408>
00409>      Unit Hyd Qpeak  (cms)=     .233
00410>
00411>      PEAK FLOW       (cms)=     .009 (i)
00412>      TIME TO PEAK    (hrs)=    3.000
00413>      RUNOFF VOLUME    (mm)=   24.068
00414>      TOTAL RAINFALL   (mm)=   42.240
00415>      RUNOFF COEFFICIENT   =     .570
00416>
00417>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00418>
00419> ---------------------------------------------------------------------------------
00420> 002:0011-----------------------------------------------------------------------------
00421> ---------------------------------------------------------------------------------
00422> 002:0002-----------------------------------------------------------------------------
00423>   ** END OF RUN :   2
00424>
00425> *************************************************************************
00426>
00427>
00428>
00429>
00430>
00431> --------------------
00432> | START            |  Project  dir.: C:\usr\_LOY\
00433> --------------------  Rainfall dir.: C:\usr\_LOY\
00434>     TZERO =   .00 hrs on        0
00435>     METOUT=   2 (output = METRIC)
00436>     NRUN  = 003
00437>     NSTORM=   1
00438>            #  1=LYA5.1hr
```

```
00439> ------------------------------------------------------------------------------
00440> 003:0002-------------------------------------------------------------------------
00441> *#*****************************************************************************
00442> *#  Project Name: [Loyalist Solar]    Project Number: [133560220]
00443> *#  Date        : 11-19-2017
00444> *#  Modeller    : [D. Williams]
00445> *#  Company     : Stantec Consulting Ltd. (Kitchener)
00446> *#  License #   :  4730904
00447> *#*****************************************************************************
00448> *#*****************************************************************************
00449> *#
00450> *#                      SUBSTATION - EXISTING CONDITIONS
00451> *#
00452> *#*****************************************************************************
00453> ------------------------------------------------------------------------------
00454> 003:0002-------------------------------------------------------------------------
00455> --------------------
00456> | READ STORM       |    Filename: Belleville IDF (1-hr 30% AES - 5 Year)
00457> | Ptotal=  28.00 mm|    Comments: Belleville IDF (1-hr 30% AES - 5 Year)
00458> --------------------
00459>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00460>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00461>                .08  30.240 |    .33  36.960 |    .58  33.600 |    .83  10.080
00462>                .17  47.040 |    .42  43.680 |    .67  16.800 |    .92   3.360
00463>                .25  70.560 |    .50  30.240 |    .75  13.440 |   1.00    .000
00464>
00465> ------------------------------------------------------------------------------
00466> 003:0003-------------------------------------------------------------------------
00467> *#*****************************************************************************
00468> *#
00469> *#                              AMC II Conditions
00470> *#
00471> *#*****************************************************************************
00472> ----------------------
00473> | DESIGN NASHYD      |   Area    (ha)=     .97   Curve Number   (CN)=80.00
00474> | 01:100    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00475> ----------------------   U.H. Tp(hrs)=    .200
00476>
00477>      Unit Hyd Qpeak  (cms)=     .185
00478>
00479>      PEAK FLOW       (cms)=     .032 (i)
00480>      TIME TO PEAK    (hrs)=     .667
00481>      RUNOFF VOLUME    (mm)=    7.803
00482>      TOTAL RAINFALL   (mm)=   28.000
00483>      RUNOFF COEFFICIENT   =     .279
00484>
00485>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00486>
00487> ------------------------------------------------------------------------------
00488> 003:0004-------------------------------------------------------------------------
00489> ----------------------
00490> | DESIGN NASHYD      |   Area    (ha)=    1.20   Curve Number   (CN)=79.00
00491> | 01:110    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00492> ----------------------   U.H. Tp(hrs)=    .160
00493>
00494>      Unit Hyd Qpeak  (cms)=     .286
00495>
00496>      PEAK FLOW       (cms)=     .041 (i)
00497>      TIME TO PEAK    (hrs)=     .633
00498>      RUNOFF VOLUME    (mm)=    7.469
00499>      TOTAL RAINFALL   (mm)=   28.000
00500>      RUNOFF COEFFICIENT   =     .267
00501>
00502>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00503>
00504> ------------------------------------------------------------------------------
00505> 003:0005-------------------------------------------------------------------------
00506> ----------------------
00507> | DESIGN NASHYD      |   Area    (ha)=    2.22   Curve Number   (CN)=81.00
00508> | 01:120    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00509> ----------------------   U.H. Tp(hrs)=    .190
00510>
00511>      Unit Hyd Qpeak  (cms)=     .446
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00512>
00513>      PEAK FLOW       (cms)=     .078 (i)
00514>      TIME TO PEAK    (hrs)=     .667
00515>      RUNOFF VOLUME    (mm)=    8.158
00516>      TOTAL RAINFALL   (mm)=   28.000
00517>      RUNOFF COEFFICIENT   =     .291
00518>
00519>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00520>
00521> ------------------------------------------------------------------------------
00522> 003:0006---------------------------------------------------------------------
00523> ----------------------
00524> | DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=78.00
00525> | 01:130    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00526> ----------------------   U.H. Tp(hrs)=    .090
00527>
00528>      Unit Hyd Qpeak  (cms)=     .233
00529>
00530>      PEAK FLOW       (cms)=     .019 (i)
00531>      TIME TO PEAK    (hrs)=     .600
00532>      RUNOFF VOLUME    (mm)=    7.155
00533>      TOTAL RAINFALL   (mm)=   28.000
00534>      RUNOFF COEFFICIENT   =     .256
00535>
00536>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00537>
00538> ------------------------------------------------------------------------------
00539> 003:0007---------------------------------------------------------------------
00540> *#*****************************************************************************
00541> *#
00542> *#                              AMC III Conditions
00543> *#
00544> *#*****************************************************************************
00545> ----------------------
00546> | DESIGN NASHYD      |   Area    (ha)=     .97   Curve Number   (CN)=91.00
00547> | 01:100    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00548> ----------------------   U.H. Tp(hrs)=    .200
00549>
00550>      Unit Hyd Qpeak  (cms)=     .185
00551>
00552>      PEAK FLOW       (cms)=     .056 (i)
00553>      TIME TO PEAK    (hrs)=     .650
00554>      RUNOFF VOLUME    (mm)=   13.604
00555>      TOTAL RAINFALL   (mm)=   28.000
00556>      RUNOFF COEFFICIENT   =     .486
00557>
00558>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00559>
00560> ------------------------------------------------------------------------------
00561> 003:0008---------------------------------------------------------------------
00562> ----------------------
00563> | DESIGN NASHYD      |   Area    (ha)=    1.20   Curve Number   (CN)=91.00
00564> | 01:110    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00565> ----------------------   U.H. Tp(hrs)=    .160
00566>
00567>      Unit Hyd Qpeak  (cms)=     .286
00568>
00569>      PEAK FLOW       (cms)=     .074 (i)
00570>      TIME TO PEAK    (hrs)=     .617
00571>      RUNOFF VOLUME    (mm)=   13.604
00572>      TOTAL RAINFALL   (mm)=   28.000
00573>      RUNOFF COEFFICIENT   =     .486
00574>
00575>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00576>
00577> ------------------------------------------------------------------------------
00578> 003:0009---------------------------------------------------------------------
00579> ----------------------
00580> | DESIGN NASHYD      |   Area    (ha)=    2.22   Curve Number   (CN)=92.00
00581> | 01:120    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00582> ----------------------   U.H. Tp(hrs)=    .190
00583>
00584>      Unit Hyd Qpeak  (cms)=     .446
```

```
00585>
00586>      PEAK FLOW       (cms)=     .138 (i)
00587>      TIME TO PEAK    (hrs)=     .633
00588>      RUNOFF VOLUME    (mm)=   14.453
00589>      TOTAL RAINFALL   (mm)=   28.000
00590>      RUNOFF COEFFICIENT   =     .516
00591>
00592>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00593>
00594> ---------------------------------------------------------------------------------
00595> 003:0010-----------------------------------------------------------------------------
00596> ----------------------
00597> | DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=90.00
00598> | 01:130    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00599> ----------------------   U.H. Tp(hrs)=    .090
00600>
00601>      Unit Hyd Qpeak  (cms)=     .233
00602>
00603>      PEAK FLOW       (cms)=     .035 (i)
00604>      TIME TO PEAK    (hrs)=     .450
00605>      RUNOFF VOLUME    (mm)=   12.833
00606>      TOTAL RAINFALL   (mm)=   28.000
00607>      RUNOFF COEFFICIENT   =     .458
00608>
00609>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00610>
00611> ---------------------------------------------------------------------------------
00612> 003:0011-----------------------------------------------------------------------------
00613> ---------------------------------------------------------------------------------
00614> 003:0002-----------------------------------------------------------------------------
00615> ---------------------------------------------------------------------------------
00616> 003:0002-----------------------------------------------------------------------------
00617>   ** END OF RUN :   3
00618>
00619> ***************************************************************************
00620>
00621>
00622>
00623>
00624>
00625> --------------------
00626> | START            |  Project  dir.: C:\usr\_LOY\
00627> --------------------  Rainfall dir.: C:\usr\_LOY\
00628>     TZERO =   .00 hrs on        0
00629>     METOUT=   2 (output = METRIC)
00630>     NRUN  = 004
00631>     NSTORM=   1
00632>            #  1=LYA5.12h
00633> ---------------------------------------------------------------------------------
00634> 004:0002-----------------------------------------------------------------------------
00635> *#*************************************************************************
00636> *#  Project Name: [Loyalist Solar]    Project Number: [133560220]
00637> *#  Date        : 11-19-2017
00638> *#  Modeller    : [D. Williams]
00639> *#  Company     : Stantec Consulting Ltd. (Kitchener)
00640> *#  License #   :  4730904
00641> *#*************************************************************************
00642> *#*************************************************************************
00643> *#
00644> *#                     SUBSTATION - EXISTING CONDITIONS
00645> *#
00646> *#*************************************************************************
00647> ---------------------------------------------------------------------------------
00648> 004:0002-----------------------------------------------------------------------------
00649> --------------------
00650> | READ STORM       |    Filename: Belleville IDF (12-hr 30% AES - 5 Year)
00651> | Ptotal=  55.97 mm|    Comments: Belleville IDF (12-hr 30% AES - 5 Year)
00652> --------------------
00653>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00654>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00655>               1.00   5.247 |   4.00   8.745 |   7.00   1.749 |  10.00    .000
00656>               2.00  15.158 |   5.00   8.162 |   8.00    .583 |  11.00    .000
00657>               3.00  11.660 |   6.00   4.664 |   9.00    .000 |  12.00    .000
```

```
00658>
00659> ---------------------------------------------------------------------------------------
00660> 004:0003-----------------------------------------------------------------------------
00661> *#*****************************************************************************
00662> *#
00663> *#                              AMC II Conditions
00664> *#
00665> *#*****************************************************************************
00666> ----------------------
00667> | DESIGN NASHYD      |   Area    (ha)=     .97   Curve Number   (CN)=80.00
00668> | 01:100    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00669> ----------------------   U.H. Tp(hrs)=    .200
00670>
00671>      Unit Hyd Qpeak  (cms)=     .185
00672>
00673>      PEAK FLOW       (cms)=     .016 (i)
00674>      TIME TO PEAK    (hrs)=    3.050
00675>      RUNOFF VOLUME    (mm)=   25.149
00676>      TOTAL RAINFALL   (mm)=   55.968
00677>      RUNOFF COEFFICIENT   =     .449
00678>
00679>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00680>
00681> ---------------------------------------------------------------------------------------
00682> 004:0004-----------------------------------------------------------------------------
00683> ----------------------
00684> | DESIGN NASHYD      |   Area    (ha)=    1.20   Curve Number   (CN)=79.00
00685> | 01:110    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00686> ----------------------   U.H. Tp(hrs)=    .160
00687>
00688>      Unit Hyd Qpeak  (cms)=     .286
00689>
00690>      PEAK FLOW       (cms)=     .019 (i)
00691>      TIME TO PEAK    (hrs)=    3.033
00692>      RUNOFF VOLUME    (mm)=   24.320
00693>      TOTAL RAINFALL   (mm)=   55.968
00694>      RUNOFF COEFFICIENT   =     .435
00695>
00696>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00697>
00698> ---------------------------------------------------------------------------------------
00699> 004:0005-----------------------------------------------------------------------------
00700> ----------------------
00701> | DESIGN NASHYD      |   Area    (ha)=    2.22   Curve Number   (CN)=81.00
00702> | 01:120    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00703> ----------------------   U.H. Tp(hrs)=    .190
00704>
00705>      Unit Hyd Qpeak  (cms)=     .446
00706>
00707>      PEAK FLOW       (cms)=     .038 (i)
00708>      TIME TO PEAK    (hrs)=    3.050
00709>      RUNOFF VOLUME    (mm)=   26.013
00710>      TOTAL RAINFALL   (mm)=   55.968
00711>      RUNOFF COEFFICIENT   =     .465
00712>
00713>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00714>
00715> ---------------------------------------------------------------------------------------
00716> 004:0006-----------------------------------------------------------------------------
00717> ----------------------
00718> | DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=78.00
00719> | 01:130    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00720> ----------------------   U.H. Tp(hrs)=    .090
00721>
00722>      Unit Hyd Qpeak  (cms)=     .233
00723>
00724>      PEAK FLOW       (cms)=     .009 (i)
00725>      TIME TO PEAK    (hrs)=    3.000
00726>      RUNOFF VOLUME    (mm)=   23.525
00727>      TOTAL RAINFALL   (mm)=   55.968
00728>      RUNOFF COEFFICIENT   =     .420
00729>
00730>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
00731>
00732> ---------------------------------------------------------------------------------
00733> 004:0007-----------------------------------------------------------------------------
00734> *#*****************************************************************************
00735> *#
00736> *#                              AMC III Conditions
00737> *#
00738> *#*****************************************************************************
00739> ----------------------
00740> | DESIGN NASHYD      |   Area    (ha)=     .97   Curve Number   (CN)=91.00
00741> | 01:100    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00742> ----------------------   U.H. Tp(hrs)=    .200
00743>
00744>      Unit Hyd Qpeak  (cms)=     .185
00745>
00746>      PEAK FLOW       (cms)=     .025 (i)
00747>      TIME TO PEAK    (hrs)=    2.083
00748>      RUNOFF VOLUME    (mm)=   37.276
00749>      TOTAL RAINFALL   (mm)=   55.968
00750>      RUNOFF COEFFICIENT   =     .666
00751>
00752>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00753>
00754> ---------------------------------------------------------------------------------
00755> 004:0008-----------------------------------------------------------------------------
00756> ----------------------
00757> | DESIGN NASHYD      |   Area    (ha)=    1.20   Curve Number   (CN)=91.00
00758> | 01:110    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00759> ----------------------   U.H. Tp(hrs)=    .160
00760>
00761>      Unit Hyd Qpeak  (cms)=     .286
00762>
00763>      PEAK FLOW       (cms)=     .031 (i)
00764>      TIME TO PEAK    (hrs)=    2.050
00765>      RUNOFF VOLUME    (mm)=   37.276
00766>      TOTAL RAINFALL   (mm)=   55.968
00767>      RUNOFF COEFFICIENT   =     .666
00768>
00769>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00770>
00771> ---------------------------------------------------------------------------------
00772> 004:0009-----------------------------------------------------------------------------
00773> ----------------------
00774> | DESIGN NASHYD      |   Area    (ha)=    2.22   Curve Number   (CN)=92.00
00775> | 01:120    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00776> ----------------------   U.H. Tp(hrs)=    .190
00777>
00778>      Unit Hyd Qpeak  (cms)=     .446
00779>
00780>      PEAK FLOW       (cms)=     .060 (i)
00781>      TIME TO PEAK    (hrs)=    2.067
00782>      RUNOFF VOLUME    (mm)=   38.754
00783>      TOTAL RAINFALL   (mm)=   55.968
00784>      RUNOFF COEFFICIENT   =     .692
00785>
00786>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00787>
00788> ---------------------------------------------------------------------------------
00789> 004:0010-----------------------------------------------------------------------------
00790> ----------------------
00791> | DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=90.00
00792> | 01:130    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00793> ----------------------   U.H. Tp(hrs)=    .090
00794>
00795>      Unit Hyd Qpeak  (cms)=     .233
00796>
00797>      PEAK FLOW       (cms)=     .014 (i)
00798>      TIME TO PEAK    (hrs)=    2.017
00799>      RUNOFF VOLUME    (mm)=   35.878
00800>      TOTAL RAINFALL   (mm)=   55.968
00801>      RUNOFF COEFFICIENT   =     .641
00802>
00803>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
00804>
00805> ------------------------------------------------------------------------------
00806> 004:0011------------------------------------------------------------------------
00807> ------------------------------------------------------------------------------
00808> 004:0002------------------------------------------------------------------------
00809> ------------------------------------------------------------------------------
00810> 004:0002------------------------------------------------------------------------
00811> ------------------------------------------------------------------------------
00812> 004:0002------------------------------------------------------------------------
00813>   ** END OF RUN :   4
00814>
00815> ********************************************************************************
00816>
00817>
00818>
00819>
00820>
00821> --------------------
00822> | START            |  Project  dir.: C:\usr\_LOY\
00823> --------------------  Rainfall dir.: C:\usr\_LOY\
00824>     TZERO =   .00 hrs on        0
00825>     METOUT=   2 (output = METRIC)
00826>     NRUN  = 005
00827>     NSTORM=   1
00828>            #  1=LYA100.1hr
00829> ------------------------------------------------------------------------------
00830> 005:0002------------------------------------------------------------------------
00831> *#*****************************************************************************
00832> *#  Project Name: [Loyalist Solar]    Project Number: [133560220]
00833> *#  Date        : 11-19-2017
00834> *#  Modeller    : [D. Williams]
00835> *#  Company     : Stantec Consulting Ltd. (Kitchener)
00836> *#  License #   :  4730904
00837> *#*****************************************************************************
00838> *#*****************************************************************************
00839> *#
00840> *#                     SUBSTATION - EXISTING CONDITIONS
00841> *#
00842> *#*****************************************************************************
00843> ------------------------------------------------------------------------------
00844> 005:0002------------------------------------------------------------------------
00845> --------------------
00846> | READ STORM       |    Filename: Belleville IDF (1-hr 30% AES - 100 Year)
00847> | Ptotal=  44.10 mm|    Comments: Belleville IDF (1-hr 30% AES - 100 Year)
00848> --------------------
00849>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00850>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00851>                .08  47.628 |    .33  58.212 |    .58  52.920 |    .83  15.876
00852>                .17  74.088 |    .42  68.796 |    .67  26.460 |    .92   5.292
00853>                .25 111.132 |    .50  47.628 |    .75  21.168 |   1.00    .000
00854>
00855> ------------------------------------------------------------------------------
00856> 005:0003------------------------------------------------------------------------
00857> *#*****************************************************************************
00858> *#
00859> *#                              AMC II Conditions
00860> *#
00861> *#*****************************************************************************
00862> ----------------------
00863> | DESIGN NASHYD      |   Area    (ha)=     .97   Curve Number   (CN)=80.00
00864> | 01:100    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00865> ----------------------   U.H. Tp(hrs)=    .200
00866>
00867>      Unit Hyd Qpeak  (cms)=     .185
00868>
00869>      PEAK FLOW       (cms)=     .070 (i)
00870>      TIME TO PEAK    (hrs)=     .650
00871>      RUNOFF VOLUME    (mm)=   17.104
00872>      TOTAL RAINFALL   (mm)=   44.100
00873>      RUNOFF COEFFICIENT   =     .388
00874>
00875>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00876>
```

```
00877> ------------------------------------------------------------------------------
00878> 005:0004------------------------------------------------------------------------
00879> ----------------------
00880> | DESIGN NASHYD      |   Area    (ha)=    1.20   Curve Number   (CN)=79.00
00881> | 01:110    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00882> ----------------------   U.H. Tp(hrs)=    .160
00883>
00884>      Unit Hyd Qpeak  (cms)=     .286
00885>
00886>      PEAK FLOW       (cms)=     .089 (i)
00887>      TIME TO PEAK    (hrs)=     .617
00888>      RUNOFF VOLUME    (mm)=   16.480
00889>      TOTAL RAINFALL   (mm)=   44.100
00890>      RUNOFF COEFFICIENT   =     .374
00891>
00892>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00893>
00894> ------------------------------------------------------------------------------
00895> 005:0005------------------------------------------------------------------------
00896> ----------------------
00897> | DESIGN NASHYD      |   Area    (ha)=    2.22   Curve Number   (CN)=81.00
00898> | 01:120    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00899> ----------------------   U.H. Tp(hrs)=    .190
00900>
00901>      Unit Hyd Qpeak  (cms)=     .446
00902>
00903>      PEAK FLOW       (cms)=     .169 (i)
00904>      TIME TO PEAK    (hrs)=     .650
00905>      RUNOFF VOLUME    (mm)=   17.760
00906>      TOTAL RAINFALL   (mm)=   44.100
00907>      RUNOFF COEFFICIENT   =     .403
00908>
00909>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00910>
00911> ------------------------------------------------------------------------------
00912> 005:0006------------------------------------------------------------------------
00913> ----------------------
00914> | DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=78.00
00915> | 01:130    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00916> ----------------------   U.H. Tp(hrs)=    .090
00917>
00918>      Unit Hyd Qpeak  (cms)=     .233
00919>
00920>      PEAK FLOW       (cms)=     .042 (i)
00921>      TIME TO PEAK    (hrs)=     .467
00922>      RUNOFF VOLUME    (mm)=   15.885
00923>      TOTAL RAINFALL   (mm)=   44.100
00924>      RUNOFF COEFFICIENT   =     .360
00925>
00926>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00927>
00928> ------------------------------------------------------------------------------
00929> 005:0007------------------------------------------------------------------------
00930> *#*************************************************************************
00931> *#
00932> *#                             AMC III Conditions
00933> *#
00934> *#*************************************************************************
00935> ----------------------
00936> | DESIGN NASHYD      |   Area    (ha)=     .97   Curve Number   (CN)=91.00
00937> | 01:100    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00938> ----------------------   U.H. Tp(hrs)=    .200
00939>
00940>      Unit Hyd Qpeak  (cms)=     .185
00941>
00942>      PEAK FLOW       (cms)=     .109 (i)
00943>      TIME TO PEAK    (hrs)=     .633
00944>      RUNOFF VOLUME    (mm)=   26.798
00945>      TOTAL RAINFALL   (mm)=   44.100
00946>      RUNOFF COEFFICIENT   =     .608
00947>
00948>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00949>
```

```
00950> ------------------------------------------------------------------------------
00951> 005:0008------------------------------------------------------------------------
00952> ----------------------
00953> | DESIGN NASHYD      |   Area    (ha)=    1.20   Curve Number   (CN)=91.00
00954> | 01:110    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00955> ----------------------   U.H. Tp(hrs)=    .160
00956>
00957>      Unit Hyd Qpeak  (cms)=     .286
00958>
00959>      PEAK FLOW       (cms)=     .142 (i)
00960>      TIME TO PEAK    (hrs)=     .583
00961>      RUNOFF VOLUME    (mm)=   26.798
00962>      TOTAL RAINFALL   (mm)=   44.100
00963>      RUNOFF COEFFICIENT   =     .608
00964>
00965>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00966>
00967> ------------------------------------------------------------------------------
00968> 005:0009------------------------------------------------------------------------
00969> ----------------------
00970> | DESIGN NASHYD      |   Area    (ha)=    2.22   Curve Number   (CN)=92.00
00971> | 01:120    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00972> ----------------------   U.H. Tp(hrs)=    .190
00973>
00974>      Unit Hyd Qpeak  (cms)=     .446
00975>
00976>      PEAK FLOW       (cms)=     .265 (i)
00977>      TIME TO PEAK    (hrs)=     .617
00978>      RUNOFF VOLUME    (mm)=   28.054
00979>      TOTAL RAINFALL   (mm)=   44.100
00980>      RUNOFF COEFFICIENT   =     .636
00981>
00982>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00983>
00984> ------------------------------------------------------------------------------
00985> 005:0010------------------------------------------------------------------------
00986> ----------------------
00987> | DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=90.00
00988> | 01:130    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00989> ----------------------   U.H. Tp(hrs)=    .090
00990>
00991>      Unit Hyd Qpeak  (cms)=     .233
00992>
00993>      PEAK FLOW       (cms)=     .069 (i)
00994>      TIME TO PEAK    (hrs)=     .450
00995>      RUNOFF VOLUME    (mm)=   25.624
00996>      TOTAL RAINFALL   (mm)=   44.100
00997>      RUNOFF COEFFICIENT   =     .581
00998>
00999>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01000>
01001> ------------------------------------------------------------------------------
01002> 005:0011------------------------------------------------------------------------
01003> ------------------------------------------------------------------------------
01004> 005:0002------------------------------------------------------------------------
01005> ------------------------------------------------------------------------------
01006> 005:0002------------------------------------------------------------------------
01007> ------------------------------------------------------------------------------
01008> 005:0002------------------------------------------------------------------------
01009> ------------------------------------------------------------------------------
01010> 005:0002------------------------------------------------------------------------
01011>   ** END OF RUN :   5
01012>
01013> ********************************************************************************
01014>
01015>
01016>
01017>
01018>
01019> --------------------
01020> | START            |  Project  dir.: C:\usr\_LOY\
01021> --------------------  Rainfall dir.: C:\usr\_LOY\
01022>     TZERO =   .00 hrs on        0
```

```
01023>     METOUT=   2 (output = METRIC)
01024>     NRUN  = 006
01025>     NSTORM=   1
01026>            #  1=LYA100.12h
01027> ------------------------------------------------------------------------------
01028> 006:0002--------------------------------------------------------------------------
01029> *#*****************************************************************************
01030> *#  Project Name: [Loyalist Solar]    Project Number: [133560220]
01031> *#  Date        : 11-19-2017
01032> *#  Modeller    : [D. Williams]
01033> *#  Company     : Stantec Consulting Ltd. (Kitchener)
01034> *#  License #   :  4730904
01035> *#*****************************************************************************
01036> *#*****************************************************************************
01037> *#
01038> *#                     SUBSTATION - EXISTING CONDITIONS
01039> *#
01040> *#*****************************************************************************
01041> ------------------------------------------------------------------------------
01042> 006:0002--------------------------------------------------------------------------
01043> --------------------
01044> | READ STORM       |    Filename: Belleville IDF (12-hr 30% AES - 100 Year
01045> | Ptotal=  93.70 mm|    Comments: Belleville IDF (12-hr 30% AES - 100 Year
01046> --------------------
01047>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
01048>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
01049>               1.00   8.784 |   4.00  14.640 |   7.00   2.928 |  10.00    .000
01050>               2.00  25.376 |   5.00  13.664 |   8.00    .976 |  11.00    .000
01051>               3.00  19.520 |   6.00   7.808 |   9.00    .000 |  12.00    .000
01052>
01053> ------------------------------------------------------------------------------
01054> 006:0003--------------------------------------------------------------------------
01055> *#*****************************************************************************
01056> *#
01057> *#                              AMC II Conditions
01058> *#
01059> *#*****************************************************************************
01060> ----------------------
01061> | DESIGN NASHYD      |   Area    (ha)=     .97   Curve Number   (CN)=80.00
01062> | 01:100    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01063> ----------------------   U.H. Tp(hrs)=    .200
01064>
01065>      Unit Hyd Qpeak  (cms)=     .185
01066>
01067>      PEAK FLOW       (cms)=     .035 (i)
01068>      TIME TO PEAK    (hrs)=    3.033
01069>      RUNOFF VOLUME    (mm)=   54.594
01070>      TOTAL RAINFALL   (mm)=   93.696
01071>      RUNOFF COEFFICIENT   =     .583
01072>
01073>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01074>
01075> ------------------------------------------------------------------------------
01076> 006:0004--------------------------------------------------------------------------
01077> ----------------------
01078> | DESIGN NASHYD      |   Area    (ha)=    1.20   Curve Number   (CN)=79.00
01079> | 01:110    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01080> ----------------------   U.H. Tp(hrs)=    .160
01081>
01082>      Unit Hyd Qpeak  (cms)=     .286
01083>
01084>      PEAK FLOW       (cms)=     .043 (i)
01085>      TIME TO PEAK    (hrs)=    3.017
01086>      RUNOFF VOLUME    (mm)=   53.221
01087>      TOTAL RAINFALL   (mm)=   93.696
01088>      RUNOFF COEFFICIENT   =     .568
01089>
01090>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01091>
01092> ------------------------------------------------------------------------------
01093> 006:0005--------------------------------------------------------------------------
01094> ----------------------
01095> | DESIGN NASHYD      |   Area    (ha)=    2.22   Curve Number   (CN)=81.00
```

```
01096> | 01:120    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01097> ----------------------   U.H. Tp(hrs)=    .190
01098>
01099>      Unit Hyd Qpeak  (cms)=     .446
01100>
01101>      PEAK FLOW       (cms)=     .083 (i)
01102>      TIME TO PEAK    (hrs)=    3.033
01103>      RUNOFF VOLUME    (mm)=   56.004
01104>      TOTAL RAINFALL   (mm)=   93.696
01105>      RUNOFF COEFFICIENT   =     .598
01106>
01107>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01108>
01109> ------------------------------------------------------------------------------
01110> 006:0006--------------------------------------------------------------------------
01111> ----------------------
01112> | DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=78.00
01113> | 01:130    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01114> ----------------------   U.H. Tp(hrs)=    .090
01115>
01116>      Unit Hyd Qpeak  (cms)=     .233
01117>
01118>      PEAK FLOW       (cms)=     .019 (i)
01119>      TIME TO PEAK    (hrs)=    3.000
01120>      RUNOFF VOLUME    (mm)=   51.882
01121>      TOTAL RAINFALL   (mm)=   93.696
01122>      RUNOFF COEFFICIENT   =     .554
01123>
01124>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01125>
01126> ------------------------------------------------------------------------------
01127> 006:0007--------------------------------------------------------------------------
01128> *#*************************************************************************
01129> *#
01130> *#                              AMC III Conditions
01131> *#
01132> *#*************************************************************************
01133> ----------------------
01134> | DESIGN NASHYD      |   Area    (ha)=     .97   Curve Number   (CN)=91.00
01135> | 01:100    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01136> ----------------------   U.H. Tp(hrs)=    .200
01137>
01138>      Unit Hyd Qpeak  (cms)=     .185
01139>
01140>      PEAK FLOW       (cms)=     .052 (i)
01141>      TIME TO PEAK    (hrs)=    2.067
01142>      RUNOFF VOLUME    (mm)=   72.454
01143>      TOTAL RAINFALL   (mm)=   93.696
01144>      RUNOFF COEFFICIENT   =     .773
01145>
01146>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01147>
01148> ------------------------------------------------------------------------------
01149> 006:0008--------------------------------------------------------------------------
01150> ----------------------
01151> | DESIGN NASHYD      |   Area    (ha)=    1.20   Curve Number   (CN)=91.00
01152> | 01:110    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01153> ----------------------   U.H. Tp(hrs)=    .160
01154>
01155>      Unit Hyd Qpeak  (cms)=     .286
01156>
01157>      PEAK FLOW       (cms)=     .065 (i)
01158>      TIME TO PEAK    (hrs)=    2.033
01159>      RUNOFF VOLUME    (mm)=   72.454
01160>      TOTAL RAINFALL   (mm)=   93.696
01161>      RUNOFF COEFFICIENT   =     .773
01162>
01163>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01164>
01165> ------------------------------------------------------------------------------
01166> 006:0009--------------------------------------------------------------------------
01167> ----------------------
01168> | DESIGN NASHYD      |   Area    (ha)=    2.22   Curve Number   (CN)=92.00
```

```
| 01:120    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=    .190

     Unit Hyd Qpeak  (cms)=     .446

     PEAK FLOW       (cms)=     .123 (i)
     TIME TO PEAK    (hrs)=    2.050
     RUNOFF VOLUME    (mm)=   74.378
     TOTAL RAINFALL   (mm)=   93.696
     RUNOFF COEFFICIENT   =     .794

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
006:0010----------------------------------------------------------------------
---------------------
| DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=90.00
| 01:130    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .233

     PEAK FLOW       (cms)=     .029 (i)
     TIME TO PEAK    (hrs)=    2.017
     RUNOFF VOLUME    (mm)=   70.588
     TOTAL RAINFALL   (mm)=   93.696
     RUNOFF COEFFICIENT   =     .753

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
006:0011----------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
  ** END OF RUN :   6

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



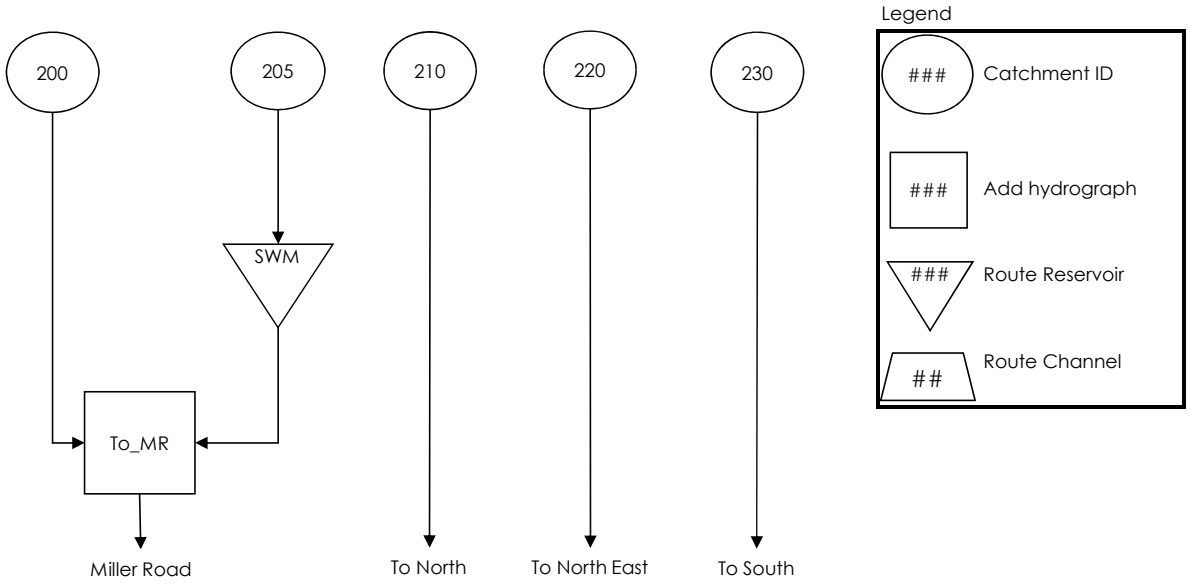

--------------------
| START            |  Project  dir.: C:\usr\_LOY\
--------------------  Rainfall dir.: C:\usr\_LOY\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 007
    NSTORM=   1
           #  1=25mm.4hr
--------------------------------------------------------------------------------
007:0002----------------------------------------------------------------------
*#**************************************************************************
*#  Project Name: [Loyalist Solar]    Project Number: [133560220]
*#  Date        : 11-19-2017
*#  Modeller    : [D. Williams]
*#  Company     : Stantec Consulting Ltd. (Kitchener)
*#  License #   :  4730904
*#**************************************************************************
*#**************************************************************************
*#
*#                     SUBSTATION - EXISTING CONDITIONS
*#
*#**************************************************************************
--------------------------------------------------------------------------------
```

```
01242> 007:0002----------------------------------------------------------------------------
01243> --------------------
01244> | READ STORM       |    Filename: 25 mm, 4hr Chicago Storm
01245> | Ptotal=  25.00 mm|    Comments: 25 mm, 4hr Chicago Storm
01246> --------------------
01247>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
01248>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
01249>                .08   1.465 |   1.08   4.024 |   2.08   5.764 |   3.08   2.074
01250>                .17   1.540 |   1.17   4.814 |   2.17   4.969 |   3.17   1.977
01251>                .25   1.625 |   1.25   6.025 |   2.25   4.374 |   3.25   1.889
01252>                .33   1.720 |   1.33   8.114 |   2.33   3.913 |   3.33   1.810
01253>                .42   1.829 |   1.42  12.526 |   2.42   3.545 |   3.42   1.737
01254>                .50   1.955 |   1.50  27.198 |   2.50   3.245 |   3.50   1.671
01255>                .58   2.101 |   1.58  74.855 |   2.58   2.994 |   3.58   1.610
01256>                .67   2.274 |   1.67  31.410 |   2.67   2.782 |   3.67   1.553
01257>                .75   2.482 |   1.75  16.819 |   2.75   2.601 |   3.75   1.501
01258>                .83   2.736 |   1.83  11.357 |   2.83   2.443 |   3.83   1.453
01259>                .92   3.055 |   1.92   8.563 |   2.92   2.305 |   3.92   1.408
01260>               1.00   3.468 |   2.00   6.882 |   3.00   2.183 |   4.00   1.366
01261>
01262> ----------------------------------------------------------------------------------
01263> 007:0003----------------------------------------------------------------------------
01264> *#*************************************************************************
01265> *#
01266> *#                              AMC II Conditions
01267> *#
01268> *#*************************************************************************
01269> ----------------------
01270> | DESIGN NASHYD      |   Area    (ha)=     .97   Curve Number   (CN)=80.00
01271> | 01:100    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01272> ----------------------   U.H. Tp(hrs)=    .200
01273>
01274>      Unit Hyd Qpeak  (cms)=     .185
01275>
01276>      PEAK FLOW       (cms)=     .020 (i)
01277>      TIME TO PEAK    (hrs)=    1.817
01278>      RUNOFF VOLUME    (mm)=    6.348
01279>      TOTAL RAINFALL   (mm)=   25.000
01280>      RUNOFF COEFFICIENT   =     .254
01281>
01282>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01283>
01284> ----------------------------------------------------------------------------------
01285> 007:0004----------------------------------------------------------------------------
01286> ----------------------
01287> | DESIGN NASHYD      |   Area    (ha)=    1.20   Curve Number   (CN)=79.00
01288> | 01:110    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01289> ----------------------   U.H. Tp(hrs)=    .160
01290>
01291>      Unit Hyd Qpeak  (cms)=     .286
01292>
01293>      PEAK FLOW       (cms)=     .027 (i)
01294>      TIME TO PEAK    (hrs)=    1.767
01295>      RUNOFF VOLUME    (mm)=    6.067
01296>      TOTAL RAINFALL   (mm)=   25.000
01297>      RUNOFF COEFFICIENT   =     .243
01298>
01299>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01300>
01301> ----------------------------------------------------------------------------------
01302> 007:0005----------------------------------------------------------------------------
01303> ----------------------
01304> | DESIGN NASHYD      |   Area    (ha)=    2.22   Curve Number   (CN)=81.00
01305> | 01:120    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01306> ----------------------   U.H. Tp(hrs)=    .190
01307>
01308>      Unit Hyd Qpeak  (cms)=     .446
01309>
01310>      PEAK FLOW       (cms)=     .050 (i)
01311>      TIME TO PEAK    (hrs)=    1.800
01312>      RUNOFF VOLUME    (mm)=    6.647
01313>      TOTAL RAINFALL   (mm)=   25.000
01314>      RUNOFF COEFFICIENT   =     .266
```

```
01315>
01316>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01317>
01318> ------------------------------------------------------------------------------
01319> 007:0006------------------------------------------------------------------------
01320> ----------------------
01321> | DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=78.00
01322> | 01:130    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01323> ----------------------   U.H. Tp(hrs)=    .090
01324>
01325>      Unit Hyd Qpeak  (cms)=     .233
01326>
01327>      PEAK FLOW       (cms)=     .016 (i)
01328>      TIME TO PEAK    (hrs)=    1.683
01329>      RUNOFF VOLUME    (mm)=    5.804
01330>      TOTAL RAINFALL   (mm)=   25.000
01331>      RUNOFF COEFFICIENT   =     .232
01332>
01333>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01334>
01335> ------------------------------------------------------------------------------
01336> 007:0007------------------------------------------------------------------------
01337> *#*************************************************************************
01338> *#
01339> *#                              AMC III Conditions
01340> *#
01341> *#*************************************************************************
01342> ----------------------
01343> | DESIGN NASHYD      |   Area    (ha)=     .97   Curve Number   (CN)=91.00
01344> | 01:100    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01345> ----------------------   U.H. Tp(hrs)=    .200
01346>
01347>      Unit Hyd Qpeak  (cms)=     .185
01348>
01349>      PEAK FLOW       (cms)=     .039 (i)
01350>      TIME TO PEAK    (hrs)=    1.817
01351>      RUNOFF VOLUME    (mm)=   11.358
01352>      TOTAL RAINFALL   (mm)=   25.000
01353>      RUNOFF COEFFICIENT   =     .454
01354>
01355>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01356>
01357> ------------------------------------------------------------------------------
01358> 007:0008------------------------------------------------------------------------
01359> ----------------------
01360> | DESIGN NASHYD      |   Area    (ha)=    1.20   Curve Number   (CN)=91.00
01361> | 01:110    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01362> ----------------------   U.H. Tp(hrs)=    .160
01363>
01364>      Unit Hyd Qpeak  (cms)=     .286
01365>
01366>      PEAK FLOW       (cms)=     .054 (i)
01367>      TIME TO PEAK    (hrs)=    1.750
01368>      RUNOFF VOLUME    (mm)=   11.358
01369>      TOTAL RAINFALL   (mm)=   25.000
01370>      RUNOFF COEFFICIENT   =     .454
01371>
01372>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01373>
01374> ------------------------------------------------------------------------------
01375> 007:0009------------------------------------------------------------------------
01376> ----------------------
01377> | DESIGN NASHYD      |   Area    (ha)=    2.22   Curve Number   (CN)=92.00
01378> | 01:120    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01379> ----------------------   U.H. Tp(hrs)=    .190
01380>
01381>      Unit Hyd Qpeak  (cms)=     .446
01382>
01383>      PEAK FLOW       (cms)=     .098 (i)
01384>      TIME TO PEAK    (hrs)=    1.800
01385>      RUNOFF VOLUME    (mm)=   12.114
01386>      TOTAL RAINFALL   (mm)=   25.000
01387>      RUNOFF COEFFICIENT   =     .485
```

```
01388>
01389>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01390>
01391> ------------------------------------------------------------------------------
01392> 007:0010-------------------------------------------------------------------------
01393> ----------------------
01394> | DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=90.00
01395> | 01:130    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01396> ----------------------   U.H. Tp(hrs)=    .090
01397>
01398>      Unit Hyd Qpeak  (cms)=     .233
01399>
01400>      PEAK FLOW       (cms)=     .031 (i)
01401>      TIME TO PEAK    (hrs)=    1.667
01402>      RUNOFF VOLUME    (mm)=   10.677
01403>      TOTAL RAINFALL   (mm)=   25.000
01404>      RUNOFF COEFFICIENT   =     .427
01405>
01406>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01407>
01408> ------------------------------------------------------------------------------
01409> 007:0011-------------------------------------------------------------------------
01410> ------------------------------------------------------------------------------
01411> 007:0002-------------------------------------------------------------------------
01412> ------------------------------------------------------------------------------
01413> 007:0002-------------------------------------------------------------------------
01414> ------------------------------------------------------------------------------
01415> 007:0002-------------------------------------------------------------------------
01416> ------------------------------------------------------------------------------
01417> 007:0002-------------------------------------------------------------------------
01418> ------------------------------------------------------------------------------
01419> 007:0002-------------------------------------------------------------------------
01420> ------------------------------------------------------------------------------
01421> 007:0002-------------------------------------------------------------------------
01422>       FINISH
01423> ------------------------------------------------------------------------------
01424> ********************************************************************************
01425>      WARNINGS / ERRORS / NOTES
01426>      -------------------------
01427>    Simulation ended on 2017-11-21     at 15:59:12
01428> ================================================================================
01429>
01430>
```

Subject: **Proposed Schematic**
Project: **Loyalist Solar Project**
Site: **Substation**
Project No.: **1335-60220**
Client: **Loyalist Solar LP**
Date: **November 19, 2017**



```
00001> 2     Metric units
00002> *#*****************************************************************************
00003> *#  Project Name: [Loyalist Solar]    Project Number: [133560220]
00004> *#  Date        : 11-19-2017
00005> *#  Modeller    : [D. Williams]
00006> *#  Company     : Stantec Consulting Ltd. (Kitchener)
00007> *#  License #   :  4730904
00008> *#*****************************************************************************
00009> *#*****************************************************************************
00010> *#
00011> *#                     SUBSTATION - PROPOSED CONDITIONS
00012> *#
00013> *#*****************************************************************************
00014> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
00015> *%                  ["LYA2.1hr"] <--storm filename, one per line for NSTORM time
00016> *%-----------------|-----------------------------------------------------------|
00017> READ STORM          STORM_FILENAME=["STORM.001"]
00018> *%-----------------|-----------------------------------------------------------|
00019> *#*****************************************************************************
00020> *#
00021> *#                              AMC II Conditions
00022> *#
00023> *#*****************************************************************************
00024> DESIGN NASHYD       ID=[1], NHYD=["200"], DT=[1]min, AREA=[0.70](ha),
00025>                     DWF=[0](cms), CN/C=[81], TP=[0.20]hrs,
00026>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00027> *%-----------------|-----------------------------------------------------------|
00028> DESIGN STANDHYD     ID=[2], NHYD=["202"], DT=[1]min, AREA=[2.20](ha),
00029>                     XIMP=[0.20], TIMP=[0.35], DWF=[0](cms), LOSS=[2], CN=[82],
00030>                     SLOPE=[1.50](%), RAINFALL=[ , , , , ](mm/hr), END=-1
00031> *%-----------------|-----------------------------------------------------------|
00032> ROUTE RESERVOIR     IDout=[3],   NHYD=["SWM"],  IDin=[2],
00033>                     RDT=[ 2 ](min),
00034>                           TABLE of ( OUTFLOW-STORAGE ) values
00035>                                      (cms) - (ha-m)
00036>                                    [   0.0 ,  0.0 ]
00037>                                    [  0.001 ,  0.0007 ]
00038>                                    [  0.002 ,  0.0052 ]
00039>                                    [  0.003 ,  0.0201 ]
00040>                                    [  0.003 ,  0.0543 ]
00041>                                    [  0.010 ,  0.1016 ]
00042>                                    [  0.016 ,  0.1507 ]
00043>                                    [  0.020 ,  0.2017 ]
00044>                                    [  0.305 ,  0.2544 ]
00045>                                    [  1.618 ,  0.3695 ]
00046>                                    [   -1   ,  -1   ]  (max twenty pts)
00047>                           IDovf=[5], NHYDovf=["OV-SWM"]
00048> *%-----------------|-----------------------------------------------------------|
00049> ADD HYD             IDsum=[4], NHYD=["TO_MR"], IDs to add=[1+3]
00050> *%-----------------|-----------------------------------------------------------|
00051> DESIGN NASHYD       ID=[1], NHYD=["210"], DT=[1]min, AREA=[0.16](ha),
00052>                     DWF=[0](cms), CN/C=[79], TP=[0.09]hrs,
00053>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00054> *%-----------------|-----------------------------------------------------------|
00055> DESIGN NASHYD       ID=[1], NHYD=["220"], DT=[1]min, AREA=[1.46](ha),
00056>                     DWF=[0](cms), CN/C=[83], TP=[0.19]hrs,
00057>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00058> *%-----------------|-----------------------------------------------------------|
00059> DESIGN NASHYD       ID=[1], NHYD=["230"], DT=[1]min, AREA=[0.42](ha),
00060>                     DWF=[0](cms), CN/C=[78], TP=[0.09]hrs,
00061>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00062> *%-----------------|-----------------------------------------------------------|
00063> *#*****************************************************************************
00064> *#
00065> *#                              AMC III Conditions
00066> *#
00067> *#*****************************************************************************
00068> DESIGN NASHYD       ID=[1], NHYD=["200"], DT=[1]min, AREA=[0.70](ha),
00069>                     DWF=[0](cms), CN/C=[92], TP=[0.20]hrs,
00070>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00071> *%-----------------|-----------------------------------------------------------|
00072> DESIGN STANDHYD     ID=[2], NHYD=["202"], DT=[1]min, AREA=[2.20](ha),
00073>                     XIMP=[0.20], TIMP=[0.35], DWF=[0](cms), LOSS=[2], CN=[92],
```

```
00074>                      SLOPE=[1.50](%), RAINFALL=[ , , , , ](mm/hr), END=-1
00075> *%-----------------|-------------------------------------------------------|
00076> ROUTE RESERVOIR     IDout=[3],   NHYD=["SWM"],  IDin=[2],
00077>                      RDT=[ 2 ](min),
00078>                            TABLE of ( OUTFLOW-STORAGE ) values
00079>                                       (cms) - (ha-m)
00080>                                     [   0.0 ,  0.0 ]
00081>                                     [  0.001 ,  0.0007 ]
00082>                                     [  0.002 ,  0.0052 ]
00083>                                     [  0.003 ,  0.0201 ]
00084>                                     [  0.003 ,  0.0543 ]
00085>                                     [  0.010 ,  0.1016 ]
00086>                                     [  0.016 ,  0.1507 ]
00087>                                     [  0.020 ,  0.2017 ]
00088>                                     [  0.305 ,  0.2544 ]
00089>                                     [  1.618 ,  0.3695 ]
00090>                                     [   -1  ,  -1  ]  (max twenty pts)
00091>                            IDovf=[5], NHYDovf=["OV-SWM"]
00092> *%-----------------|-------------------------------------------------------|
00093> ADD HYD             IDsum=[4], NHYD=["TO_MR"], IDs to add=[1+3]
00094> *%-----------------|-------------------------------------------------------|
00095> DESIGN NASHYD       ID=[1], NHYD=["210"], DT=[1]min, AREA=[0.16](ha),
00096>                      DWF=[0](cms), CN/C=[91], TP=[0.09]hrs,
00097>                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00098> *%-----------------|-------------------------------------------------------|
00099> DESIGN NASHYD       ID=[1], NHYD=["220"], DT=[1]min, AREA=[1.46](ha),
00100>                      DWF=[0](cms), CN/C=[93], TP=[0.19]hrs,
00101>                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00102> *%-----------------|-------------------------------------------------------|
00103> DESIGN NASHYD       ID=[1], NHYD=["230"], DT=[1]min, AREA=[0.42](ha),
00104>                      DWF=[0](cms), CN/C=[90], TP=[0.09]hrs,
00105>                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00106> *%-----------------|-------------------------------------------------------|
00107> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[2]
00108> *%                  ["LYA2.12h"] <--storm filename, one per line for NSTORM time
00109> *%-----------------|-------------------------------------------------------|
00110> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[3]
00111> *%                  ["LYA5.1hr"] <--storm filename, one per line for NSTORM time
00112> *%-----------------|-------------------------------------------------------|
00113> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[4]
00114> *%                  ["LYA5.12h"] <--storm filename, one per line for NSTORM time
00115> *%-----------------|-------------------------------------------------------|
00116> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[5]
00117> *%                  ["LYA100.1hr"] <--storm filename, one per line for NSTORM time
00118> *%-----------------|-------------------------------------------------------|
00119> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[6]
00120> *%                  ["LYA100.12h"] <--storm filename, one per line for NSTORM time
00121> *%-----------------|-------------------------------------------------------|
00122> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[7]
00123> *%                  ["25mm.4hr"] <--storm filename, one per line for NSTORM time
00124> *%-----------------|-------------------------------------------------------|
00125> FINISH
00126>
00127>
00128>
00129>
00130>
00131>
00132>
00133>
00134>
00135>
00136>
00137>
00138>
```

```
00001> ================================================================================
00002>
00003>    SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
00004>    S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>    SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
00006>        S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
00007>    SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
00008>                                                          9   9  9   9   # 4730904
00009>         StormWater Management HYdrologic Model            999    999    =========
00010>
00011>  ********************************************************************************
00012>  ***************************** SWMHYMO Ver/4.05  ****************************
00013>  *********  A single event and continuous hydrologic simulation model  *********
00014>  *********     based on the principles of HYMO and its successors      *********
00015>  *********                OTTHYMO-83 and OTTHYMO-89.                   *********
00016>  ********************************************************************************
00017>  ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
00018>  *********                  Ottawa,  Ontario: (613) 836-3884           *********
00019>  *********                  Gatineau, Quebec: (819) 243-6858           *********
00020>  *********                  E-Mail: swmhymo@jfsa.com                   *********
00021>  ********************************************************************************
00022>
00023>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++++ Licensed user: Stantec Consulting Ltd. (Kitchener)          +++++++++
00025>  +++++++++                Kitchener             SERIAL#:4730904       +++++++++
00026>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028>  ********************************************************************************
00029>  *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
00030>  *********           Maximum value for ID numbers  :     10             *********
00031>  *********           Max. number of rainfall points: 105408             *********
00032>  *********           Max. number of flow points    : 105408             *********
00033>  ********************************************************************************
00034>
00035>
00036>  **********************   D E T A I L E D   O U T P U T   **********************
00037>  ********************************************************************************
00038>  *         DATE: 2017-11-21     TIME: 15:58:59     RUN COUNTER: 001620         *
00039>  ********************************************************************************
00040>  * Input   filename: C:\usr\_LOY\LYSBPR.dat                                     *
00041>  * Output  filename: C:\usr\_LOY\LYSBPR.out                                     *
00042>  * Summary filename: C:\usr\_LOY\LYSBPR.sum                                     *
00043>  * User comments:                                                               *
00044>  * 1:_____________________________________________________________________________*
00045>  * 2:_____________________________________________________________________________*
00046>  * 3:_____________________________________________________________________________*
00047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001----------------------------------------------------------------------------
00051> *#*****************************************************************************
00052> *#  Project Name: [Loyalist Solar]    Project Number: [133560220]
00053> *#  Date        : 11-19-2017
00054> *#  Modeller    : [D. Williams]
00055> *#  Company     : Stantec Consulting Ltd. (Kitchener)
00056> *#  License #   :  4730904
00057> *#*****************************************************************************
00058> *#*****************************************************************************
00059> *#
00060> *#                     SUBSTATION - PROPOSED CONDITIONS
00061> *#
00062> *#*****************************************************************************
00063> --------------------
00064> | START            |  Project  dir.: C:\usr\_LOY\
00065> --------------------  Rainfall dir.: C:\usr\_LOY\
00066>     TZERO =   .00 hrs on        0
00067>     METOUT=   2 (output = METRIC)
00068>     NRUN  = 001
00069>     NSTORM=   1
00070>            #  1=LYA2.1hr
00071> --------------------------------------------------------------------------------
00072> 001:0002----------------------------------------------------------------------------
00073> --------------------
```

```
00074> | READ STORM       |    Filename: Belleville IDF (1-hr 30% AES - 2 Year)
00075> | Ptotal=  22.10 mm|    Comments: Belleville IDF (1-hr 30% AES - 2 Year)
00076> --------------------
00077>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00078>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00079>                .08  23.868 |    .33  29.172 |    .58  26.520 |    .83   7.956
00080>                .17  37.128 |    .42  34.476 |    .67  13.260 |    .92   2.652
00081>                .25  55.692 |    .50  23.868 |    .75  10.608 |   1.00    .000
00082>
00083> ------------------------------------------------------------------------------
00084> 001:0003-------------------------------------------------------------------------
00085> *#*****************************************************************************
00086> *#
00087> *#                              AMC II Conditions
00088> *#
00089> *#*****************************************************************************
00090> ----------------------
00091> | DESIGN NASHYD      |   Area    (ha)=     .70   Curve Number   (CN)=81.00
00092> | 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00093> ----------------------   U.H. Tp(hrs)=    .200
00094>
00095>      Unit Hyd Qpeak  (cms)=     .134
00096>
00097>      PEAK FLOW       (cms)=     .016 (i)
00098>      TIME TO PEAK    (hrs)=     .683
00099>      RUNOFF VOLUME    (mm)=    5.292
00100>      TOTAL RAINFALL   (mm)=   22.100
00101>      RUNOFF COEFFICIENT   =     .239
00102>
00103>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00104>
00105> ------------------------------------------------------------------------------
00106> 001:0004-------------------------------------------------------------------------
00107> ----------------------
00108> | DESIGN STANDHYD    |   Area    (ha)=    2.20
00109> | 02:202    DT= 1.00 |   Total Imp(%)=   35.00   Dir. Conn.(%)=   20.00
00110> ----------------------
00111>                              IMPERVIOUS    PERVIOUS (i)
00112>      Surface Area     (ha)=        .77         1.43
00113>      Dep. Storage     (mm)=        .80         1.50
00114>      Average Slope     (%)=       1.50         1.50
00115>      Length            (m)=     121.11        40.00
00116>      Mannings n           =       .013         .250
00117>
00118>      Max.eff.Inten.(mm/hr)=      55.69        14.21
00119>                 over (min)        3.00        20.00
00120>      Storage Coeff.  (min)=       3.21 (ii)   20.00 (ii)
00121>      Unit Hyd. Tpeak (min)=       3.00        20.00
00122>      Unit Hyd. peak  (cms)=        .36          .06
00123>                                                        *TOTALS*
00124>      PEAK FLOW       (cms)=        .06          .04          .063 (iii)
00125>      TIME TO PEAK    (hrs)=        .27          .82          .267
00126>      RUNOFF VOLUME    (mm)=      21.30         6.59         9.531
00127>      TOTAL RAINFALL   (mm)=      22.10        22.10        22.100
00128>      RUNOFF COEFFICIENT   =        .96          .30          .431
00129>
00130>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00131>            CN* =  82.0    Ia = Dep. Storage  (Above)
00132>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00133>            THAN THE STORAGE COEFFICIENT.
00134>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00135>
00136> ------------------------------------------------------------------------------
00137> 001:0005-------------------------------------------------------------------------
00138> ----------------------
00139> | ROUTE RESERVOIR    |    Requested routing time step =  2.0 min.
00140> |  IN>02:(202    )   |
00141> | OUT<03:(SWM    )   |    =========  OUTLFOW STORAGE TABLE  =========
00142> ----------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00143>                             (cms)    (ha.m.)   |    (cms)    (ha.m.)
00144>                              .000  .0000E+00    |     .010  .1016E+00
00145>                              .001  .7000E-03    |     .016  .1507E+00
00146>                              .002  .5200E-02    |     .020  .2017E+00
```

```
00147>                              .003  .2010E-01   |     .305  .2544E+00
00148>                              .003  .5430E-01   |    1.618  .3695E+00
00149>
00150>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
00151>      --------------------       (ha)     (cms)     (hrs)       (mm)
00152>      INFLOW >02: (202   )       2.20      .063      .267      9.531
00153>      OUTFLOW<03: (SWM   )       2.20      .003     1.850      9.531
00154>     OVERFLOW<05: (OV-SWM)        .00      .000      .000       .000
00155>
00156>                     TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00157>                     CUMULATIVE TIME OF OVERFLOWS  (hours)=       .00
00158>                     PERCENTAGE OF TIME OVERFLOWING    (%)=       .00
00159>
00160>
00161>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=    4.683
00162>                     TIME SHIFT OF PEAK FLOW         (min)=    95.00
00163>                     MAXIMUM  STORAGE   USED       (ha.m.)=.1908E-01
00164>
00165> ------------------------------------------------------------------------------
00166> 001:0006---------------------------------------------------------------------
00167> ------------------------
00168> | ADD HYD (TO_MR     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00169> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00170>                       ID1 01:200            .70     .016     .68   5.29    .000
00171>                      +ID2 03:SWM           2.20     .003    1.85   9.53    .000
00172>                       ============================================================
00173>                       SUM 04:TO_MR          2.90     .018     .68   8.51    .000
00174>
00175>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00176>
00177> ------------------------------------------------------------------------------
00178> 001:0007---------------------------------------------------------------------
00179> ----------------------
00180> | DESIGN NASHYD      |   Area    (ha)=     .16   Curve Number   (CN)=79.00
00181> | 01:210    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00182> ----------------------   U.H. Tp(hrs)=    .090
00183>
00184>      Unit Hyd Qpeak  (cms)=     .068
00185>
00186>      PEAK FLOW       (cms)=     .004 (i)
00187>      TIME TO PEAK    (hrs)=     .600
00188>      RUNOFF VOLUME    (mm)=    4.815
00189>      TOTAL RAINFALL   (mm)=   22.100
00190>      RUNOFF COEFFICIENT   =     .218
00191>
00192>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00193>
00194> ------------------------------------------------------------------------------
00195> 001:0008---------------------------------------------------------------------
00196> ----------------------
00197> | DESIGN NASHYD      |   Area    (ha)=    1.46   Curve Number   (CN)=83.00
00198> | 01:220    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00199> ----------------------   U.H. Tp(hrs)=    .190
00200>
00201>      Unit Hyd Qpeak  (cms)=     .293
00202>
00203>      PEAK FLOW       (cms)=     .037 (i)
00204>      TIME TO PEAK    (hrs)=     .667
00205>      RUNOFF VOLUME    (mm)=    5.843
00206>      TOTAL RAINFALL   (mm)=   22.100
00207>      RUNOFF COEFFICIENT   =     .264
00208>
00209>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00210>
00211> ------------------------------------------------------------------------------
00212> 001:0009---------------------------------------------------------------------
00213> ----------------------
00214> | DESIGN NASHYD      |   Area    (ha)=     .42   Curve Number   (CN)=78.00
00215> | 01:230    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00216> ----------------------   U.H. Tp(hrs)=    .090
00217>
00218>      Unit Hyd Qpeak  (cms)=     .178
00219>
```

```
00220>      PEAK FLOW       (cms)=     .010 (i)
00221>      TIME TO PEAK    (hrs)=     .600
00222>      RUNOFF VOLUME    (mm)=    4.600
00223>      TOTAL RAINFALL   (mm)=   22.100
00224>      RUNOFF COEFFICIENT   =     .208
00225>
00226>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00227>
00228> ---------------------------------------------------------------------------------
00229> 001:0010-----------------------------------------------------------------------------
00230> *#*****************************************************************************
00231> *#
00232> *#                              AMC III Conditions
00233> *#
00234> *#*****************************************************************************
00235> ----------------------
00236> | DESIGN NASHYD      |   Area    (ha)=     .70   Curve Number   (CN)=92.00
00237> | 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00238> ----------------------   U.H. Tp(hrs)=    .200
00239>
00240>      Unit Hyd Qpeak  (cms)=     .134
00241>
00242>      PEAK FLOW       (cms)=     .030 (i)
00243>      TIME TO PEAK    (hrs)=     .650
00244>      RUNOFF VOLUME    (mm)=    9.941
00245>      TOTAL RAINFALL   (mm)=   22.100
00246>      RUNOFF COEFFICIENT   =     .450
00247>
00248>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00249>
00250> ---------------------------------------------------------------------------------
00251> 001:0011-----------------------------------------------------------------------------
00252> ----------------------
00253> | DESIGN STANDHYD    |   Area    (ha)=    2.20
00254> | 02:202    DT= 1.00 |   Total Imp(%)=   35.00   Dir. Conn.(%)=   20.00
00255> ----------------------
00256>                              IMPERVIOUS    PERVIOUS (i)
00257>      Surface Area     (ha)=        .77         1.43
00258>      Dep. Storage     (mm)=        .80         1.50
00259>      Average Slope     (%)=       1.50         1.50
00260>      Length            (m)=     121.11        40.00
00261>      Mannings n             =       .013         .250
00262>
00263>      Max.eff.Inten.(mm/hr)=      55.69        25.81
00264>                  over (min)        3.00        16.00
00265>      Storage Coeff.  (min)=       3.21 (ii)   16.43 (ii)
00266>      Unit Hyd. Tpeak (min)=       3.00        16.00
00267>      Unit Hyd. peak  (cms)=        .36          .07
00268>                                                        *TOTALS*
00269>      PEAK FLOW       (cms)=        .06          .07          .098 (iii)
00270>      TIME TO PEAK    (hrs)=        .27          .72          .600
00271>      RUNOFF VOLUME    (mm)=      21.30        11.23         13.244
00272>      TOTAL RAINFALL   (mm)=      22.10        22.10         22.100
00273>      RUNOFF COEFFICIENT   =        .96          .51          .599
00274>
00275>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00276>            CN* =  92.0    Ia = Dep. Storage  (Above)
00277>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00278>            THAN THE STORAGE COEFFICIENT.
00279>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00280>
00281> ---------------------------------------------------------------------------------
00282> 001:0012-----------------------------------------------------------------------------
00283> --------------------
00284> | ROUTE RESERVOIR   |    Requested routing time step =  2.0 min.
00285> |  IN>02:(202   )   |
00286> | OUT<03:(SWM   )   |    =========  OUTLFOW STORAGE TABLE  =========
00287> --------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00288>                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
00289>                            .000  .0000E+00   |     .010  .1016E+00
00290>                            .001  .7000E-03   |     .016  .1507E+00
00291>                            .002  .5200E-02   |     .020  .2017E+00
00292>                            .003  .2010E-01   |     .305  .2544E+00
```

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00293>                              .003  .5430E-01   |    1.618  .3695E+00
00294>
00295>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
00296>      -------------------        (ha)     (cms)     (hrs)       (mm)
00297>      INFLOW >02: (202   )       2.20      .098      .600     13.244
00298>      OUTFLOW<03: (SWM   )       2.20      .003      .867     13.244
00299>     OVERFLOW<05: (OV-SWM)        .00      .000      .000       .000
00300>
00301>                     TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00302>                     CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
00303>                     PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
00304>
00305>
00306>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=    3.051
00307>                     TIME SHIFT OF PEAK FLOW         (min)=    16.00
00308>                     MAXIMUM  STORAGE   USED       (ha.m.)=.2727E-01
00309>
00310> ------------------------------------------------------------------------------
00311> 001:0013-------------------------------------------------------------------------
00312> ------------------------
00313> | ADD HYD (TO_MR     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00314> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00315>                       ID1 01:200            .70     .030     .65   9.94    .000
00316>                      +ID2 03:SWM           2.20     .003     .87  13.24    .000
00317>                       ============================================================
00318>                       SUM 04:TO_MR          2.90     .032     .67  12.45    .000
00319>
00320>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00321>
00322> ------------------------------------------------------------------------------
00323> 001:0014-------------------------------------------------------------------------
00324> ----------------------
00325> | DESIGN NASHYD      |   Area    (ha)=     .16   Curve Number   (CN)=91.00
00326> | 01:210    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00327> ----------------------   U.H. Tp(hrs)=    .090
00328>
00329>      Unit Hyd Qpeak  (cms)=     .068
00330>
00331>      PEAK FLOW       (cms)=     .007 (i)
00332>      TIME TO PEAK    (hrs)=     .467
00333>      RUNOFF VOLUME    (mm)=    9.281
00334>      TOTAL RAINFALL   (mm)=   22.100
00335>      RUNOFF COEFFICIENT   =     .420
00336>
00337>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00338>
00339> ------------------------------------------------------------------------------
00340> 001:0015-------------------------------------------------------------------------
00341> ----------------------
00342> | DESIGN NASHYD      |   Area    (ha)=    1.46   Curve Number   (CN)=93.00
00343> | 01:220    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00344> ----------------------   U.H. Tp(hrs)=    .190
00345>
00346>      Unit Hyd Qpeak  (cms)=     .293
00347>
00348>      PEAK FLOW       (cms)=     .068 (i)
00349>      TIME TO PEAK    (hrs)=     .633
00350>      RUNOFF VOLUME    (mm)=   10.684
00351>      TOTAL RAINFALL   (mm)=   22.100
00352>      RUNOFF COEFFICIENT   =     .483
00353>
00354>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00355>
00356> ------------------------------------------------------------------------------
00357> 001:0016-------------------------------------------------------------------------
00358> ----------------------
00359> | DESIGN NASHYD      |   Area    (ha)=     .42   Curve Number   (CN)=90.00
00360> | 01:230    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00361> ----------------------   U.H. Tp(hrs)=    .090
00362>
00363>      Unit Hyd Qpeak  (cms)=     .178
00364>
00365>      PEAK FLOW       (cms)=     .018 (i)
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00366>      TIME TO PEAK    (hrs)=     .467
00367>      RUNOFF VOLUME    (mm)=    8.692
00368>      TOTAL RAINFALL   (mm)=   22.100
00369>      RUNOFF COEFFICIENT   =     .393
00370>
00371>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00372>
00373> ---------------------------------------------------------------------------------
00374> 001:0017-----------------------------------------------------------------------------
00375>   ** END OF RUN :   1
00376>
00377> ********************************************************************************
00378>
00379>
00380>
00381>
00382>
00383> --------------------
00384> | START            |  Project  dir.: C:\usr\_LOY\
00385> --------------------  Rainfall dir.: C:\usr\_LOY\
00386>     TZERO =   .00 hrs on        0
00387>     METOUT=   2 (output = METRIC)
00388>     NRUN  = 002
00389>     NSTORM=   1
00390>            #  1=LYA2.12h
00391> ---------------------------------------------------------------------------------
00392> 002:0002-----------------------------------------------------------------------------
00393> *#*****************************************************************************
00394> *#  Project Name: [Loyalist Solar]    Project Number: [133560220]
00395> *#  Date        : 11-19-2017
00396> *#  Modeller    : [D. Williams]
00397> *#  Company     : Stantec Consulting Ltd. (Kitchener)
00398> *#  License #   :  4730904
00399> *#*****************************************************************************
00400> *#*****************************************************************************
00401> *#
00402> *#                     SUBSTATION - PROPOSED CONDITIONS
00403> *#
00404> *#*****************************************************************************
00405> ---------------------------------------------------------------------------------
00406> 002:0002-----------------------------------------------------------------------------
00407> --------------------
00408> | READ STORM       |    Filename: Belleville IDF (12-hr 30% AES - 2 Year)
00409> | Ptotal=  42.24 mm|    Comments: Belleville IDF (12-hr 30% AES - 2 Year)
00410> --------------------
00411>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00412>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00413>               1.00   3.960 |   4.00   6.600 |   7.00   1.320 |  10.00    .000
00414>               2.00  11.440 |   5.00   6.160 |   8.00    .440 |  11.00    .000
00415>               3.00   8.800 |   6.00   3.520 |   9.00    .000 |  12.00    .000
00416>
00417> ---------------------------------------------------------------------------------
00418> 002:0003-----------------------------------------------------------------------------
00419> *#*****************************************************************************
00420> *#
00421> *#                              AMC II Conditions
00422> *#
00423> *#*****************************************************************************
00424> ----------------------
00425> | DESIGN NASHYD      |   Area    (ha)=     .70   Curve Number   (CN)=81.00
00426> | 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00427> ----------------------   U.H. Tp(hrs)=    .200
00428>
00429>      Unit Hyd Qpeak  (cms)=     .134
00430>
00431>      PEAK FLOW       (cms)=     .008 (i)
00432>      TIME TO PEAK    (hrs)=    3.050
00433>      RUNOFF VOLUME    (mm)=   16.545
00434>      TOTAL RAINFALL   (mm)=   42.240
00435>      RUNOFF COEFFICIENT   =     .392
00436>
00437>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00438>
```

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00439> ------------------------------------------------------------------------------
00440> 002:0004-------------------------------------------------------------------------
00441> ----------------------
00442> | DESIGN STANDHYD    |   Area    (ha)=    2.20
00443> | 02:202    DT= 1.00 |   Total Imp(%)=   35.00   Dir. Conn.(%)=   20.00
00444> ----------------------
00445>                              IMPERVIOUS    PERVIOUS (i)
00446>      Surface Area     (ha)=        .77         1.43
00447>      Dep. Storage     (mm)=        .80         1.50
00448>      Average Slope     (%)=       1.50         1.50
00449>      Length            (m)=     121.11        40.00
00450>      Mannings n             =      .013         .250
00451>
00452>      Max.eff.Inten.(mm/hr)=      11.44         5.74
00453>                 over (min)        6.00        30.00
00454>      Storage Coeff.  (min)=       6.04 (ii)   30.18 (ii)
00455>      Unit Hyd. Tpeak (min)=       6.00        30.00
00456>      Unit Hyd. peak  (cms)=        .19          .04
00457>                                                          *TOTALS*
00458>      PEAK FLOW       (cms)=        .01          .02          .031 (iii)
00459>      TIME TO PEAK    (hrs)=       2.00         3.32         3.017
00460>      RUNOFF VOLUME    (mm)=      41.44        19.49        23.883
00461>      TOTAL RAINFALL   (mm)=      42.24        42.24        42.240
00462>      RUNOFF COEFFICIENT   =        .98          .46          .565
00463>
00464>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00465>            CN* =  82.0    Ia = Dep. Storage  (Above)
00466>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00467>            THAN THE STORAGE COEFFICIENT.
00468>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00469>
00470> ------------------------------------------------------------------------------
00471> 002:0005-------------------------------------------------------------------------
00472> ----------------------
00473> | ROUTE RESERVOIR    |    Requested routing time step =  2.0 min.
00474> |  IN>02:(202   )    |
00475> | OUT<03:(SWM   )    |    =========  OUTLFOW STORAGE TABLE  =========
00476> ----------------------    OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
00477>                             (cms)    (ha.m.)    |    (cms)    (ha.m.)
00478>                              .000  .0000E+00    |     .010  .1016E+00
00479>                              .001  .7000E-03    |     .016  .1507E+00
00480>                              .002  .5200E-02    |     .020  .2017E+00
00481>                              .003  .2010E-01    |     .305  .2544E+00
00482>                              .003  .5430E-01    |    1.618  .3695E+00
00483>
00484>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
00485>      --------------------       (ha)     (cms)     (hrs)       (mm)
00486>      INFLOW >02: (202   )       2.20      .031     3.017     23.883
00487>      OUTFLOW<03: (SWM   )       2.20      .003     3.450     23.883
00488>     OVERFLOW<05: (OV-SWM)        .00      .000      .000       .000
00489>
00490>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00491>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
00492>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
00493>
00494>
00495>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    9.787
00496>                    TIME SHIFT OF PEAK FLOW         (min)=    26.00
00497>                    MAXIMUM  STORAGE   USED       (ha.m.)=.4493E-01
00498>
00499> ------------------------------------------------------------------------------
00500> 002:0006-------------------------------------------------------------------------
00501> ------------------------
00502> | ADD HYD (TO_MR     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00503> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00504>                       ID1 01:200            .70      .008    3.05  16.54    .000
00505>                      +ID2 03:SWM            2.20     .003    3.45  23.88    .000
00506>                       ============================================================
00507>                       SUM 04:TO_MR          2.90     .010    3.07  22.11    .000
00508>
00509>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00510>
00511> ------------------------------------------------------------------------------
```

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00512> 002:0007-------------------------------------------------------------------------------
00513> ----------------------
00514> | DESIGN NASHYD      |   Area    (ha)=     .16   Curve Number   (CN)=79.00
00515> | 01:210    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00516> ----------------------   U.H. Tp(hrs)=    .090
00517>
00518>      Unit Hyd Qpeak  (cms)=     .068
00519>
00520>      PEAK FLOW       (cms)=     .002 (i)
00521>      TIME TO PEAK    (hrs)=    3.000
00522>      RUNOFF VOLUME    (mm)=   15.331
00523>      TOTAL RAINFALL   (mm)=   42.240
00524>      RUNOFF COEFFICIENT   =     .363
00525>
00526>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00527>
00528> -------------------------------------------------------------------------------
00529> 002:0008-------------------------------------------------------------------------------
00530> ----------------------
00531> | DESIGN NASHYD      |   Area    (ha)=    1.46   Curve Number   (CN)=83.00
00532> | 01:220    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00533> ----------------------   U.H. Tp(hrs)=    .190
00534>
00535>      Unit Hyd Qpeak  (cms)=     .293
00536>
00537>      PEAK FLOW       (cms)=     .017 (i)
00538>      TIME TO PEAK    (hrs)=    3.050
00539>      RUNOFF VOLUME    (mm)=   17.892
00540>      TOTAL RAINFALL   (mm)=   42.240
00541>      RUNOFF COEFFICIENT   =     .424
00542>
00543>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00544>
00545> -------------------------------------------------------------------------------
00546> 002:0009-------------------------------------------------------------------------------
00547> ----------------------
00548> | DESIGN NASHYD      |   Area    (ha)=     .42   Curve Number   (CN)=78.00
00549> | 01:230    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00550> ----------------------   U.H. Tp(hrs)=    .090
00551>
00552>      Unit Hyd Qpeak  (cms)=     .178
00553>
00554>      PEAK FLOW       (cms)=     .004 (i)
00555>      TIME TO PEAK    (hrs)=    3.000
00556>      RUNOFF VOLUME    (mm)=   14.769
00557>      TOTAL RAINFALL   (mm)=   42.240
00558>      RUNOFF COEFFICIENT   =     .350
00559>
00560>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00561>
00562> -------------------------------------------------------------------------------
00563> 002:0010-------------------------------------------------------------------------------
00564> *#*****************************************************************************
00565> *#
00566> *#                              AMC III Conditions
00567> *#
00568> *#*****************************************************************************
00569> ----------------------
00570> | DESIGN NASHYD      |   Area    (ha)=     .70   Curve Number   (CN)=92.00
00571> | 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00572> ----------------------   U.H. Tp(hrs)=    .200
00573>
00574>      Unit Hyd Qpeak  (cms)=     .134
00575>
00576>      PEAK FLOW       (cms)=     .012 (i)
00577>      TIME TO PEAK    (hrs)=    3.033
00578>      RUNOFF VOLUME    (mm)=   26.418
00579>      TOTAL RAINFALL   (mm)=   42.240
00580>      RUNOFF COEFFICIENT   =     .625
00581>
00582>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00583>
00584> -------------------------------------------------------------------------------
```

```
00585> 002:0011--------------------------------------------------------------------------------
00586> ----------------------
00587> | DESIGN STANDHYD    |   Area    (ha)=    2.20
00588> | 02:202    DT= 1.00 |   Total Imp(%)=   35.00   Dir. Conn.(%)=   20.00
00589> ----------------------
00590>                              IMPERVIOUS    PERVIOUS (i)
00591>      Surface Area     (ha)=        .77         1.43
00592>      Dep. Storage     (mm)=        .80         1.50
00593>      Average Slope     (%)=       1.50         1.50
00594>      Length            (m)=     121.11        40.00
00595>      Mannings n             =       .013         .250
00596>
00597>      Max.eff.Inten.(mm/hr)=      11.44         8.89
00598>                 over (min)        6.00        26.00
00599>      Storage Coeff.  (min)=       6.04 (ii)   26.30 (ii)
00600>      Unit Hyd. Tpeak (min)=       6.00        26.00
00601>      Unit Hyd. peak  (cms)=        .19          .04
00602>                                                        *TOTALS*
00603>      PEAK FLOW       (cms)=        .01          .03          .043 (iii)
00604>      TIME TO PEAK    (hrs)=       2.00         3.12         3.017
00605>      RUNOFF VOLUME    (mm)=      41.44        28.53        31.118
00606>      TOTAL RAINFALL   (mm)=      42.24        42.24        42.240
00607>      RUNOFF COEFFICIENT   =        .98          .68          .737
00608>
00609>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00610>            CN* =  92.0    Ia = Dep. Storage  (Above)
00611>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00612>            THAN THE STORAGE COEFFICIENT.
00613>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00614>
00615> --------------------------------------------------------------------------------
00616> 002:0012--------------------------------------------------------------------------------
00617> ----------------------
00618> | ROUTE RESERVOIR    |    Requested routing time step =  2.0 min.
00619> |  IN>02:(202    )   |
00620> | OUT<03:(SWM    )   |    =========  OUTLFOW STORAGE TABLE  =========
00621> ----------------------    OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
00622>                             (cms)    (ha.m.)    |    (cms)    (ha.m.)
00623>                              .000  .0000E+00     |     .010  .1016E+00
00624>                              .001  .7000E-03     |     .016  .1507E+00
00625>                              .002  .5200E-02     |     .020  .2017E+00
00626>                              .003  .2010E-01     |     .305  .2544E+00
00627>                              .003  .5430E-01     |    1.618  .3695E+00
00628>
00629>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
00630>      --------------------       (ha)     (cms)     (hrs)       (mm)
00631>      INFLOW >02: (202   )       2.20      .043     3.017     31.118
00632>      OUTFLOW<03: (SWM   )       2.20      .004     7.817     31.118
00633>     OVERFLOW<05: (OV-SWM)        .00      .000      .000       .000
00634>
00635>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00636>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
00637>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
00638>
00639>
00640>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    9.049
00641>                    TIME SHIFT OF PEAK FLOW         (min)=   288.00
00642>                    MAXIMUM  STORAGE   USED       (ha.m.)=.6019E-01
00643>
00644> --------------------------------------------------------------------------------
00645> 002:0013--------------------------------------------------------------------------------
00646> ------------------------
00647> | ADD HYD (TO_MR     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00648> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00649>                       ID1 01:200            .70     .012    3.03  26.42    .000
00650>                      +ID2 03:SWM           2.20     .004    7.82  31.12    .000
00651>                       ============================================================
00652>                       SUM 04:TO_MR          2.90     .015    3.03  29.98    .000
00653>
00654>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00655>
00656> --------------------------------------------------------------------------------
00657> 002:0014--------------------------------------------------------------------------------
```

```
00658> ----------------------
00659> | DESIGN NASHYD      |   Area    (ha)=     .16   Curve Number   (CN)=91.00
00660> | 01:210    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00661> ----------------------   U.H. Tp(hrs)=    .090
00662>
00663>      Unit Hyd Qpeak  (cms)=     .068
00664>
00665>      PEAK FLOW       (cms)=     .003 (i)
00666>      TIME TO PEAK    (hrs)=    2.017
00667>      RUNOFF VOLUME    (mm)=   25.201
00668>      TOTAL RAINFALL   (mm)=   42.240
00669>      RUNOFF COEFFICIENT   =     .597
00670>
00671>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00672>
00673> ------------------------------------------------------------------------------------
00674> 002:0015----------------------------------------------------------------------------
00675> ----------------------
00676> | DESIGN NASHYD      |   Area    (ha)=    1.46   Curve Number   (CN)=93.00
00677> | 01:220    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00678> ----------------------   U.H. Tp(hrs)=    .190
00679>
00680>      Unit Hyd Qpeak  (cms)=     .293
00681>
00682>      PEAK FLOW       (cms)=     .028 (i)
00683>      TIME TO PEAK    (hrs)=    2.083
00684>      RUNOFF VOLUME    (mm)=   27.728
00685>      TOTAL RAINFALL   (mm)=   42.240
00686>      RUNOFF COEFFICIENT   =     .656
00687>
00688>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00689>
00690> ------------------------------------------------------------------------------------
00691> 002:0016----------------------------------------------------------------------------
00692> ----------------------
00693> | DESIGN NASHYD      |   Area    (ha)=     .42   Curve Number   (CN)=90.00
00694> | 01:230    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00695> ----------------------   U.H. Tp(hrs)=    .090
00696>
00697>      Unit Hyd Qpeak  (cms)=     .178
00698>
00699>      PEAK FLOW       (cms)=     .007 (i)
00700>      TIME TO PEAK    (hrs)=    3.000
00701>      RUNOFF VOLUME    (mm)=   24.068
00702>      TOTAL RAINFALL   (mm)=   42.240
00703>      RUNOFF COEFFICIENT   =     .570
00704>
00705>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00706>
00707> ------------------------------------------------------------------------------------
00708> 002:0017----------------------------------------------------------------------------
00709> ------------------------------------------------------------------------------------
00710> 002:0002----------------------------------------------------------------------------
00711>   ** END OF RUN :   2
00712>
00713> ************************************************************************************
00714>
00715>
00716>
00717>
00718>
00719> --------------------
00720> | START            |  Project  dir.: C:\usr\_LOY\
00721> --------------------  Rainfall dir.: C:\usr\_LOY\
00722>     TZERO =   .00 hrs on        0
00723>     METOUT=   2 (output = METRIC)
00724>     NRUN  = 003
00725>     NSTORM=   1
00726>            #  1=LYA5.1hr
00727> ------------------------------------------------------------------------------------
00728> 003:0002----------------------------------------------------------------------------
00729> *#*********************************************************************************
00730> *#  Project Name: [Loyalist Solar]    Project Number: [133560220]
```

```
00731> *#  Date        : 11-19-2017
00732> *#  Modeller    : [D. Williams]
00733> *#  Company     : Stantec Consulting Ltd. (Kitchener)
00734> *#  License #   :  4730904
00735> *#*****************************************************************************
00736> *#*****************************************************************************
00737> *#
00738> *#                     SUBSTATION - PROPOSED CONDITIONS
00739> *#
00740> *#*****************************************************************************
00741> ------------------------------------------------------------------------------
00742> 003:0002--------------------------------------------------------------------------
00743> --------------------
00744> | READ STORM       |    Filename: Belleville IDF (1-hr 30% AES - 5 Year)
00745> | Ptotal=  28.00 mm|    Comments: Belleville IDF (1-hr 30% AES - 5 Year)
00746> --------------------
00747>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00748>               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00749>               .08  30.240 |    .33  36.960 |    .58  33.600 |    .83  10.080
00750>               .17  47.040 |    .42  43.680 |    .67  16.800 |    .92   3.360
00751>               .25  70.560 |    .50  30.240 |    .75  13.440 |   1.00    .000
00752>
00753> ------------------------------------------------------------------------------
00754> 003:0003--------------------------------------------------------------------------
00755> *#*****************************************************************************
00756> *#
00757> *#                              AMC II Conditions
00758> *#
00759> *#*****************************************************************************
00760> ----------------------
00761> | DESIGN NASHYD      |   Area    (ha)=     .70   Curve Number   (CN)=81.00
00762> | 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00763> ----------------------   U.H. Tp(hrs)=    .200
00764>
00765>      Unit Hyd Qpeak  (cms)=     .134
00766>
00767>      PEAK FLOW       (cms)=     .024 (i)
00768>      TIME TO PEAK    (hrs)=     .667
00769>      RUNOFF VOLUME    (mm)=    8.158
00770>      TOTAL RAINFALL   (mm)=   28.000
00771>      RUNOFF COEFFICIENT   =     .291
00772>
00773>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00774>
00775> ------------------------------------------------------------------------------
00776> 003:0004--------------------------------------------------------------------------
00777> ----------------------
00778> | DESIGN STANDHYD    |   Area    (ha)=    2.20
00779> | 02:202    DT= 1.00 |   Total Imp(%)=   35.00   Dir. Conn.(%)=   20.00
00780> ----------------------
00781>                              IMPERVIOUS    PERVIOUS (i)
00782>      Surface Area     (ha)=        .77          1.43
00783>      Dep. Storage     (mm)=        .80          1.50
00784>      Average Slope     (%)=       1.50          1.50
00785>      Length            (m)=     121.11         40.00
00786>      Mannings n             =       .013          .250
00787>
00788>      Max.eff.Inten.(mm/hr)=      70.56         21.68
00789>                  over (min)        3.00         17.00
00790>      Storage Coeff.  (min)=       2.92 (ii)    17.10 (ii)
00791>      Unit Hyd. Tpeak (min)=       3.00         17.00
00792>      Unit Hyd. peak  (cms)=        .38           .07
00793>                                                          *TOTALS*
00794>      PEAK FLOW       (cms)=        .08           .06          .095 (iii)
00795>      TIME TO PEAK    (hrs)=        .25           .75          .600
00796>      RUNOFF VOLUME    (mm)=      27.20          9.95         13.400
00797>      TOTAL RAINFALL   (mm)=      28.00         28.00         28.000
00798>      RUNOFF COEFFICIENT   =        .97           .36           .479
00799>
00800>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00801>            CN* =  82.0    Ia = Dep. Storage  (Above)
00802>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00803>            THAN THE STORAGE COEFFICIENT.
```

```
00804>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00805>
00806> ------------------------------------------------------------------------------
00807> 003:0005----------------------------------------------------------------------
00808> ---------------------
00809> | ROUTE RESERVOIR   |    Requested routing time step =  2.0 min.
00810> |  IN>02:(202   )   |
00811> | OUT<03:(SWM   )   |    =========  OUTLFOW STORAGE TABLE  =========
00812> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00813>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
00814>                             .000  .0000E+00   |     .010  .1016E+00
00815>                             .001  .7000E-03   |     .016  .1507E+00
00816>                             .002  .5200E-02   |     .020  .2017E+00
00817>                             .003  .2010E-01   |     .305  .2544E+00
00818>                             .003  .5430E-01   |    1.618  .3695E+00
00819>
00820>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
00821>      --------------------       (ha)     (cms)     (hrs)       (mm)
00822>      INFLOW >02: (202   )       2.20      .095      .600     13.400
00823>      OUTFLOW<03: (SWM   )       2.20      .003      .850     13.400
00824>     OVERFLOW<05: (OV-SWM)        .00      .000      .000       .000
00825>
00826>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00827>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
00828>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
00829>
00830>
00831>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    3.165
00832>                    TIME SHIFT OF PEAK FLOW         (min)=    15.00
00833>                    MAXIMUM  STORAGE   USED       (ha.m.)=.2755E-01
00834>
00835> ------------------------------------------------------------------------------
00836> 003:0006----------------------------------------------------------------------
00837> ------------------------
00838> | ADD HYD (TO_MR     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00839> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00840>                       ID1 01:200            .70     .024     .67   8.16    .000
00841>                      +ID2 03:SWM           2.20     .003     .85  13.40    .000
00842>                       ============================================================
00843>                       SUM 04:TO_MR          2.90     .027     .68  12.13    .000
00844>
00845>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00846>
00847> ------------------------------------------------------------------------------
00848> 003:0007----------------------------------------------------------------------
00849> ----------------------
00850> | DESIGN NASHYD      |   Area    (ha)=     .16   Curve Number   (CN)=79.00
00851> | 01:210    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00852> ----------------------   U.H. Tp(hrs)=    .090
00853>
00854>      Unit Hyd Qpeak  (cms)=     .068
00855>
00856>      PEAK FLOW       (cms)=     .006 (i)
00857>      TIME TO PEAK    (hrs)=     .600
00858>      RUNOFF VOLUME    (mm)=    7.468
00859>      TOTAL RAINFALL   (mm)=   28.000
00860>      RUNOFF COEFFICIENT   =     .267
00861>
00862>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00863>
00864> ------------------------------------------------------------------------------
00865> 003:0008----------------------------------------------------------------------
00866> ----------------------
00867> | DESIGN NASHYD      |   Area    (ha)=    1.46   Curve Number   (CN)=83.00
00868> | 01:220    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00869> ----------------------   U.H. Tp(hrs)=    .190
00870>
00871>      Unit Hyd Qpeak  (cms)=     .293
00872>
00873>      PEAK FLOW       (cms)=     .056 (i)
00874>      TIME TO PEAK    (hrs)=     .650
00875>      RUNOFF VOLUME    (mm)=    8.943
00876>      TOTAL RAINFALL   (mm)=   28.000
```

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00877>      RUNOFF COEFFICIENT   =     .319
00878>
00879>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00880>
00881> ------------------------------------------------------------------------------------
00882> 003:0009-------------------------------------------------------------------------------
00883> ----------------------
00884> | DESIGN NASHYD      |   Area    (ha)=     .42   Curve Number   (CN)=78.00
00885> | 01:230    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00886> ----------------------   U.H. Tp(hrs)=    .090
00887>
00888>      Unit Hyd Qpeak  (cms)=     .178
00889>
00890>      PEAK FLOW       (cms)=     .015 (i)
00891>      TIME TO PEAK    (hrs)=     .600
00892>      RUNOFF VOLUME    (mm)=    7.155
00893>      TOTAL RAINFALL   (mm)=   28.000
00894>      RUNOFF COEFFICIENT   =     .256
00895>
00896>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00897>
00898> ------------------------------------------------------------------------------------
00899> 003:0010-------------------------------------------------------------------------------
00900> *#*****************************************************************************
00901> *#
00902> *#                              AMC III Conditions
00903> *#
00904> *#*****************************************************************************
00905> ----------------------
00906> | DESIGN NASHYD      |   Area    (ha)=     .70   Curve Number   (CN)=92.00
00907> | 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00908> ----------------------   U.H. Tp(hrs)=    .200
00909>
00910>      Unit Hyd Qpeak  (cms)=     .134
00911>
00912>      PEAK FLOW       (cms)=     .043 (i)
00913>      TIME TO PEAK    (hrs)=     .650
00914>      RUNOFF VOLUME    (mm)=   14.453
00915>      TOTAL RAINFALL   (mm)=   28.000
00916>      RUNOFF COEFFICIENT   =     .516
00917>
00918>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00919>
00920> ------------------------------------------------------------------------------------
00921> 003:0011-------------------------------------------------------------------------------
00922> ----------------------
00923> | DESIGN STANDHYD    |   Area    (ha)=    2.20
00924> | 02:202    DT= 1.00 |   Total Imp(%)=   35.00   Dir. Conn.(%)=   20.00
00925> ----------------------
00926>                              IMPERVIOUS    PERVIOUS (i)
00927>      Surface Area     (ha)=       .77         1.43
00928>      Dep. Storage     (mm)=       .80         1.50
00929>      Average Slope     (%)=      1.50         1.50
00930>      Length            (m)=    121.11        40.00
00931>      Mannings n            =      .013         .250
00932>
00933>      Max.eff.Inten.(mm/hr)=     70.56        37.97
00934>                 over (min)       3.00        14.00
00935>      Storage Coeff.  (min)=      2.92 (ii)   14.25 (ii)
00936>      Unit Hyd. Tpeak (min)=      3.00        14.00
00937>      Unit Hyd. peak  (cms)=       .38          .08
00938>                                                      *TOTALS*
00939>      PEAK FLOW       (cms)=       .08          .11          .145 (iii)
00940>      TIME TO PEAK    (hrs)=       .25          .65          .600
00941>      RUNOFF VOLUME    (mm)=     27.20        16.04        18.269
00942>      TOTAL RAINFALL   (mm)=     28.00        28.00        28.000
00943>      RUNOFF COEFFICIENT   =       .97          .57          .652
00944>
00945>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00946>            CN* =  92.0    Ia = Dep. Storage  (Above)
00947>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00948>            THAN THE STORAGE COEFFICIENT.
00949>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

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00950>
00951> ------------------------------------------------------------------------------------
00952> 003:0012----------------------------------------------------------------------------
00953> ---------------------
00954> | ROUTE RESERVOIR   |    Requested routing time step =  2.0 min.
00955> |  IN>02:(202   )   |
00956> | OUT<03:(SWM   )   |    =========  OUTLFOW STORAGE TABLE  =========
00957> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00958>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
00959>                             .000  .0000E+00   |     .010  .1016E+00
00960>                             .001  .7000E-03   |     .016  .1507E+00
00961>                             .002  .5200E-02   |     .020  .2017E+00
00962>                             .003  .2010E-01   |     .305  .2544E+00
00963>                             .003  .5430E-01   |    1.618  .3695E+00
00964>
00965>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
00966>      -------------------        (ha)     (cms)     (hrs)       (mm)
00967>      INFLOW >02: (202   )       2.20      .145      .600     18.269
00968>      OUTFLOW<03: (SWM   )       2.20      .003      .650     18.269
00969>     OVERFLOW<05: (OV-SWM)        .00      .000      .000       .000
00970>
00971>                     TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00972>                     CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
00973>                     PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
00974>
00975>
00976>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=    2.064
00977>                     TIME SHIFT OF PEAK FLOW         (min)=     3.00
00978>                     MAXIMUM  STORAGE   USED       (ha.m.)=.3835E-01
00979>
00980> ------------------------------------------------------------------------------------
00981> 003:0013----------------------------------------------------------------------------
00982> ------------------------
00983> | ADD HYD (TO_MR     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00984> ------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
00985>                       ID1 01:200            .70      .043     .65  14.45    .000
00986>                      +ID2 03:SWM           2.20      .003     .65  18.27    .000
00987>                       ============================================================
00988>                       SUM 04:TO_MR          2.90      .046     .65  17.35    .000
00989>
00990>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00991>
00992> ------------------------------------------------------------------------------------
00993> 003:0014----------------------------------------------------------------------------
00994> ----------------------
00995> | DESIGN NASHYD      |   Area    (ha)=     .16   Curve Number   (CN)=91.00
00996> | 01:210    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00997> ----------------------   U.H. Tp(hrs)=    .090
00998>
00999>      Unit Hyd Qpeak  (cms)=     .068
01000>
01001>      PEAK FLOW       (cms)=     .011 (i)
01002>      TIME TO PEAK    (hrs)=     .450
01003>      RUNOFF VOLUME    (mm)=   13.603
01004>      TOTAL RAINFALL   (mm)=   28.000
01005>      RUNOFF COEFFICIENT   =     .486
01006>
01007>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01008>
01009> ------------------------------------------------------------------------------------
01010> 003:0015----------------------------------------------------------------------------
01011> ----------------------
01012> | DESIGN NASHYD      |   Area    (ha)=    1.46   Curve Number   (CN)=93.00
01013> | 01:220    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01014> ----------------------   U.H. Tp(hrs)=    .190
01015>
01016>      Unit Hyd Qpeak  (cms)=     .293
01017>
01018>      PEAK FLOW       (cms)=     .097 (i)
01019>      TIME TO PEAK    (hrs)=     .633
01020>      RUNOFF VOLUME    (mm)=   15.394
01021>      TOTAL RAINFALL   (mm)=   28.000
01022>      RUNOFF COEFFICIENT   =     .550
```

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01023>
01024>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01025>
01026> ---------------------------------------------------------------------------------
01027> 003:0016-----------------------------------------------------------------------------
01028> ----------------------
01029> | DESIGN NASHYD      |   Area    (ha)=     .42   Curve Number   (CN)=90.00
01030> | 01:230    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01031> ----------------------   U.H. Tp(hrs)=    .090
01032>
01033>      Unit Hyd Qpeak  (cms)=     .178
01034>
01035>      PEAK FLOW       (cms)=     .026 (i)
01036>      TIME TO PEAK    (hrs)=     .450
01037>      RUNOFF VOLUME    (mm)=   12.833
01038>      TOTAL RAINFALL   (mm)=   28.000
01039>      RUNOFF COEFFICIENT   =     .458
01040>
01041>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01042>
01043> ---------------------------------------------------------------------------------
01044> 003:0017-----------------------------------------------------------------------------
01045> ---------------------------------------------------------------------------------
01046> 003:0002-----------------------------------------------------------------------------
01047> ---------------------------------------------------------------------------------
01048> 003:0002-----------------------------------------------------------------------------
01049>   ** END OF RUN :   3
01050>
01051> *********************************************************************************
01052>
01053>
01054>
01055>
01056>
01057> --------------------
01058> | START            |  Project  dir.: C:\usr\_LOY\
01059> --------------------  Rainfall dir.: C:\usr\_LOY\
01060>     TZERO =   .00 hrs on        0
01061>     METOUT=   2 (output = METRIC)
01062>     NRUN  = 004
01063>     NSTORM=   1
01064>            #  1=LYA5.12h
01065> ---------------------------------------------------------------------------------
01066> 004:0002-----------------------------------------------------------------------------
01067> *#*****************************************************************************
01068> *#  Project Name: [Loyalist Solar]    Project Number: [133560220]
01069> *#  Date        : 11-19-2017
01070> *#  Modeller    : [D. Williams]
01071> *#  Company     : Stantec Consulting Ltd. (Kitchener)
01072> *#  License #   :  4730904
01073> *#*****************************************************************************
01074> *#*****************************************************************************
01075> *#
01076> *#                     SUBSTATION - PROPOSED CONDITIONS
01077> *#
01078> *#*****************************************************************************
01079> ---------------------------------------------------------------------------------
01080> 004:0002-----------------------------------------------------------------------------
01081> --------------------
01082> | READ STORM       |    Filename: Belleville IDF (12-hr 30% AES - 5 Year)
01083> | Ptotal=  55.97 mm|    Comments: Belleville IDF (12-hr 30% AES - 5 Year)
01084> --------------------
01085>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
01086>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
01087>               1.00   5.247 |   4.00   8.745 |   7.00   1.749 |  10.00    .000
01088>               2.00  15.158 |   5.00   8.162 |   8.00    .583 |  11.00    .000
01089>               3.00  11.660 |   6.00   4.664 |   9.00    .000 |  12.00    .000
01090>
01091> ---------------------------------------------------------------------------------
01092> 004:0003-----------------------------------------------------------------------------
01093> *#*****************************************************************************
01094> *#
01095> *#                              AMC II Conditions
```

```
01096> *#
01097> *#*****************************************************************************
01098> ----------------------
01099> | DESIGN NASHYD      |   Area    (ha)=     .70   Curve Number   (CN)=81.00
01100> | 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01101> ----------------------   U.H. Tp(hrs)=    .200
01102>
01103>      Unit Hyd Qpeak  (cms)=     .134
01104>
01105>      PEAK FLOW       (cms)=     .012 (i)
01106>      TIME TO PEAK    (hrs)=    3.050
01107>      RUNOFF VOLUME    (mm)=   26.013
01108>      TOTAL RAINFALL   (mm)=   55.968
01109>      RUNOFF COEFFICIENT   =     .465
01110>
01111>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01112>
01113> -------------------------------------------------------------------------------
01114> 004:0004---------------------------------------------------------------------------
01115> ----------------------
01116> | DESIGN STANDHYD    |   Area    (ha)=    2.20
01117> | 02:202    DT= 1.00 |   Total Imp(%)=   35.00   Dir. Conn.(%)=   20.00
01118> ----------------------
01119>                              IMPERVIOUS    PERVIOUS (i)
01120>      Surface Area     (ha)=        .77         1.43
01121>      Dep. Storage     (mm)=        .80         1.50
01122>      Average Slope     (%)=       1.50         1.50
01123>      Length            (m)=     121.11        40.00
01124>      Mannings n             =       .013         .250
01125>
01126>      Max.eff.Inten.(mm/hr)=      15.16         8.91
01127>                  over (min)        5.00        26.00
01128>      Storage Coeff.  (min)=        5.40 (ii)   25.64 (ii)
01129>      Unit Hyd. Tpeak (min)=        5.00        26.00
01130>      Unit Hyd. peak  (cms)=         .21          .04
01131>                                                      *TOTALS*
01132>      PEAK FLOW       (cms)=        .02          .03          .047 (iii)
01133>      TIME TO PEAK    (hrs)=       2.00         3.18         3.017
01134>      RUNOFF VOLUME    (mm)=      55.17        29.95        35.001
01135>      TOTAL RAINFALL   (mm)=      55.97        55.97        55.968
01136>      RUNOFF COEFFICIENT   =         .99          .54          .625
01137>
01138>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01139>            CN* =  82.0    Ia = Dep. Storage  (Above)
01140>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01141>            THAN THE STORAGE COEFFICIENT.
01142>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01143>
01144> -------------------------------------------------------------------------------
01145> 004:0005---------------------------------------------------------------------------
01146> ----------------------
01147> | ROUTE RESERVOIR    |    Requested routing time step =  2.0 min.
01148> |  IN>02:(202   )    |
01149> | OUT<03:(SWM   )    |    =========  OUTLFOW STORAGE TABLE  =========
01150> ----------------------    OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
01151>                             (cms)    (ha.m.)    |    (cms)    (ha.m.)
01152>                              .000  .0000E+00     |     .010  .1016E+00
01153>                              .001  .7000E-03     |     .016  .1507E+00
01154>                              .002  .5200E-02     |     .020  .2017E+00
01155>                              .003  .2010E-01     |     .305  .2544E+00
01156>                              .003  .5430E-01     |    1.618  .3695E+00
01157>
01158>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
01159>      -------------------        (ha)     (cms)     (hrs)       (mm)
01160>      INFLOW >02: (202   )       2.20      .047     3.017     35.001
01161>      OUTFLOW<03: (SWM   )       2.20      .005     7.700     35.001
01162>     OVERFLOW<05: (OV-SWM)        .00      .000      .000       .000
01163>
01164>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
01165>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
01166>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
01167>
01168>
```

```
                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   10.653
                    TIME SHIFT OF PEAK FLOW         (min)=   281.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.6758E-01

------------------------------------------------------------------------------------
004:0006----------------------------------------------------------------------------
------------------------
| ADD HYD (TO_MR     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:200            .70     .012    3.05  26.01    .000
                     +ID2 03:SWM           2.20     .005    7.70  35.00    .000
                      ============================================================
                      SUM 04:TO_MR          2.90     .015    3.05  32.83    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------------
004:0007----------------------------------------------------------------------------
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .16   Curve Number   (CN)=79.00
| 01:210    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .068

     PEAK FLOW       (cms)=     .003 (i)
     TIME TO PEAK    (hrs)=    3.000
     RUNOFF VOLUME    (mm)=   24.320
     TOTAL RAINFALL   (mm)=   55.968
     RUNOFF COEFFICIENT   =     .435

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------------
004:0008----------------------------------------------------------------------------
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.46   Curve Number   (CN)=83.00
| 01:220    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .190

     Unit Hyd Qpeak  (cms)=     .293

     PEAK FLOW       (cms)=     .027 (i)
     TIME TO PEAK    (hrs)=    3.033
     RUNOFF VOLUME    (mm)=   27.859
     TOTAL RAINFALL   (mm)=   55.968
     RUNOFF COEFFICIENT   =     .498

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------------
004:0009----------------------------------------------------------------------------
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .42   Curve Number   (CN)=78.00
| 01:230    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .178

     PEAK FLOW       (cms)=     .007 (i)
     TIME TO PEAK    (hrs)=    3.000
     RUNOFF VOLUME    (mm)=   23.526
     TOTAL RAINFALL   (mm)=   55.968
     RUNOFF COEFFICIENT   =     .420

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------------
004:0010----------------------------------------------------------------------------
*#**************************************************************************
*#
*#                              AMC III Conditions
*#
```

```
01242> *#*****************************************************************************
01243> ----------------------
01244> | DESIGN NASHYD      |   Area    (ha)=     .70   Curve Number   (CN)=92.00
01245> | 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01246> ----------------------   U.H. Tp(hrs)=    .200
01247>
01248>      Unit Hyd Qpeak  (cms)=     .134
01249>
01250>      PEAK FLOW       (cms)=     .019 (i)
01251>      TIME TO PEAK    (hrs)=    2.083
01252>      RUNOFF VOLUME    (mm)=   38.754
01253>      TOTAL RAINFALL   (mm)=   55.968
01254>      RUNOFF COEFFICIENT   =     .692
01255>
01256>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01257>
01258> ------------------------------------------------------------------------------------
01259> 004:0011---------------------------------------------------------------------------
01260> ----------------------
01261> | DESIGN STANDHYD    |   Area    (ha)=    2.20
01262> | 02:202    DT= 1.00 |   Total Imp(%)=   35.00   Dir. Conn.(%)=   20.00
01263> ----------------------
01264>                               IMPERVIOUS    PERVIOUS (i)
01265>      Surface Area     (ha)=        .77          1.43
01266>      Dep. Storage     (mm)=        .80          1.50
01267>      Average Slope     (%)=       1.50          1.50
01268>      Length            (m)=     121.11         40.00
01269>      Mannings n             =       .013          .250
01270>
01271>      Max.eff.Inten.(mm/hr)=      15.16         13.49
01272>                  over (min)        5.00         23.00
01273>      Storage Coeff.  (min)=        5.40 (ii)    22.54 (ii)
01274>      Unit Hyd. Tpeak (min)=        5.00         23.00
01275>      Unit Hyd. peak  (cms)=         .21           .05
01276>                                                          *TOTALS*
01277>      PEAK FLOW       (cms)=        .02           .05          .061 (iii)
01278>      TIME TO PEAK    (hrs)=       2.00          3.05         3.000
01279>      RUNOFF VOLUME    (mm)=      55.17         41.23         44.021
01280>      TOTAL RAINFALL   (mm)=      55.97         55.97         55.968
01281>      RUNOFF COEFFICIENT   =        .99           .74           .787
01282>
01283>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01284>            CN* =  92.0    Ia = Dep. Storage  (Above)
01285>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01286>            THAN THE STORAGE COEFFICIENT.
01287>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01288>
01289> ------------------------------------------------------------------------------------
01290> 004:0012---------------------------------------------------------------------------
01291> ----------------------
01292> | ROUTE RESERVOIR    |    Requested routing time step =  2.0 min.
01293> |  IN>02:(202   )    |
01294> | OUT<03:(SWM   )    |    =========  OUTLFOW STORAGE TABLE  =========
01295> ----------------------    OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
01296>                             (cms)    (ha.m.)    |    (cms)    (ha.m.)
01297>                              .000  .0000E+00     |     .010  .1016E+00
01298>                              .001  .7000E-03     |     .016  .1507E+00
01299>                              .002  .5200E-02     |     .020  .2017E+00
01300>                              .003  .2010E-01     |     .305  .2544E+00
01301>                              .003  .5430E-01     |    1.618  .3695E+00
01302>
01303>      ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
01304>      --------------------        (ha)     (cms)     (hrs)       (mm)
01305>      INFLOW >02: (202   )       2.20      .061     3.000     44.021
01306>      OUTFLOW<03: (SWM   )       2.20      .007     7.383     44.019
01307>     OVERFLOW<05: (OV-SWM)        .00      .000      .000       .000
01308>
01309>                     TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
01310>                     CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
01311>                     PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
01312>
01313>
01314>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=   12.176
```

```
                    TIME SHIFT OF PEAK FLOW         (min)=   263.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.8455E-01

 ------------------------------------------------------------------------------
 004:0013-------------------------------------------------------------------------
 ------------------------
 | ADD HYD (TO_MR     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
 ------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 01:200            .70     .019    2.08  38.75    .000
                      +ID2 03:SWM            2.20     .007    7.38  44.02    .000
                       ============================================================
                       SUM 04:TO_MR          2.90     .022    2.10  42.75    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 004:0014-------------------------------------------------------------------------
 ----------------------
 | DESIGN NASHYD      |   Area    (ha)=     .16   Curve Number   (CN)=91.00
 | 01:210    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
 ----------------------   U.H. Tp(hrs)=    .090

      Unit Hyd Qpeak  (cms)=     .068

      PEAK FLOW       (cms)=     .004 (i)
      TIME TO PEAK    (hrs)=    2.017
      RUNOFF VOLUME    (mm)=   37.276
      TOTAL RAINFALL   (mm)=   55.968
      RUNOFF COEFFICIENT   =     .666

      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ------------------------------------------------------------------------------
 004:0015-------------------------------------------------------------------------
 ----------------------
 | DESIGN NASHYD      |   Area    (ha)=    1.46   Curve Number   (CN)=93.00
 | 01:220    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
 ----------------------   U.H. Tp(hrs)=    .190

      Unit Hyd Qpeak  (cms)=     .293

      PEAK FLOW       (cms)=     .042 (i)
      TIME TO PEAK    (hrs)=    2.067
      RUNOFF VOLUME    (mm)=   40.317
      TOTAL RAINFALL   (mm)=   55.968
      RUNOFF COEFFICIENT   =     .720

      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ------------------------------------------------------------------------------
 004:0016-------------------------------------------------------------------------
 ----------------------
 | DESIGN NASHYD      |   Area    (ha)=     .42   Curve Number   (CN)=90.00
 | 01:230    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
 ----------------------   U.H. Tp(hrs)=    .090

      Unit Hyd Qpeak  (cms)=     .178

      PEAK FLOW       (cms)=     .011 (i)
      TIME TO PEAK    (hrs)=    2.017
      RUNOFF VOLUME    (mm)=   35.878
      TOTAL RAINFALL   (mm)=   55.968
      RUNOFF COEFFICIENT   =     .641

      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ------------------------------------------------------------------------------
 004:0017-------------------------------------------------------------------------
 ------------------------------------------------------------------------------
 004:0002-------------------------------------------------------------------------
 ------------------------------------------------------------------------------
 004:0002-------------------------------------------------------------------------
 ------------------------------------------------------------------------------
```

```
01388> 004:0002--------------------------------------------------------------------------------
01389>   ** END OF RUN :   4
01390>
01391> ********************************************************************************
01392>
01393>
01394>
01395>
01396>
01397> --------------------
01398> | START            |  Project  dir.: C:\usr\_LOY\
01399> --------------------  Rainfall dir.: C:\usr\_LOY\
01400>     TZERO =   .00 hrs on        0
01401>     METOUT=   2 (output = METRIC)
01402>     NRUN  = 005
01403>     NSTORM=   1
01404>            #  1=LYA100.1hr
01405> --------------------------------------------------------------------------------------
01406> 005:0002--------------------------------------------------------------------------------
01407> *#*****************************************************************************
01408> *#  Project Name: [Loyalist Solar]    Project Number: [133560220]
01409> *#  Date        : 11-19-2017
01410> *#  Modeller    : [D. Williams]
01411> *#  Company     : Stantec Consulting Ltd. (Kitchener)
01412> *#  License #   :  4730904
01413> *#*****************************************************************************
01414> *#*****************************************************************************
01415> *#
01416> *#                     SUBSTATION - PROPOSED CONDITIONS
01417> *#
01418> *#*****************************************************************************
01419> --------------------------------------------------------------------------------------
01420> 005:0002--------------------------------------------------------------------------------
01421> --------------------
01422> | READ STORM       |    Filename: Belleville IDF (1-hr 30% AES - 100 Year)
01423> | Ptotal=  44.10 mm|    Comments: Belleville IDF (1-hr 30% AES - 100 Year)
01424> --------------------
01425>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
01426>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
01427>                .08  47.628 |    .33  58.212 |    .58  52.920 |    .83  15.876
01428>                .17  74.088 |    .42  68.796 |    .67  26.460 |    .92   5.292
01429>                .25 111.132 |    .50  47.628 |    .75  21.168 |   1.00    .000
01430>
01431> --------------------------------------------------------------------------------------
01432> 005:0003--------------------------------------------------------------------------------
01433> *#*****************************************************************************
01434> *#
01435> *#                              AMC II Conditions
01436> *#
01437> *#*****************************************************************************
01438> ----------------------
01439> | DESIGN NASHYD      |   Area    (ha)=     .70   Curve Number   (CN)=81.00
01440> | 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01441> ----------------------   U.H. Tp(hrs)=    .200
01442>
01443>      Unit Hyd Qpeak  (cms)=     .134
01444>
01445>      PEAK FLOW       (cms)=     .052 (i)
01446>      TIME TO PEAK    (hrs)=     .650
01447>      RUNOFF VOLUME    (mm)=   17.760
01448>      TOTAL RAINFALL   (mm)=   44.100
01449>      RUNOFF COEFFICIENT   =     .403
01450>
01451>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01452>
01453> --------------------------------------------------------------------------------------
01454> 005:0004--------------------------------------------------------------------------------
01455> ----------------------
01456> | DESIGN STANDHYD    |   Area    (ha)=    2.20
01457> | 02:202    DT= 1.00 |   Total Imp(%)=   35.00   Dir. Conn.(%)=   20.00
01458> ----------------------
01459>                              IMPERVIOUS    PERVIOUS (i)
01460>      Surface Area     (ha)=        .77         1.43
```

```
01461>      Dep. Storage     (mm)=        .80         1.50
01462>      Average Slope     (%)=       1.50         1.50
01463>      Length            (m)=     121.11        40.00
01464>      Mannings n           =       .013         .250
01465>
01466>      Max.eff.Inten.(mm/hr)=     111.13        47.84
01467>                 over (min)        2.00        13.00
01468>      Storage Coeff.  (min)=       2.43 (ii)   12.77 (ii)
01469>      Unit Hyd. Tpeak (min)=       2.00        13.00
01470>      Unit Hyd. peak  (cms)=        .49          .09
01471>                                                          *TOTALS*
01472>      PEAK FLOW       (cms)=        .13          .15          .206 (iii)
01473>      TIME TO PEAK    (hrs)=        .25          .65          .583
01474>      RUNOFF VOLUME    (mm)=      43.30        20.85         25.342
01475>      TOTAL RAINFALL   (mm)=      44.10        44.10         44.100
01476>      RUNOFF COEFFICIENT   =        .98          .47          .575
01477>
01478>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01479>            CN* =  82.0    Ia = Dep. Storage  (Above)
01480>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01481>            THAN THE STORAGE COEFFICIENT.
01482>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01483>
01484> ------------------------------------------------------------------------------
01485> 005:0005---------------------------------------------------------------------
01486> ---------------------
01487> | ROUTE RESERVOIR   |    Requested routing time step =  2.0 min.
01488> |  IN>02:(202   )   |
01489> | OUT<03:(SWM   )   |    =========  OUTLFOW STORAGE TABLE  =========
01490> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
01491>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
01492>                             .000  .0000E+00   |     .010  .1016E+00
01493>                             .001  .7000E-03   |     .016  .1507E+00
01494>                             .002  .5200E-02   |     .020  .2017E+00
01495>                             .003  .2010E-01   |     .305  .2544E+00
01496>                             .003  .5430E-01   |    1.618  .3695E+00
01497>
01498>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
01499>      --------------------       (ha)     (cms)     (hrs)       (mm)
01500>      INFLOW >02: (202   )       2.20      .206      .583     25.342
01501>      OUTFLOW<03: (SWM   )       2.20      .003      .500     25.342
01502>     OVERFLOW<05: (OV-SWM)        .00      .000      .000       .000
01503>
01504>                     TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
01505>                     CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
01506>                     PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
01507>
01508>
01509>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.458
01510>                     TIME SHIFT OF PEAK FLOW         (min)=    -5.00
01511>                     MAXIMUM  STORAGE   USED       (ha.m.)=.5389E-01
01512>
01513> ------------------------------------------------------------------------------
01514> 005:0006---------------------------------------------------------------------
01515> ------------------------
01516> | ADD HYD (TO_MR     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
01517> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
01518>                       ID1 01:200            .70     .052     .65  17.76    .000
01519>                      +ID2 03:SWM           2.20     .003     .50  25.34    .000
01520>                       ============================================================
01521>                       SUM 04:TO_MR          2.90     .055     .65  23.51    .000
01522>
01523>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01524>
01525> ------------------------------------------------------------------------------
01526> 005:0007---------------------------------------------------------------------
01527> ----------------------
01528> | DESIGN NASHYD      |   Area    (ha)=     .16   Curve Number   (CN)=79.00
01529> | 01:210    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01530> ----------------------   U.H. Tp(hrs)=    .090
01531>
01532>      Unit Hyd Qpeak  (cms)=     .068
01533>
```

```
01534>      PEAK FLOW       (cms)=     .013 (i)
01535>      TIME TO PEAK    (hrs)=     .467
01536>      RUNOFF VOLUME    (mm)=   16.479
01537>      TOTAL RAINFALL   (mm)=   44.100
01538>      RUNOFF COEFFICIENT   =     .374
01539>
01540>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01541>
01542> ---------------------------------------------------------------------------------
01543> 005:0008-----------------------------------------------------------------------------
01544> ----------------------
01545> | DESIGN NASHYD      |   Area    (ha)=    1.46   Curve Number   (CN)=83.00
01546> | 01:220    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01547> ----------------------   U.H. Tp(hrs)=    .190
01548>
01549>      Unit Hyd Qpeak  (cms)=     .293
01550>
01551>      PEAK FLOW       (cms)=     .120 (i)
01552>      TIME TO PEAK    (hrs)=     .650
01553>      RUNOFF VOLUME    (mm)=   19.179
01554>      TOTAL RAINFALL   (mm)=   44.100
01555>      RUNOFF COEFFICIENT   =     .435
01556>
01557>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01558>
01559> ---------------------------------------------------------------------------------
01560> 005:0009-----------------------------------------------------------------------------
01561> ----------------------
01562> | DESIGN NASHYD      |   Area    (ha)=     .42   Curve Number   (CN)=78.00
01563> | 01:230    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01564> ----------------------   U.H. Tp(hrs)=    .090
01565>
01566>      Unit Hyd Qpeak  (cms)=     .178
01567>
01568>      PEAK FLOW       (cms)=     .032 (i)
01569>      TIME TO PEAK    (hrs)=     .467
01570>      RUNOFF VOLUME    (mm)=   15.885
01571>      TOTAL RAINFALL   (mm)=   44.100
01572>      RUNOFF COEFFICIENT   =     .360
01573>
01574>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01575>
01576> ---------------------------------------------------------------------------------
01577> 005:0010-----------------------------------------------------------------------------
01578> *#*****************************************************************************
01579> *#
01580> *#                              AMC III Conditions
01581> *#
01582> *#*****************************************************************************
01583> ----------------------
01584> | DESIGN NASHYD      |   Area    (ha)=     .70   Curve Number   (CN)=92.00
01585> | 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01586> ----------------------   U.H. Tp(hrs)=    .200
01587>
01588>      Unit Hyd Qpeak  (cms)=     .134
01589>
01590>      PEAK FLOW       (cms)=     .082 (i)
01591>      TIME TO PEAK    (hrs)=     .633
01592>      RUNOFF VOLUME    (mm)=   28.054
01593>      TOTAL RAINFALL   (mm)=   44.100
01594>      RUNOFF COEFFICIENT   =     .636
01595>
01596>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01597>
01598> ---------------------------------------------------------------------------------
01599> 005:0011-----------------------------------------------------------------------------
01600> ----------------------
01601> | DESIGN STANDHYD    |   Area    (ha)=    2.20
01602> | 02:202    DT= 1.00 |   Total Imp(%)=   35.00   Dir. Conn.(%)=   20.00
01603> ----------------------
01604>                              IMPERVIOUS    PERVIOUS (i)
01605>      Surface Area     (ha)=        .77         1.43
01606>      Dep. Storage     (mm)=        .80         1.50
```

```
01607>      Average Slope     (%)=       1.50         1.50
01608>      Length            (m)=     121.11        40.00
01609>      Mannings n           =       .013         .250
01610>
01611>      Max.eff.Inten.(mm/hr)=     111.13        73.29
01612>                 over (min)        2.00        11.00
01613>      Storage Coeff.  (min)=       2.43 (ii)   11.14 (ii)
01614>      Unit Hyd. Tpeak (min)=       2.00        11.00
01615>      Unit Hyd. peak  (cms)=        .49          .10
01616>                                                      *TOTALS*
01617>      PEAK FLOW       (cms)=        .13          .22          .283 (iii)
01618>      TIME TO PEAK    (hrs)=        .25          .58          .583
01619>      RUNOFF VOLUME    (mm)=      43.30        30.23        32.844
01620>      TOTAL RAINFALL   (mm)=      44.10        44.10        44.100
01621>      RUNOFF COEFFICIENT   =        .98          .69          .745
01622>
01623>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01624>            CN* =  92.0    Ia = Dep. Storage  (Above)
01625>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01626>            THAN THE STORAGE COEFFICIENT.
01627>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01628>
01629> ---------------------------------------------------------------------------------
01630> 005:0012-----------------------------------------------------------------------
01631> ----------------------
01632> | ROUTE RESERVOIR   |    Requested routing time step =  2.0 min.
01633> |  IN>02:(202   )   |
01634> | OUT<03:(SWM   )   |    =========  OUTLFOW STORAGE TABLE  =========
01635> ----------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
01636>                             (cms)    (ha.m.)   |    (cms)    (ha.m.)
01637>                              .000  .0000E+00   |     .010  .1016E+00
01638>                              .001  .7000E-03   |     .016  .1507E+00
01639>                              .002  .5200E-02   |     .020  .2017E+00
01640>                              .003  .2010E-01   |     .305  .2544E+00
01641>                              .003  .5430E-01   |    1.618  .3695E+00
01642>
01643>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
01644>      --------------------       (ha)     (cms)     (hrs)       (mm)
01645>      INFLOW >02: (202   )       2.20      .283      .583     32.844
01646>      OUTFLOW<03: (SWM   )       2.20      .005     1.533     32.844
01647>     OVERFLOW<05: (OV-SWM)        .00      .000      .000       .000
01648>
01649>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
01650>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
01651>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
01652>
01653>
01654>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.881
01655>                    TIME SHIFT OF PEAK FLOW         (min)=    57.00
01656>                    MAXIMUM  STORAGE   USED       (ha.m.)=.6997E-01
01657>
01658> ---------------------------------------------------------------------------------
01659> 005:0013-----------------------------------------------------------------------
01660> ------------------------
01661> | ADD HYD (TO_MR     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
01662> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
01663>                       ID1 01:200            .70     .082     .63  28.05    .000
01664>                      +ID2 03:SWM           2.20     .005    1.53  32.84    .000
01665>                       ============================================================
01666>                       SUM 04:TO_MR          2.90     .085     .63  31.69    .000
01667>
01668>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01669>
01670> ---------------------------------------------------------------------------------
01671> 005:0014-----------------------------------------------------------------------
01672> ----------------------
01673> | DESIGN NASHYD      |   Area    (ha)=     .16   Curve Number   (CN)=91.00
01674> | 01:210    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01675> ----------------------   U.H. Tp(hrs)=    .090
01676>
01677>      Unit Hyd Qpeak  (cms)=     .068
01678>
01679>      PEAK FLOW       (cms)=     .021 (i)
```

```
01680>      TIME TO PEAK    (hrs)=     .450
01681>      RUNOFF VOLUME    (mm)=   26.797
01682>      TOTAL RAINFALL   (mm)=   44.100
01683>      RUNOFF COEFFICIENT   =     .608
01684>
01685>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01686>
01687> ------------------------------------------------------------------------------
01688> 005:0015---------------------------------------------------------------------
01689> ----------------------
01690> | DESIGN NASHYD      |   Area    (ha)=    1.46   Curve Number   (CN)=93.00
01691> | 01:220    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01692> ----------------------   U.H. Tp(hrs)=    .190
01693>
01694>      Unit Hyd Qpeak  (cms)=     .293
01695>
01696>      PEAK FLOW       (cms)=     .182 (i)
01697>      TIME TO PEAK    (hrs)=     .617
01698>      RUNOFF VOLUME    (mm)=   29.404
01699>      TOTAL RAINFALL   (mm)=   44.100
01700>      RUNOFF COEFFICIENT   =     .667
01701>
01702>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01703>
01704> ------------------------------------------------------------------------------
01705> 005:0016---------------------------------------------------------------------
01706> ----------------------
01707> | DESIGN NASHYD      |   Area    (ha)=     .42   Curve Number   (CN)=90.00
01708> | 01:230    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01709> ----------------------   U.H. Tp(hrs)=    .090
01710>
01711>      Unit Hyd Qpeak  (cms)=     .178
01712>
01713>      PEAK FLOW       (cms)=     .053 (i)
01714>      TIME TO PEAK    (hrs)=     .450
01715>      RUNOFF VOLUME    (mm)=   25.624
01716>      TOTAL RAINFALL   (mm)=   44.100
01717>      RUNOFF COEFFICIENT   =     .581
01718>
01719>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01720>
01721> ------------------------------------------------------------------------------
01722> 005:0017---------------------------------------------------------------------
01723> ------------------------------------------------------------------------------
01724> 005:0002---------------------------------------------------------------------
01725> ------------------------------------------------------------------------------
01726> 005:0002---------------------------------------------------------------------
01727> ------------------------------------------------------------------------------
01728> 005:0002---------------------------------------------------------------------
01729> ------------------------------------------------------------------------------
01730> 005:0002---------------------------------------------------------------------
01731>   ** END OF RUN :   5
01732>
01733> ******************************************************************************
01734>
01735>
01736>
01737>
01738>
01739> --------------------
01740> | START            |  Project  dir.: C:\usr\_LOY\
01741> --------------------  Rainfall dir.: C:\usr\_LOY\
01742>     TZERO =   .00 hrs on        0
01743>     METOUT=   2 (output = METRIC)
01744>     NRUN  = 006
01745>     NSTORM=   1
01746>            #  1=LYA100.12h
01747> ------------------------------------------------------------------------------
01748> 006:0002---------------------------------------------------------------------
01749> *#**************************************************************************
01750> *#  Project Name: [Loyalist Solar]    Project Number: [133560220]
01751> *#  Date        : 11-19-2017
01752> *#  Modeller    : [D. Williams]
```

```
*#  Company     : Stantec Consulting Ltd. (Kitchener)
*#  License #   :  4730904
*#*****************************************************************************
*#*****************************************************************************
*#
*#                     SUBSTATION - PROPOSED CONDITIONS
*#
*#*****************************************************************************
------------------------------------------------------------------------------
006:0002--------------------------------------------------------------------------
--------------------
| READ STORM       |    Filename: Belleville IDF (12-hr 30% AES - 100 Year
| Ptotal=  93.70 mm|    Comments: Belleville IDF (12-hr 30% AES - 100 Year
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              1.00   8.784 |   4.00  14.640 |   7.00   2.928 |  10.00    .000
              2.00  25.376 |   5.00  13.664 |   8.00    .976 |  11.00    .000
              3.00  19.520 |   6.00   7.808 |   9.00    .000 |  12.00    .000

------------------------------------------------------------------------------
006:0003--------------------------------------------------------------------------
*#*****************************************************************************
*#
*#                              AMC II Conditions
*#
*#*****************************************************************************
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .70   Curve Number   (CN)=81.00
| 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .134

     PEAK FLOW       (cms)=     .026 (i)
     TIME TO PEAK    (hrs)=    3.033
     RUNOFF VOLUME    (mm)=   56.004
     TOTAL RAINFALL   (mm)=   93.696
     RUNOFF COEFFICIENT   =     .598

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
006:0004--------------------------------------------------------------------------
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    2.20
| 02:202    DT= 1.00 |   Total Imp(%)=   35.00   Dir. Conn.(%)=   20.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .77          1.43
     Dep. Storage     (mm)=        .80          1.50
     Average Slope     (%)=       1.50          1.50
     Length            (m)=     121.11         40.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=      25.38         19.56
                over (min)        4.00         19.00
     Storage Coeff.  (min)=       4.39 (ii)    19.17 (ii)
     Unit Hyd. Tpeak (min)=       4.00         19.00
     Unit Hyd. peak  (cms)=        .27           .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .03           .07          .095 (iii)
     TIME TO PEAK    (hrs)=       1.92          3.07         3.000
     RUNOFF VOLUME    (mm)=      92.89         62.06        68.236
     TOTAL RAINFALL   (mm)=      93.70         93.70        93.696
     RUNOFF COEFFICIENT   =        .99           .66          .728

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  82.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
01826> ------------------------------------------------------------------------------
01827> 006:0005------------------------------------------------------------------------
01828> ---------------------
01829> | ROUTE RESERVOIR   |    Requested routing time step =  2.0 min.
01830> |  IN>02:(202   )   |
01831> | OUT<03:(SWM   )   |    =========  OUTLFOW STORAGE TABLE  =========
01832> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
01833>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
01834>                             .000  .0000E+00   |     .010  .1016E+00
01835>                             .001  .7000E-03   |     .016  .1507E+00
01836>                             .002  .5200E-02   |     .020  .2017E+00
01837>                             .003  .2010E-01   |     .305  .2544E+00
01838>                             .003  .5430E-01   |    1.618  .3695E+00
01839>
01840>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
01841>      --------------------       (ha)     (cms)     (hrs)       (mm)
01842>      INFLOW >02: (202   )       2.20      .095     3.000     68.236
01843>      OUTFLOW<03: (SWM   )       2.20      .013     7.233     68.239
01844>     OVERFLOW<05: (OV-SWM)        .00      .000      .000       .000
01845>
01846>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
01847>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
01848>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
01849>
01850>
01851>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   14.123
01852>                    TIME SHIFT OF PEAK FLOW         (min)=   254.00
01853>                    MAXIMUM  STORAGE   USED       (ha.m.)=.1292E+00
01854>
01855> ------------------------------------------------------------------------------
01856> 006:0006------------------------------------------------------------------------
01857> ------------------------
01858> | ADD HYD (TO_MR     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
01859> ------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
01860>                       ID1 01:200            .70     .026    3.03  56.00    .000
01861>                      +ID2 03:SWM           2.20     .013    7.23  68.24    .000
01862>                       ========================================================
01863>                       SUM 04:TO_MR          2.90     .032    5.03  65.29    .000
01864>
01865>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01866>
01867> ------------------------------------------------------------------------------
01868> 006:0007------------------------------------------------------------------------
01869> ----------------------
01870> | DESIGN NASHYD      |   Area    (ha)=     .16   Curve Number   (CN)=79.00
01871> | 01:210    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01872> ----------------------   U.H. Tp(hrs)=    .090
01873>
01874>      Unit Hyd Qpeak  (cms)=     .068
01875>
01876>      PEAK FLOW       (cms)=     .006 (i)
01877>      TIME TO PEAK    (hrs)=    2.017
01878>      RUNOFF VOLUME    (mm)=   53.221
01879>      TOTAL RAINFALL   (mm)=   93.696
01880>      RUNOFF COEFFICIENT   =     .568
01881>
01882>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01883>
01884> ------------------------------------------------------------------------------
01885> 006:0008------------------------------------------------------------------------
01886> ----------------------
01887> | DESIGN NASHYD      |   Area    (ha)=    1.46   Curve Number   (CN)=83.00
01888> | 01:220    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01889> ----------------------   U.H. Tp(hrs)=    .190
01890>
01891>      Unit Hyd Qpeak  (cms)=     .293
01892>
01893>      PEAK FLOW       (cms)=     .058 (i)
01894>      TIME TO PEAK    (hrs)=    2.083
01895>      RUNOFF VOLUME    (mm)=   58.939
01896>      TOTAL RAINFALL   (mm)=   93.696
01897>      RUNOFF COEFFICIENT   =     .629
01898>
```

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01899>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01900>
01901> ---------------------------------------------------------------------------------
01902> 006:0009-----------------------------------------------------------------------------
01903> ----------------------
01904> | DESIGN NASHYD      |   Area    (ha)=     .42   Curve Number   (CN)=78.00
01905> | 01:230    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01906> ----------------------   U.H. Tp(hrs)=    .090
01907>
01908>      Unit Hyd Qpeak  (cms)=     .178
01909>
01910>      PEAK FLOW       (cms)=     .015 (i)
01911>      TIME TO PEAK    (hrs)=    3.000
01912>      RUNOFF VOLUME    (mm)=   51.882
01913>      TOTAL RAINFALL   (mm)=   93.696
01914>      RUNOFF COEFFICIENT   =     .554
01915>
01916>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01917>
01918> ---------------------------------------------------------------------------------
01919> 006:0010-----------------------------------------------------------------------------
01920> *#*****************************************************************************
01921> *#
01922> *#                              AMC III Conditions
01923> *#
01924> *#*****************************************************************************
01925> ----------------------
01926> | DESIGN NASHYD      |   Area    (ha)=     .70   Curve Number   (CN)=92.00
01927> | 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01928> ----------------------   U.H. Tp(hrs)=    .200
01929>
01930>      Unit Hyd Qpeak  (cms)=     .134
01931>
01932>      PEAK FLOW       (cms)=     .039 (i)
01933>      TIME TO PEAK    (hrs)=    2.067
01934>      RUNOFF VOLUME    (mm)=   74.378
01935>      TOTAL RAINFALL   (mm)=   93.696
01936>      RUNOFF COEFFICIENT   =     .794
01937>
01938>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01939>
01940> ---------------------------------------------------------------------------------
01941> 006:0011-----------------------------------------------------------------------------
01942> ----------------------
01943> | DESIGN STANDHYD    |   Area    (ha)=    2.20
01944> | 02:202    DT= 1.00 |   Total Imp(%)=   35.00   Dir. Conn.(%)=   20.00
01945> ----------------------
01946>                              IMPERVIOUS    PERVIOUS (i)
01947>      Surface Area     (ha)=        .77          1.43
01948>      Dep. Storage     (mm)=        .80          1.50
01949>      Average Slope     (%)=       1.50          1.50
01950>      Length            (m)=     121.11         40.00
01951>      Mannings n             =       .013          .250
01952>
01953>      Max.eff.Inten.(mm/hr)=      25.38         26.71
01954>                 over (min)        4.00         17.00
01955>      Storage Coeff.  (min)=       4.39 (ii)    17.44 (ii)
01956>      Unit Hyd. Tpeak (min)=       4.00         17.00
01957>      Unit Hyd. peak  (cms)=        .27           .07
01958>                                                          *TOTALS*
01959>      PEAK FLOW       (cms)=        .03           .10          .125 (iii)
01960>      TIME TO PEAK    (hrs)=       1.92          2.15         2.017
01961>      RUNOFF VOLUME    (mm)=      92.89         77.44        80.538
01962>      TOTAL RAINFALL   (mm)=      93.70         93.70        93.696
01963>      RUNOFF COEFFICIENT   =        .99           .83          .860
01964>
01965>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01966>            CN* =  92.0    Ia = Dep. Storage  (Above)
01967>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01968>            THAN THE STORAGE COEFFICIENT.
01969>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01970>
01971> ---------------------------------------------------------------------------------
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01972> 006:0012-------------------------------------------------------------------------------
01973> ---------------------
01974> | ROUTE RESERVOIR   |    Requested routing time step =  2.0 min.
01975> |  IN>02:(202   )   |
01976> | OUT<03:(SWM   )   |    =========  OUTLFOW STORAGE TABLE  =========
01977> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
01978>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
01979>                             .000  .0000E+00   |     .010  .1016E+00
01980>                             .001  .7000E-03   |     .016  .1507E+00
01981>                             .002  .5200E-02   |     .020  .2017E+00
01982>                             .003  .2010E-01   |     .305  .2544E+00
01983>                             .003  .5430E-01   |    1.618  .3695E+00
01984>
01985>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
01986>      --------------------       (ha)     (cms)     (hrs)       (mm)
01987>      INFLOW >02: (202   )       2.20      .125     2.017     80.538
01988>      OUTFLOW<03: (SWM   )       2.20      .016     7.117     80.540
01989>     OVERFLOW<05: (OV-SWM)        .00      .000      .000       .000
01990>
01991>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
01992>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
01993>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
01994>
01995>
01996>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   12.808
01997>                    TIME SHIFT OF PEAK FLOW         (min)=   306.00
01998>                    MAXIMUM  STORAGE   USED       (ha.m.)=.1516E+00
01999>
02000> -------------------------------------------------------------------------------------
02001> 006:0013-------------------------------------------------------------------------------
02002> ------------------------
02003> | ADD HYD (TO_MR     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
02004> ------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
02005>                       ID1 01:200            .70     .039    2.07  74.38    .000
02006>                      +ID2 03:SWM           2.20     .016    7.12  80.54    .000
02007>                       ========================================================
02008>                       SUM 04:TO_MR          2.90     .042    2.07  79.05    .000
02009>
02010>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02011>
02012> -------------------------------------------------------------------------------------
02013> 006:0014-------------------------------------------------------------------------------
02014> ----------------------
02015> | DESIGN NASHYD      |   Area    (ha)=     .16   Curve Number   (CN)=91.00
02016> | 01:210    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
02017> ----------------------   U.H. Tp(hrs)=    .090
02018>
02019>      Unit Hyd Qpeak  (cms)=     .068
02020>
02021>      PEAK FLOW       (cms)=     .009 (i)
02022>      TIME TO PEAK    (hrs)=    2.000
02023>      RUNOFF VOLUME    (mm)=   72.454
02024>      TOTAL RAINFALL   (mm)=   93.696
02025>      RUNOFF COEFFICIENT   =     .773
02026>
02027>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02028>
02029> -------------------------------------------------------------------------------------
02030> 006:0015-------------------------------------------------------------------------------
02031> ----------------------
02032> | DESIGN NASHYD      |   Area    (ha)=    1.46   Curve Number   (CN)=93.00
02033> | 01:220    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
02034> ----------------------   U.H. Tp(hrs)=    .190
02035>
02036>      Unit Hyd Qpeak  (cms)=     .293
02037>
02038>      PEAK FLOW       (cms)=     .084 (i)
02039>      TIME TO PEAK    (hrs)=    2.050
02040>      RUNOFF VOLUME    (mm)=   76.361
02041>      TOTAL RAINFALL   (mm)=   93.696
02042>      RUNOFF COEFFICIENT   =     .815
02043>
02044>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

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02045>
02046> ---------------------------------------------------------------------------------
02047> 006:0016-----------------------------------------------------------------------
02048> ----------------------
02049> | DESIGN NASHYD      |   Area    (ha)=     .42   Curve Number   (CN)=90.00
02050> | 01:230    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
02051> ----------------------   U.H. Tp(hrs)=    .090
02052>
02053>      Unit Hyd Qpeak  (cms)=     .178
02054>
02055>      PEAK FLOW       (cms)=     .022 (i)
02056>      TIME TO PEAK    (hrs)=    2.017
02057>      RUNOFF VOLUME    (mm)=   70.588
02058>      TOTAL RAINFALL   (mm)=   93.696
02059>      RUNOFF COEFFICIENT   =     .753
02060>
02061>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02062>
02063> ---------------------------------------------------------------------------------
02064> 006:0017-----------------------------------------------------------------------
02065> ---------------------------------------------------------------------------------
02066> 006:0002-----------------------------------------------------------------------
02067> ---------------------------------------------------------------------------------
02068> 006:0002-----------------------------------------------------------------------
02069> ---------------------------------------------------------------------------------
02070> 006:0002-----------------------------------------------------------------------
02071> ---------------------------------------------------------------------------------
02072> 006:0002-----------------------------------------------------------------------
02073> ---------------------------------------------------------------------------------
02074> 006:0002-----------------------------------------------------------------------
02075>   ** END OF RUN :   6
02076>
02077> ***************************************************************************
02078>
02079>
02080>
02081>
02082>
02083> --------------------
02084> | START            |  Project  dir.: C:\usr\_LOY\
02085> --------------------  Rainfall dir.: C:\usr\_LOY\
02086>     TZERO =   .00 hrs on        0
02087>     METOUT=   2 (output = METRIC)
02088>     NRUN  = 007
02089>     NSTORM=   1
02090>            #  1=25mm.4hr
02091> ---------------------------------------------------------------------------------
02092> 007:0002-----------------------------------------------------------------------
02093> *#*************************************************************************
02094> *#  Project Name: [Loyalist Solar]    Project Number: [133560220]
02095> *#  Date        : 11-19-2017
02096> *#  Modeller    : [D. Williams]
02097> *#  Company     : Stantec Consulting Ltd. (Kitchener)
02098> *#  License #   :  4730904
02099> *#*************************************************************************
02100> *#*************************************************************************
02101> *#
02102> *#                     SUBSTATION - PROPOSED CONDITIONS
02103> *#
02104> *#*************************************************************************
02105> ---------------------------------------------------------------------------------
02106> 007:0002-----------------------------------------------------------------------
02107> --------------------
02108> | READ STORM       |    Filename: 25 mm, 4hr Chicago Storm
02109> | Ptotal=  25.00 mm|    Comments: 25 mm, 4hr Chicago Storm
02110> --------------------
02111>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
02112>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
02113>                .08   1.465 |   1.08   4.024 |   2.08   5.764 |   3.08   2.074
02114>                .17   1.540 |   1.17   4.814 |   2.17   4.969 |   3.17   1.977
02115>                .25   1.625 |   1.25   6.025 |   2.25   4.374 |   3.25   1.889
02116>                .33   1.720 |   1.33   8.114 |   2.33   3.913 |   3.33   1.810
02117>                .42   1.829 |   1.42  12.526 |   2.42   3.545 |   3.42   1.737
```

```
02118>                .50   1.955 |   1.50  27.198 |   2.50   3.245 |   3.50   1.671
02119>                .58   2.101 |   1.58  74.855 |   2.58   2.994 |   3.58   1.610
02120>                .67   2.274 |   1.67  31.410 |   2.67   2.782 |   3.67   1.553
02121>                .75   2.482 |   1.75  16.819 |   2.75   2.601 |   3.75   1.501
02122>                .83   2.736 |   1.83  11.357 |   2.83   2.443 |   3.83   1.453
02123>                .92   3.055 |   1.92   8.563 |   2.92   2.305 |   3.92   1.408
02124>               1.00   3.468 |   2.00   6.882 |   3.00   2.183 |   4.00   1.366
02125>
02126> ---------------------------------------------------------------------------------
02127> 007:0003-----------------------------------------------------------------------------
02128> *#*****************************************************************************
02129> *#
02130> *#                              AMC II Conditions
02131> *#
02132> *#*****************************************************************************
02133> ----------------------
02134> | DESIGN NASHYD      |   Area    (ha)=     .70   Curve Number   (CN)=81.00
02135> | 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
02136> ----------------------   U.H. Tp(hrs)=    .200
02137>
02138>      Unit Hyd Qpeak  (cms)=     .134
02139>
02140>      PEAK FLOW       (cms)=     .015 (i)
02141>      TIME TO PEAK    (hrs)=    1.817
02142>      RUNOFF VOLUME    (mm)=    6.647
02143>      TOTAL RAINFALL   (mm)=   25.000
02144>      RUNOFF COEFFICIENT   =     .266
02145>
02146>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02147>
02148> ---------------------------------------------------------------------------------
02149> 007:0004-----------------------------------------------------------------------------
02150> ----------------------
02151> | DESIGN STANDHYD    |   Area    (ha)=    2.20
02152> | 02:202    DT= 1.00 |   Total Imp(%)=   35.00   Dir. Conn.(%)=   20.00
02153> ----------------------
02154>                             IMPERVIOUS    PERVIOUS (i)
02155>      Surface Area     (ha)=        .77         1.43
02156>      Dep. Storage     (mm)=        .80         1.50
02157>      Average Slope     (%)=       1.50         1.50
02158>      Length            (m)=     121.11        40.00
02159>      Mannings n             =       .013         .250
02160>
02161>      Max.eff.Inten.(mm/hr)=      74.85        15.57
02162>                  over (min)        3.00        19.00
02163>      Storage Coeff.  (min)=       2.85 (ii)   19.04 (ii)
02164>      Unit Hyd. Tpeak (min)=       3.00        19.00
02165>      Unit Hyd. peak  (cms)=        .39          .06
02166>                                                          *TOTALS*
02167>      PEAK FLOW       (cms)=        .08          .04          .084 (iii)
02168>      TIME TO PEAK    (hrs)=       1.60         1.92         1.600
02169>      RUNOFF VOLUME    (mm)=      24.20         8.19        11.389
02170>      TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
02171>      RUNOFF COEFFICIENT   =        .97          .33          .456
02172>
02173>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02174>            CN* =  82.0    Ia = Dep. Storage  (Above)
02175>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02176>            THAN THE STORAGE COEFFICIENT.
02177>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02178>
02179> ---------------------------------------------------------------------------------
02180> 007:0005-----------------------------------------------------------------------------
02181> --------------------
02182> | ROUTE RESERVOIR   |    Requested routing time step =  2.0 min.
02183> |  IN>02:(202   )   |
02184> | OUT<03:(SWM   )   |    =========  OUTLFOW STORAGE TABLE  =========
02185> --------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
02186>                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
02187>                            .000  .0000E+00   |     .010  .1016E+00
02188>                            .001  .7000E-03   |     .016  .1507E+00
02189>                            .002  .5200E-02   |     .020  .2017E+00
02190>                            .003  .2010E-01   |     .305  .2544E+00
```

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02191>                              .003  .5430E-01   |    1.618  .3695E+00
02192>
02193>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
02194>      -------------------        (ha)     (cms)     (hrs)       (mm)
02195>      INFLOW >02: (202   )       2.20      .084     1.600     11.389
02196>      OUTFLOW<03: (SWM   )       2.20      .003     3.183     11.389
02197>     OVERFLOW<05: (OV-SWM)        .00      .000      .000       .000
02198>
02199>                     TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
02200>                     CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
02201>                     PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
02202>
02203>
02204>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=    3.560
02205>                     TIME SHIFT OF PEAK FLOW         (min)=    95.00
02206>                     MAXIMUM  STORAGE   USED       (ha.m.)=.2171E-01
02207>
02208> ------------------------------------------------------------------------------
02209> 007:0006--------------------------------------------------------------------------
02210> ------------------------
02211> | ADD HYD (TO_MR     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
02212> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
02213>                       ID1 01:200            .70     .015    1.82   6.65    .000
02214>                      +ID2 03:SWM           2.20     .003    3.18  11.39    .000
02215>                       ============================================================
02216>                       SUM 04:TO_MR          2.90     .018    1.82  10.24    .000
02217>
02218>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02219>
02220> ------------------------------------------------------------------------------
02221> 007:0007--------------------------------------------------------------------------
02222> ----------------------
02223> | DESIGN NASHYD      |   Area    (ha)=     .16   Curve Number   (CN)=79.00
02224> | 01:210    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
02225> ----------------------   U.H. Tp(hrs)=    .090
02226>
02227>      Unit Hyd Qpeak  (cms)=     .068
02228>
02229>      PEAK FLOW       (cms)=     .005 (i)
02230>      TIME TO PEAK    (hrs)=    1.683
02231>      RUNOFF VOLUME    (mm)=    6.066
02232>      TOTAL RAINFALL   (mm)=   25.000
02233>      RUNOFF COEFFICIENT   =     .243
02234>
02235>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02236>
02237> ------------------------------------------------------------------------------
02238> 007:0008--------------------------------------------------------------------------
02239> ----------------------
02240> | DESIGN NASHYD      |   Area    (ha)=    1.46   Curve Number   (CN)=83.00
02241> | 01:220    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
02242> ----------------------   U.H. Tp(hrs)=    .190
02243>
02244>      Unit Hyd Qpeak  (cms)=     .293
02245>
02246>      PEAK FLOW       (cms)=     .037 (i)
02247>      TIME TO PEAK    (hrs)=    1.800
02248>      RUNOFF VOLUME    (mm)=    7.312
02249>      TOTAL RAINFALL   (mm)=   25.000
02250>      RUNOFF COEFFICIENT   =     .292
02251>
02252>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02253>
02254> ------------------------------------------------------------------------------
02255> 007:0009--------------------------------------------------------------------------
02256> ----------------------
02257> | DESIGN NASHYD      |   Area    (ha)=     .42   Curve Number   (CN)=78.00
02258> | 01:230    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
02259> ----------------------   U.H. Tp(hrs)=    .090
02260>
02261>      Unit Hyd Qpeak  (cms)=     .178
02262>
02263>      PEAK FLOW       (cms)=     .012 (i)
```

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02264>      TIME TO PEAK    (hrs)=    1.683
02265>      RUNOFF VOLUME    (mm)=    5.804
02266>      TOTAL RAINFALL   (mm)=   25.000
02267>      RUNOFF COEFFICIENT   =     .232
02268>
02269>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02270>
02271> ------------------------------------------------------------------------------
02272> 007:0010----------------------------------------------------------------------
02273> *#*****************************************************************************
02274> *#
02275> *#                              AMC III Conditions
02276> *#
02277> *#*****************************************************************************
02278> ----------------------
02279> | DESIGN NASHYD      |   Area    (ha)=     .70   Curve Number   (CN)=92.00
02280> | 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
02281> ----------------------   U.H. Tp(hrs)=    .200
02282>
02283>      Unit Hyd Qpeak  (cms)=     .134
02284>
02285>      PEAK FLOW       (cms)=     .030 (i)
02286>      TIME TO PEAK    (hrs)=    1.800
02287>      RUNOFF VOLUME    (mm)=   12.114
02288>      TOTAL RAINFALL   (mm)=   25.000
02289>      RUNOFF COEFFICIENT   =     .485
02290>
02291>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02292>
02293> ------------------------------------------------------------------------------
02294> 007:0011----------------------------------------------------------------------
02295> ----------------------
02296> | DESIGN STANDHYD    |   Area    (ha)=    2.20
02297> | 02:202    DT= 1.00 |   Total Imp(%)=   35.00   Dir. Conn.(%)=   20.00
02298> ----------------------
02299>                              IMPERVIOUS    PERVIOUS (i)
02300>      Surface Area     (ha)=        .77         1.43
02301>      Dep. Storage     (mm)=        .80         1.50
02302>      Average Slope     (%)=       1.50         1.50
02303>      Length            (m)=     121.11        40.00
02304>      Mannings n             =       .013         .250
02305>
02306>      Max.eff.Inten.(mm/hr)=      74.85        30.91
02307>                 over (min)        3.00        15.00
02308>      Storage Coeff.  (min)=       2.85 (ii)   15.15 (ii)
02309>      Unit Hyd. Tpeak (min)=       3.00        15.00
02310>      Unit Hyd. peak  (cms)=        .39          .07
02311>                                                          *TOTALS*
02312>      PEAK FLOW       (cms)=        .08          .08          .101 (iii)
02313>      TIME TO PEAK    (hrs)=       1.60         1.82         1.600
02314>      RUNOFF VOLUME    (mm)=      24.20        13.55        15.683
02315>      TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
02316>      RUNOFF COEFFICIENT   =        .97          .54          .627
02317>
02318>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02319>            CN* =  92.0    Ia = Dep. Storage  (Above)
02320>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02321>            THAN THE STORAGE COEFFICIENT.
02322>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02323>
02324> ------------------------------------------------------------------------------
02325> 007:0012----------------------------------------------------------------------
02326> ----------------------
02327> | ROUTE RESERVOIR    |    Requested routing time step =  2.0 min.
02328> |  IN>02:(202    )   |
02329> | OUT<03:(SWM    )   |    =========  OUTLFOW STORAGE TABLE  =========
02330> ----------------------    OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
02331>                             (cms)    (ha.m.)    |    (cms)    (ha.m.)
02332>                              .000  .0000E+00     |     .010  .1016E+00
02333>                              .001  .7000E-03     |     .016  .1507E+00
02334>                              .002  .5200E-02     |     .020  .2017E+00
02335>                              .003  .2010E-01     |     .305  .2544E+00
02336>                              .003  .5430E-01     |    1.618  .3695E+00
```

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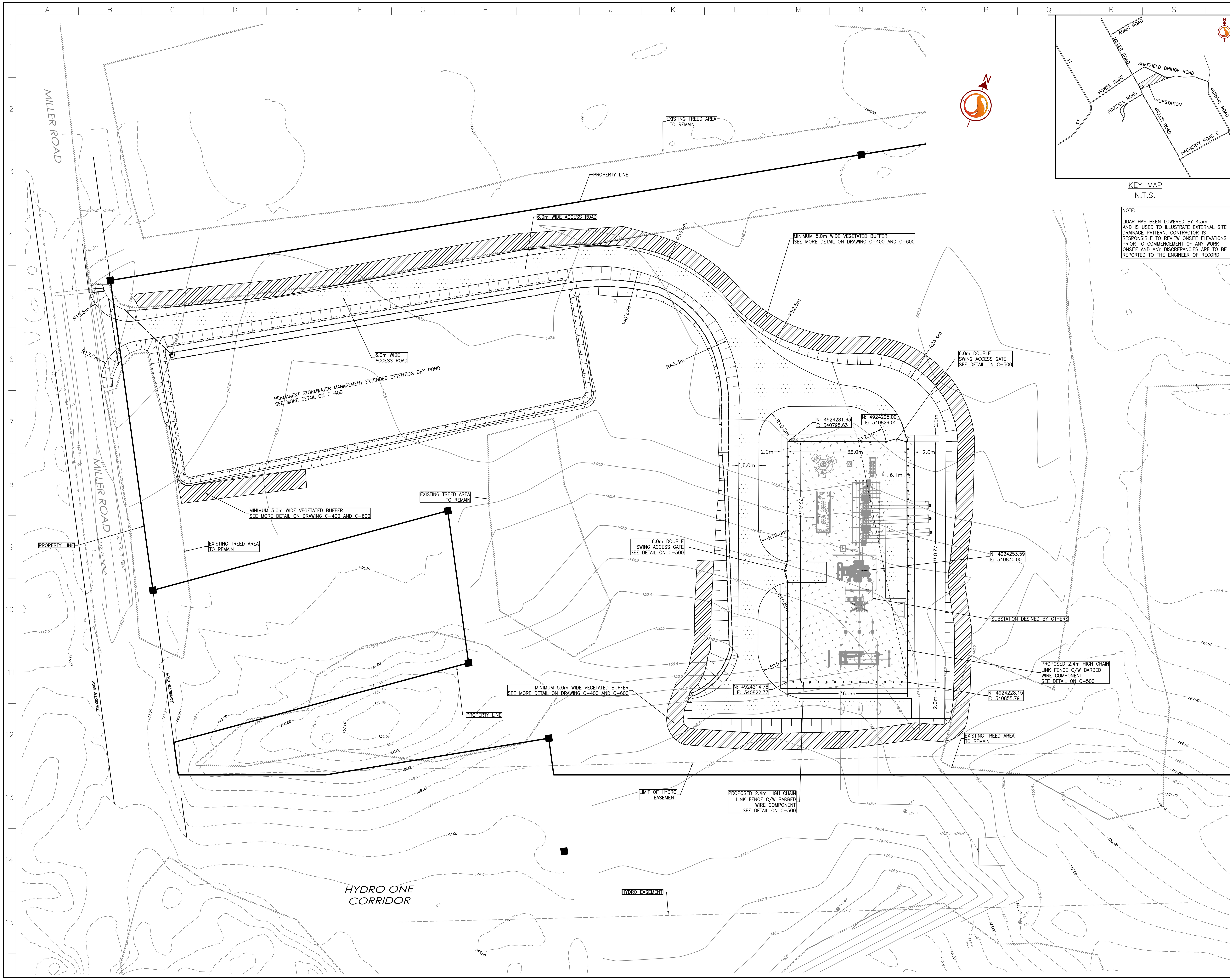
02337>
02338>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
02339>      -------------------        (ha)     (cms)     (hrs)       (mm)
02340>      INFLOW >02: (202   )       2.20      .101     1.600     15.683
02341>      OUTFLOW<03: (SWM   )       2.20      .003     2.133     15.683
02342>     OVERFLOW<05: (OV-SWM)        .00      .000      .000       .000
02343>
02344>                     TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
02345>                     CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
02346>                     PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
02347>
02348>
02349>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=    2.973
02350>                     TIME SHIFT OF PEAK FLOW         (min)=    32.00
02351>                     MAXIMUM  STORAGE   USED       (ha.m.)=.3109E-01
02352>
02353> ------------------------------------------------------------------------------
02354> 007:0013----------------------------------------------------------------------
02355> ------------------------
02356> | ADD HYD (TO_MR     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
02357> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
02358>                       ID1 01:200            .70      .030    1.80  12.11    .000
02359>                      +ID2 03:SWM           2.20      .003    2.13  15.68    .000
02360>                       ============================================================
02361>                       SUM 04:TO_MR         2.90      .032    1.82  14.82    .000
02362>
02363>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02364>
02365> ------------------------------------------------------------------------------
02366> 007:0014----------------------------------------------------------------------
02367> ----------------------
02368> | DESIGN NASHYD      |   Area    (ha)=     .16   Curve Number   (CN)=91.00
02369> | 01:210    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
02370> ----------------------   U.H. Tp(hrs)=    .090
02371>
02372>      Unit Hyd Qpeak  (cms)=     .068
02373>
02374>      PEAK FLOW       (cms)=     .010 (i)
02375>      TIME TO PEAK    (hrs)=    1.667
02376>      RUNOFF VOLUME    (mm)=   11.357
02377>      TOTAL RAINFALL   (mm)=   25.000
02378>      RUNOFF COEFFICIENT   =     .454
02379>
02380>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02381>
02382> ------------------------------------------------------------------------------
02383> 007:0015----------------------------------------------------------------------
02384> ----------------------
02385> | DESIGN NASHYD      |   Area    (ha)=    1.46   Curve Number   (CN)=93.00
02386> | 01:220    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
02387> ----------------------   U.H. Tp(hrs)=    .190
02388>
02389>      Unit Hyd Qpeak  (cms)=     .293
02390>
02391>      PEAK FLOW       (cms)=     .070 (i)
02392>      TIME TO PEAK    (hrs)=    1.783
02393>      RUNOFF VOLUME    (mm)=   12.958
02394>      TOTAL RAINFALL   (mm)=   25.000
02395>      RUNOFF COEFFICIENT   =     .518
02396>
02397>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02398>
02399> ------------------------------------------------------------------------------
02400> 007:0016----------------------------------------------------------------------
02401> ----------------------
02402> | DESIGN NASHYD      |   Area    (ha)=     .42   Curve Number   (CN)=90.00
02403> | 01:230    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
02404> ----------------------   U.H. Tp(hrs)=    .090
02405>
02406>      Unit Hyd Qpeak  (cms)=     .178
02407>
02408>      PEAK FLOW       (cms)=     .024 (i)
02409>      TIME TO PEAK    (hrs)=    1.667
```

```
02410>      RUNOFF VOLUME    (mm)=   10.677
02411>      TOTAL RAINFALL   (mm)=   25.000
02412>      RUNOFF COEFFICIENT   =     .427
02413>
02414>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02415>
02416> ---------------------------------------------------------------------------------
02417> 007:0017---------------------------------------------------------------------------
02418> ---------------------------------------------------------------------------------
02419> 007:0002---------------------------------------------------------------------------
02420> ---------------------------------------------------------------------------------
02421> 007:0002---------------------------------------------------------------------------
02422> ---------------------------------------------------------------------------------
02423> 007:0002---------------------------------------------------------------------------
02424> ---------------------------------------------------------------------------------
02425> 007:0002---------------------------------------------------------------------------
02426> ---------------------------------------------------------------------------------
02427> 007:0002---------------------------------------------------------------------------
02428> ---------------------------------------------------------------------------------
02429> 007:0002---------------------------------------------------------------------------
02430>       FINISH
02431> ---------------------------------------------------------------------------------
02432> *********************************************************************************
02433>      WARNINGS / ERRORS / NOTES
02434>      -------------------------
02435>    Simulation ended on 2017-11-21     at 15:59:01
02436> =================================================================================
02437>
02438>
```

DRAWINGS

Drawing C-400 – Substation Grading Plan
Drawing C-500 – General Detail
Drawing C-600 – Substation Sediment and Erosion Control Plan
Drawing C-650 – Sediment and Erosion Control Details



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PCL
CONSTRUCTION LEADERS

Notes

1. TOPOGRAPHICAL INFORMATION PROVIDED BY LESLIE M. HIGGINSON SURVEYING LTD, RECEIVED ON OCTOBER 6TH, 2017. TOPOGRAPHICAL SURVEY IS IN UTM NAD83 (ZONE 18) CSRS (1997) GROUND COORDINATES LIDAR INFORMATION CONDUCTED BY TULLOCH ENGINEERING ON JUNE 27, 2016. LIDAR SURVEY IS UTM 18. CONTRACTOR IS RESPONSIBLE TO REVIEW ONSITE ELEVATIONS PRIOR TO START OF WORK AND ANY DISCREPANCIES REPORTED TO THE ENGINEER OF RECORD.
2. LEGAL PLAN OF SURVEY BY CALLON DIETZ INC. MARCH 6, 2017. EPTCON, (REV. A) SEPTEMBER 20, 2017.
3. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS IN THIS SET PREPARED BY STANTEC CONSULTING LTD.
4. 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.
5. 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).
6. IF, FOR UNFORESEEN REASONS, THE OWNER AND/OR HIS/HER REPRESENTATIVE MUST ENCROACH ONTO PRIVATE LANDS TO UNDERTAKE ANY WORKS, HE/SHE MUST OBTAIN WRITTEN PERMISSION FROM THE ADJACENT PROPERTY OWNERS PRIOR TO ENTERING UPON THE PRIVATE PROPERTY TO PERFORM ANY WORKS. COPIES OF THESE LETTERS OF CONSENT MUST BE SUBMITTED TO STANTEC, PRIOR TO ANY WORK BEING PERFORMED. FAILURE TO COMPLY WITH THE ABOVE IS AT THE PROPERTY OWNERS OWN RISK.
7. THE CONTRACTOR IS RESPONSIBLE FOR RESTORATION OF ALL DAMAGED AND/OR DISTURBED PROPERTY WITHIN THE MUNICIPAL RIGHT-OF-WAY.
8. 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 EVERYWHERE PRIOR TO THE INSTALLATION OF SOLAR PANELS.
9. CONSTRUCTION TURNING RADIUS LIMITS IDENTIFY AREAS WHERE ADDITIONAL ROAD WIDTH IS REQUIRED TO ALLOW FOR ADEQUATE CLEARANCE FOR CONSTRUCTION VEHICLES.
10. CULVERTS ARE TO BE INSTALLED AS PER OPSD 802.010. SOIL TYPE TO BE CONFIRMED ON SITE FOR DETERMINATION OF TRENCH WIDTH.
11. ALL AREAS WITHIN THE PROPOSED WORKS ARE TO BE RE-VEGETATED USING NATIVE TOPSOIL AND SEED. MIX AND APPLICATION RATE/METHOD TO BE SUBMITTED AND APPROVED BY OWNER PRIOR TO IMPLEMENTATION.
12. CLEARING AND GRUBBING AND REMOVALS TO BE COMPLETED IN ACCORDANCE WITH OPSS 201. TEMPORARY EROSION CONTROL TO BE COMPLETED IN ACCORDANCE WITH OPSS 577.
13. GRADING TO BE COMPLETED IN ACCORDANCE WITH OPSS 206. GRANULAR MATERIAL TO BE USED IN ACCORDANCE WITH OPSS 1010.
14. CULVERT TO BE CONSTRUCTED IN ACCORDANCE WITH OPSS 421. HEIGHT OF FILL TABLE FOR CSP CULVERTS TO COMPLY WITH OPSD 805.010.
15. RIPRAP SHALL BE IN ACCORDANCE WITH OPSD 810.010 SECTION B-B.

PROPOSED — EXISTING

FENCE
EX. CONTOUR (185.0)
LIDAR CONTOUR (184.5)
6.0m ACCESS ROAD
DITCH
CULVERT
PROPERTY LINE
SLOPE (3:1 UNLESS NOTED OTHERWISE)
FINISHED SUBSTATION SURFACE (19mm CLEAR STONE SURFACE)
VEGETATED BUFFER
TREE LINE

		By	Appd.	YY.MM.DD
B.	ISSUED FOR TENDER	MALM	CTC	17.11.21
A.	ISSUED FOR CLIENT REVIEW	DMS	CTC	17.10.31

Revision

File Name: 133560220_CS-SP-SUBSTATION.dwg	DMS	CTC	DMS	17.10.31
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project
LOYALIST SOLAR LP
LOYALIST SOLAR PROJECT

54MW GROUND-MOUNT SOLAR FARM

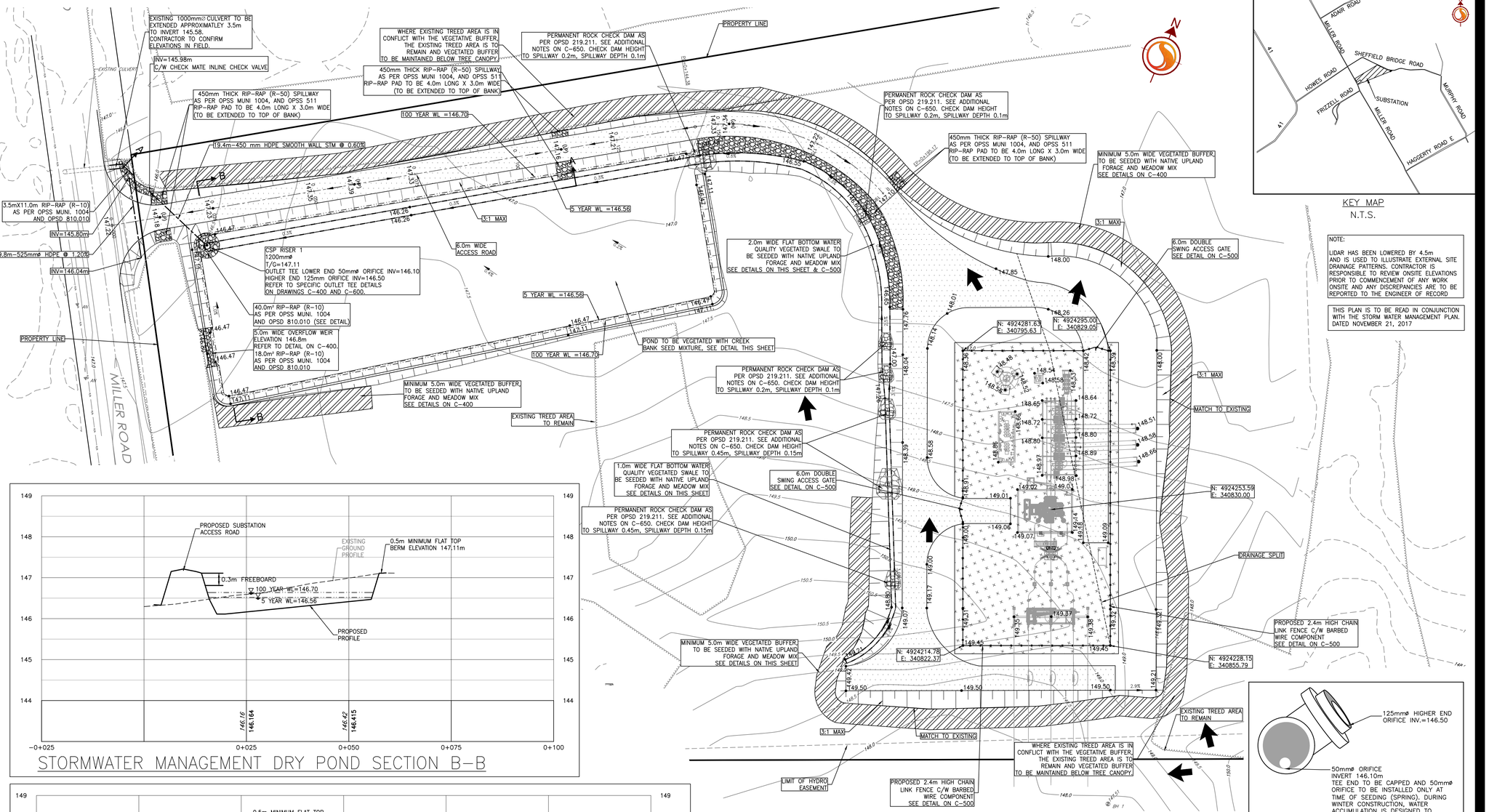
County of Lennox and Addington, Ontario

Title
SUBSTATION SITE PLAN

Project No. 133560220
Scale 1:500 (0 5 15 25m)
Drawing No. C-010
Sheet 1 of 1
Revision B

V:\01614\active\133560220\design\drawing_06\civil_substation\sheet_files\133560220_CS-SP-SUBSTATION.dwg
2017/11/22 3:59 PM By: Brown, Kevin (Waterloo)

ORIGINAL SHEET - ARCH D

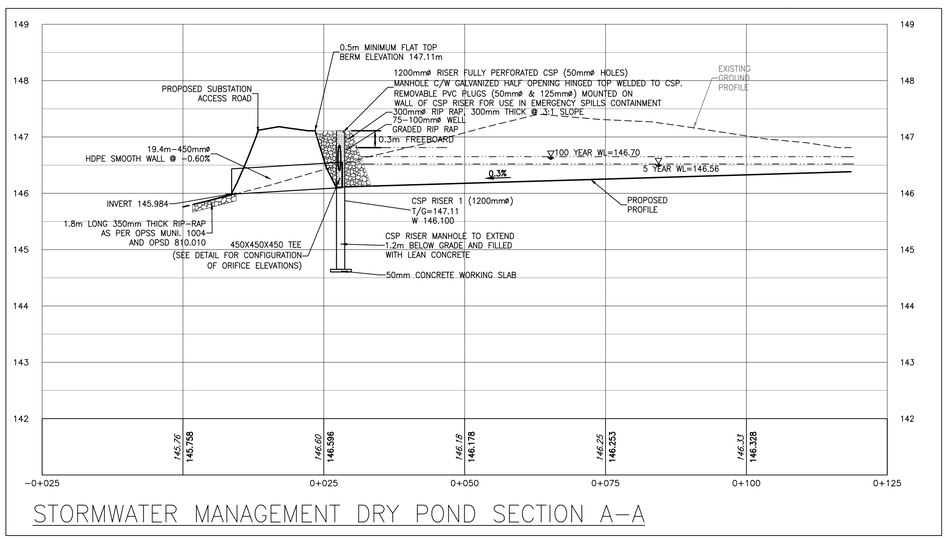


KEY MAP
N.T.S.

NOTE:
LIDAR HAS BEEN LOWERED BY 4.5m AND IS USED TO ILLUSTRATE EXTERNAL SITE DRAINAGE PATTERNS. CONTRACTOR IS RESPONSIBLE TO REVIEW ONSITE ELEVATIONS PRIOR TO COMMENCEMENT OF ANY WORK ONSITE AND ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER OF RECORD

THIS PLAN IS TO BE READ IN CONJUNCTION WITH THE STORM WATER MANAGEMENT PLAN. DATED NOVEMBER 21, 2017

STORMWATER MANAGEMENT DRY POND SECTION B-B



STORMWATER MANAGEMENT DRY POND SECTION A-A

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%
POA PALUSTRIS	FOWL BLUEGRASS/	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)

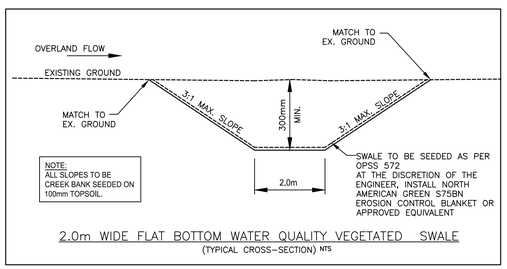
AVAILABLE FROM:
PHONE: 519-886-0557 or 1-800-465-5849
FAX: 519-866-0605

OSC SEED MIX #8140 - NATIVE UPLAND FORAGE AND MEADOW MIX

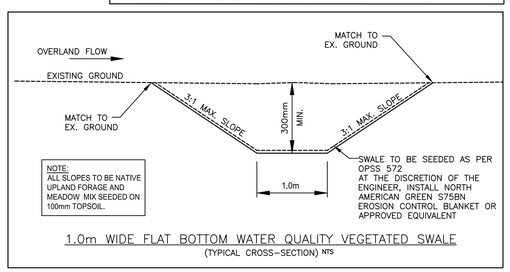
LATIN NAME	COMMON NAME	%
ELYMUS CANDENSIS	CANADA WILD RYE	35%
ELYMUS VIRGINICUS	VIRGINIA WILD RYE	35%
POA PALUSTRIS	FOWL BLUEGRASS	10%
CAREX VULPINOIDEA	FOX SEDGE	5%
SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM	5%
SPOROBOLUS CRYPTANDRUS	SAND DROPSEED	10%

APPLICATION:
SOW SEED MIX AT RATE OF 25kg/ha WITH A NURSE CROP OF ANNUAL RYE GRASS, SEEDED AT A RATE OF 22kg/ha

AVAILABLE FROM:
PHONE: 519-886-0557 or 1-800-465-5849
FAX: 519-866-0605

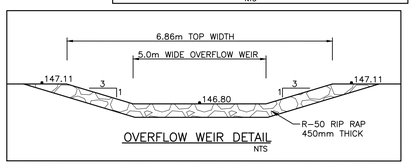


2.0m WIDE FLAT BOTTOM WATER QUALITY VEGETATED SWALE
(TYPICAL CROSS-SECTION) NTS



1.0m WIDE FLAT BOTTOM WATER QUALITY VEGETATED SWALE
(TYPICAL CROSS-SECTION) NTS

450X450X450 HDPE OUTLET TEE END VIEW SHOWING ORIENTATION
NTS



OVERFLOW WEIR DETAIL
NTS

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PCL
CONSTRUCTION LEADERS

Notes

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8. 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 EITHER BEFORE PRIOR TO THE INSTALLATION OF EQUIPMENT.
9. CONSTRUCTION TURNING RADIUS LIMITS IDENTIFY AREAS WHERE ADDITIONAL ROAD WIDTH IS REQUIRED TO ALLOW FOR ADEQUATE CLEARANCE FOR CONSTRUCTION VEHICLES.
10. CULVERTS ARE TO BE INSTALLED AS PER OPSD 802.010. SOIL TYPE TO BE CONFIRMED ON SITE FOR DETERMINATION OF TRENCH WIDTH.
11. ALL AREAS WITHIN THE PROPOSED WORKS ARE TO BE RE-VEGETATED USING NATIVE TOPSOIL AND SEED. ANY AND APPLICATION RATE/METHOD TO BE SUBMITTED AND APPROVED BY OWNER PRIOR TO IMPLEMENTATION.
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13. GRADING TO BE COMPLETED IN ACCORDANCE WITH OPSS 206. GRANULAR MATERIAL TO BE USED IN ACCORDANCE WITH OPSS 1010.
14. CULVERT TO BE CONSTRUCTED IN ACCORDANCE WITH OPSS 421. HEIGHT OF FILL TABLE FOR CSP CULVERTS TO COMPLY WITH OPSD 805.010.
15. RIPRAP SHALL BE IN ACCORDANCE WITH OPSD 810.010 SECTION B-B.

Legend

PROPOSED		EXISTING
187.00	ELEVATION	(185.19) (EX)
	DITCH	
	TOPOGRAPHIC SURVEY CONTOUR	184.5
	LIDAR CONTOUR	184.5
	PROPERTY LINE	
	FENCE	
2.00%	GRADE	
	CULVERT	
	SLOPE (3:1 MAX UNLESS NOTED OTHERWISE)	
	ROCK CHECK DAM REFER TO C-500 FOR INSTALLATION DETAIL	
	TREE LINE	
	TEMPORARY TOPSOIL STOCKPILE LIMIT	
	5.0 WIDE VEGETATED BUFFER	
	6.0m WIDE ACCESS ROAD (SEE DWG C-500 FOR DETAILS) FINISHED SUBSTATION SURFACE (19mm WASHED CLEAR STONE SEE DWG C-500 FOR DETAILS)	
	OVERLAND FLOW DIRECTION	

D.	ISSUED FOR TENDER	MALM	CC	17.11.21
C.	ISSUED FOR CLIENT REVIEW	DMS	CC	17.10.31
B.	RE-ISSUED FOR CLIENT REVIEW	MALM	CC	17.10.12
A.	ISSUED FOR CLIENT REVIEW	MALM	CC	17.10.02
Revision		By	Appd.	YY.MM.DD

File Name: 133560220_C-GP-SUBSTATION.dwg	MALM	DMS	MALM	17.10.02
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project
LOYALIST SOLAR LP
LOYALIST SOLAR PROJECT

54MW GROUND-MOUNT SOLAR FARM

County of Lennox and Addington, Ontario

Title
SUBSTATION GRADING PLAN

Project No.	Scale
133560220	1:500 (0 5 15 25m)
Drawing No.	Sheet / Revision
C-400	1 of 1 / D

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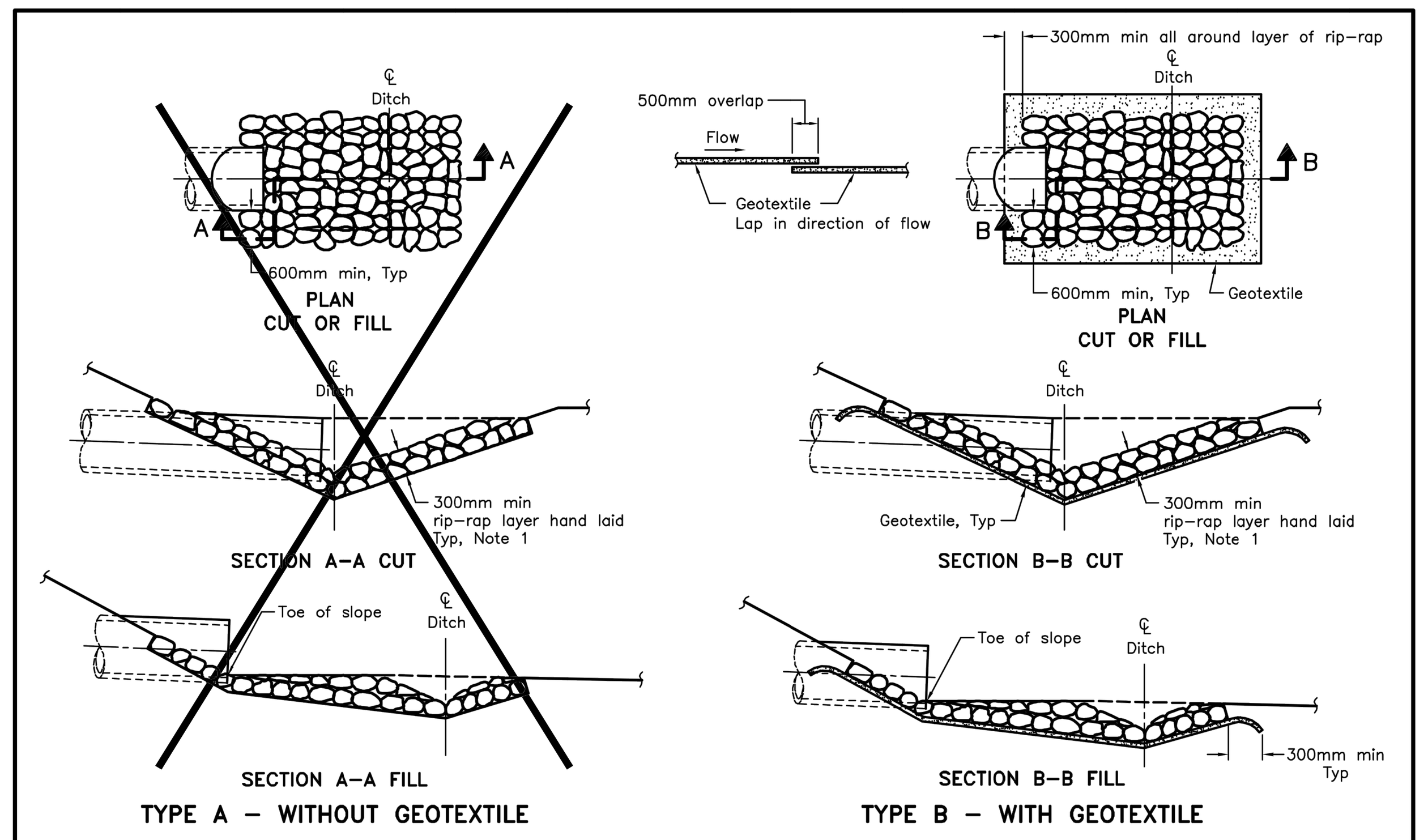
2017/11/22 1:50 PM By Steven, Kevin (Waterloo)

ORIGINAL SHEET - ARCH D



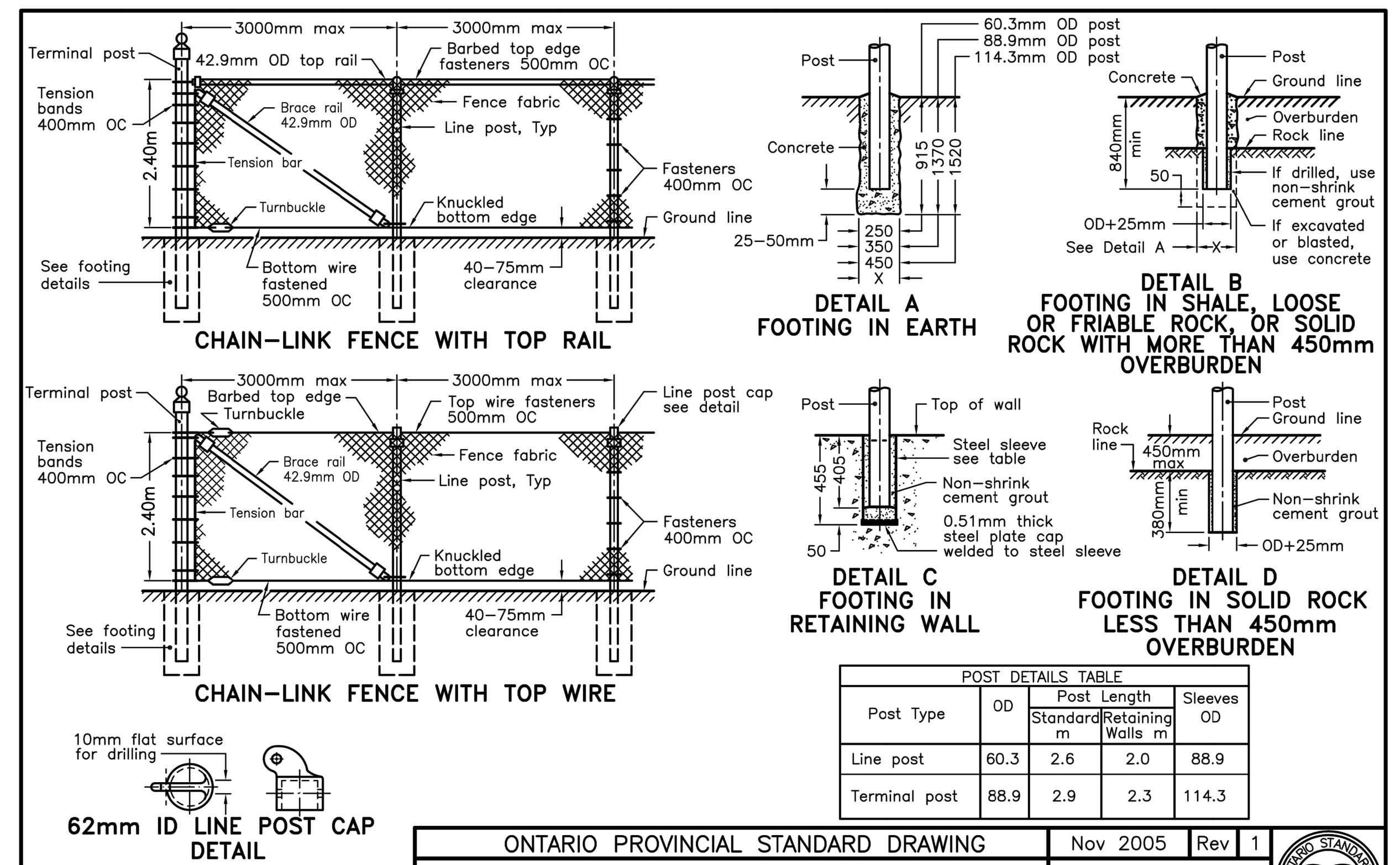
NOTES:
1 The thickness of the rip–rap layer shall be at least 1.5 times the rip–rap mean diameter.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev 2

GENERAL RIP–RAP LAYOUT FOR SEWER AND CULVERT OUTLETS

OPSD 810.010

RIP–RAP TO BE PLACED:
–3 x THE CULVERT DIAMETER WIDE
–4 x THE CULVERT DIAMETER LONG
–FOR MULTIPLE CULVERTS THE WIDTH AND LENGTH ARE TO BE MULTIPLIED BY THE NUMBER OF CULVERTS. FOR THE WIDTH 0.5m BETWEEN CULVERTS IS TO BE ADDED



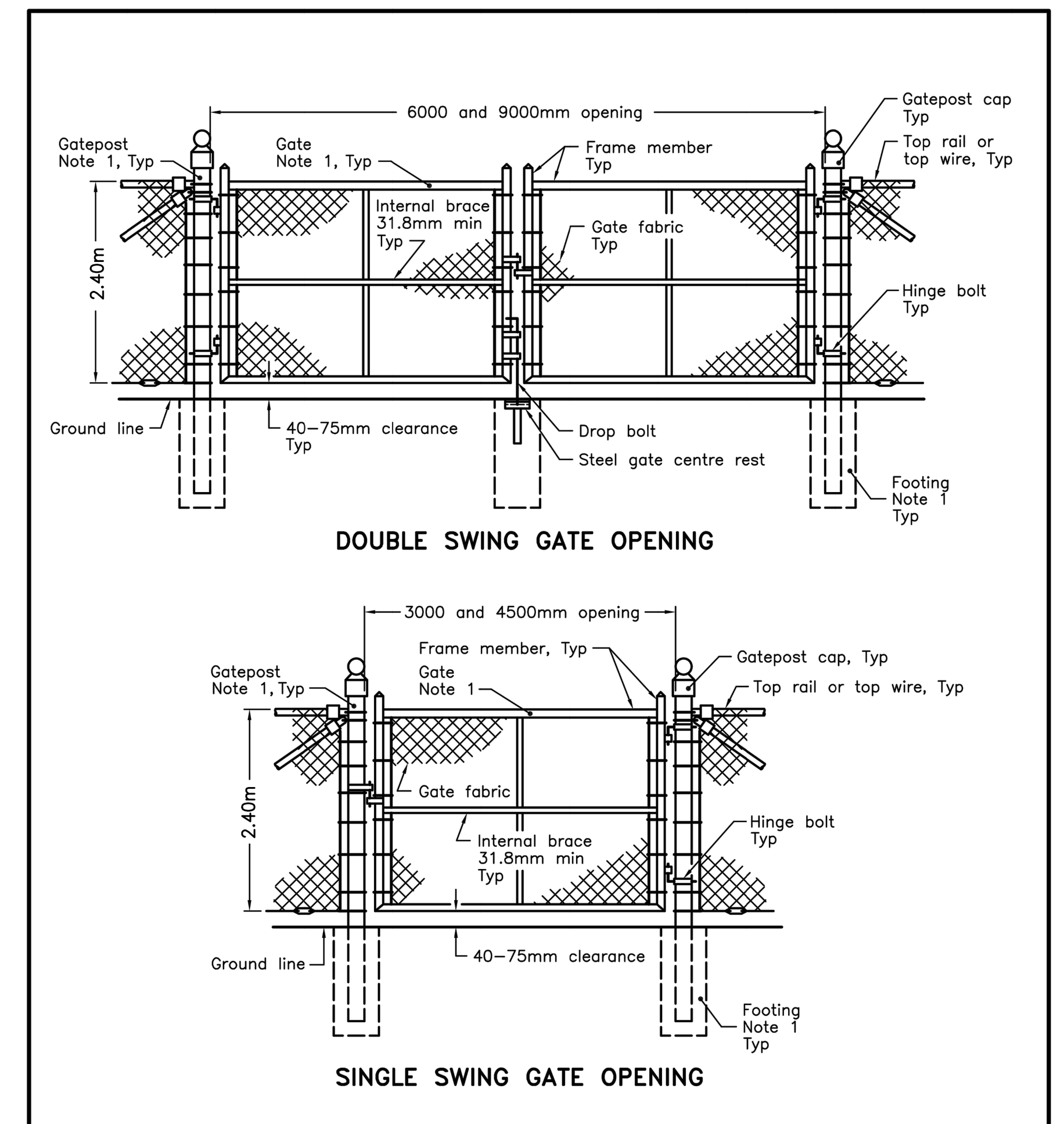
POST DETAILS TABLE				
Post Type	OD	Post Length Standard m	Post Length Retaining Walls m	Sleeves OD
Line post	60.3	2.6	2.0	88.9
Terminal post	88.9	2.9	2.3	114.3

NOTE:
A Fence as viewed from the roadway.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2005 | Rev 1

FENCE, CHAIN–LINK
INSTALLATION – ROADWAY

OPSD – 972.130

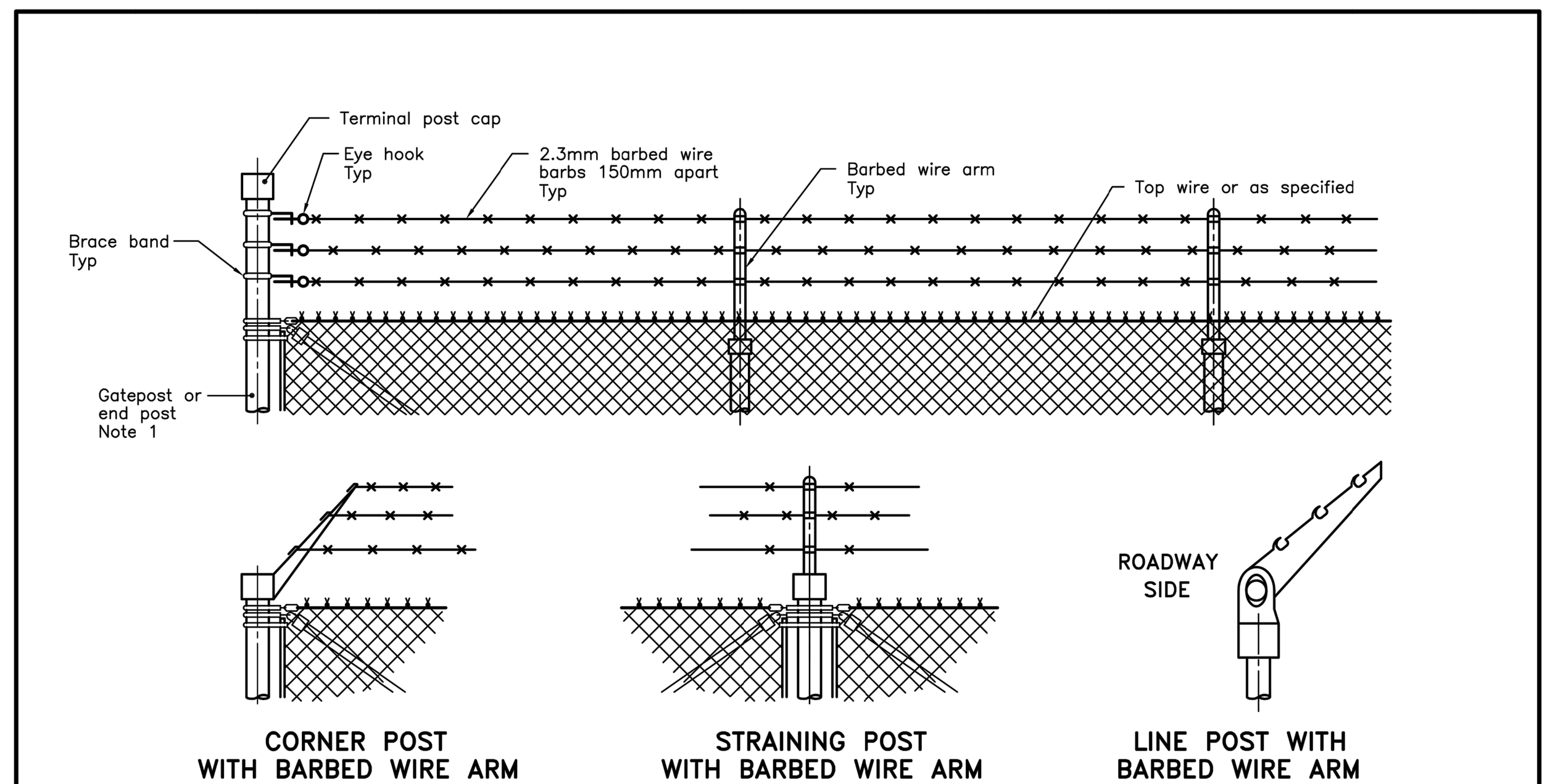


NOTES:
1 For footing details and Gate and Gatepost Details Table refer to OPSD 972.132.
A Gates as viewed from the roadway.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev 2

FENCE, CHAIN–LINK
COMPONENT – GATE

OPSD 972.102

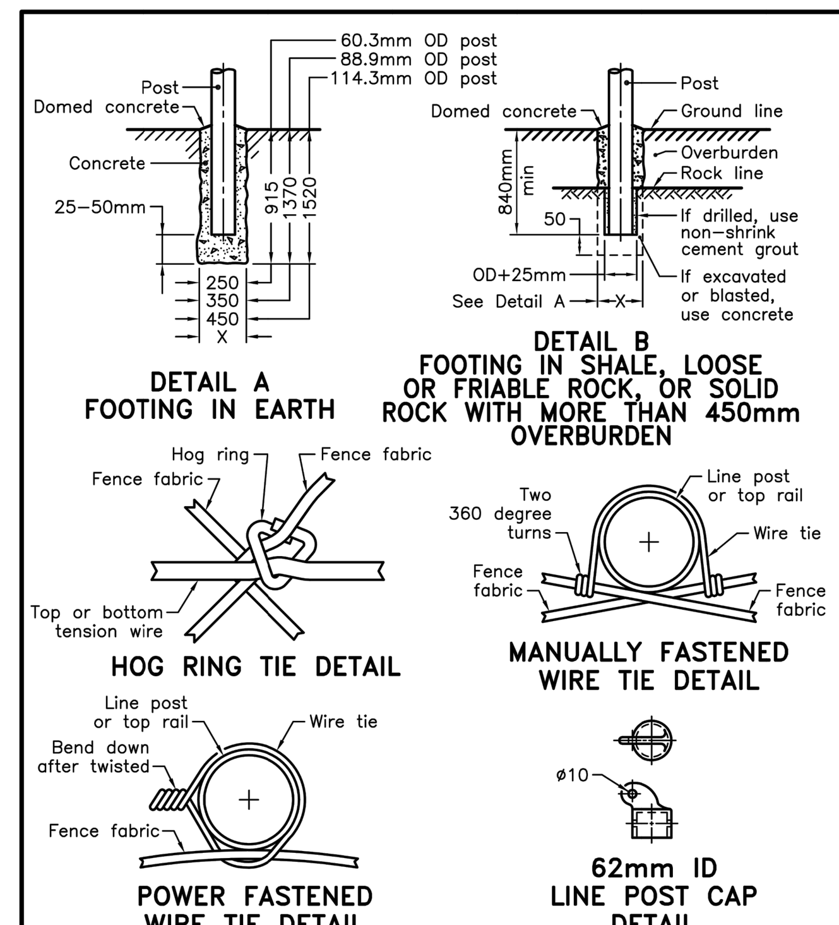


NOTES:
1 Terminal post shall be lengthened when barbed wire is specified, except when barbed wire arms are used.
A Installation as viewed from the roadway.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev 2

FENCE, CHAIN–LINK
COMPONENT – BARBED WIRE

OPSD 972.101



POST DETAILS TABLE (Note 1)						
Post/Frame Member Type		OD	Post Length Standard m	Post Length Retaining Walls m	Wall Thickness	Nominal Weight kg/m (Note 2)
Line post		60.3	2.6	2.0	3.91	5.4
Terminal Post		88.9	2.9	2.3	5.49	11.3
Gates (Single 3.0m, Double 6.0m)	Gatepost	88.9	2.6	n/a	5.49	11.3
	Frame Members	42.2	n/a	n/a	3.56	3.4
Gates (Single 4.5m, Double 9.0m)	Gatepost	114.3	2.9	n/a	6.02	16.1
	Frame Members	48.3	n/a	n/a	3.68	4.0
Post Sleeves	Line Post	88.9	n/a	0.455	5.49	11.3
	Terminal Post	114.3	n/a	0.455	6.02	16.1

NOTES:
1 All posts and frame members are Schedule 40, Regular Grade, steel pipe.
2 The actual weight shall not vary by more than 10% of the nominal weight.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev 0

FENCE, CHAIN–LINK
DETAILS AND TABLE

OPSD 972.132

ROAD CONSTRUCTION NOTES

1. THE FOREGOING DESIGN ASSUMES THAT CONSTRUCTION IS CARRIED OUT DURING DRY PERIODS AND THE SUB–GRADE IS STABLE UNDER THE LOAD OF CONSTRUCTION EQUIPMENT. IF CONSTRUCTION IS CARRIED OUT DURING WET WEATHER AND HEAVING OR ROLLING OF THE SUB–GRADE IS EXPERIENCED, ADDITIONAL THICKNESS OF GRANULAR ROAD BASE MAY BE REQUIRED AND INSPECTED BY A QUALIFIED GEOTECHNICAL ENGINEER.
2. THE LONG–TERM PERFORMANCE OF THE ROAD BASE STRUCTURE IS HIGHLY DEPENDENT UPON THE SUB–GRADE SUPPORT CONDITIONS. STRINGENT CONSTRUCTION CONTROL PROCEDURES SHALL BE MAINTAINED TO ENSURE THAT UNIFORM SUB–GRADE MOISTURE AND DENSITY CONDITIONS ARE ACHIEVED. IF, DURING THE EXCAVATION PROCESS, NATIVE MATERIAL APPEARS SUITABLE TO BE USED AS ROAD SUB–BASE A GRAIN SIZE ANALYSIS MUST BE COMPLETED TO DETERMINE IF THE MATERIAL CAN BE LEFT IN PLACE AND WHETHER A REDUCTION IN DEPTH OF THE GRANULAR ROAD STRUCTURE IS WARRANTED. THE UNDERLYING SUB–GRADE SHALL BE FREE OF DEPRESSIONS AND IS TO BE SLOPED TO PROVIDE POSITIVE SURFACE DRAINAGE. SURFACE WATER SHALL NOT BE PERMITTED TO POND ADJACENT TO THE OUTSIDE EDGES.
3. AS PART OF THE SUB–GRADE PREPARATION, PROPOSED ROADWAYS SHALL BE STRIPPED OF TOPSOIL AND OBVIOUSLY UNSUITABLE MATERIAL. FILL REQUIRED TO RAISE THE SUB–GRADE TO DESIGN ELEVATIONS SHALL BE ORGANIC–FREE AND SHALL HAVE A MOISTURE CONTENT WHICH WILL PERMIT COMPACTION TO THE DENSITIES INDICATED. THE SUB–GRADE SHALL BE SHAPED, CROWNED AND THEN PROOF–ROLLED IN THE PRESENCE OF A GEOTECHNICAL CONSULTANT. SOFT OR SPONGY SUB–GRADE AREAS SHALL BE SUB–EXCAVATED AND REPLACED WITH SUITABLE APPROVED BACKFILL COMPACTED TO 98 PERCENT SPMDD.

AREA GRADING NOTES

1. TOPSOIL IS TO BE STRIPPED ONLY IN AREAS REQUIRING EARTHWORKS AND PLACED IN TEMPORARY STOCKPILES, REFER TO ADDITIONAL NOTES ON C–650 REGARDING TOPSOIL STOCK PILING.
2. ALL TEMPORARY TOPSOIL STOCKPILES TO BE LOCATED IN CONSTRUCTION LAY DOWN AREAS AS SHOWN ON PLANS. SHOULD NO STOCKPILES LOCATIONS BE PROVIDED ON THE GRADING PLANS, WITH LOCATIONS TO BE CONFIRMED WITH CONTRACT ADMINISTRATOR.
3. ROADWAYS AND STONE BASE LAY DOWN AREAS ARE TO BE PLACED ON NATIVE GROUND AFTER TOPSOIL HAS BEEN STRIPPED.
4. ALL ADDITIONAL TOPSOIL IS TO BE SPREAD IN DESIGNATED FILL AREAS IDENTIFIED ON THE GRADING PLANS (INCREASE IF ADDITIONAL TOPSOIL IS AVAILABLE).

Stantec

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PCL
CONSTRUCTION LEADERS

Notes

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2. 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.
3. 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).
4. IF, FOR UNFORESEEN REASONS, THE OWNER AND/OR HIS/HER REPRESENTATIVE MUST ENCROACH ONTO PRIVATE LANDS TO UNDERTAKE ANY WORKS, HE/SHE MUST OBTAIN WRITTEN PERMISSION FROM THE ADJACENT PROPERTY OWNERS PRIOR TO ENTERING UPON THE PRIVATE PROPERTY TO PERFORM ANY WORKS. COPIES OF THESE LETTERS OF CONSENT MUST BE SUBMITTED TO STANTEC, PRIOR TO ANY WORK BEING PERFORMED. FAILURE TO COMPLY WITH THE ABOVE IS AT THE PROPERTY OWNERS OWN RISK.
5. THE CONTRACTOR IS RESPONSIBLE FOR RESTORATION OF ALL DAMAGED AND/OR DISTURBED PROPERTY WITHIN THE MUNICIPAL RIGHT–OF–WAY.
6. 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 EVERYWHERE PRIOR TO THE INSTALLATION OF SOLAR PANELS.
7. CONSTRUCTION TURNING RADIUS LIMITS IDENTIFY AREAS WHERE ADDITIONAL ROAD WIDTH IS REQUIRED TO ALLOW FOR ADEQUATE CLEARANCE FOR CONSTRUCTION VEHICLES.
8. CULVERTS ARE TO BE INSTALLED AS PER OPSD 802.010. SOIL TYPE TO BE CONFIRMED ON SITE FOR DETERMINATION OF TRENCH WIDTH.
9. ALL AREAS WITHIN THE PROPOSED WORKS ARE TO BE RE–VEGETATED USING NATIVE TOPSOIL AND SEED. MIX AND APPLICATION RATE/METHOD TO BE SUBMITTED AND APPROVED BY OWNER 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. GRANULAR MATERIAL TO BE USED IN ACCORDANCE WITH OPSS 1010.
12. CULVERT TO BE CONSTRUCTED IN ACCORDANCE WITH OPSS 421. HEIGHT OF FILL TABLE FOR CSP CULVERTS TO COMPLY WITH OPSD 805.010.
13. RIPRAP SHALL BE IN ACCORDANCE WITH OPSD 810.010 SECTION B–B.
14. ALL SEEDING TO BE COMPLETED IN ACCORDANCE WITH OPSS 804.

Revision	By	Appd.	YY.MM.DD
B. ISSUED FOR TENDER	DRR	DS	17.11.23
A. ISSUED FOR CLIENT REVIEW	MALM	DS	17.10.31

File Name: 133560220_C-DT-SUBSTATION.dwg	Dwn.	Chkd.	Dsgn.	YY.MM.DD
	DRR	DS	DRR	17.10.18

Permit-Seal

Client/Project
LOYALIST SOLAR LP
LOYALIST SOLAR PROJECT

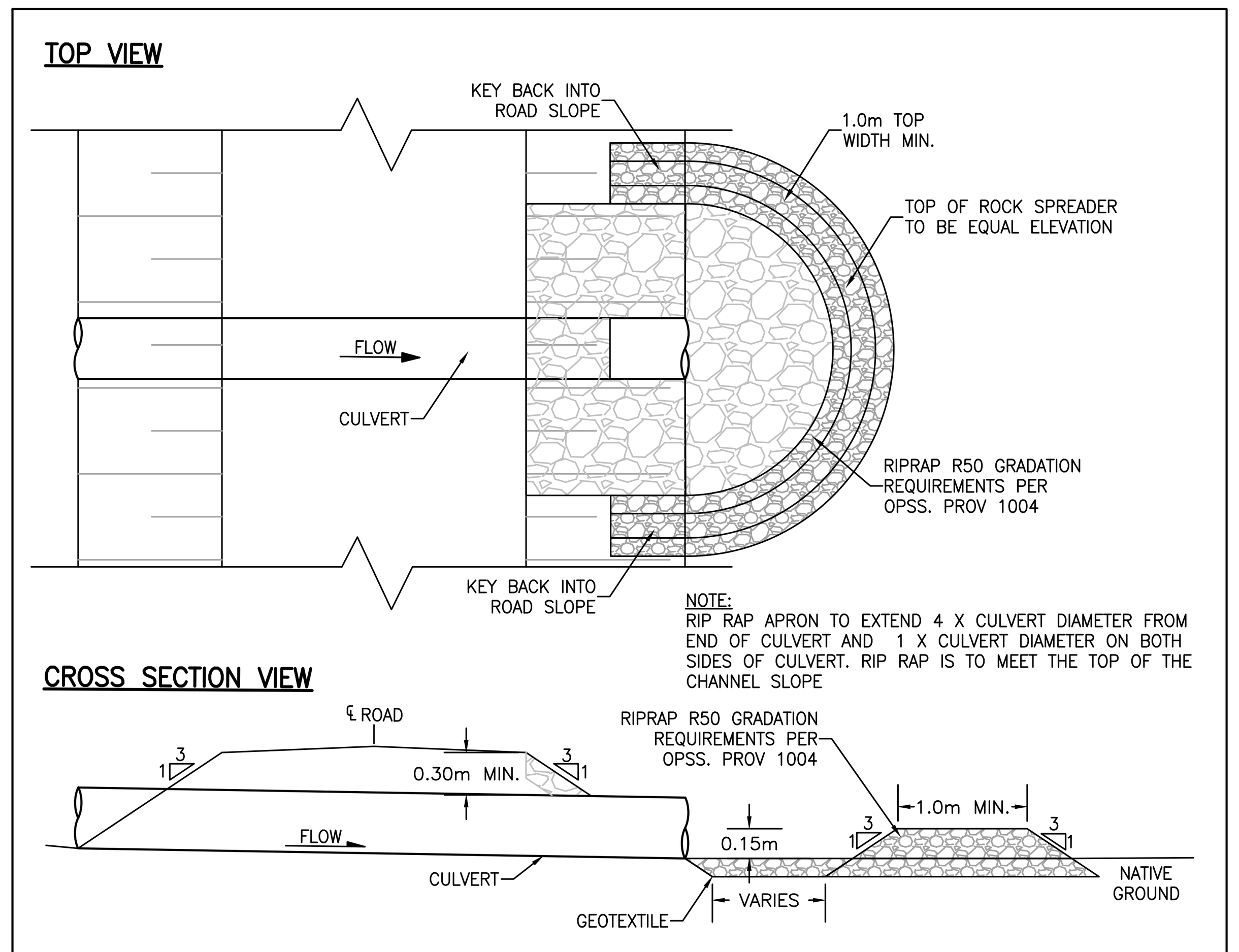
54MW GROUND-MOUNT SOLAR FARM

County of Lennox and Addington, Ontario

Title
GENERAL DETAILS
AND NOTES

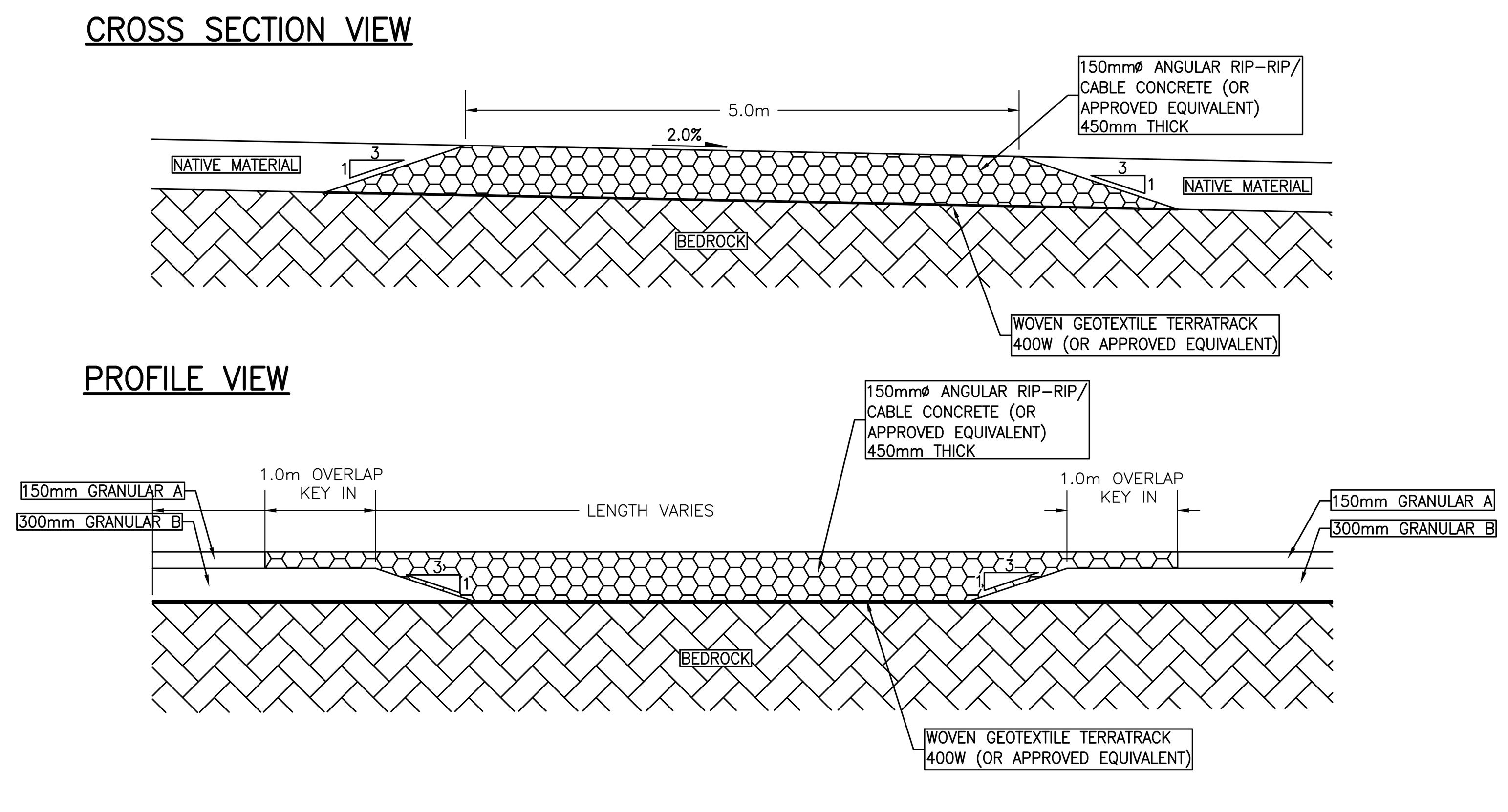
Project No. 133560220
Scale AS NOTED

Drawing No. C-500
Sheet 1 of 2
Revision B



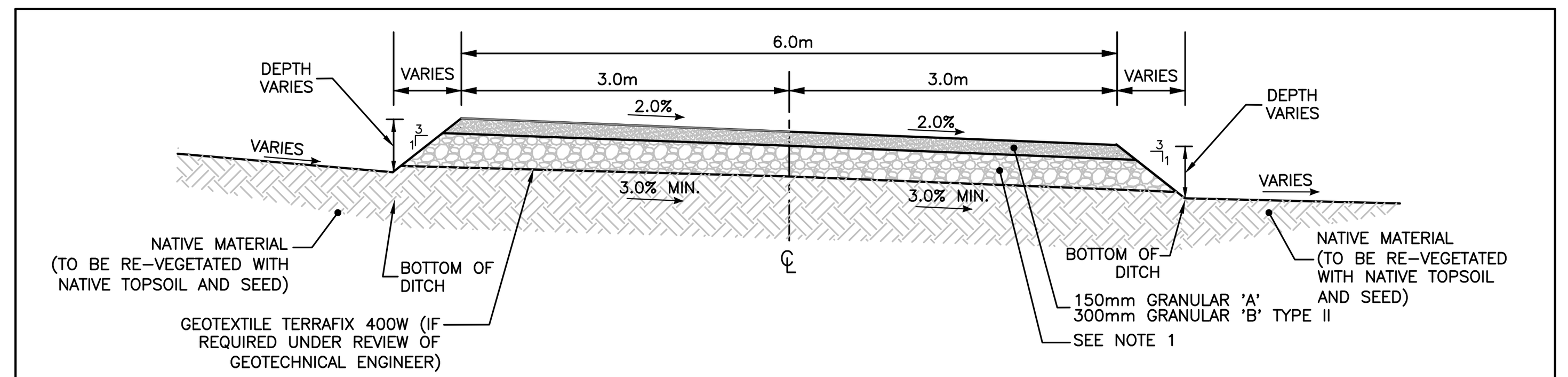
ROCK CHECK SPREADER SWALE DETAIL

N.T.S.



HARDENED SURFACE/EXPOSED BEDROCK FRACTURE ACCESS ROAD DETAIL

(N.T.S.)



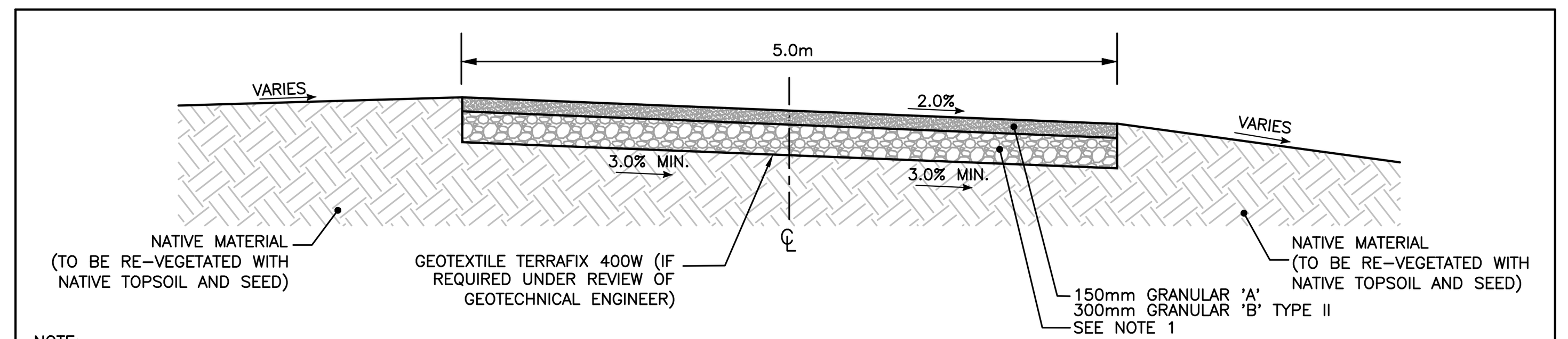
NOTE:

1 ALL TOPSOIL AND ORGANIC SOILS TO BE REMOVED FROM BELOW ANY PROPOSED STRUCTURES, ACCESS ROADS, AND PARKING AREAS. THE EXPOSED SUBGRADE TO BE PROOF-ROLLED AND INSPECTED BY A QUALIFIED GEOTECHNICAL ENGINEER. ANY LOOSE/SOFT OR WET AREAS IDENTIFIED AT THE TIME OF PROOF-ROLLING TO BE SUB-EXCAVATED AND REMOVED

2 GEOTECHNICAL RECOMMENDATION OF ROAD STRUCTURE TO BE CONFIRMED BASED ON SITE CONDITIONS BY A QUALIFIED GEOTECHNICAL ENGINEER.

SUBSTATION TYPICAL SUPER-ELEVATED CROSS-SECTION 6.0m WIDE ACCESS ROAD DETAIL

NTS



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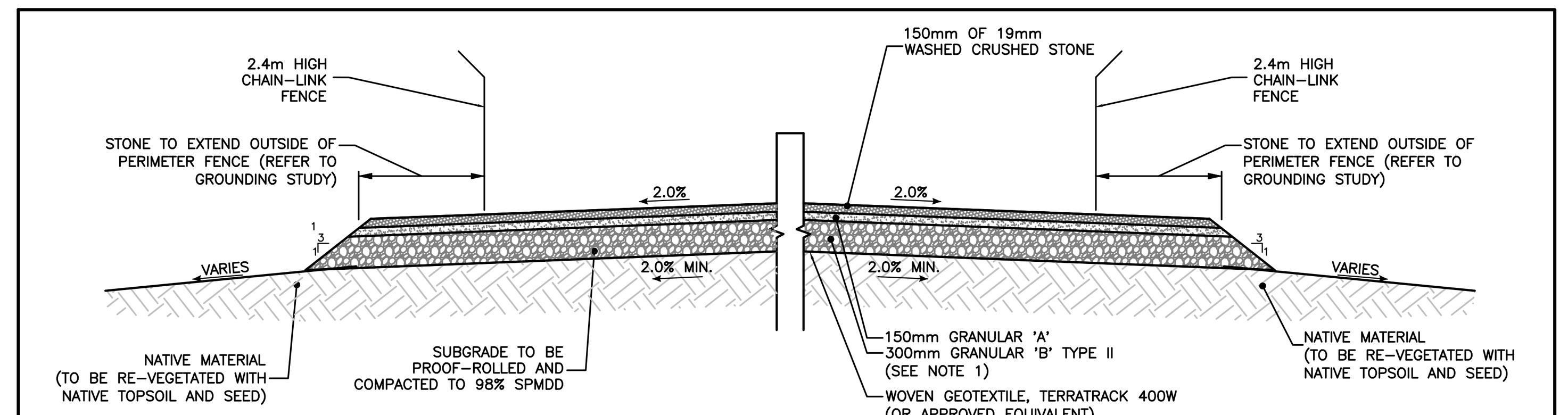
2 GEOTECHNICAL RECOMMENDATION OF ROAD STRUCTURE TO BE CONFIRMED BASED ON SITE CONDITIONS BY A QUALIFIED GEOTECHNICAL ENGINEER.

TYPICAL CROSS-SECTION 5.0m WIDE ACCESS ROAD DETAIL (SUPER ELEVATED)

NTS

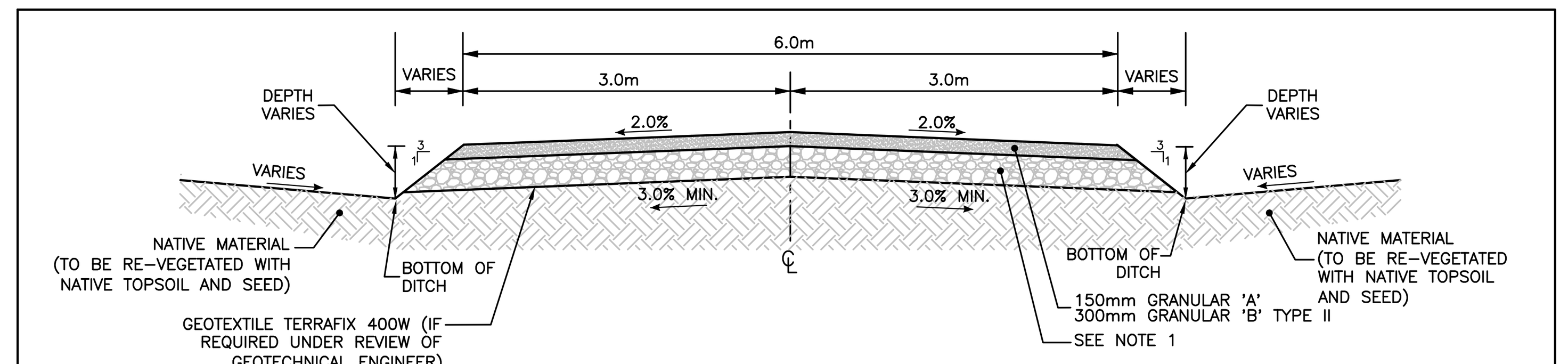


NOTE:

1. ALL TOPSOIL AND ORGANIC SOILS TO BE REMOVED FROM BELOW ANY PROPOSED STRUCTURES, ACCESS ROADS, AND PARKING AREAS. THE EXPOSED SUBGRADE TO BE PROOF-ROLLED, COMPACTED TO 98% SPMDD, AND INSPECTED BY A QUALIFIED GEOTECHNICAL ENGINEER. ANY LOOSE/SOFT OR WET AREAS IDENTIFIED AT THE TIME OF PROOF-ROLLING TO BE SUB-EXCAVATED AND REMOVED.

COLLECTOR SUBSTATION TYPICAL CROSS-SECTION

NTS



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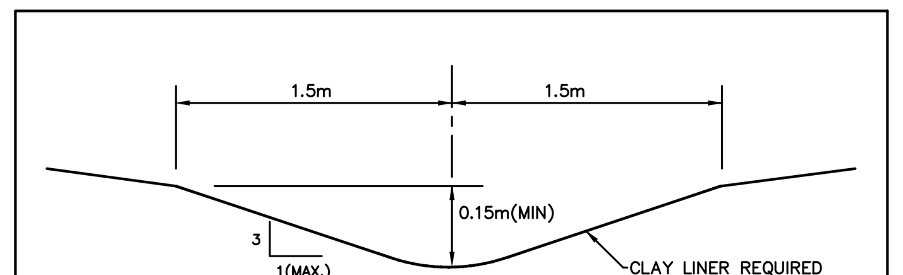
2 GEOTECHNICAL RECOMMENDATION OF ROAD STRUCTURE TO BE CONFIRMED BASED ON SITE CONDITIONS BY A QUALIFIED GEOTECHNICAL ENGINEER.

SUBSTATION TYPICAL CROSS-SECTION 6.0m WIDE ACCESS ROAD DETAIL

NTS

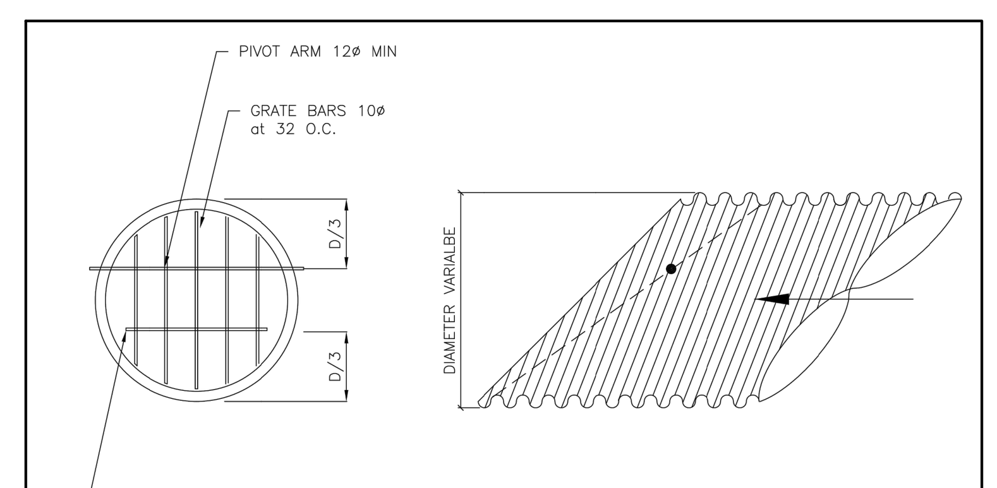


TYPICAL SECTION OF GRASS SWALE

NTS

NOTE:

OPTIMUM SIDE SLOPE – 1 VERTICAL TO 6 HORIZONTAL
MAXIMUM SIDE SLOPE – 1 VERTICAL TO 3 HORIZONTAL



1. FOR 300mmø PIPES AND OVER, ADDITIONAL 12mmø HORIZONTAL GRATE BAR TO BE PLACED IN THIS LOCATION.
2. FOR PIPES LESS THAN 300mmø, NO HORIZONTAL GRATE BARS REQUIRED.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
4. ALL MATERIALS TO BE DOUBLE HOT DIPPED GALVANIZED TO: CSA G164-M.

RODENT GRATE FOR ATTACHMENT TO OUTLET

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B. ISSUED FOR TENDER	DRR	DS	17.11.23
A. ISSUED FOR CLIENT REVIEW	MALM	DS	17.10.31

File Name: 133560220_C-DT-SUBSTATION.dwg	Dwn.	Chkd.	Dsgn.	YY.MM.DD
	DRR	DS	DRR	17.10.18

Permit-Seal

Client/Project

LOYALIST SOLAR LP
LOYALIST SOLAR PROJECT

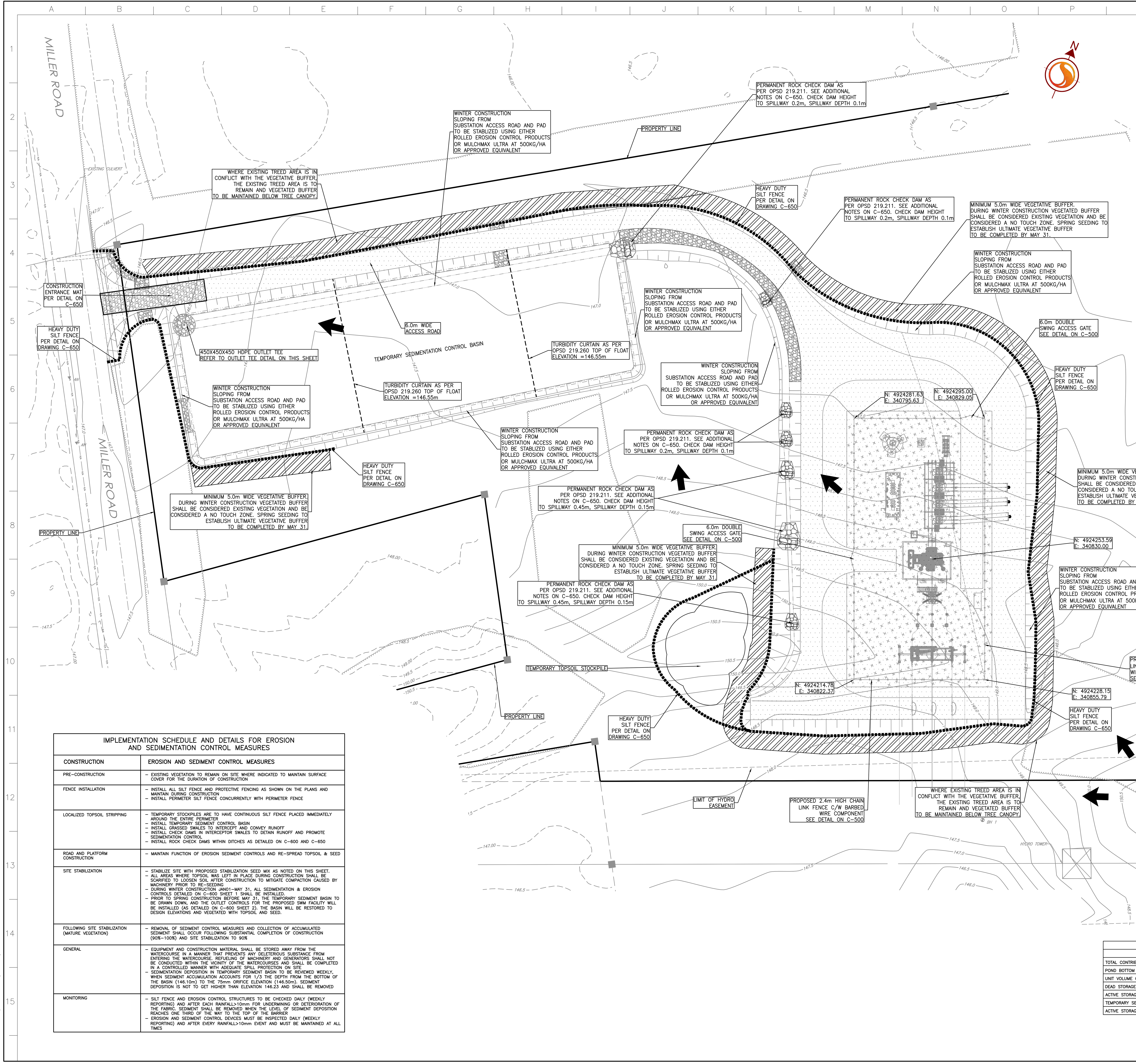
54MW GROUND-MOUNT SOLAR FARM

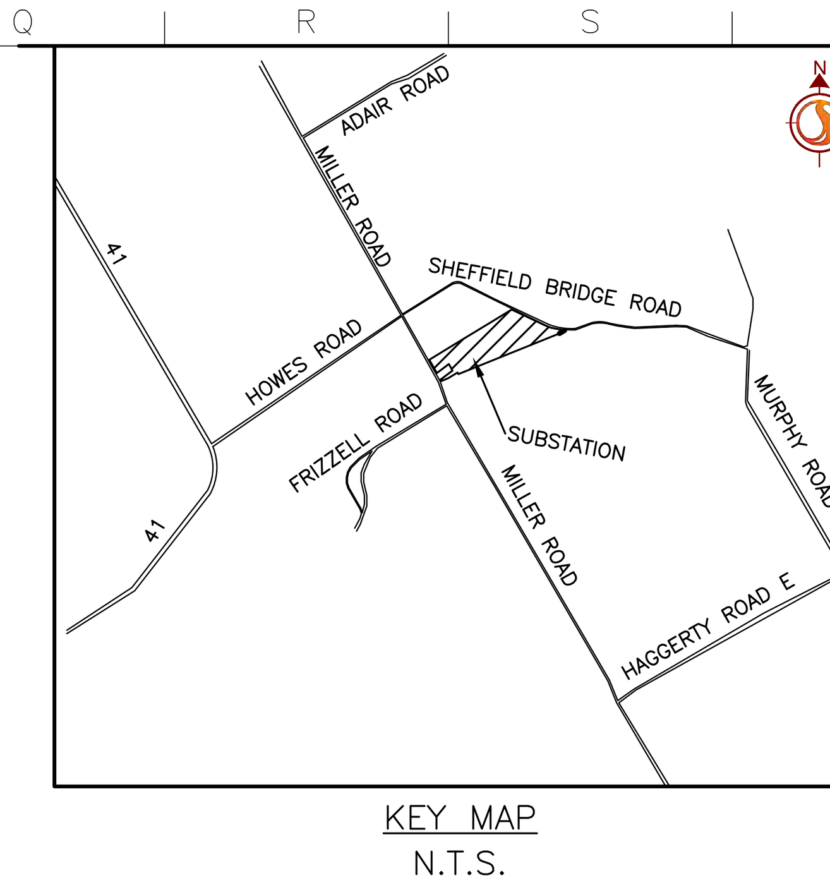
County of Lennox and Addington, Ontario

Title

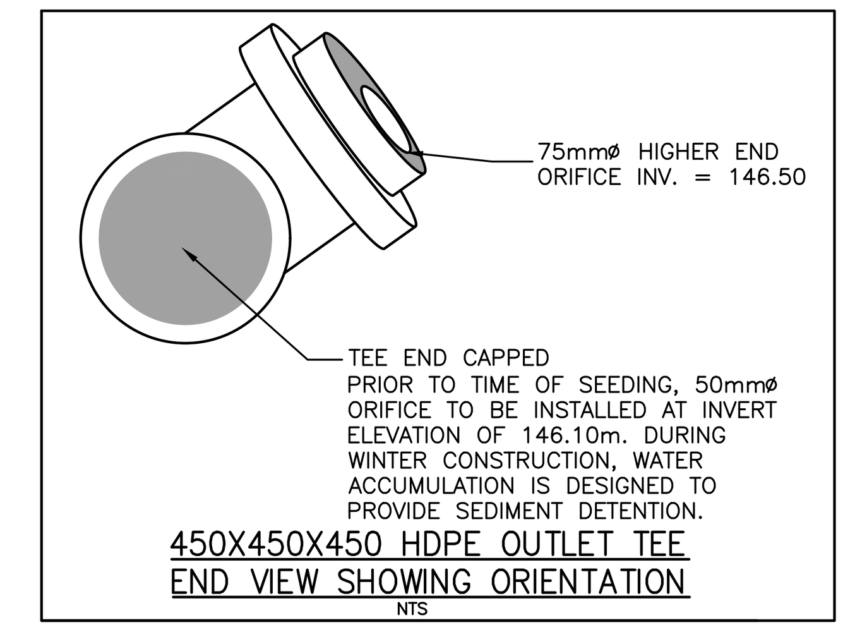
GENERAL DETAILS AND NOTES

Project No.	Scale	
133560220	AS NOTED	
Drawing No.	Sheet	Revision
C-500	2 of 2	B





KEY MAP
N.T.S.



450X450X450 HDPE OUTLET TEE END VIEW SHOWING ORIENTATION
NTS

IMPLEMENTATION SCHEDULE AND DETAILS FOR EROSION AND SEDIMENTATION CONTROL MEASURES	
CONSTRUCTION	EROSION AND SEDIMENT CONTROL MEASURES
PRE-CONSTRUCTION	– EXISTING VEGETATION TO REMAIN ON SITE WHERE INDICATED TO MAINTAIN SURFACE COVER FOR THE DURATION OF CONSTRUCTION
FENCE INSTALLATION	– INSTALL ALL SILT FENCE AND PROTECTIVE FENCING AS SHOWN ON THE PLANS AND MAINTAIN DURING CONSTRUCTION – INSTALL PERIMETER SILT FENCE CONCURRENTLY WITH PERIMETER FENCE
LOCALIZED TOPSOIL STRIPPING	– TEMPORARY STOCKPILES ARE TO HAVE CONTINUOUS SILT FENCE PLACED IMMEDIATELY AROUND THE ENTIRE PERIMETER – INSTALL TEMPORARY SEDIMENT CONTROL BASIN – INSTALL GRASSED SWALES TO INTERCEPT AND CONVEY RUNOFF – INSTALL CHECK DAMS IN INTERCEPTOR SWALES TO DETAIN RUNOFF AND PROMOTE SEDIMENTATION CONTROL – INSTALL ROCK CHECK DAMS WITHIN DITCHES AS DETAILED ON C-600 AND C-650
ROAD AND PLATFORM CONSTRUCTION	– MAINTAIN FUNCTION OF EROSION SEDIMENT CONTROLS AND RE-SPREAD TOPSOIL & SEED
SITE STABILIZATION	– STABILIZE SITE WITH PROPOSED STABILIZATION SEED MIX AS NOTED ON THIS SHEET. – ALL AREAS WHERE TOPSOIL WAS LEFT IN PLACE DURING CONSTRUCTION SHALL BE SCARIFIED TO LOOSEN SOIL AFTER CONSTRUCTION TO MITIGATE COMPACTION CAUSED BY MACHINERY PRIOR TO RE-SEEDING – DURING WINTER CONSTRUCTION JAN01-MAY 31, ALL SEDIMENTATION & EROSION CONTROLS DETAILED ON C-600 SHEET 1 SHALL BE INSTALLED. – PRIOR TO SPRING CONSTRUCTION BEFORE MAY 31, THE TEMPORARY SEDIMENT BASIN TO BE DRAWN DOWN, AND THE OUTLET CONTROLS FOR THE PROPOSED SWM FACILITY WILL BE INSTALLED (AS DETAILED ON C-600 SHEET 2). THE BASIN WILL BE RESTORED TO DESIGN ELEVATIONS AND VEGETATED WITH TOPSOIL AND SEED.
FOLLOWING SITE STABILIZATION (MATURE VEGETATION)	– REMOVAL OF SEDIMENT CONTROL MEASURES AND COLLECTION OF ACCUMULATED SEDIMENT SHALL OCCUR FOLLOWING SUBSTANTIAL COMPLETION OF CONSTRUCTION (90%-100%) AND SITE STABILIZATION TO 90%
GENERAL	– EQUIPMENT AND CONSTRUCTION MATERIAL SHALL BE STORED AWAY FROM THE WATERCOURSE IN A MANNER THAT PREVENTS ANY DELETERIOUS SUBSTANCE FROM ENTERING THE WATERCOURSE. REFUELING OF MACHINERY AND GENERATORS SHALL NOT BE CONDUCTED WITHIN THE VICINITY OF THE WATERCOURSES AND SHALL BE COMPLETED IN A CONTROLLED MANNER WITH ADEQUATE SPILL PROTECTION ON SITE – SEDIMENTATION DEPOSITION IN TEMPORARY SEDIMENT BASIN TO BE REVIEWED WEEKLY, WHEN SEDIMENT ACCUMULATION ACCOUNTS FOR 1/3 THE DEPTH FROM THE BOTTOM OF THE BASIN (146.10m) TO THE 75mm ORIFICE ELEVATION (146.50m). SEDIMENT DEPOSITION IS NOT TO GET HIGHER THAN ELEVATION 146.23 AND SHALL BE REMOVED
MONITORING	– SILT FENCE AND EROSION CONTROL STRUCTURES TO BE CHECKED DAILY (WEEKLY REPORTING) AND AFTER EACH RAINFALL>10mm FOR UNDERMINING OR DETERIORATION OF THE FABRIC. SEDIMENT SHALL BE REMOVED WHEN THE LEVEL OF SEDIMENT DEPOSITION REACHES ONE THIRD OF THE WAY TO THE TOP OF THE BARRIER – EROSION AND SEDIMENT CONTROL DEVICES MUST BE INSPECTED DAILY (WEEKLY REPORTING) AND AFTER EVERY RAINFALL>10mm EVENT AND MUST BE MAINTAINED AT ALL TIMES

TEMPORARY SEDIMENT BASIN DESIGN CHARACTERISTICS	
PARAMETER	SWM CHARACTERISTICS
TOTAL CONTRIBUTION AREA (ha) / % IMPERVIOUS	2.20
POND BOTTOM ELEVATION (m) / POND TOP ELEVATION (m)	146.10 / 147.10
UNIT VOLUME OF DEAD (m3/ha) / ACTIVE STORAGE (m3/ha) REQUIRED	185 / 125
DEAD STORAGE REQUIRED (m3) / PROVIDED (m3)	407 / 543
ACTIVE STORAGE REQUIRED (m3) / PROVIDED (m3)	275 / 1474
TEMPORARY SEDIMENT BASIN OUTLET ELEVATION (m) / DIAMETER (mm)	146.50 / 75
ACTIVE STORAGE DRAWDOWN TIME REQUIRED / PROVIDED (hrs)	48 / 26

ORIGINAL SHEET - ARCH D

Stantec

Stantec Consulting Ltd.
300 Hagey Boulevard
Waterloo ON Canada
Tel. 519.579.4410
www.stantec.com

PCL CONSTRUCTION LEADERS

Notes

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8. 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 EVERYWHERE PRIOR TO THE INSTALLATION OF SOLAR PANELS.
9. CONSTRUCTION TURNING RADIUS LIMITS IDENTIFY AREAS WHERE ADDITIONAL ROAD WIDTH IS REQUIRED TO ALLOW FOR ADEQUATE CLEARANCE FOR CONSTRUCTION VEHICLES.
10. CULVERTS ARE TO BE INSTALLED AS PER OPSD 802.010. SOIL TYPE TO BE CONFIRMED ON SITE FOR DETERMINATION OF TRENCH WIDTH.
11. ALL AREAS WITHIN THE PROPOSED WORKS ARE TO BE RE-VEGETATED USING NATIVE TOPSOIL AND SEED. MIX AND APPLICATION RATE/METHOD TO BE SUBMITTED AND APPROVED BY OWNER PRIOR TO IMPLEMENTATION.
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14. CULVERT TO BE CONSTRUCTED IN ACCORDANCE WITH OPSS 421. HEIGHT OF FILL TABLE FOR CSP CULVERTS TO COMPLY WITH OPSD 805.010.
15. RIPRAP SHALL BE IN ACCORDANCE WITH OPSD 810.010 SECTION B-B.

Legend

PROPOSED / EXISTING

- DITCH
- TOPOGRAPHIC SURVEY CONTOUR (184.5)
- LIDAR CONTOUR (184.5)
- PROPERTY LINE
- FENCE
- OVERLAND FLOW DIRECTION
- CULVERT
- SLOPE (3:1 UNLESS NOTED OTHERWISE)
- 5.0M WIDE VEGETATIVE BUFFER
- GRAVELLED AREA
- HEAVY DUTY SILT FENCE (SEE DETAILS ON C-650)
- ROCK CHECK DAMS (SEE DETAILS ON C-650)
- CONSTRUCTION ENTRANCE MAT (SEE DETAILS ON C-650)
- TURBIDITY CURTAIN
- TEMPORARY TOPSOIL STOCKPILE LIMIT

B.	ISSUED FOR TENDER	KDB	CC	17.11.21
A.	ISSUED FOR CLIENT REVIEW	DRR	DS	17.10.31
Revision		By	Appd.	YY.MM.DD

File Name: 133560220_C-EC-SUBSTATION-WINTER.dwg	DRR	DS	DRR	17.10.18
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project

LOYALIST SOLAR LP
LOYALIST SOLAR PROJECT

54MW GROUND-MOUNT SOLAR FARM

County of Lennox and Addington, Ontario

Title

SUBSTATION
SEDIMENT AND EROSION
CONTROL PLAN-WINTER CONSTRUCTION

Project No. 133560220
Scale 1:500 (0 5 15 25m)

Drawing No. C-600
Sheet 1 of 2
Revision B

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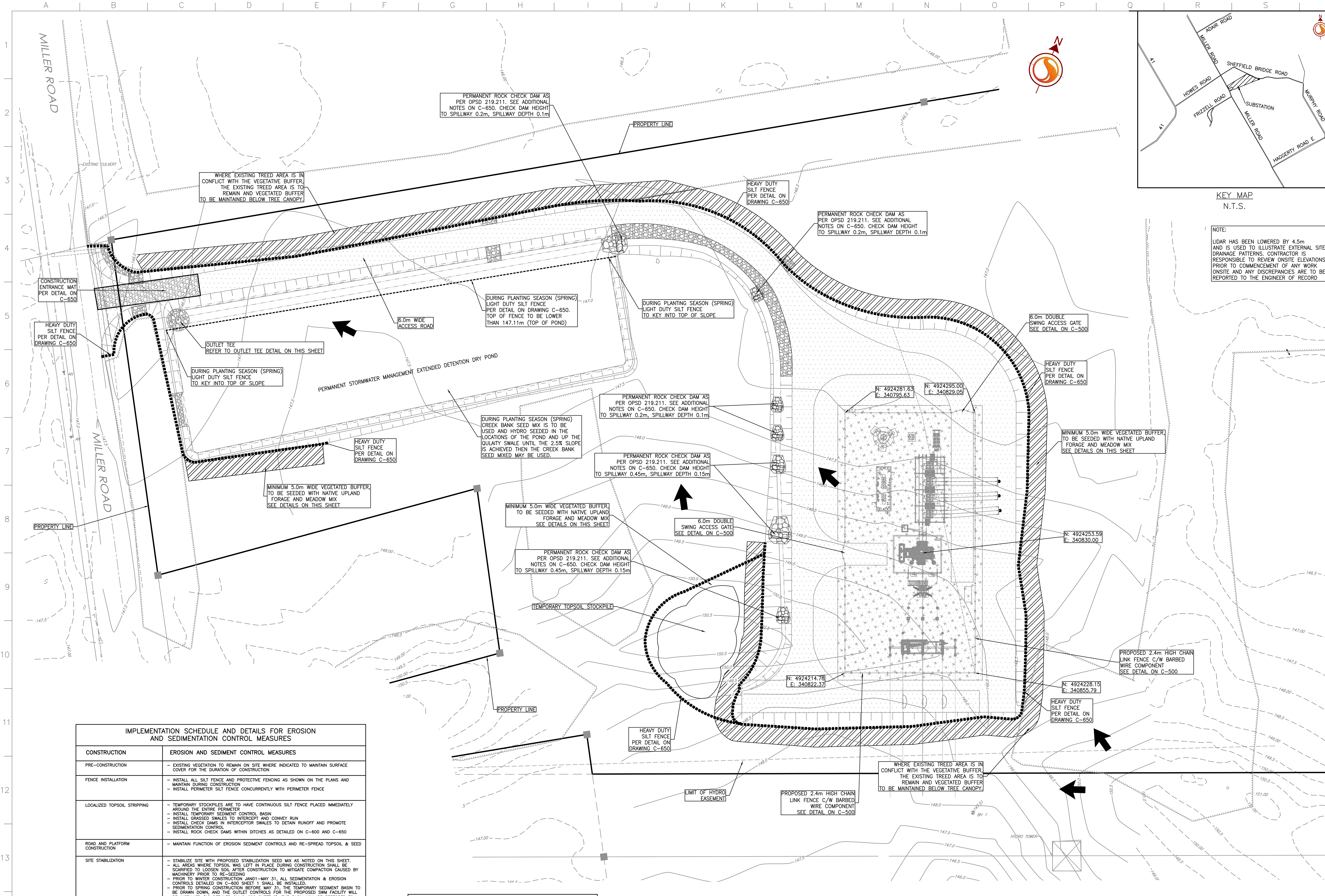
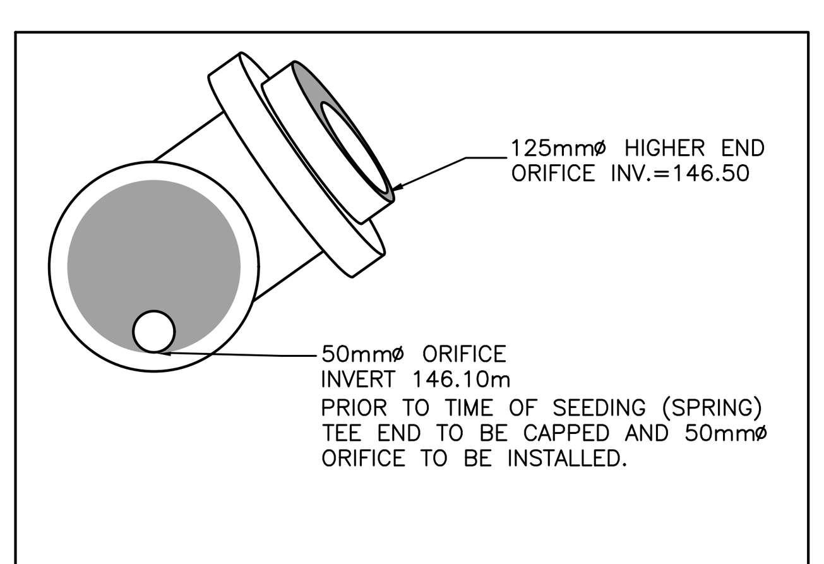
2017/11/23 3:53 PM By: Brown, Kevin (Waterloo)



KEY MAP
N.T.S.

IMPLEMENTATION SCHEDULE AND DETAILS FOR EROSION AND SEDIMENTATION CONTROL MEASURES	
CONSTRUCTION	EROSION AND SEDIMENT CONTROL MEASURES
PRE-CONSTRUCTION	– EXISTING VEGETATION TO REMAIN ON SITE WHERE INDICATED TO MAINTAIN SURFACE COVER FOR THE DURATION OF CONSTRUCTION
FENCE INSTALLATION	– INSTALL ALL SILT FENCE AND PROTECTIVE FENCING AS SHOWN ON THE PLANS AND MAINTAIN DURING CONSTRUCTION – INSTALL PERIMETER SILT FENCE CONCURRENTLY WITH PERIMETER FENCE
LOCALIZED TOPSOIL STRIPPING	– TEMPORARY STOCKPILES ARE TO HAVE CONTINUOUS SILT FENCE PLACED IMMEDIATELY AROUND THE ENTIRE PERIMETER – INSTALL TEMPORARY SEDIMENT CONTROL BASIN – INSTALL GRASSED SWALES TO INTERCEPT AND CONVEY RUN – INSTALL CHECK DAMS IN INTERCEPTOR SWALES TO DETAIN RUNOFF AND PROMOTE SEDIMENTATION CONTROL – INSTALL ROCK CHECK DAMS WITHIN DITCHES AS DETAILED ON C-600 AND C-650
ROAD AND PLATFORM CONSTRUCTION	– MAINTAIN FUNCTION OF EROSION SEDIMENT CONTROLS AND RE-SPREAD TOPSOIL & SEED
SITE STABILIZATION	– STABILIZE SITE WITH PROPOSED STABILIZATION SEED MIX AS NOTED ON THIS SHEET. – ALL AREAS WHERE TOPSOIL WAS LEFT IN PLACE DURING CONSTRUCTION SHALL BE SCARIFIED TO LOOSEN SOIL AFTER CONSTRUCTION TO MITIGATE COMPACTION CAUSED BY MACHINERY PRIOR TO RE-SEEDING – PRIOR TO WINTER CONSTRUCTION JAN01-MAY 31, ALL SEDIMENTATION & EROSION CONTROLS DETAILED ON C-600 SHEET 1 SHALL BE INSTALLED. – PRIOR TO SPRING CONSTRUCTION BEFORE MAY 31, THE TEMPORARY SEDIMENT BASIN TO BE DRAWN DOWN, AND THE OUTLET CONTROLS FOR THE PROPOSED SWM FACILITY WILL BE INSTALLED (AS DETAILED ON C-600 SHEET 2). THE BASIN WILL BE RESTORED TO DESIGN ELEVATIONS AND VEGETATED WITH TOPSOIL AND SEED.
FOLLOWING SITE STABILIZATION (MATURE VEGETATION)	– REMOVAL OF SEDIMENT CONTROL MEASURES AND COLLECTION OF ACCUMULATED SEDIMENT SHALL OCCUR FOLLOWING SUBSTANTIAL COMPLETION OF CONSTRUCTION (90%-100%) AND SITE STABILIZATION TO 90%
GENERAL	– EQUIPMENT AND CONSTRUCTION MATERIAL SHALL BE STORED AWAY FROM THE WATERCOURSE IN A MANNER THAT PREVENTS ANY DELETERIOUS SUBSTANCE FROM ENTERING THE WATERCOURSE. REFUELING OF MACHINERY AND GENERATORS SHALL NOT BE CONDUCTED WITHIN THE VICINITY OF THE WATERCOURSES AND SHALL BE COMPLETED IN A CONTROLLED MANNER WITH ADEQUATE SPILL PROTECTION ON SITE – SEDIMENTATION DEPOSITION IN PERMANENT STORMWATER MANAGEMENT EXTENDED DETENTION DRY POND TO BE REVIEWED WEEKLY, WHEN SEDIMENT ACCUMULATION ACCOUNTS FOR 1/3 THE DEPTH FROM THE BOTTOM OF THE BASIN (146.10m) TO THE 125mm ORIFICE ELEVATION (146.50m). SEDIMENT DEPOSITION IS NOT TO GET HIGHER THAN ELEVATION 146.23 AND SHALL BE REMOVED
MONITORING	– SILT FENCE AND EROSION CONTROL STRUCTURES TO BE CHECKED DAILY (WEEKLY REPORTING) AND AFTER EACH RAINFALL>10mm FOR UNDERMINING OR DETERIORATION OF THE FABRIC. SEDIMENT SHALL BE REMOVED WHEN THE LEVEL OF SEDIMENT DEPOSITION REACHES ONE THIRD OF THE WAY TO THE TOP OF THE BARRIER – EROSION AND SEDIMENT CONTROL DEVICES MUST BE INSPECTED DAILY (WEEKLY REPORTING) AND AFTER EVERY RAINFALL>10mm EVENT AND MUST BE MAINTAINED AT ALL TIMES



450X450X450 HDPE OUTLET TEE END VIEW SHOWING ORIENTATION
NTS

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%
POA PALUSTRIS	FOWL BLUEGRASS/	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:
PHONE: 519-886-0557 or 1-800-465-5849
FAX: 519-866-0605

OSC SEED MIX #8140 – NATIVE UPLAND FORAGE AND MEADOW MIX

LATIN NAME	COMMON NAME	%
ELYMUS CANDENSIS	CANADA WILD RYE	35%
ELYMUS VIRGINICUS	VIRGINIA WILD RYE	35%
POA PALUSTRIS	FOWL BLUEGRASS	10%
CAREX VULPINOIDEA	FOX SEDGE	5%
SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM	5%
SPOROBOLUS CRYPTANDRUS	SAND DROPSEED	10%

APPLICATION:
SOW SEED MIX AT RATE OF 25kg/ha WITH A NURSE CROP OF ANNUAL RYE GRASS, SEEDED AT A RATE OF 22kg/ha

AVAILABLE FROM:
PHONE: 519-886-0557 or 1-800-465-5849
FAX: 519-866-0605

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A. ISSUED FOR CLIENT REVIEW	DRR	DS	17.10.31

File Name:	Dwn.	Chkd.	Dsgn.	YY.MM.DD
133560220_C-EC-SUBSTATION-SPRING.dwg	DRR	DS	DRR	17.10.18

Permit-Seal

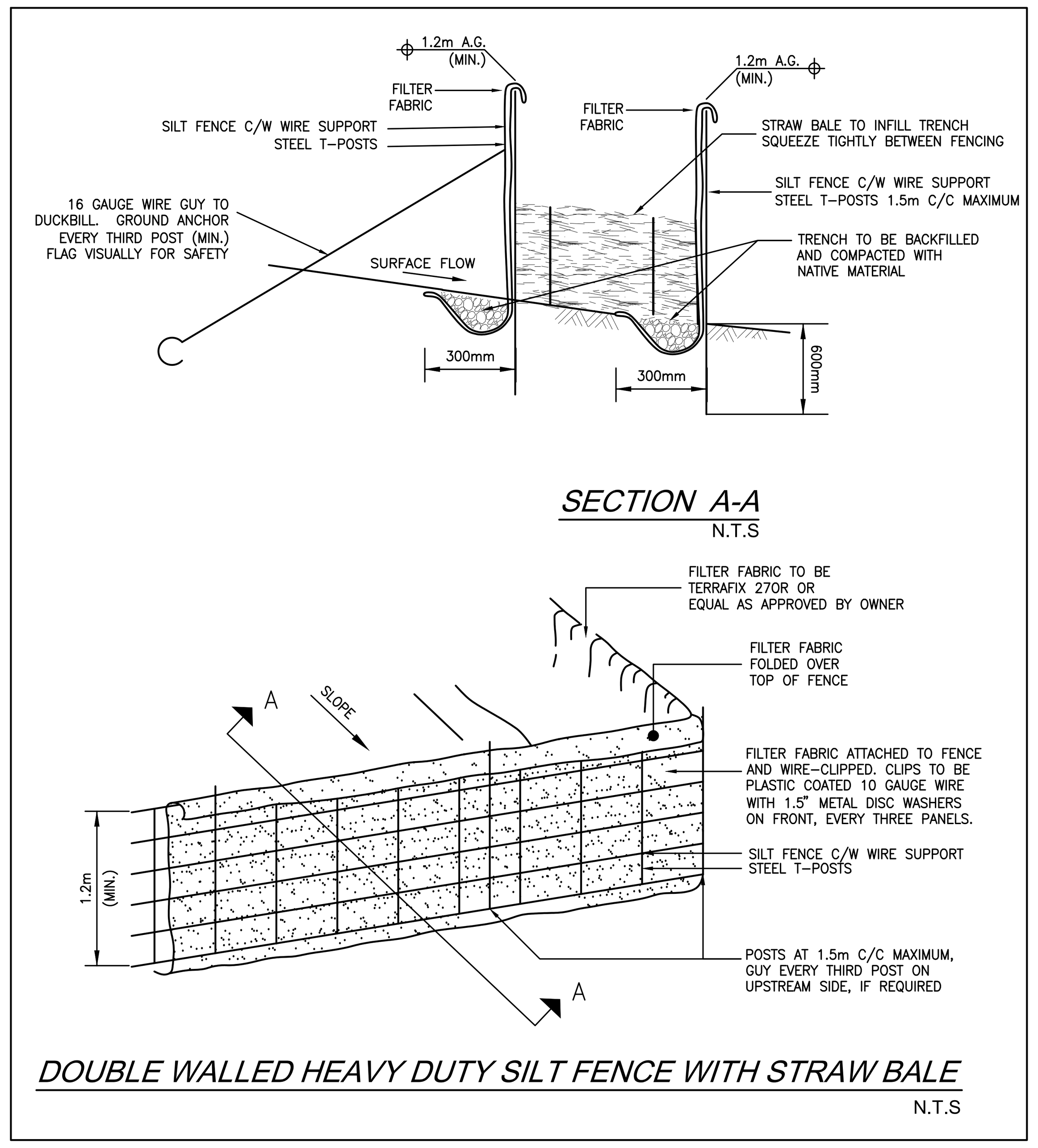
Client/Project
LOYALIST SOLAR LP
LOYALIST SOLAR PROJECT

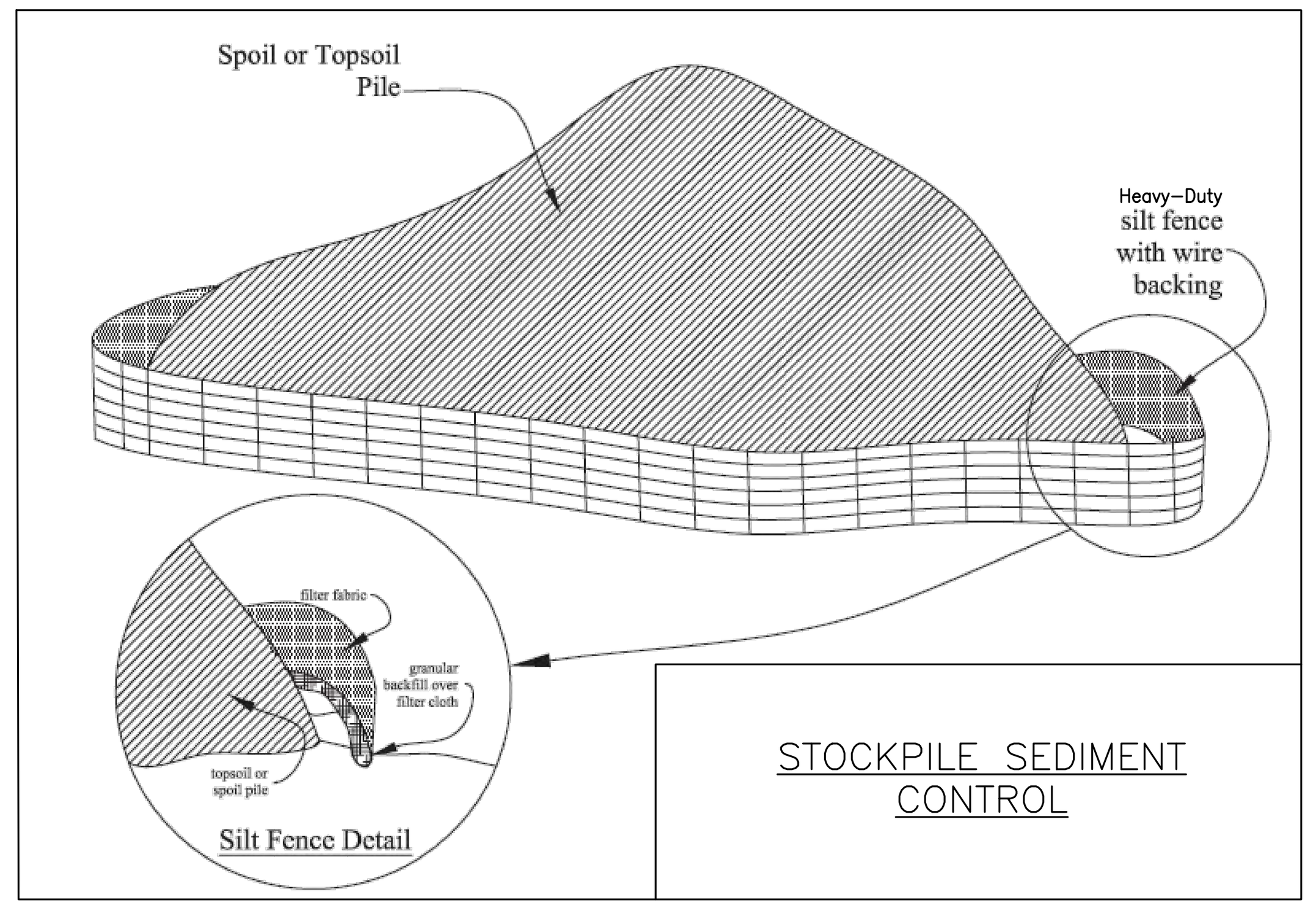
54MW GROUND-MOUNT SOLAR FARM

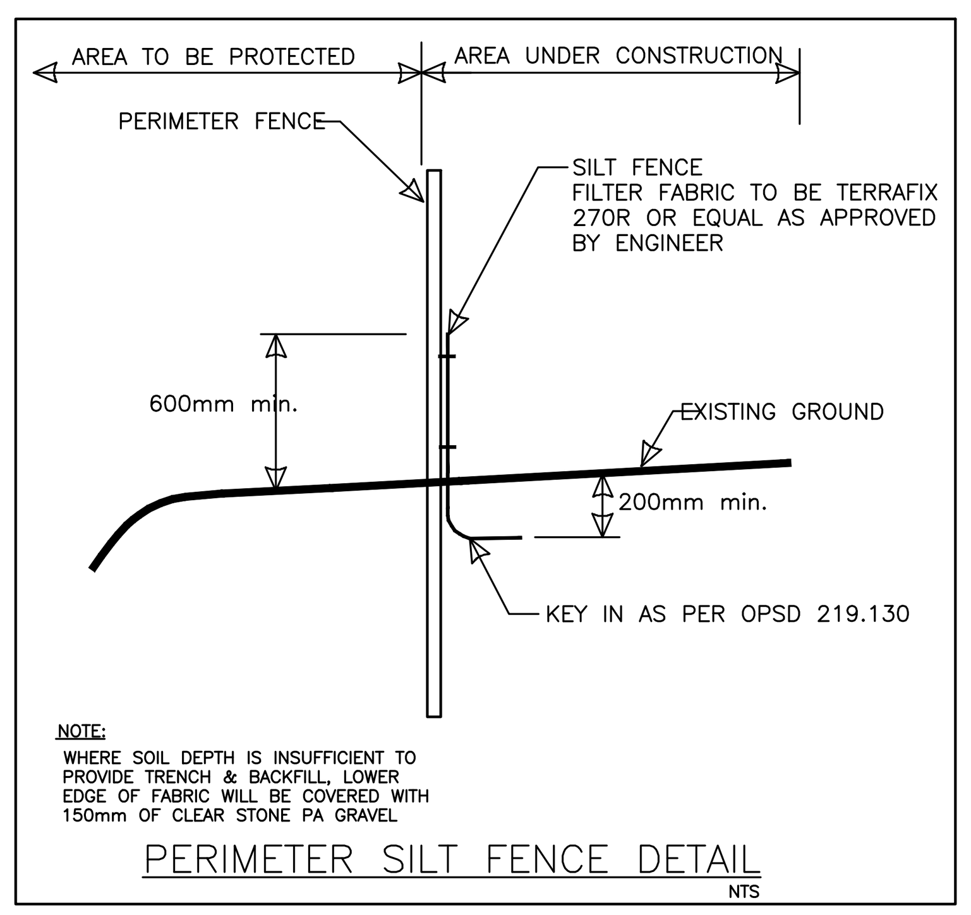
County of Lennox and Addington, Ontario

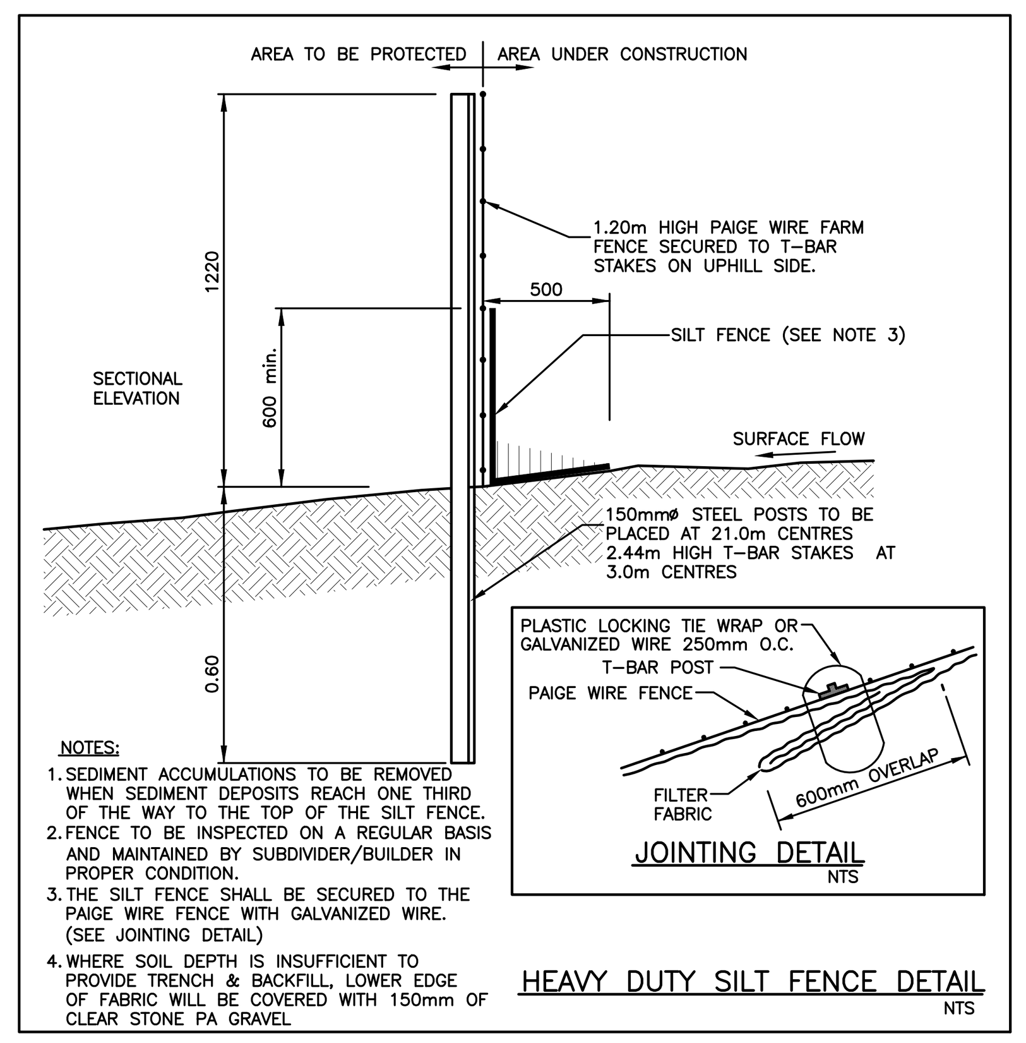
Title
SUBSTATION
SEDIMENT AND EROSION
CONTROL PLAN-SPRING CONSTRUCTION

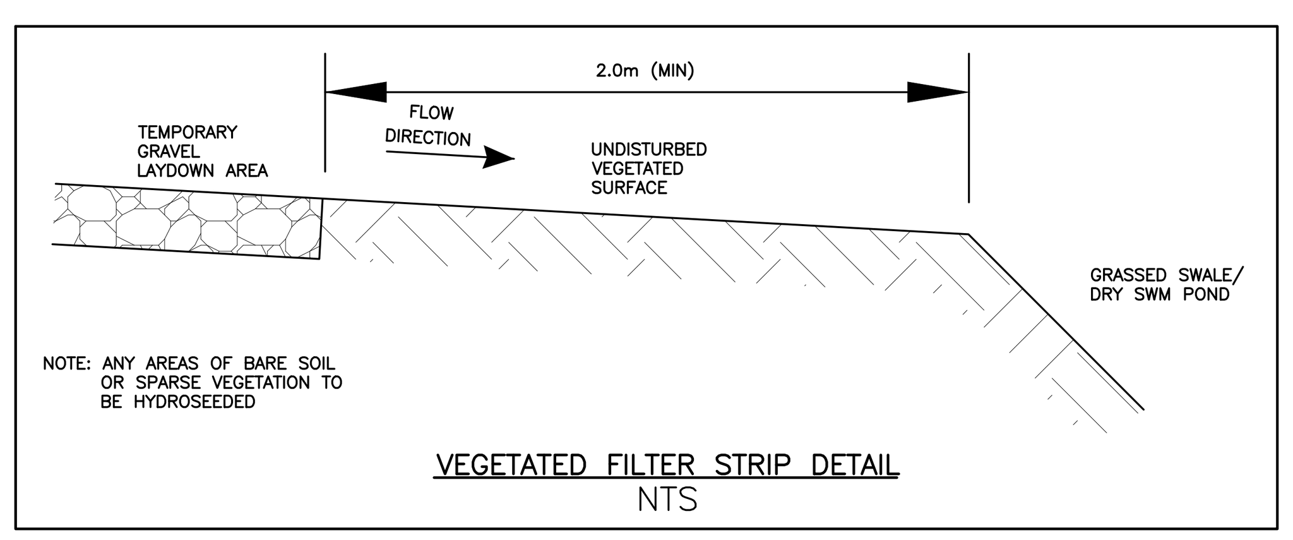
Project No. 133560220
Scale 1:500 (0 5 15 25m)
Drawing No. C-600
Sheet 2 of 2
Revision B

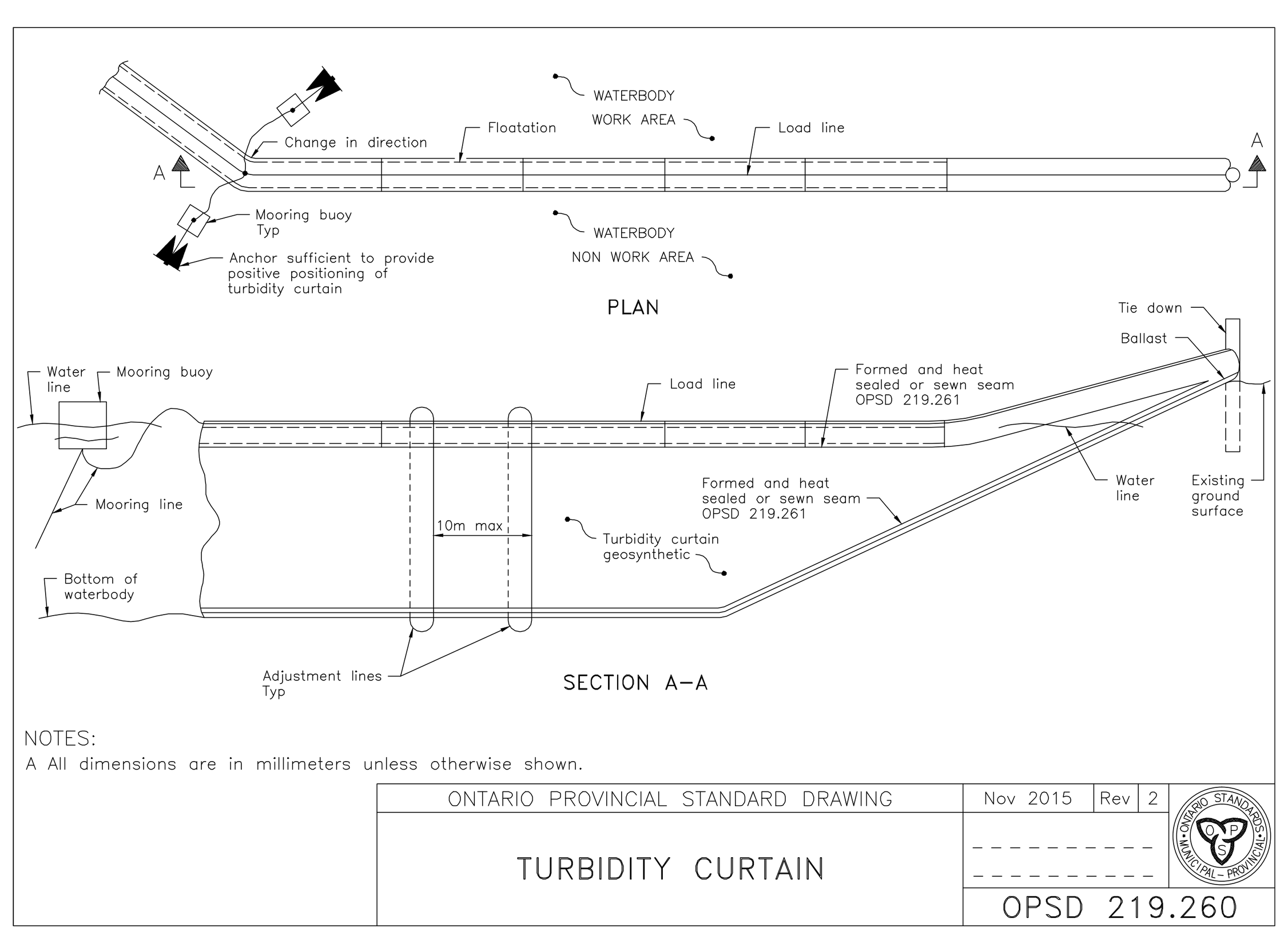


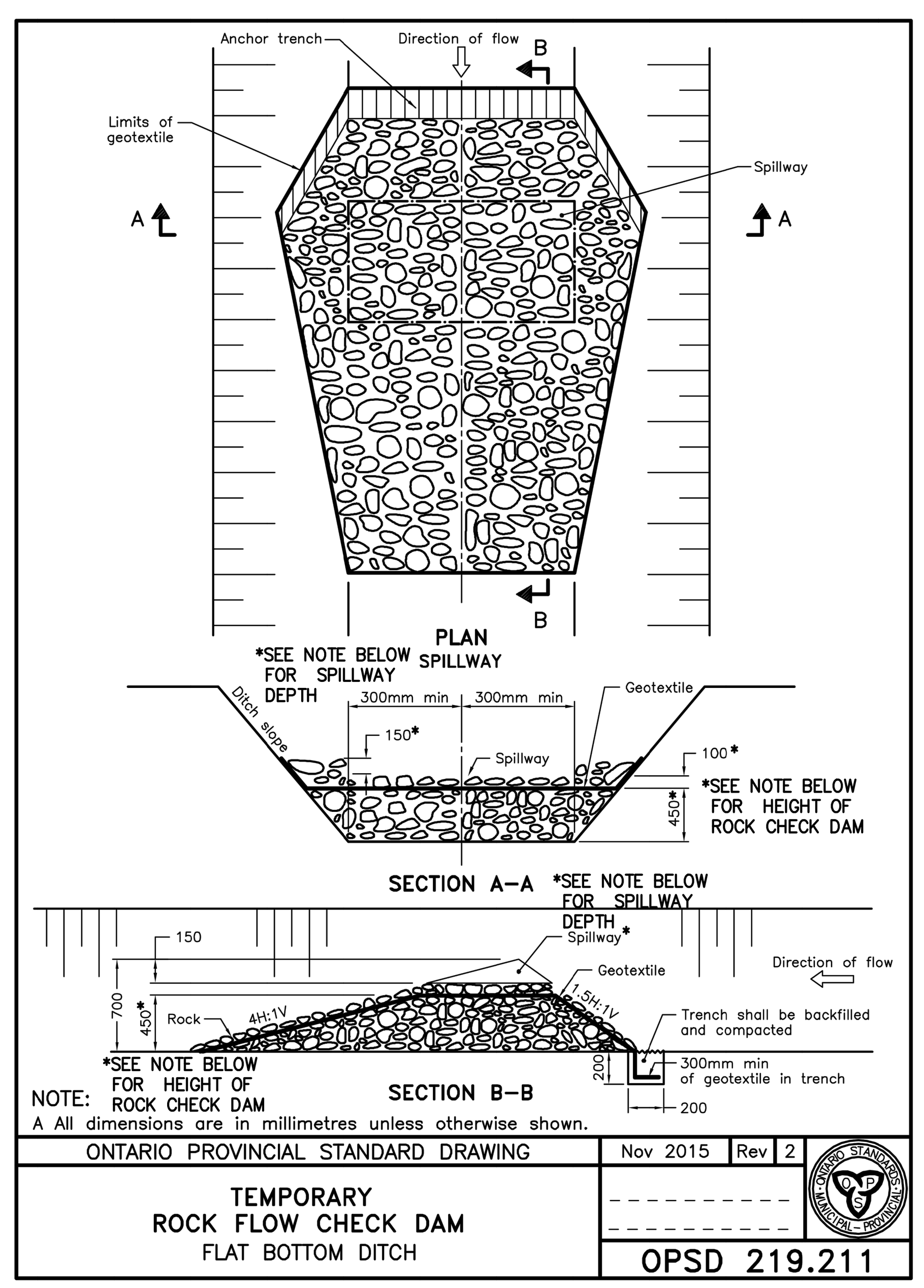












*THE 550mm HEIGHT OF ROCK CHECK DAM TO VARY PER SITE AND TO SUIT LOCAL CONDITIONS. THIS VARIANCE IS NOTED ON ENGINEER DRAWINGS AS HEIGHT OF DAM. SPILLWAY DEPTH ALSO NOTED ON THE ENGINEER DRAWINGS.

EROSION AND SEDIMENT CONTROL NOTES:
(SEE DETAILS THIS SHEET)

1. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM DURING CONSTRUCTION ACTIVITIES. THIS INCLUDES LIMITING THE AMOUNT AND DURATION OF EXPOSED SOIL AND INSTALLING SILT FENCES AND OTHER SEDIMENT TRAPS/FILTERS SIMILAR TO THOSE ILLUSTRATED HEREIN.
2. EROSION AND SEDIMENT CONTROL WORKS SHALL BE INSTALLED AND IN WORKING CONDITION PRIOR TO COMMENCEMENT OF CONSTRUCTION RELATED ACITVITIES.
3. SEDIMENT CONTROL MEASURES ADJACENT TO CONSTRUCTION AREAS MAY REQUIRE REMOVAL / RELOCATION IN ORDER TO COMPLETE SPECIFIC CONSTRUCTION ACTIVITIES. THE CONTRACTOR SHALL ENSURE THAT ADEQUATE SEDIMENT CONTROL MEASURES ARE IN PLACE AT ALL TIMES.
4. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO MAINTAIN AND BOLSTER EROSION AND SEDIMENT CONTROL MEASURES AS NECESSARY TO KEEP THEM EFFECTIVE AND MINIMIZE THE POTENTIAL FOR EROSION AND MIGRATION OF SEDIMENT TO THE DOWNSTREAM NATURAL ENVIRONMENT
5. AT THE DISCRETION OF THE OWNER OR OWNER'S CONSULTANT, ADDITIONAL SILT CONTROL DEVICES SHALL BE INSTALLED AT DESIGNATED LOCATIONS.
6. STOCKPILED MATERIAL IS TO BE STORED AWAY FROM POTENTIAL RECEIVERS (EG. WATERCOURSES) AND BE SURROUNDED BY EROSION CONTROL MEASURES WHERE MATERIAL IS TO BE LEFT IN PLACE IN EXCESS OF 10 DAYS OR PRIOR TO A RAIN EVENT, WHICHEVER OCCURS SOONER.
7. SEDIMENT THAT IS ACCUMULATED BY THE TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES SHALL BE REMOVED IN A MANNER THAT AVOIDS ESCAPE OF THE SEDIMENT TO THE DOWNSTREAM SIDE OF THE CONTROL MEASURE AND AVOIDS DAMAGE TO THE CONTROL MEASURE. ALL SEDIMENT SHALL BE REMOVED AND TOPSOIL WITH SEED TO BE ADDED IF NECESSARY.
8. ACCUMULATED SEDIMENT IS TO BE REMOVED AND DISPOSED OF AS PER OPSS 180, PRIOR TO THE REMOVAL OF ANY CONTROL MEASURE.
9. SILT FENCE AND EROSION CONTROL STRUCTURES TO BE CHECKED WEEKLY AND AFTER EACH RAINFALL (>10mm) BY A QUALIFIED INSPECTOR FOR UNDERMINING OR DETERIORATION OF THE FABRIC. SEDIMENT SHALL BE REMOVED WHEN THE LEVEL OF SEDIMENT DEPOSITION REACHES ONE THIRD OF THE WAY TO THE TOP OF THE BARRIER.
10. ALL AREAS WHERE ACTIVE CONSTRUCTION IS NOT EXPECTED FOR 30 DAYS SHALL BE STABILIZED THROUGH SEEDING WITH NATIVE PLANT SPECIES AND APPLICATION OF HYDRAULIC MULCH.
11. STOCKPILED MATERIAL IS TO BE STORED A SUFFICIENT DISTANCE FROM WATERCOURSES, TO PRECLUDE SEDIMENT INPUTS DUE TO EROSION OF STORED SOIL MATERIALS. WHERE STOCKPILED EXCAVATED NATIVE MATERIALS AND IMPORTED MATERIALS WITH A D50 LESS THAN 4.75mm ARE TO BE LEFT IN PLACE UNDISTURBED IN EXCESS OF 30 DAYS, STOCKPILES ARE TO BE COVERED WITH A ROLLED EROSION CONTROL PRODUCT (RECP) SUCH AS A TARP, SINGLE NET STRAW MAT OR DOUBLE NET STRAW MAT. IMPORTED MATERIALS WITH A D50 OF 4.75mm OR GREATER CAN REMAIN UNCOVERED. GRANULAR A AND B (TYPE II) GRADATION REQUIREMENTS ALLOW UP TO 55% PERCENT PASSING A 4.75mm SIEVE (#4 SIEVE), AND MAY BE STOCKPILED WITHOUT COVERING WITH AN RECP.
12. EROSION AND SEDIMENT CONTROL MONITORING RECORDS SHALL BE KEPT AND MADE AVAILABLE TO THE MINISTRY OF ENVIRONMENT AND CLIMATE CHANGE AND QUINTE CONSERVATION UPON REQUEST.
13. IN THE EVENT OF INCLEMENT WEATHER OR UNFAVOURABLE TERRAIN FOR CONSTRUCTION, CONSTRUCTION BEST PRACTICES, SUCH AS TEMPORARY RIG-MATS MAY BE USED TO PREVENT DISRUPTION OF SURFACE SOILS AND VEGETATIVE COVER BY CONSTRUCTION VEHICLES AND EQUIPMENT.
14. ADDITIONAL CONTROLS MAY BE REQUIRED DUE TO UNFORESEEN CIRCUMSTANCES, CHANGING SITE CONDITIONS OR IF THE PROPOSED CONTROLS DO NOT ACHIEVE THEIR ANTICIPATED RESULT. IN THESE CIRCUMSTANCES, ADDITIONAL CONTROLS WILL BE INSTALLED CONSISTENT WITH THE EROSION AND SEDIMENT CONTROL GUIDELINE FOR URBAN CONSTRUCTION (GREATER GOLDEN HORSESHOE CONSERVATION AUTHORITIES, DECEMBER, 2006). THE LOCATIONS AND APPLICATION OF THE CONTROLS WILL BE APPROVED BY THE INSPECTOR PRIOR TO THEIR INSTALLATION.
15. PUBLIC ROADS TO BE CLEANED DAILY OF ACCUMULATED SEDIMENT CAUSED BY CONSTRUCTION.
16. IN ADDITION TO BEING RESPONSIBLE FOR ENSURING THAT THE PRESCRIBED MEASURES ARE INSTITUTED AND FUNCTIONING AS INTENDED, THE CONTRACTOR IS ALSO RESPONSIBLE FOR IMPLEMENTING ANY INTERIM OR EMERGENCY MEASURES REQUIRED, TO ENSURE THAT NO SEDIMENT IS DISCHARGED TO THE NATURAL ENVIRONMENT. THE FOLLOWING EXTRA EQUIPMENT/MATERIALS ARE TO BE KEPT ON SITE AS A CONTINGENCY, IN CASE THE PROPOSED CONTROL MEASURES ARE BREACHED.
   - SILT FENCE
   - FILTER CLOTH
   - PUMPS
   - CLEAN RIP-RAP (FREE OF FINES) FOR ROCK CHECK DAMS
   - SAND BAGS
   - ANY ADDITIONAL MATERIAL DEEMED NECESSARY TO REPAIR/ CONSTRUCT PROPOSED MEASURES OR TO ADEQUATELY DEAL WITH UNEXPECTED HIGH FLOWS

   THE CONTRACTOR WILL IMMEDIATELY REPAIR OR REPLACE

DURING AREA GRADING :

1. TOPSOIL IS TO BE STRIPPED ONLY IN AREAS REQUIRING EARTHWORKS AND PLACED IN STOCK PILES AT THE LOCATIONS SHOWN ON THE PLANS OR AS APPROVED BY THE QUALIFIED ENVIRONMENTAL SITE INSPECTOR.
2. ROADWAYS AND LAY DOWN YARDS ARE TO BE PLACED ON NATIVE GROUND AFTER TOPSOIL HAS BEEN STRIPPED
3. ALL TOPSOIL IS TO BE RE-SPREAD ON CONSTRUCTION IMPACTED AREAS AFTER FINAL GRADING IS COMPLETE TO A MINIMUM DEPTH OF 150mm
4. NO TOPSOIL MAY BE EXPORTED FROM THE SITE.

SEEDING MAINTENANCE NOTES:

1. CONTRACTOR SHALL REPAIR AND RESEED DEAD OR BARE SPOTS PRIOR TO SUBSTANTIAL COMPLETION.
2. SEEDING SHALL BE WATERED AS REQUIRED TO ESTABLISH WEED-FREE, HEALTHY ESTABLISHMENT OF SEED MIX.
3. CONTROL NOXIOUS AND INVASIVE WEED GROWTH DURING (2) YEAR MAINTENANCE PERIOD. NATIVE SPECIES THAT HAVE GERMINATED NATURALLY SHALL BE RETAINED (i.e. GOLDENRODS, ASTERS etc.) REFER TO OMAFRA's NOXIOUS WEEDS IN ONTARIO FOR A LIST OF SPECIES TO BE REMOVED http: //www.omafra.gov.on.ca/english/crops/facts/noxious_weeds.htm
4. SEEDED AREAS SHALL BE UNIFORM, FREE OF RUTS EROSION AND/OR BARE AND DEAD SPOTS, FREE OF WEEDS, AND HAVE, MINIMUM 80% COVER OF GERMINATED PERENNIAL SEED FOR FINAL ACCEPTANCE.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DAMAGE TO SEEDED AREAS AND SHALL RESTORE IT TO ORIGINAL CONDITION TO THE SATISFACTION OF THE CONTRACT ADMINISTRATOR.

AFTER AREA GRADING :

1. ALL AREAS WHERE ACTIVE CONSTRUCTION IS NOT EXPECTED FOR 30 DAYS SHALL BE RE-SEEDED WITH NATIVE PLANT SPECIES PER LANDSCAPE PLAN
2. REMOVAL OF SEDIMENT CONTROL MEASURES AND COLLECTION OF ACCUMULATED SEDIMENT SHALL OCCUR FOLLOWING SUBSTANTIAL COMPLETION OF CONSTRUCTION (90%-100%) AND SITE STABILIZATION TO 90%

SILT FENCE NOTES (AS PER OPSD):

1. STAKES/POSTS ARE TO BE INSTALLED ON THE DOWNSTREAM SIDE OF THE BARRIER.
2. SILT FENCE FABRIC TO BE TERRAFIX 270R OR EQUIVALENT
3. CONTRACTOR TO MONITOR SILT FENCE FOR UV DEGRADATION.
4. SILT FENCE IS TO BE CLEANED OUT ONCE SEDIMENT REACHES MAXIMUM 1/3 OF THE FENCE HEIGHT.
5. PERIMETER SILT FENCE TO BE SECURED TO PERIMETER PROJECT FENCE AT MINIMUM 2.0m INTERVALS
6. PAIGE WIRE TO BE 16 GAUGE OR HEAVIER

ROLLED EROSION CONTROL PRODUCT (RECP) NOTES:

1. EITHER ROLLED EROSION CONTROL PRODUCTS (RECP) OR MULCHMAX ULTRA AT 500KG/HA ARE TO BE USED ON 3:1 SLOPES OR GREATER.
2. RECP SHALL BE BIODEGRADABLE AND CONSIST OF STRAW, STRAW-COCONUT, OR COCONUT FIBER WHICH ARE HELD IN PLACE BY NETTING SEWN ON BOTH SIDES OF THE MATERIAL.
3. RECP MUST BE SECURED ON STOCK PILE BY STAPLING AT THE BOTTOM OF THE SLOPE AND UPHILL TRENCHES ON THE STOCKPILE/SLOPED SURFACE.
4. RECP PRODUCTS ARE TO BE INSTALLED PER MANUFACTURER SPECIFICATIONS. INSTALLATION TO BE INSPECTED AND REPAIRED AS NEEDED.
5. RECP ARE TO BE APPLIED AS SOON AS POSSIBLE FOLLOWING GRADING AND SEEDING OF SUBJECT AREAS.
6. SURFACES ARE TO BE SMOOTH AND FREE OF STONES AND DEBRIS OR OTHER WEED CLUMPS PRIOR TO RECP BEING INSTALLED.
7. CONTRACTOR TO ENSURE THAT RILLING/GULLYING IS RECTIFIED PRIOR TO RECP INSTALLATION. CONTRACTOR TO MONITOR RUNOFF UNDER THE RECP FOLLOWING INSTALLATION.
8. CONTRACTOR TO ENSURE THAT RECP IS SECURED AT THE TOP OF THE SLOPE IN A TRENCH AND OVERLAP (SIDE TO SIDE AND BOTTOM TO TOP)
9. CONTRACTOR TO INSPECT THE SITE WEEKLY AND AFTER EVERY SIGNIFICANT RAINFALL EVENT (>10mm) AND IDENTIFY AREAS OF EROSION OR POTENTIAL EROSION. BEST MANAGEMENT PRACTICES ARE TO BE USED TO CONTROL THE EROSION. METHODS OF CONTROL MAY INCLUDE THE USE OF EROSION CONTROL BLANKETS C/W SEEDING, HYDRAULIC MULCH OR STRAW MULCH, OR SOIL BINDER. SOILS ARE TO BE STABILIZED AS SOON AS AREAS ARE IDENTIFIED TO PREVENT FURTHER EROSION.
10. SURFACES ARE TO BE SMOOTH AND FREE OF STONES AND DEBRIS OR OTHER WEED CLUMPS PRIOR TO RECP PRODUCTS BEING INSTALLED
11. CONTRACTORS TO ENSURE THAT RILLING/GULLYING RECTIFIED PRIOR TO RECP MULCHMAX ULTRA INSTALLATION CONTRACTOR TO MONITOR RUNOFF UNDER THE RECP FOLLOWING INSTALLATION.
12. CONTRACTOR TO ENSURE THAT RECP IS SECURED AT THE TOP OF THE SLOPE IN A TRENCH AND OVERLAP (SIDE TO SIDE AND BOTTOM TO TOP)

HYDRAULIC MULCH NOTES:

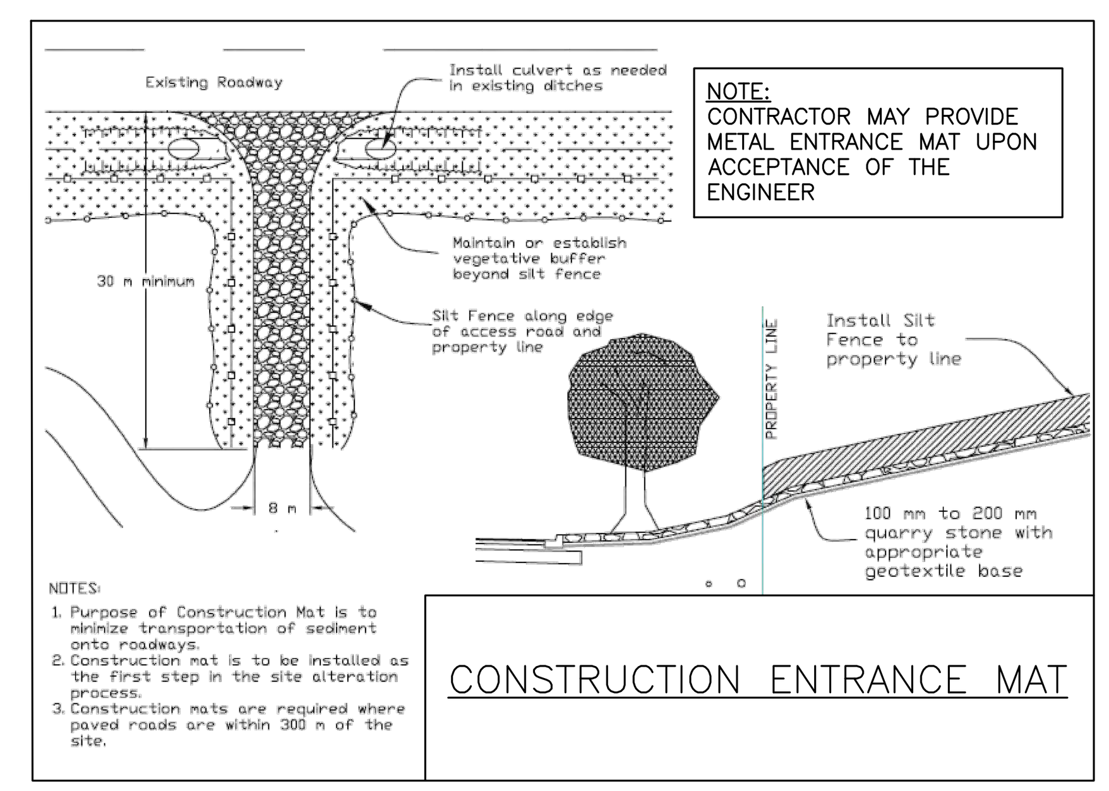
1. COORDINATE/CONSULT WITH OWNER PRIOR TO UTILIZING ANY HYDRAULIC MULCH. TIMELINES AND SEEDING METHODS NEED TO BE CAREFULLY CONSIDERED PRIOR TO IMPLEMENTATION.
2. ENSURE THAT A TACKIFIER IS USED TO KEEP PRODUCT IN PLACE.
3. APPLY SEED MIX PRIOR TO MULCH WITH TACKIFIER.
4. HYDRAULIC MULCH IS TO BE APPLIED AS SOON AS GRADING AND SEEDING WORK IS COMPLETE TO ENSURE STABILIZATION OF SOILS.
5. RE-APPLY HYDRAULIC MULCH IF THE SUBJECT AREA IS DAMAGED OR ERODED BY WIND OR WATER, SURFACE COVERAGE MUST BE AT LEAST 80% AT ALL TIMES.

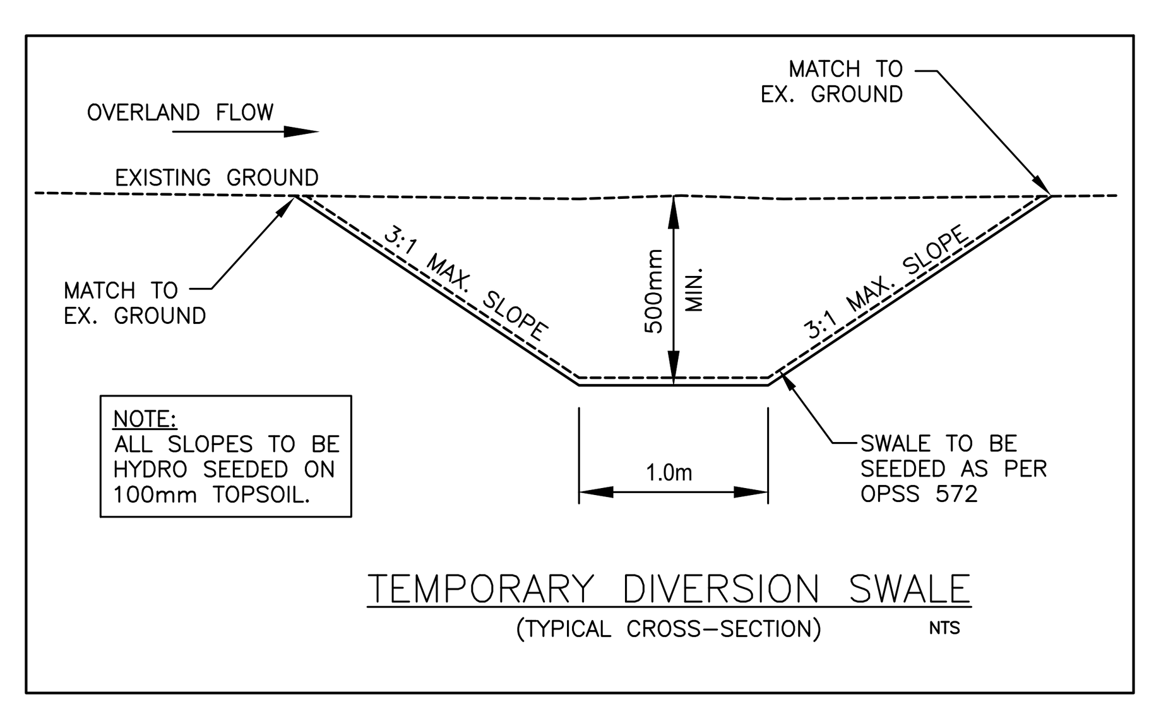
CULVERT NOTES:

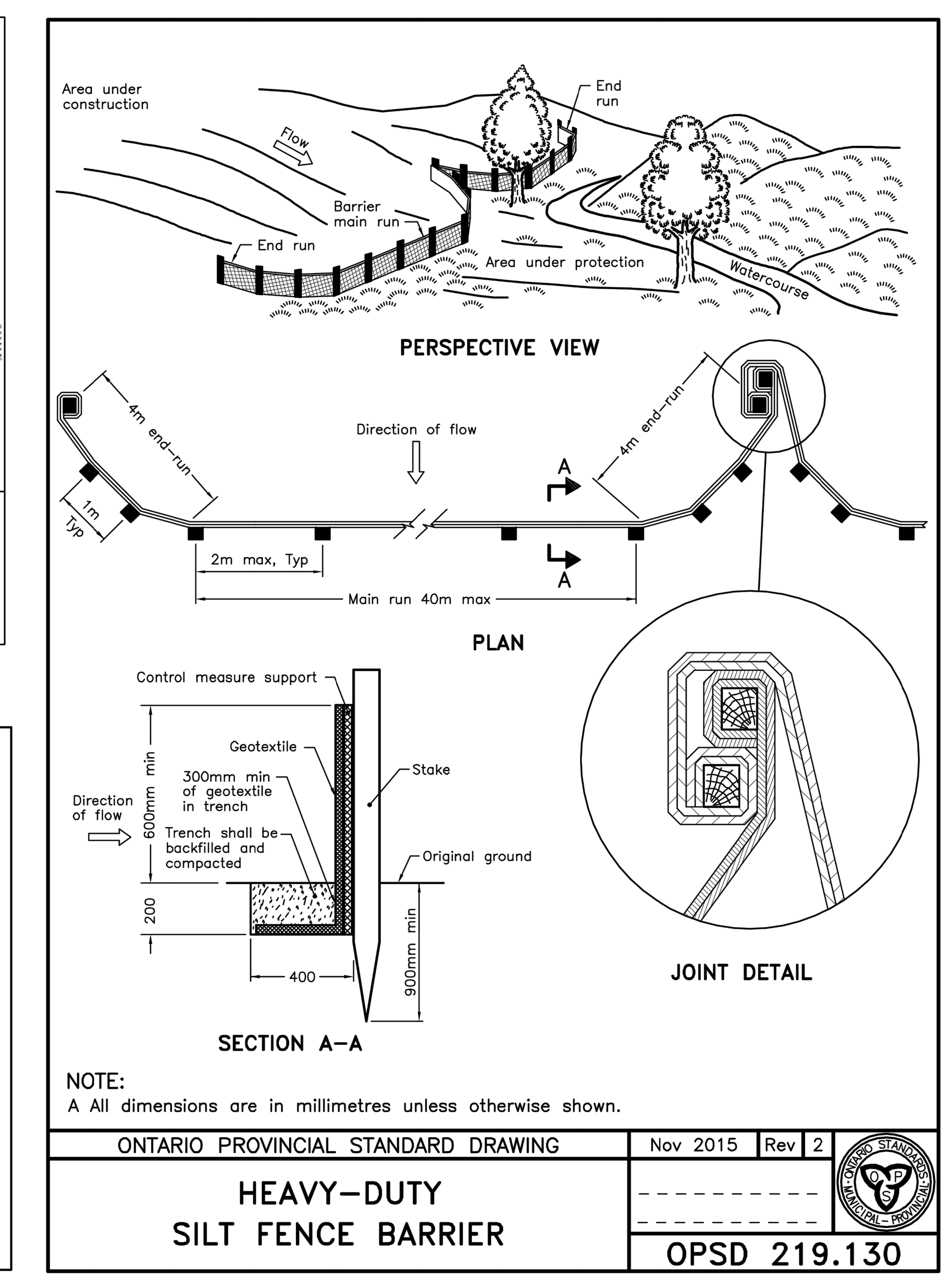
1. CULVERT SLOPE TO MATCH EXISTING DITCH GRADE UNLESS OTHERWISE NOTED.
2. CULVERT TO BE EMBEDDED 10% OF PIPE DIAMETER BELOW DITCH INVERT.
3. CULVERTS TO BE CORRUGATED STEEL PIPE (CSP). PIPE MATERIAL TO BE GALVANIZED STEEL AND HAVE A 68mm x 13mm CORRUGATION WITH 1.6mm METAL THICKNESS.
4. CULVERT TO BE INSTALLED IN ACCORDANCE WITH OPSD 802.010.
5. CULVERT ELEVATIONS ARE APPROXIMATE AND ARE TO BE FINALIZED IN THE FIELD.

GENERAL NOTES:

1. EQUIPMENT AND CONSTRUCTION MATERIAL SHALL BE STORED AWAY FROM WATER BODIES IN A MANNER THAT PREVENTS ANY DELETERIOUS SUBSTANCE FROM ENTERING THE WATER, REFUELLING OF MACHINERY AND GENERATORS SHALL NOT BE CONDUCTED WITHIN 30m OF A WATERCOURSE AND SHALL BE COMPLETED IN A CONTROLLED MANNER WITH ADEQUATE SPILL PROTECTION ON SITE







Stantec

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PCL
CONSTRUCTION LEADERS

Notes

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS IN THIS SET PREPARED BY STANTEC CONSULTING LTD.
2. 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.
3. 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).
4. IF, FOR UNFORESEEN REASONS, THE OWNER AND/OR HIS/HER REPRESENTATIVE MUST ENCROACH ONTO PRIVATE LANDS TO UNDERTAKE ANY WORKS, HE/SHE MUST OBTAIN WRITTEN PERMISSION FROM THE ADJACENT PROPERTY OWNERS PRIOR TO ENTERING UPON THE PRIVATE PROPERTY TO PERFORM ANY WORKS. COPIES OF THESE LETTERS OF CONSENT MUST BE SUBMITTED TO STANTEC, PRIOR TO ANY WORK BEING PERFORMED. FAILURE TO COMPLY WITH THE ABOVE IS AT THE PROPERTY OWNERS OWN RISK.
5. THE CONTRACTOR IS RESPONSIBLE FOR RESTORATION OF ALL DAMAGED AND/OR DISTURBED PROPERTY WITHIN THE MUNICIPAL RIGHT-OF-WAY.
6. 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 EVERYWHERE PRIOR TO THE INSTALLATION OF SOLAR PANELS.
7. CONSTRUCTION TURNING RADIUS LIMITS IDENTIFY AREAS WHERE ADDITIONAL ROAD WIDTH IS REQUIRED TO ALLOW FOR ADEQUATE CLEARANCE FOR CONSTRUCTION VEHICLES.
8. CULVERTS ARE TO BE INSTALLED AS PER OPSD 802.010. SOIL TYPE TO BE CONFIRMED ON SITE FOR DETERMINATION OF TRENCH WIDTH.
9. ALL AREAS WITHIN THE PROPOSED WORKS ARE TO BE RE-VEGETATED USING NATIVE TOPSOIL AND SEED. MIX AND APPLICATION RATE/METHOD TO BE SUBMITTED AND APPROVED BY OWNER 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. GRANULAR MATERIAL TO BE USED IN ACCORDANCE WITH OPSS 1010.
12. CULVERT TO BE CONSTRUCTED IN ACCORDANCE WITH OPSS 421. HEIGHT OF FILL TABLE FOR CSP CULVERTS TO COMPLY WITH OPSD 805.010.
13. RIPRAP SHALL BE IN ACCORDANCE WITH OPSD 810.010 SECTION B-B.
14. ALL SEEDING TO BE COMPLETED IN ACCORDANCE WITH OPSS 804.

B.	ISSUED FOR TENDER	DRR	DS	17.11.21
A.	ISSUED FOR CLIENT REVIEW	DRR	DS	17.10.30
Revision		By	Appd.	YY.MM.DD

File Name: 133560220_C-DT-EC-SUBSTATION.dwg	DRR	DS	DRR	17.10.18
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Permit-Seal

Client/Project
LOYALIST SOLAR LP
LOYALIST SOLAR PROJECT

54MW GROUND-MOUNT SOLAR FARM

County of Lennox and Addington, Ontario

Title
SUBSTATION
SEDIMENTATION AND EROSION
CONTROLS DETAILS

Project No.	Scale	
133560220		
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C-650	1 of 1	B

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