Preliminary Stormwater Pollution Protection Plan (SWPPP)

for the

City of Canandaigua

Solar Array Project

Town of Canandaigua
Ontario County, New York

June 2016

HUNT 3076.003

Prepared by:

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1. Background Information

A. Project Location and Scope

Pfister Energy of Baltimore, LLC is proposing to construct a Solar Array on a property currently occupied by the City of Canandaigua Transfer station. The proposed property is located at 4620 County Road 46, in the Town of Canandaigua, Ontario County, New York.

The development includes the installation of approximately 10 acres of solar panels, which will be mounted on concrete pads. Improvements to the site will also include a gravel access road, chain link perimeter fence, electrical equipment pads and electric utility connection.

To install the proposed improvements, it will be necessary to disturb approximately 10.5 acres of soil within the project site. The project site is currently used as a transfer station by the City of Canandaigua, with mounds of construction materials debris scattered throughout the site. It is anticipated that the restoration of the site from poorly covered grass areas and fill material to stabilized grass will decrease runoff. The project is considered redevelopment with a decrease in impervious, and for this reason water quality controls will not be provided for the proposed development. Temporary and permanent erosion and sediment control measures are proposed in accordance with New York State Department of Environmental Conservation regulations in order to minimize erosion and transportation of sediment from the project site resulting from development activities.

B. Application Information

A copy of the Notice of Intent (NOI), Notice of Termination (NOT), and Contractor's certification for Stormwater Discharges Associated with Construction Activity, are included in Appendix B. The applicant is requesting permission from the New York State Department of Environmental Conservation (NYSDEC) to disturb more than one (1) acre on the site property in accordance with the enclosed Erosion and Sediment Control Plans and Stormwater Pollution Prevention Plan (SWPPP). Copies of the SWPPP shall remain on the jobsite, with copies available at the request of and in accordance with the NYSDEC.

Contact information for owner:

Pfister Energy of Baltimore, LLC
Attn. Mike Bufalini
3915 Coolidge Avenue
Baltimore, MD 21229
ph: (410) 242-2449 email: Mbufalini@pfisterenergy.com

2. Stormwater Management Objectives

To maintain the quality and quantity of off-site stormwater both during and after the construction, the following Stormwater Management Objectives have been incorporated:

- On-site construction activities will utilize Best Management Practices (BMP's) to control the erosion of on-site soil and sediment through control measures indicated in the Erosion and Sedimentation Control Plans (Attachment G). All erosion and sediment control measures shall be

installed before any construction begins and shall be maintained in accordance with the New York State Guidelines for Urban Erosion and Sediment Control.

- Construction activities will include the stabilization of disturbed soils through a combination of temporary BMP's including temporary seeding or mulching along excavated areas, and dust control where appropriate.

- During construction, sediment control will be provided by the use of a variety of approved measures including stabilized construction entrance, silt fence. Once vegetation has reached 80 percent coverage, these sediment control measures may be removed.

- In order to maintain the existing conditions to the greatest extent possible, any existing impervious areas being converted to lawn will use soil restorative measures after final grading. As specified by the NYSDEC manual, a minimum six (6) inches of topsoil with aeration is required to restore the soil to the pre-developed condition.

- The post-construction stormwater control systems have been designed using the five-step process, including site planning and storm water management practice (SMP) selection as follows:

    1. Site planning to preserve natural features and reduce impervious cover.
    2. Calculation of the water quality volume for the site.
    3. Incorporation of green infrastructure techniques and standard SMP's with Runoff Reduction Volume (RRv) capacity.
    4. Use of standard SMPs, where applicable, to treat the portion of water quality volume remaining after runoff reduction measures.
    5. Evaluation of site hydrology to determine pre-development run-off conditions are not adversely impacted.

3. Existing Conditions & Site Planning

A. Description of Existing Hydrology

The project site is currently a mixture of poorly covered grass, with construction debris scattered throughout the site. There are impervious gravel areas and roads located on site. The site is surrounded by wetlands to the east and west, with wooded areas to the north, and generally drains westward to the Canandaigua outlet. For the analysis of project the site can be delineated into three watersheds, with the edge of the woods being the study point. The areas can be described as follows:

Drainage Area A – An approximately 11.5 Acre drainage area encompassing the southwestern portion of the site. The area contains most of the solar array and drains southwest towards a wetland, which then empties into the Canandaigua Outlet. It contains sparsely covered grasses, a dirt road, transfer station pad and associated existing paving. The area is solely HSG type D soils.

Drainage Area B – Located on the northern end of the property is an 3.26 drainage area that drains north to a wooded area. The primary soils are HSG Type D.

Drainage Area C – 3.25 Acre portion of the project site with HSG Type D soils and drains easterly towards the woods. It is primarily made up of poorly covered grass, large mounds of debris, and a gravel road.

A summary of the drainage areas is below, detailed calculations can be found in Appendix E.

Existing Conditions
(See Attachment D for calculations)

Drainage Areas	Curve Number	Area (acres)	TC (hrs)
DA A PRE	87	11.50	0.108
DA B PRE	89	3.26	0.083
DA C PRE	89	3.25	0.083
Total	88.5	18.16	0.108

B. Water Bodies and Wetlands Impacted by Site

There is a Class C stream onsite, the Canandaigua Outlet, which flows roughly 34 miles north and merges with the Erie Canal in Lyons, New York. The project is not anticipated to impact this stream with the proposed improvements. Run-off to the stream will be maintained as to not result in adverse impacts.

There are state and federal wetlands located on the property but will not be impacted by the associated development.

C. Environmentally Sensitive Areas

As required by the SPDES Permit, the Historical Resource maps available online from the State Historical Preservation Office (SHPO) have been consulted. As shown in the map in Appendix A, the project site is not located in an archeologically sensitive area. Clearance has been obtained from OPRHP stating there will not be impacts to historic properties.

As shown on the NYSDEC Environmental Resource Map in Appendix A, the project site is not in the vicinity of rare plants or animals.

D. TMDL Identification Requirements

The site does not drain to a water body on the 303d list of impaired waters.

E. Existing Utility Lines, Easements, Water Supply and Sewage Treatment

The proposed project does not require water or sewer connections. A connection to the existing RG&E utility lines along County Road 46 will be provided to facilitate the distribution of the solar generated electricity. This will be accomplished by providing an overhead electric line from the solar array to the ROW. The access road will utilize the existing road for the transfer station.

F. Soil Identification, Description and Hydrological Soil Group

The entire site consists of a variety of Silt Clay Loam types, with the proposed improvement being classified as HSG Type D soil. This soil type is typical of fine grained material that has a low to moderate infiltration rate. It is unlikely that the soils currently existing on the site represent the soils native to the area due to the previous land use. For a conservative design, it has been assumed that the soils are saturated and calculations are based on HSG D soil characteristics.

G. Protection and Enhancement of Natural Resources

The site plan was developed to utilize the natural hydrology of the site, preserve natural resources and reduce impervious cover. As part of the planning process various strategies have been implemented to minimize runoff and maintain pre-construction hydrology. All reasonable opportunities as specified by the NYSDEC Stormwater Design manual have been evaluated. Existing features will be conserved to the greatest extent possible and vegetation removal will be limited to those areas directly affected by the improvements or that will impact the solar array.

In order to maintain the existing conditions to the greatest extent possible, the site will use soil restorative measures after final grading. If there is not adequate topsoil, as specified by the NYSDEC manual, a minimum six (6) inches of topsoil with aeration is required to restore the soil to the pre-developed condition. Full soil restoration is specified in areas of existing impervious or heavy construction traffic areas.

The site planning process included provisions to reduce impervious cover. The proposed impervious at the site includes the gravel access road, and the ballast foundations that will be used for the Array Panels.

H. Acreage and Location of Proposed Impervious Areas

The project site currently has 1.5 acres of impervious surface. After redevelopment, the total impervious will be reduced to 0.89 acres and will be made up of the remaining gravel drive, and concrete ballasts for the array panels. Because there is a reduction in impervious surface by 40.6%, additional stormwater mitigation will not be required.

4. Post-Construction SWPPP

A. Proposed Stormwater Management Plan

The proposed development was designed to maintain or reduce the existing runoff rates to the aforementioned study points.

Proposed Conditions
(See Attachment D for Calculations)

Drainage Areas	Curve Number	Area (acres)	TC (hrs)
DA A POST	84	11.32	0.167
DA B POST	85	3.51	0.143
DA C POST	88	3.2	0.209
Total	86	18.03	0.173

Summary of Stormwater Runoff Rates at Study Points (cfs)

	10-Year			100-Year		
	Pre (cfs)	Post (cfs)	Difference	Pre (cfs)	Post (cfs)	Difference
SP #A	32.09	24.77	-23%	63.94	52.80	-17%
SP #B	9.97	8.47	-15%	19.45	17.72	-8%
SP #C	9.94	7.96	-20%	19.39	15.72	-19%
Total	**52**	**41.2**	**-20.7%**	**102.78**	**86.24**	**-16%**

5. During Construction SWPPP

A. SWPPP Inspection

Site inspections will be completed by a qualified person a minimum of every seven (7) days (2 if greater than 5 acre disturbance). Typical items of inspection will be:

1. Placement of mulch and seeding
2. Silt fence, and all other erosion and sediment control devices
3. Visible signs of erosion
4. Identify potential pollutants entering or exiting site, such as turbidity in receiving or exiting waters, and signs of mud or dirt transported from the site onto the public road.

B. Construction Site Log Book

A Construction Site Log Book with inspection forms are included in Attachment E and shall be updated and amended as the project progresses.

C. Construction Sequence

The following are steps regarding the construction and installation of various project components that will assist in the control of erosion and sediment control. At no point throughout construction shall greater than five (5) acres of the site be disturbed unless a 5-acre waiver document has been obtained:

1. Install stabilized construction entrance as shown on C4.0.
2. Install and perimeter protection measures (silt fence, etc.).
3. Remove vegetation as necessary for entrance road and proposed improvements.
4. Restore impervious areas in accordance with NYSDEC standards. Seed and mulch upon completion of restoration.
5. Provide temporary stabilization of all disturbed areas using mulch, temporary seeding or permanent seeding as appropriate..
6. Install solar arrays and all other proposed site improvements.
7. Provide permanent vegetation on any disturbed areas that have not achieved 80% stabilization.
8. Remove all temporary erosion and sediment controls once 80% permanent stabilization has been achieved.

D. Greater than 5 Acre Disturbance

This project is proposed to disturb more than than five (5) acres as one time. To ensure the area is protected from erosion and sediment, these additional measures must be followed whenever the unstabilized area exceeds five (5) acres:

1. A minimum of two (2) inspections will be performed by a qualified inspector at least every seven (7) days, for as long as greater than five (5) acres of soil remain disturbed.
2. Areas where soil disturbance activity will be temporarily ceased shall be stabilized within five (5) days from when soil disturbance ceases.
3. If the contractor proposes to phase construction, a phasing plan must be prepared identifying the areas and close out requirements.

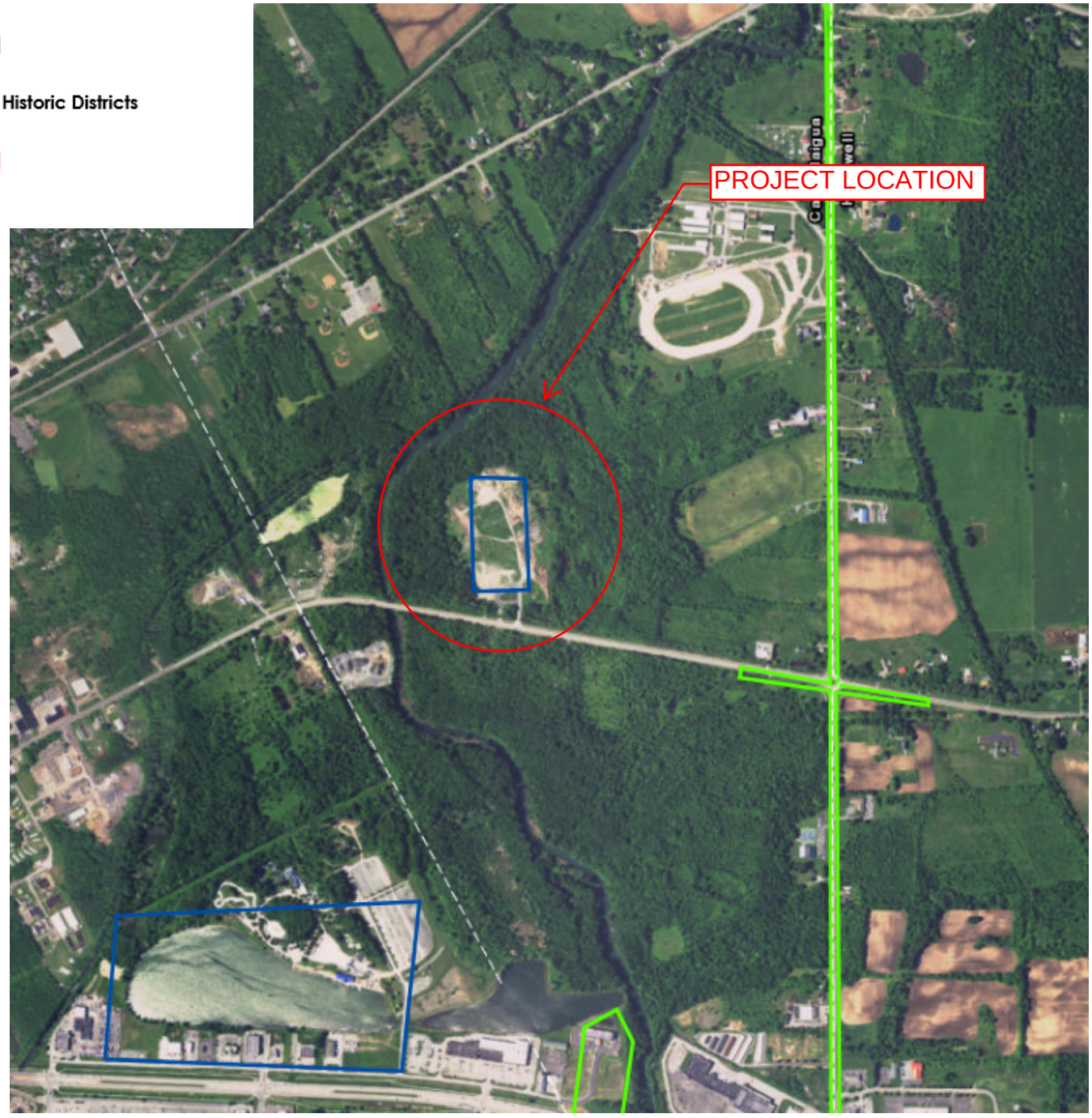
ATTACHMENT A

Project Location Maps

Survey Archaeology Areas (View)

Consultation Projects (View)

LPC Historic Districts



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ARCHEOLOGICAL SENSITIVITY FIGURE

Canandaigua County Road 46 Solar Design
Pfister Energy of Baltimore, LLC
Town of Canandaigua, Ontario County, New York

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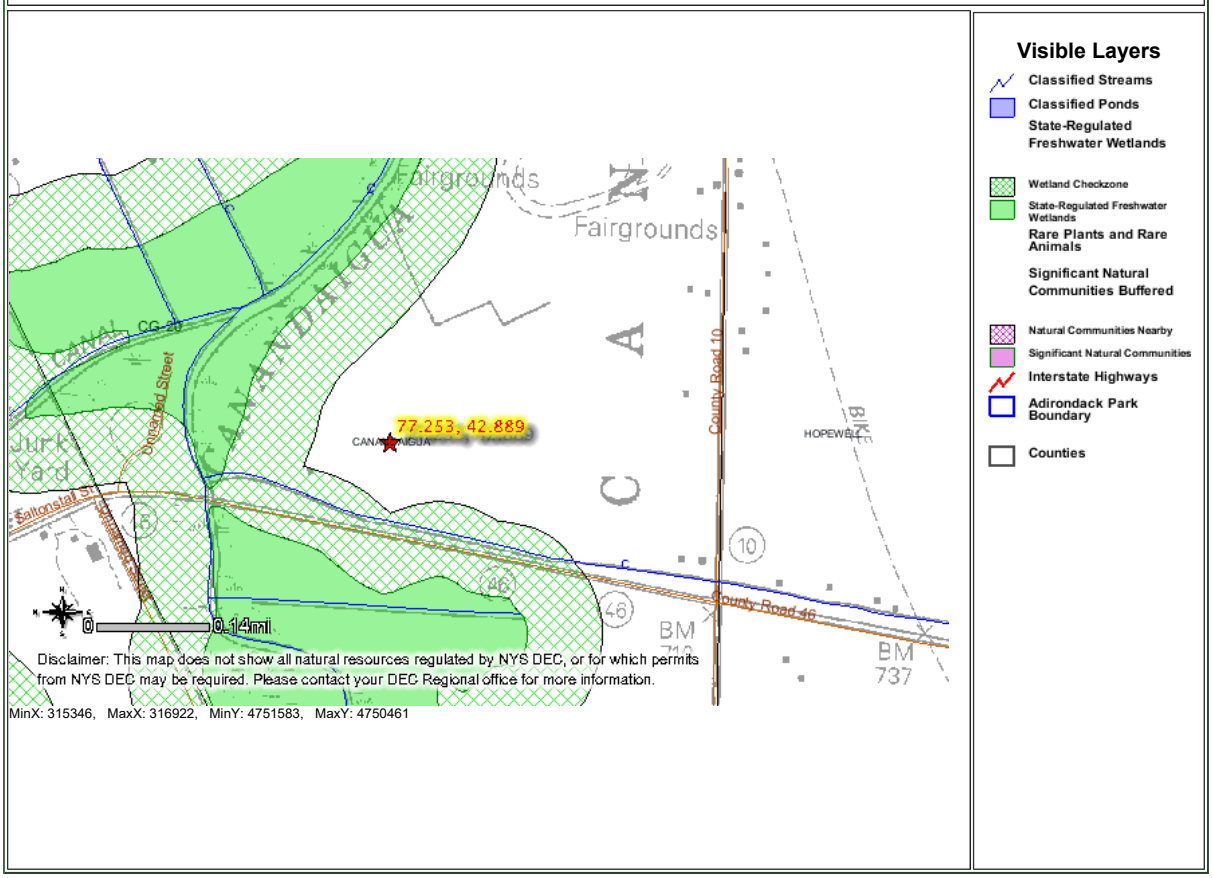
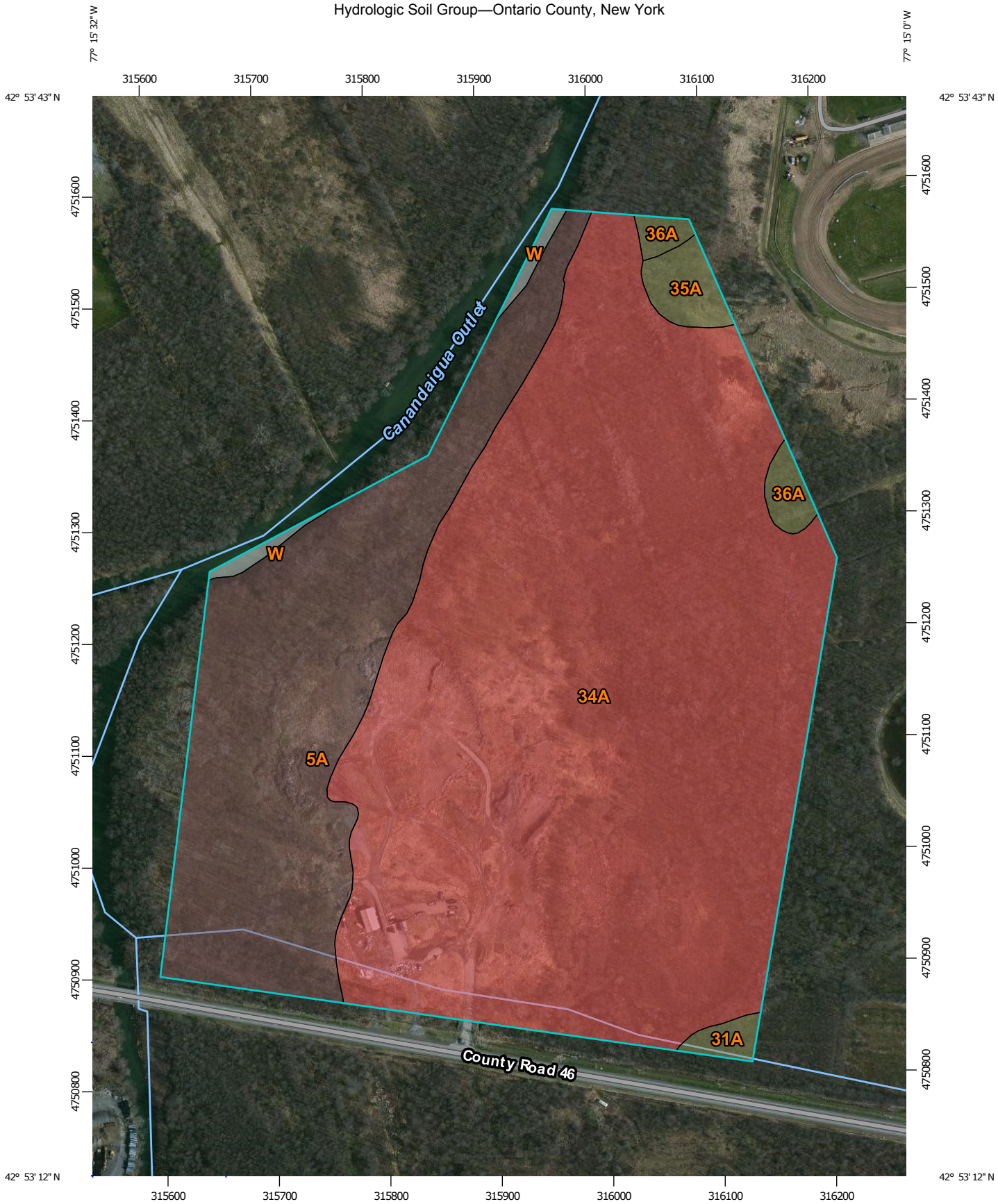
[print page] [close window]

Please set your printer orientation to "Landscape".

NYSDEC ENVIRO



Disclaimer:This map was prepared by the New York State Department of Environmental Conservation using the most
current data available. It is deemed accurate but is not guaranteed. NYS DEC is not responsible for any inaccuracies
in the data and does not necessarily endorse any interpretations or products derived from the data.


77° 15' 32" W
77° 15' 0" W
42° 53' 43" N
42° 53' 12" N
315600
315700
315800
315900
316000
316100
316200
4751600
4751500
4751400
4751300
4751200
4751100
4751000
4750900
4750800
36A
35A
W
Canandaigua-Outlet
36A
W
34A
5A
31A
County Road 46
Map Scale: 1:4,700 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 50 100 200 300
Feet
0 200 400 800 1200
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Ontario County, New York
Survey Area Data: Version 12, Sep 24, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Ontario County, New York (NY069)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
5A	Wayland soils complex, 0 to 3 percent slopes, frequently flooded	B/D	19.7	25.2%
31A	Collamer silt loam, 0 to 3 percent slopes	C/D	0.5	0.6%
34A	Lakemont silty clay loam, 0 to 3 percent slopes	D	55.6	70.9%
35A	Odessa silt loam, 0 to 3 percent slopes	C/D	1.1	1.4%
36A	Schoharie silty clay loam, 0 to 3 percent slopes	C/D	1.0	1.2%
W	Water		0.5	0.7%
Totals for Area of Interest			**78.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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HORSEHEADS, NY ROCHESTER, NY TOWANDA, PA

LOCATION MAP

Canandaigua County Road 6 Solar Design
Pfister Energy of Baltimore, LLC
Town of Canandaigua, Ontario County, New York

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ATTACHMENT B

NOI and NOT

ATTACHMENT C

Contractor's Certification

Contractor Certification Statement

I hereby certify that I understand and agree to comply with the terms and conditions of the Town of Canandaigua Solar Array Project SWPPP dated June 2016, agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Elements of the SWPPP that are my responsibility include:

_____

_____

_____

_____

_____

The name and title of the trained individual responsible for the SWPPP implementation is:

_____

Signature _____

Date _____

Printed Name & Title _____

Company Name _____

Address _____

_____

Phone _____

ATTACHMENT D

Hydrologic Calculations with PondPack

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
DA-A PRE	Pre-Development 1	1	0.797	11.950	14.26
DA-A PRE	Pre-Development 10	10	1.801	11.950	32.09
DA-A PRE	Pre-Development 100	100	3.696	11.950	63.94
DA-B PRE	Pre-Development 1	1	0.254	11.950	4.59
DA-B PRE	Pre-Development 10	10	0.550	11.900	9.97
DA-B PRE	Pre-Development 100	100	1.097	11.900	19.45
DA-C PRE	Pre-Development 1	1	0.254	11.950	4.58
DA-C PRE	Pre-Development 10	10	0.548	11.900	9.94
DA-C PRE	Pre-Development 100	100	1.093	11.900	19.39
DA-A POST	Post-Development 1	1	0.627	12.000	10.13
DA-A POST	Post-Development 10	10	1.536	12.000	25.21
DA-A POST	Post-Development 100	100	3.321	12.000	53.30
DA-B POST	Post-Development 1	1	0.209	12.000	3.50
DA-B POST	Post-Development 10	10	0.498	11.950	8.35
DA-B POST	Post-Development 100	100	1.059	11.950	17.58
DA-C POST	Post-Development 1	1	0.234	11.950	4.23
DA-C POST	Post-Development 10	10	0.518	11.900	9.40
DA-C POST	Post-Development 100	100	1.048	11.900	18.70

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
SP A	Post-Development 1	1	0.627	12.000	10.13
SP A	Pre-Development 1	1	0.797	11.950	14.26
SP A	Pre-Development 10	10	1.801	11.950	32.09
SP A	Post-Development 10	10	1.536	12.000	25.21
SP A	Pre-Development 100	100	3.696	11.950	63.94
SP A	Post-Development 100	100	3.321	12.000	53.30
DA B	Post-Development 1	1	0.209	12.000	3.50
DA B	Pre-Development 1	1	0.254	11.950	4.59
DA B	Pre-Development 10	10	0.550	11.900	9.97
DA B	Post-Development 10	10	0.498	11.950	8.35
DA B	Pre-Development 100	100	1.097	11.900	19.45
DA B	Post-Development 100	100	1.059	11.950	17.58
DA C	Post-Development 1	1	0.234	11.950	4.23
DA C	Pre-Development 1	1	0.254	11.950	4.58
DA C	Pre-Development 10	10	0.548	11.900	9.94
DA C	Post-Development 10	10	0.518	11.900	9.40
DA C	Pre-Development 100	100	1.093	11.900	19.39

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
DA C	Post-Development 100	100	1.048	11.900	18.70

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.110
Slope	0.050 ft/ft
2 Year 24 Hour Depth	2.2 in
Average Velocity	0.26 ft/s
Segment Time of Concentration	0.107 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	228.00 ft
Is Paved?	False
Slope	0.050 ft/ft
Average Velocity	3.61 ft/s
Segment Time of Concentration	0.018 hours

Segment #3: Length and Velocity	
Hydraulic Length	228.00 ft
Velocity	1.50 ft/s
Segment Time of Concentration	0.042 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.167 hours

==== User Defined Length & Velocity

Tc = (Lf / V) / 3600

Where:
Tc= Time of concentration, hours
Lf= Flow length, feet
V= Velocity, ft/sec

==== SCS Channel Flow

Tc =
R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =
Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.110
Slope	0.050 ft/ft
2 Year 24 Hour Depth	2.2 in
Average Velocity	0.26 ft/s
Segment Time of Concentration	0.107 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	228.00 ft
Is Paved?	False
Slope	0.050 ft/ft
Average Velocity	3.61 ft/s
Segment Time of Concentration	0.018 hours

Segment #3: Length and Velocity	
Hydraulic Length	228.00 ft
Velocity	1.50 ft/s
Segment Time of Concentration	0.042 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.167 hours

==== User Defined Length & Velocity

Tc = (Lf / V) / 3600

Where:
Tc= Time of concentration, hours
Lf= Flow length, feet
V= Velocity, ft/sec

==== SCS Channel Flow

Tc =
R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =
Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.110
Slope	0.050 ft/ft
2 Year 24 Hour Depth	2.2 in
Average Velocity	0.26 ft/s
Segment Time of Concentration	0.107 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	228.00 ft
Is Paved?	False
Slope	0.050 ft/ft
Average Velocity	3.61 ft/s
Segment Time of Concentration	0.018 hours

Segment #3: Length and Velocity	
Hydraulic Length	228.00 ft
Velocity	1.50 ft/s
Segment Time of Concentration	0.042 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.167 hours

==== User Defined Length & Velocity

Tc = (Lf / V) / 3600

Where:
Tc= Time of concentration, hours
Lf= Flow length, feet
V= Velocity, ft/sec

==== SCS Channel Flow

Tc =
R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Tc =
Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.020
Slope	0.013 ft/ft
2 Year 24 Hour Depth	2.2 in
Average Velocity	0.59 ft/s
Segment Time of Concentration	0.047 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	500.00 ft
Is Paved?	False
Slope	0.050 ft/ft
Average Velocity	3.61 ft/s
Segment Time of Concentration	0.038 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	228.00 ft
Is Paved?	False
Slope	0.030 ft/ft
Average Velocity	2.79 ft/s
Segment Time of Concentration	0.023 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.108 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.020
Slope	0.013 ft/ft
2 Year 24 Hour Depth	2.2 in
Average Velocity	0.59 ft/s
Segment Time of Concentration	0.047 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	500.00 ft
Is Paved?	False
Slope	0.050 ft/ft
Average Velocity	3.61 ft/s
Segment Time of Concentration	0.038 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	228.00 ft
Is Paved?	False
Slope	0.030 ft/ft
Average Velocity	2.79 ft/s
Segment Time of Concentration	0.023 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.108 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.020
Slope	0.013 ft/ft
2 Year 24 Hour Depth	2.2 in
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Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	500.00 ft
Is Paved?	False
Slope	0.050 ft/ft
Average Velocity	3.61 ft/s
Segment Time of Concentration	0.038 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	228.00 ft
Is Paved?	False
Slope	0.030 ft/ft
Average Velocity	2.79 ft/s
Segment Time of Concentration	0.023 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.108 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.100
Slope	0.020 ft/ft
2 Year 24 Hour Depth	2.2 in
Average Velocity	0.19 ft/s
Segment Time of Concentration	0.143 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	2.08 ft
Is Paved?	False
Slope	0.050 ft/ft
Average Velocity	3.61 ft/s
Segment Time of Concentration	0.000 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.143 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.100
Slope	0.020 ft/ft
2 Year 24 Hour Depth	2.2 in
Average Velocity	0.19 ft/s
Segment Time of Concentration	0.143 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	2.08 ft
Is Paved?	False
Slope	0.050 ft/ft
Average Velocity	3.61 ft/s
Segment Time of Concentration	0.000 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.143 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.100
Slope	0.020 ft/ft
2 Year 24 Hour Depth	2.2 in
Average Velocity	0.19 ft/s
Segment Time of Concentration	0.143 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	2.08 ft
Is Paved?	False
Slope	0.050 ft/ft
Average Velocity	3.61 ft/s
Segment Time of Concentration	0.000 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.143 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.015
Slope	0.020 ft/ft
2 Year 24 Hour Depth	2.2 in
Average Velocity	0.89 ft/s
Segment Time of Concentration	0.031 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	150.00 ft
Is Paved?	False
Slope	0.050 ft/ft
Average Velocity	3.61 ft/s
Segment Time of Concentration	0.012 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.015
Slope	0.020 ft/ft
2 Year 24 Hour Depth	2.2 in
Average Velocity	0.89 ft/s
Segment Time of Concentration	0.031 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	150.00 ft
Is Paved?	False
Slope	0.050 ft/ft
Average Velocity	3.61 ft/s
Segment Time of Concentration	0.012 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

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Hydraulic Length	150.00 ft
Is Paved?	False
Slope	0.050 ft/ft
Average Velocity	3.61 ft/s
Segment Time of Concentration	0.012 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
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Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.010
Slope	0.010 ft/ft
2 Year 24 Hour Depth	2.2 in
Average Velocity	0.93 ft/s
Segment Time of Concentration	0.030 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	265.00 ft
Is Paved?	False
Slope	0.050 ft/ft
Average Velocity	3.61 ft/s
Segment Time of Concentration	0.020 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.010
Slope	0.010 ft/ft
2 Year 24 Hour Depth	2.2 in
Average Velocity	0.93 ft/s
Segment Time of Concentration	0.030 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	265.00 ft
Is Paved?	False
Slope	0.050 ft/ft
Average Velocity	3.61 ft/s
Segment Time of Concentration	0.020 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

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Hydraulic Length	265.00 ft
Is Paved?	False
Slope	0.050 ft/ft
Average Velocity	3.61 ft/s
Segment Time of Concentration	0.020 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.011
Slope	0.010 ft/ft
2 Year 24 Hour Depth	2.2 in
Average Velocity	0.86 ft/s
Segment Time of Concentration	0.032 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	2.65 ft
Is Paved?	False
Slope	0.030 ft/ft
Average Velocity	2.79 ft/s
Segment Time of Concentration	0.000 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.011
Slope	0.010 ft/ft
2 Year 24 Hour Depth	2.2 in
Average Velocity	0.86 ft/s
Segment Time of Concentration	0.032 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	2.65 ft
Is Paved?	False
Slope	0.030 ft/ft
Average Velocity	2.79 ft/s
Segment Time of Concentration	0.000 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
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Slope	0.010 ft/ft
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Average Velocity	0.86 ft/s
Segment Time of Concentration	0.032 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	2.65 ft
Is Paved?	False
Slope	0.030 ft/ft
Average Velocity	2.79 ft/s
Segment Time of Concentration	0.000 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Subsection: Runoff CN-Area
Label: DA-A POST

Return Event: 1 years
Storm Event: 1

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil D	80.000	7.355	0.0	0.0	80.000
Open space (Lawns,parks etc.) - Poor condition; grass cover < 50% - Soil D	89.000	1.624	0.0	0.0	89.000
Woods - good - Soil D	77.000	0.399	0.0	0.0	77.000
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil D	98.000	0.864	0.0	0.0	98.000
Impervious Areas - Gravel (w/ right-of-way) - Soil D	91.000	1.078	0.0	0.0	91.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	11.320	(N/A)	(N/A)	83.607

Subsection: Runoff CN-Area
Label: DA-A POST

Return Event: 10 years
Storm Event: 1

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil D	80.000	7.355	0.0	0.0	80.000
Open space (Lawns,parks etc.) - Poor condition; grass cover < 50% - Soil D	89.000	1.624	0.0	0.0	89.000
Woods - good - Soil D	77.000	0.399	0.0	0.0	77.000
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil D	98.000	0.864	0.0	0.0	98.000
Impervious Areas - Gravel (w/ right-of-way) - Soil D	91.000	1.078	0.0	0.0	91.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	11.320	(N/A)	(N/A)	83.607

Subsection: Runoff CN-Area
Label: DA-A POST

Return Event: 100 years
Storm Event: 1

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil D	80.000	7.355	0.0	0.0	80.000
Open space (Lawns,parks etc.) - Poor condition; grass cover < 50% - Soil D	89.000	1.624	0.0	0.0	89.000
Woods - good - Soil D	77.000	0.399	0.0	0.0	77.000
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil D	98.000	0.864	0.0	0.0	98.000
Impervious Areas - Gravel (w/ right-of-way) - Soil D	91.000	1.078	0.0	0.0	91.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	11.320	(N/A)	(N/A)	83.607

Subsection: Runoff CN-Area
Label: DA-B POST

Return Event: 1 years
Storm Event: 1

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil D	80.000	1.578	0.0	0.0	80.000
Open space (Lawns,parks etc.) - Poor condition; grass cover < 50% - Soil D	89.000	1.790	0.0	0.0	89.000
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil D	98.000	0.142	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	3.510	(N/A)	(N/A)	85.318

Subsection: Runoff CN-Area
Label: DA-B POST

Return Event: 10 years
Storm Event: 1

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil D	80.000	1.578	0.0	0.0	80.000
Open space (Lawns,parks etc.) - Poor condition; grass cover < 50% - Soil D	89.000	1.790	0.0	0.0	89.000
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil D	98.000	0.142	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	3.510	(N/A)	(N/A)	85.318

Subsection: Runoff CN-Area
Label: DA-B POST

Return Event: 100 years
Storm Event: 1

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil D	80.000	1.578	0.0	0.0	80.000
Open space (Lawns,parks etc.) - Poor condition; grass cover < 50% - Soil D	89.000	1.790	0.0	0.0	89.000
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil D	98.000	0.142	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	3.510	(N/A)	(N/A)	85.318

Subsection: Runoff CN-Area
Label: DA-C POST

Return Event: 1 years
Storm Event: 1

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil D	80.000	0.327	0.0	0.0	80.000
Open space (Lawns,parks etc.) - Poor condition; grass cover < 50% - Soil D	89.000	2.850	0.0	0.0	89.000
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil D	98.000	0.023	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	3.200	(N/A)	(N/A)	88.145

Subsection: Runoff CN-Area
Label: DA-C POST

Return Event: 10 years
Storm Event: 1

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil D	80.000	0.327	0.0	0.0	80.000
Open space (Lawns,parks etc.) - Poor condition; grass cover < 50% - Soil D	89.000	2.850	0.0	0.0	89.000
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil D	98.000	0.023	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	3.200	(N/A)	(N/A)	88.145

Subsection: Runoff CN-Area
Label: DA-C POST

Return Event: 100 years
Storm Event: 1

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil D	80.000	0.327	0.0	0.0	80.000
Open space (Lawns,parks etc.) - Poor condition; grass cover < 50% - Soil D	89.000	2.850	0.0	0.0	89.000
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil D	98.000	0.023	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	3.200	(N/A)	(N/A)	88.145

ATTACHMENT E

Construction Site Log Book

STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM FOR CONSTRUCTION ACTIVITIES

CONSTRUCTION SITE LOG BOOK
For

Supplement to City of Canandaigua
Solar Array Project

HUNT #3076.003
June 2016

TABLE OF CONTENTS

I. PRE-CONSTRUCTION MEETING DOCUMENTS

Project Name _____

Permit No. _____ **Date of Authorization** _____

Name of Operator _____

Prime Contractor _____

a. Preamble to Site Assessment and Inspections

The Following Information to be read by all person's involved in The Construction of Stormwater Related Activities:

The Operator agrees to have a qualified professional[1] conduct an assessment of the site prior to the commencement of construction[2] and certify in this inspection report that the appropriate erosion and sediment controls described in the SWPPP have been adequately installed or implemented to ensure overall preparedness of the site for the commencement of construction.

Prior to the commencement of construction, the Operator shall certify in this site logbook that the SWPPP has been prepared in accordance with the State's standards and meets all Federal, State and local erosion and sediment control requirements.

When construction starts, site inspections shall be conducted by the qualified professional at least every 7 calendar days[3] and within 24 hours of the end of a storm event of 0.5 inches or greater (Construction Duration Inspections). The Operator shall maintain a record of all inspection reports in this site logbook. The site logbook shall be maintained on site and be made available to the permitting authorities upon request.

Prior to filing the Notice of Termination or the end of permit term, the Operator shall have a qualified professional perform a final site inspection. The qualified professional shall certify that the site has undergone final stabilization[4] using either vegetative or structural stabilization methods and that all temporary erosion and sediment controls (such as silt fencing) not needed for long-term erosion control have been removed. In addition, the Operator must identify and certify that all permanent structures described in the SWPPP have been constructed and provide the owner(s) with an operation and maintenance plan that ensures the structure(s) continuously functions as designed.

1) "Qualified Professional means a person knowledgeable in the principles and practice of erosion and sediment controls, such as a Certified Professional in Erosion and Sediment Control (CPESC), soil scientist, licensed engineer or someone working under the direction and supervision of a licensed engineer (person must have experience in the principles and practices of erosion and sediment control).
2) "Commencement of construction" means the initial removal of vegetation and disturbance of soils associated with clearing, grading or excavating activities or other construction activities.
3) If greater than five (5) acres is disturbed at any point in construction, inspection frequency shall increase to twice every seven (7) calendar days.
4) "Final stabilization" means that all soil-disturbing activities at the site have been completed and a uniform, perennial vegetative cover with a density of eighty (80) percent has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed on all unpaved areas and areas not covered by permanent structures.

b. Qualified Professional's Credentials & Certification

"I hereby certify that I meet the criteria set forth in the General Permit to conduct site inspections for this project and that the appropriate erosion and sediment controls described in the SWPPP and as described in the following Pre-construction Site Assessment Checklist have been adequately installed or implemented, ensuring the overall preparedness of this site for the commencement of construction."

Name (please print): _____

Title: _____ **Date:** _____

Address: _____

Phone: _____ **Email:** _____

Signature: _____

c. Pre-construction Site Assessment Checklist
(NOTE: Provide comments below as necessary)

1. Notice of Intent, SWPPP, and Contractors Certification:

Yes	No	NA	
[ ]	[ ]	[ ]	Has a Notice of Intent been filed with the NYS Department of Conservation?
[ ]	[ ]	[ ]	Is the SWPPP on-site? Where?_____
[ ]	[ ]	[ ]	Is the Plan current? What is the latest revision date? _____
[ ]	[ ]	[ ]	Is a copy of the NOI (with brief description) onsite? Where? _____
[ ]	[ ]	[ ]	Have all contractors involved with stormwater related activities signed a contractor's certification?

2. Resource Protection

Yes	No	NA	
[ ]	[ ]	[ ]	Are construction limits clearly flagged or fenced?
[ ]	[ ]	[ ]	Important trees and associated rooting zones, on-site septic system absorption fields, existing vegetated areas suitable for filter strips, especially in perimeter areas, have been flagged for protection.
[ ]	[ ]	[ ]	Creek crossings installed prior to land-disturbing activity, including clearing and blasting.

3. Surface Water Protection

Yes	No	NA	
[ ]	[ ]	[ ]	Clean stormwater runoff has been diverted from areas to be disturbed.
[ ]	[ ]	[ ]	Bodies of water located either on site or in the vicinity of the site have been identified and protected.
[ ]	[ ]	[ ]	Appropriate practices to protect on-site or downstream surface water are installed.
[ ]	[ ]	[ ]	Are clearing and grading operations divided into areas <5 acres?

4. Stabilized Construction Entrance

Yes	No	NA	
[ ]	[ ]	[ ]	A temporary construction entrance to capture mud and debris from construction vehicles before they enter the public highway has been installed.
[ ]	[ ]	[ ]	Other access areas (entrances, construction routes, equipment parking areas) are stabilized immediately as work takes place with gravel or other cover.
[ ]	[ ]	[ ]	Sediment tracked onto public streets is removed or cleaned on a regular basis.

5. Perimeter Sediment Controls

Yes	No	NA	
[ ]	[ ]	[ ]	Silt sock material and installation comply with the standard drawing and specifications.
[ ]	[ ]	[ ]	Silt socks are installed at appropriate spacing intervals.
[ ]	[ ]	[ ]	Sediment/detention basin was installed as first land disturbing activity.
[ ]	[ ]	[ ]	Sediment traps and barriers are installed.

6. Pollution Prevention for Waste and Hazardous Materials

Yes	No	NA	
[ ]	[ ]	[ ]	The Operator or designated representative has been assigned to implement the spill prevention avoidance and response plan.
[ ]	[ ]	[ ]	The contractor maintains a Spill Prevention Control and Counter Measures Program. A supplemental Materials Handling and Spill Prevention plan is contained in Section III of this log book.
[ ]	[ ]	[ ]	Appropriate materials to control spills are onsite. Where? _____

II. CONSTRUCTION DURATION INSPECTION DOCUMENTS

a. Directions:

Inspection Forms will be filled out during the entire construction phase of the project.

Required Elements:

(1) On a site map, indicate the extent of all disturbed site areas and drainage pathways. Indicate site areas that are expected to undergo initial disturbance or significant site work within the next 14-day period;

(2) Indicate on a site map all areas of the site that have undergone temporary or permanent stabilization;

(3) Indicate all disturbed site areas that have not undergone active site work during the previous 14-day period;

(4) Inspect all sediment control practices and record the approximate degree of sediment accumulation as a percentage of sediment storage volume (for example, 10 percent, 20 percent, 50 percent);

(5) Inspect all erosion and sediment control practices and record all maintenance requirements such as verifying the integrity of barrier or diversion systems (earthen berms or silt fencing) and containment systems (sediment basins and sediment traps). Identify any evidence of rill or gully erosion occurring on slopes and any loss of stabilizing vegetation or seeding/mulching. Document any excessive deposition of sediment or ponding water along barrier or diversion systems. Record the depth of sediment within containment structures, any erosion near outlet and overflow structures, and verify the ability of rock filters around perforated riser pipes to pass water; and

(6) Immediately report to the Operator any deficiencies that are identified with the implementation of the SWPPP.

CONSTRUCTION DURATION INSPECTIONS

DATE _____
BY _____

SITE PLAN/SKETCH

Inspector (print name)	**Date of Inspection**
Qualified Professional (print name)	**Qualified Professional Signature**

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the forms is accurate and complete.

CONSTRUCTION DURATION INSPECTIONS

Page 2 of _____
DATE _____
BY _____

Maintaining Water Quality

Yes	No	NA	
[ ]	[ ]	[ ]	Is there an increase in turbidity causing a substantial visible contrast to natural conditions?
[ ]	[ ]	[ ]	Is there residue from oil and floating substances, visible oil film, or globules or grease?
[ ]	[ ]	[ ]	All disturbance is within the limits of the approved plans.
[ ]	[ ]	[ ]	Have receiving lake/bay, stream, and/or wetland been impacted by silt from project?

Housekeeping

1. General Site Conditions

Yes	No	NA	
[ ]	[ ]	[ ]	Is construction site litter and debris appropriately managed?
[ ]	[ ]	[ ]	Are facilities and equipment necessary for implementation of erosion and sediment control in working order and/or properly maintained?
[ ]	[ ]	[ ]	Is construction impacting the adjacent property?
[ ]	[ ]	[ ]	Is dust adequately controlled?

2. Temporary Stream Crossing

Yes	No	NA	
[ ]	[ ]	[ ]	Maximum diameter pipes necessary to span creek without dredging are installed.
[ ]	[ ]	[ ]	Installed non-woven geotextile fabric beneath approaches.
[ ]	[ ]	[ ]	Is fill composed of aggregate (no earth or soil)?
[ ]	[ ]	[ ]	Rock on approaches is clean enough to remove mud from vehicles & prevent sediment from entering stream during high flow.

Runoff Control Practices

1. Excavation Dewatering

Yes	No	NA	
[ ]	[ ]	[ ]	Upstream and downstream berms (sandbags, inflatable dams, etc.) are installed per plan.
[ ]	[ ]	[ ]	Clean water from upstream pool is being pumped to the downstream pool.
[ ]	[ ]	[ ]	Sediment laden water from work area is being discharged to a silt-trapping device.
[ ]	[ ]	[ ]	Constructed upstream berm with one-foot minimum freeboard.

2. Level Spreader

Yes	No	NA	
[ ]	[ ]	[ ]	Installed per plan.
[ ]	[ ]	[ ]	Constructed on undisturbed soil, not on fill, receiving only clear, non-sediment laden flow.
[ ]	[ ]	[ ]	Flow sheets out of level spreader without erosion on downstream edge.

3. Interceptor Dikes and Swales

Yes	No	NA	
[ ]	[ ]	[ ]	Installed per plan with minimum side slopes 2H:1V or flatter.
[ ]	[ ]	[ ]	Stabilized by geotextile fabric, seed, or mulch with no erosion occurring.
[ ]	[ ]	[ ]	Sediment-laden runoff directed to sediment trapping structure

CONSTRUCTION DURATION INSPECTIONS

Page 3 of _____
DATE _____
BY _____

Runoff Control Practices (continued)

4. Stone Check Dam

Yes	No	NA	
[ ]	[ ]	[ ]	Is channel stable? (flow is not eroding soil underneath or around the structure).
[ ]	[ ]	[ ]	Check is in good condition (rocks in place and no permanent pools behind the structure).
[ ]	[ ]	[ ]	Has accumulated sediment been removed?

5. Rock Outlet Protection

Yes	No	NA	
[ ]	[ ]	[ ]	Installed per plan.
[ ]	[ ]	[ ]	Installed concurrently with pipe installation.

Soil Stabilization

1. Topsoil and Spoil Stockpiles

Yes	No	NA	
[ ]	[ ]	[ ]	Stockpiles are stabilized with vegetation and/or mulch.
[ ]	[ ]	[ ]	Sediment control is installed at the toe of the slope.

2. Revegetation

Yes	No	NA	
[ ]	[ ]	[ ]	Temporary seedings and mulch have been applied to idle areas.
[ ]	[ ]	[ ]	4 inches minimum of topsoil has been applied under permanent seedings.

Sediment Control Practices

1. Stabilized Construction Entrance

Yes	No	NA	
[ ]	[ ]	[ ]	Stone is clean enough to effectively remove mud from vehicles.
[ ]	[ ]	[ ]	Installed per standards and specifications?
[ ]	[ ]	[ ]	Does all traffic use the stabilized entrance to enter and leave site?
[ ]	[ ]	[ ]	Is adequate drainage provided to prevent ponding at entrance?

2. Silt Sock

Yes	No	NA	
[ ]	[ ]	[ ]	Installed on Contour, 10 feet from toe of slope (not across conveyance channels).
[ ]	[ ]	[ ]	Joints constructed by butting the two ends securely together.
[ ]	[ ]	[ ]	Proper staking has been provided.
[ ]	[ ]	[ ]	Socks are in adequate condition without rips or frayed areas.
			Sediment accumulation is _____% of design capacity.

CONSTRUCTION DURATION INSPECTIONS

Page 4 of _____
DATE _____
BY _____

Sediment Control Practices (continued)

3. Storm Drain Inlet Protection (Use for Stone & Block; Filter Fabric; Curb; or, Excavated practices).

Yes	No	NA	
[ ]	[ ]	[ ]	Triangular Silt Dikes are installed.
[ ]	[ ]	[ ]	Geotextile fabric is installed over silt dikes and extends two to three feet beyond dike
[ ]	[ ]	[ ]	Staples (or applicable adhesive in hard surface areas) have been installed per plan detail.
[ ]	[ ]	[ ]	If silt sacks are used, they have been installed correctly.
[ ]	[ ]	[ ]	Drainage area is 1 acre or less.
[ ]	[ ]	[ ]	Sediment accumulation is _____% of design capacity.

4. Temporary Sediment Trap

Yes	No	NA	
[ ]	[ ]	[ ]	Trap and outlet structure is constructed per the approved plan or drawing.
[ ]	[ ]	[ ]	Side slopes are stabilized with seed/mulch.
[ ]	[ ]	[ ]	Drainage structure flushed and basin surface restored upon removal of sediment basin facility.
			Sediment accumulation is _____% of design capacity.

5. Temporary Sediment Basin

Yes	No	NA	
[ ]	[ ]	[ ]	Basin and outlet structure constructed per the approved plan.
[ ]	[ ]	[ ]	Basin side slopes are stabilized with seed/mulch.
[ ]	[ ]	[ ]	Drainage structure flushed and basin surface restored upon removal of sediment basin facility.
			Sediment accumulation is _____% of design capacity.

Action Items and Required Maintenance

Yes	No	NA	
[ ]	[ ]	[ ]	All previous action and maintenance items have been addressed.

ACTIONS/MAINTENANCE REQUIRED

Area	Action/Maintenance Item	Responsible Party

Modifications to the SWPPP (To be completed as described below if necessary)

The Operator shall amend the SWPPP whenever:

1. There is a significant change in design, construction, operation, or maintenance which may have a significant effect on the potential for the discharge of pollutants to the waters of the United States and which has not otherwise been addressed in the SWPPP; or

2. The SWPPP proves to be ineffective in:
   a. Eliminating or significantly minimizing pollutants from sources identified in the SWPPP and as required by this permit; or
   b. Achieving the general objectives of controlling pollutants in stormwater discharges from permitted construction activity; and

3. Additionally, the SWPPP shall be amended to identify any new contractor or subcontractor that will implement any measure of the SWPPP.

Modification & Reason:

III. MATERIALS HANDLING AND SPILL PREVENTION

The Contractor shall follow all Federal, State and local regulations pertaining to material handling, spill prevention and spill cleanup. The Contractor shall notify the appropriate agencies when a spill occurs. The following are recommended guidelines for the Contractor and shall not replace governmental regulations:

Concrete Washout Structure: Concrete Washout Structures are used to contain concrete and liquids when the chutes of concrete mixers and hoppers of concrete pumps are rinsed out after delivery. The washout facilities can be constructed or ready-made. All washout facilities consolidate solids for easier disposal and prevent runoff of liquids. The wash water is alkaline and contains high levels of chromium, which can leach into the ground and contaminate groundwater. It can also migrate to a storm drain, which can increase the pH of nearby waterways and harm aquatic life.

- The Contractor shall designate a concrete washout area and shall install the washout a minimum of 100 feet upstream from a storm drain, stream, pond or waterway.
- The facilities shall be cleaned out once they are 2/3 full or new facilities be constructed to provide additional storage.
- Adding solvents, flocculent, or acid to washwater is prohibited.
- Permanent disposal of concrete washout waste on the construction site is prohibited. Disposal of waste shall be in a legal manor.

Construction Site Liquid and Solid Waste Management: Building materials and other construction site wastes, including sanitary wastes, must be properly managed and disposed of to reduce the risk of pollution. Practices such as trash disposal, recycling, proper sanitary facility maintenance, and spill prevention and cleanup measures can reduce the potential for stormwater runoff to mobilize construction site wastes and contaminate surface or ground water.

- The Contractor shall designate one area for construction vehicle refueling that is at least 100 feet away from a storm drain, stream, pond or waterway.
- Temporary sanitary facilities should be located at least 50 feet away from drainageways, storm drains, receiving waters, areas of high traffic, and areas susceptible to flooding. Wastewater generated from sanitary facilities shall not be allowed to flow into storm sewers and drainageways. Only licensed haulers shall be authorized to dispose of waste. Facilities shall be secured to prevent overturning in areas susceptible to strong winds.
- Construction waste shall be segregated properly into various categories such as hazardous materials, toxic liquids and non-hazardous materials.
- Containers of liquids should have secondary containment and be stored away from drainageways, storm drains, receiving waters, areas of high traffic, and areas susceptible to flooding. Containers shall also be properly labeled.

Spill Prevention and Control: Spill Prevention, Control and Counter Measure Plan (SPCC) shall clearly state measures to stop the source of a spill, contain the spill, clean up the spill, dispose of contaminated materials, and train personnel to prevent and control future spills. SPCCs are applicable to construction sites where hazardous waste are stored or used. Hazardous waste includes pesticides, paints, cleaners, petroleum products, fertilizers, and solvents.

- The Contractor shall develop and implement a Spill Prevention, Control and Counter Measure Plan in conformance with State and Federal Regulations.
- Spills shall be contained and cleaned up as soon as possible.
- Residuals left over from the clean up activity, such as absorbent pads or containers of spill material, shall be disposed of properly.
- Proper spill and illicit discharge reporting procedures including calling NYS DEC hotline (1-800-457-7362) shall be followed for both hazardous and non-hazardous materials.
- Spills shall not be washed down into the storm drain or buried anywhere.
- The Contractor shall refer to NYS DEC Spill Guidance Manual (SGM) for additional requirements.

SECTION IV – COMPLETED INSPECTION REPORTS

SECTION V – COMPLETED MODIFICATIONS TO THE SWPPP

ATTACHMENT F

NYSDEC SPDES General Permit for Construction

ATTACHMENT G

Select Engineering Plans