Stormwater Pollution Prevention Plan

ELP Marlborough Solar, LLC
Marlborough, Ulster County, NY

November 2024
C&A #4996.26

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Report History

Rev #	Date	Prepared By	Checked By	Approved By	Description
0	8/9/24	ETY/TSB	CJK	CJK	Initial Release
1	9/4/24	DPB	TSB	CJK	Revisions per PB Comments
2	11/22/24	JH	ETY	CJK	Revisions per PB Comments

PROJECT INFORMATION

- Operator/Owners — ELP Marlborough Solar
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- Site Location — 335 Bingham Road, Marlborough, NY, 12542

- Authorized Agency — Town of Marlborough

- Review Agency — Town of Marlborough

- Certifying Engineer — Crawford & Associates
  Engineering & Land Surveying, P.C.
  Contact: Christopher J. Knox, PE
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- Site Contractor — TBD

SWPPP Preparer Certification Form

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

SWPPP Preparer Certification Form

SPDES General Permit for Stormwater Discharges From Construction Activity (GP-0-20-001)

Project Site Information

Project/Site Name

ELP Marlborough Solar

Owner/Operator Information

Owner/Operator (Company Name/Private Owner/Municipality Name)

ELP Marlborough Solar, LLC.

Certification Statement – SWPPP Preparer

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-20-001. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

First name	MI	Last Name
Christopher	J.	Knox, P.E.

Signature

Date

Owner/Operator Certification Form

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Owner/Operator Certification Form

SPDES General Permit For Stormwater Discharges From Construction Activity (GP-0-20-001)

Project/Site Name: ELP Marlborough Solar

eNOI Submission Number: HQ4-PQJ7-90CN4

eNOI Submitted by: ☐ **Owner/Operator** ☑ **SWPPP Preparer** ☐ **Other**

Certification Statement - Owner/Operator

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Owner/Operator First Name	M.I.	Last Name
David		**Velasco, o/b/o ELP Marlborough Solar, LLC.**

Signature

Date

TABLE OF CONTENTS

I. Introduction

This report accompanies the site plan submission for ELP Marlborough Solar, LLC. (the applicant) site plan submitted to the Town of Marlborough, NY, by Crawford & Associates Engineering, P.C, (C&A) on behalf of the applicant. The proposed site plan includes development of a 5.0 Megawatt (AC) photovoltaic facility. This report has been prepared to determine and mitigate the impacts that the above-mentioned project is anticipated to have on existing drainage and stormwater runoff conditions. Recommendations for Stormwater Management practices will meet the requirements of the New York State Department of Environmental Conservation State (NYSDEC) Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity, Permit No. GP-0-20-001, or current version. This document shall be taken as the preliminary Stormwater Pollution Prevention Plans (SWPPP) for the project, and administered and implemented in accordance with Permit No. GP-0-20-001 Parts III, IV, and V. The SWPPP has been prepared in accordance with the NYSDEC standards.

The subject property is located at 335 Bingham Road in the Town of Marlborough, Ulster County, New York. The project involves the development of tax lot 108.3-3-21, comprising a total of +/- 80.1 acres. The proposed solar development will encompass approximately 21.0 acres of land and include the construction of a ground-mounted photovoltaic facility, pervious gravel driveway, perimeter fence, and concrete equipment pads. Disturbance of the proposed project is approximately 21.91 acres. The area disturbed as part of the common plan for development will be greater than 1 acre; therefore, the construction activities will fall under the provisions of GP-0-20-001 or most current version.

The pre-development drainage area is composed of three catchment areas defined as DA-1 through DA-3. The catchments have their own respective design points (DP). Post development conditions largely reflect pre-development in regard to location of design points and sizing of drainage areas. Minor differences between pre and post development hydrology can be attributed to land cover type changes. These modifications to existing conditions result in post-construction drainage areas to produce similar if not lower runoff volumes, explained in greater detail below.

The SWPPP outlined herein, provides an in depth look at existing site conditions – including soils and land cover – and proposed site conditions while detailing specific erosion and sediment control practices and techniques and outlining construction sequences for development of the project. The proposed project meets the criteria of Scenario 1 outlined in the NYSDEC Solar Panel Construction Stormwater Permitting/SWPPP Guidance, which specifies that an Erosion and Sediment Control Plan is required, only.

II. Description of Drainage Area

A. Existing Conditions

The subject property is located at 335 Bingham Road (Tax lot 108.3-3-21, 80.1 acres) in the Town of Marlborough, Ulster County, NY. The property currently operates as an apple orchard, with other areas of the site consisting of open meadow (non-grazed), wooded, and scrub areas. The total drainage area that was considered in the hydrology analysis includes approximately 66.04 acres.

Three ponds exist on site, and the U.S. Army Corps of Engineers (USACE) National Wetland Inventory indicates there is a potential Freshwater Forested/Shrub Wetland habitat and riverine located onsite, to the west of the development area. The New York State Department of Environmental Conservation (NYSDEC) Environmental Mapper indicated there are no state wetlands located within the project area.

The project area topography varies in grade, mostly ranging between 5-10 percent slope, though some areas ranging between 10-20 percent exist within the project area. Slopes over 15 percent will not be used for the project. Slopes in other areas of the site, which are not planned for development, exceed 20% slope. The site generally drains towards the north, in the direction of Bingham Road.

Review of the New York State Office of Parks, Recreation and Historic Preservation mapping was conducted. An initial consultation submission to SHPO was completed in April 2024, and on April 9, 2024 a letter was received from SHPO stating that the proposed project will have no adverse impact to historic and cultural resources. This correspondence can be found in Appendix K.

Soils maps detailing hydrologic soil group, drainage class, depth to bedrock, and depth to water table can be found in Appendix J of this SWPPP. The following is a summary of Ulster County soils on site from the U.S. Department of Agriculture (USDA) Web Soil Survey. Please note that the soil characteristics presented below are representative of the entire parcel area and not solely representative of the project's lease area, or drainage area considered in the hydrology analysis.

1. **Bath Gravelly Silt Loam (BgC) – Hydrologic Group C**

   This soil comprises 1.4 percent of the property and consists of well drained soils located in the northeast corner of the site. Slopes range from 8 to 15 percent. Depth to water table is about 27 inches and the depth to bedrock is greater than 80 inches.

2. **Bath-Nassau Complex (BnC) – Hydrologic Group C**

   This soil comprises 20.9 percent of the property and consists of well drained soils and is scattered throughout the site. Slopes range from 8 to 25 percent. Depth to water table is about 27 inches and the depth to bedrock is greater than 48 inches.

3. **Bath-Nassau-Rock Outcrop Complex (BOD) – Hydrologic Group C**

   This soil comprises 20.5 percent of the property and consists of well drained soils located both at the center and northeast section of the site. Depth to water table is about 27 inches and the depth to bedrock is greater than 48 inches.

4. **Canandaigua Silt Loam (Cd) – Hydrologic Group C/D**

   This soil comprises 0.1 percent of the property and consists of very poorly drained soils located in the southeast portion of the site. Depth to water table is near 0 inches and the depth to bedrock is greater than 80 inches.

5. **Lyons-Atherton Complex (LY) – Hydrologic Group C/D**

This soil comprises 7.8 percent of the property and consists of very poorly drained soils located sporadically around the site. Depth to water table is near 0 inches and the depth to bedrock is greater than 80 inches.

6. **Nassau-Bath-Rock Outcrop Complex, very steep (NBF)**

This soil comprises 10.6 percent of the property and consists of gravelly loam soils located sporadically around the site. Depth to the high water is over 80 inches and the depth to bedrock is greater than 16 inches.

7. **Palms Muck (Pa) – Hydrologic Group A/D**

This soil comprises 2.9 percent of the property and consists of very poorly drained soil located in the northern section of the site. Depth to the high water is near 0 inches and the depth to bedrock is greater than 80 inches.

8. **Voluslia Gravelly Silt Loam (VoB) – Hydrologic Group D**

This soil comprises 14.9 percent of the property and consists of somewhat poorly drained soil located in the eastern section of the site. Slopes range from 3 to 8 percent. Depth to water table is about 8 inches and the depth to bedrock is greater than 80 inches.

9. **Voluslia Gravelly Silt Loam (VoC) – Hydrologic Group D**

This soil comprises 17.3 percent of the property and consists of somewhat poorly drained soil located sporadically around the site. Slopes range from 8 to 15 percent. Depth to water table is about 8 inches and the depth to bedrock is greater than 80 inches.

In general, the project area consists primarily of Volusia gravelly silt loam, Hydrologic Soil Group D, and Bath-Nassau complex, Hydrologic Soil Group C. The existing drainage for the site is made up of 3 drainage areas, which were derived based on the site topography. The following are descriptions of each drainage area; see Appendix A for the hydrologic modeling in HydroCAD:

DA-1: 51.09 acres, located along the western half of the development. This drainage area discharges via overland flow into a pond that is classified as a wetland then into a vegetated swale running under Bingham Road. This drainage area is made up of:

DA-1: 51.09 Acres		
HSG	**Land Cover[1]**	**Area (acres)**
C	Meadow, Non-grazed	18.06
	Woods, Good Condition	5.42
	Impervious, Existing Road	0.49
C	Impervious, Buildings	0.02
	Wetland	0.33
D	Meadow, Non-grazed	15.57
	Woods, Good Condition	3.09
	Impervious, Existing Road	0.66
	Impervious, Buildings	0.08
	Wetland	0.64
N/A	Rock Outcrop	1.33
	Rock Outcrop	2.96
	Impervious, Buildings	0.01
	Water Surface	2.43

DA-2: 10.11 acres, located on the northeast corner of the development. This drainage area discharges to the northeast corner of the subject parcel via overland flow. This drainage area is made up of 10.11 acres of:

DA-2: 10.11 Acres		
HSG	**Land Cover[1]**	**Area (acres)**
C	Meadow, Non-grazed	3.09
	Impervious, Exist Road	0.49
D	Meadow, Non-grazed	6.35
	Impervious, Exist Road	0.18

[1] Existing agricultural land, in this case the existing orchard, was conservatively modeled as meadow, per 2015 New York State Stormwater Management Design Manual, accessible at: https://www.dec.ny.gov/fs/docs/pdf/stormwaterdesignmanual2015.pdf

DA-3: 4.84 acres, located on the southeast corner of the development. This drainage area discharges to the southeast corner of the subject parcel via overland flow. This drainage area is made up of:

DA-3: 4.84 Acres		
HSG	**Land Cover[1]**	**Area (acres)**
C	Meadow, Non-grazed	0.05
	Impervious, Exist Road	0.03
D	Meadow, Non-grazed	4.45
	Impervious, Exist Road	0.31

B. Proposed Site Development

Development will include construction of a 5.0 Megawatt (AC) photovoltaic facility encompassing approximately 21.0 acres of land. Construction will include ground-mounted photovoltaic modules, pervious gravel driveway, perimeter fence and concrete equipment pads. The following is a description of the proposed post-construction drainage area:

The proposed drainage for the site is made up of three drainage areas which include sub catchment areas due to development. These drainage areas were derived based on the site topography. The following are descriptions of each drainage area; see Appendix A for hydrologic modeling of the post-construction conditions in HydroCAD:

DA-1P: 51.09 acres, located along the western half of the development. The location and design point remain unchanged. This drainage area is made up of:

DA-1P: 51.09 Acres		
HSG	**Land Cover[1]**	**Area (acres)**
C	Meadow, Non-grazed	16.56
	Woods, Good Cond	5.42
	Impervious, Exist Road	0.27
	Impervious, Buildings	0.02
	Wetland	0.33
	Meadow, Non-grazed	1.40
	Impervious, Proposed Drive	0.10
D	Meadow, Non-grazed	5.50
	Woods, Good Cond	3.09
	Impervious, Buildings	0.08
	Wetland	0.64
	Meadow, Non-grazed	10.54
	Impervious, Proposed Drive	0.35
	Impervious, Proposed EQ Pad	0.06
N/A	Rock Outcrop	1.33
	Rock Outcrop	2.96
	Impervious, Buildings	0.01
N/A	Water Surface	2.43

DA-2P: 10.11 acres, located on the northeast corner of the development. The location and design point remain unchanged. This drainage area is made up of 10.11 acres of:

DA-2P: 10.11 Acres		
HSG	**Land Cover[1]**	**Area (acres)**
C	Meadow, Non-Grazed	2.36
	Impervious, Exist Road	0.21
	Meadow, Non-Grazed	0.91
	Impervious, Proposed Drive	0.10
D	Meadow, Non-Grazed	5.10
	Impervious, Exist Road	0.09
	Meadow, Non-Grazed	1.29
	Impervious, Proposed Drive	0.05

DA-3P: 4.84 acres, located on the southeast corner of the development. The location and design point remain unchanged. This drainage area is made up of 4.84 acres of:

DA-3P: 4.84 Acres		
HSG	**Land Cover[1]**	**Area (acres)**
C	Meadow, Non-Grazed	0.05
	Impervious, Exist Road	0.03
D	Meadow, Non-Grazed	1.27
	Impervious, Exist Road	0.26
	Meadow, Non-Grazed	3.23

C. Design Point Descriptions

The drainage analysis area consists of approximately 66.04 acres which contains the developed area and some of the surrounding area that will remain undisturbed. The overall watershed was broken down into smaller watersheds, or subcatchments, to allow for analysis of runoff conditions at several locations throughout the drainage area watershed. Each of these locations was defined as a Design Point (DP) in order to evaluate the effects of the project on the watershed hydrology. Descriptions of each design point are provided below. The site currently has three design points defined based on the site's hydrology.

- Design Point One (DP-1): This design point is located at the northwest section of the site. Runoff discharges into a wetland via overland flow then into a vegetated swale which eventually leads to a culvert extending under Bingham Road.
- Design Point Two (DP-2): This design point is located at the northeast section of the site. Runoff discharges to the northeast via overland flow.
- Design Point Three (DP-3): This design point is located at the southeast section of the site. Runoff discharges to the southeast via overland flow.

III. Method of Analysis

According to the New York State Stormwater Management Design Manual, the methods described below are meant to provide a "uniform approach for sizing [stormwater management practices] to meet pollutant removal goals, reduce channel erosion, prevent overbank flooding and help control extreme floods."

A. NYSDEC SWPPP Solar Guidance

According to a memo provided by Robert Wither, Chief, of NYSDEC, dated April 05, 2018, this project follows the criteria of Scenario 1 as listed below. NYSDEC considers solar panel projects designed and constructed in accordance with criteria applicable to Scenario 1 as listed below. The SWPPP Solar

Guidance memo can be found in Appendix E of this SWPPP. Solar projects meeting the requirements of scenario 1 only need to address erosion and sediment controls.

1. Solar panels are constructed on post or rack systems and elevated off the ground surface;
2. The panels are spaced apart so that rain water can flow off the down gradient side of the panel and continue as sheet flow across the ground surface;
3. For solar panels constructed on slopes, the individual rows of solar panels are generally installed along the contour so rain water sheet flows down slope;
4. The ground surface below the panels consists of a well-established vegetative cover;
5. The project does not include the construction of any traditional impervious areas (i.e. buildings, substation pads, gravel access roads, or parking areas, etc.);
6. Construction of the solar panels will not alter the hydrology from pre-to post development conditions. Note: the design professional shall perform the necessary site assessment/hydrology analysis to make this determination.

B. Water Quality Volume

The Water Quality Volume (WQv) was calculated using the method described in the New York State Stormwater Design Manual, August 2015. This volume is used to size drainage structures that capture and treat 90% of the average stormwater volume. The WQv must be held onsite for 24 hours to meet water quality requirements under Phase II of NPDES. WQv is used instead of the “first flush” volume that was recommended in Phase I.

C. Runoff Reduction Volume

The Runoff Reduction Volume (RRv) was calculated using the method described in the New York State Stormwater Design Manual, August 2015. This volume is used as a method for reduction of the total WQv by application of green infrastructure techniques and conventional stormwater management practices. The goal is to have 100% of the post-development WQv to replicate pre-development hydrology by maintaining pre-construction infiltration, peak runoff flow, discharge volume, as well as minimizing concentrated flow by using runoff control techniques to provide treatment in a distributed manner before it reaches the collection system.

D. Stream Channel Protection Volume

The Stream Channel Protection Volume (Cpv) was calculated using the TR-55 method developed by the National Resources Conservation Service (NRCS) in conjunction with HydroCAD. Calculations were performed for the 1-year 24-hour storm event, as indicated in the NYSDEC Stormwater Design Manual, p. 4-1, for existing conditions and post-site development conditions. The Cpv is intended to protect stream channels from erosion by holding the 1-year 24-hour post development runoff volume in detention on site for 24 hours. If infiltration of the entire Cpv can be achieved on site within 24 hours, there is no need for extended detention or outlet control.

E. Overbank Flood Protection Volume

The NYSDEC requires storage to attenuate the post-development peak discharge rate (Q_p) to pre-development levels. The Flood Protection Volume, also required by SPDES Phase II, requires analysis of the 10-year, 24-hour storm. These calculations were performed using HydroCAD.

F. Extreme Flood Control Peak Flow

The NYSDEC requires storage to attenuate the post-development 100-year, 24-hour storm event peak discharge rate (Q_F) to pre-development levels. These calculations were also performed using HydroCAD.

G. Storage Volumes

The storage volume for the WQv is equivalent to the WQv. Storage volumes for Channel protection, Overbank and Extreme Flood control are calculated using HydroCAD, and are based on the ratio of peak flow rate before development to the peak flow rate after development (qo/qi), which is used to determine the ratio of the volume of total runoff over the 24-hour period of the storm to the volume of runoff that needs to be stored (vs/vr).

H. HydroCAD

HydroCAD, developed by Applied Microcomputer Systems, is a Computer-Aided-Design program for analyzing the hydrologic and hydraulic characteristics of a given watershed and associated stormwater management facilities. It has the capability of computing hydrographs (which show discharge rates of specified watershed conditions and precipitation), combining hydrographs and routing flows through pipes, streams and ponds.

The sites watersheds were broken down into a network of four types of components:

- Subcatchment: represented by a hexagon (Drainage Areas) is a relatively homogenous area of land, which produces a volume and rate of runoff unique to that area.
- Reach: represented by a square, is a uniform stream, channel, or pipe that conveys water from one point to another.
- Pond/Catch basin: represented by a triangle (Infiltration units, ponds, wetlands and storage pipes). For ponds it typically is a natural or man-made impoundment, which temporarily stores stormwater runoff and empties in a manner determined by its geometry and the hydraulic structure located at its outlet. For catch basins, this is typically considered a special type of pond that provides insignificant storage.
- Link: represented by a flag shape (Design Points and interconnection of hydrographs), are generally used to 1) interconnect several routing diagrams, 2) generate hydrograph, and 3) define tidal tail water elevations.

Watershed diagrams and computations for pre and post construction conditions are provided in Appendix A of this report.

Analysis of hydrologic and hydraulic conditions and proposed stormwater management facilities, servicing the study area, was preformed by dividing the tributary watershed into relatively homogenous subcatchments. The separation of the watershed into subcatchments was dictated by watershed conditions, methods of collection, conveyance, and points of discharge. Watershed characteristics for each subcatchment were then assessed from topographical survey, soil surveys, USGS 7.5-minute topographic maps, and field investigations of the site.

IV. Green Infrastructure

A. General Overview

Green infrastructure approach for stormwater management reduces site's impact on an aquatic ecosystem through the use of site planning techniques, runoff reduction techniques, and certain standard stormwater management practices. The objective is to replicate the pre-development hydrology by maintaining pre-construction infiltration, peak runoff flow, discharge volume, and minimizing concentrated runoff by use of runoff control techniques. When implemented, green infrastructure can reduce volume, peak flow, flow duration, promote infiltration and evapotranspiration, improve groundwater recharge, reduce downstream flooding, and protect water and wetlands.

Green infrastructure consists of implementing several techniques during the site planning process which include:

- Preservation of Natural Resources – Preservation of undisturbed areas; preservation of buffers; reduction of clearing and grading; locating development in less sensitive areas; open space design; soil restoration.
- Reduction of Impervious Cover – Roadway reduction; sidewalk reduction; driveway reduction; cul-de-sac reduction; building footprint reduction; parking reduction.
- Runoff Reduction Techniques – Conservation of natural areas; sheet flow to riparian buffers or filter strips; vegetated open swale; tree planting/tree box; disconnection of roof runoff; stream daylighting for redevelopment projects; bio-retention areas; rain gardens; green roofs; stormwater planters; rain tank/cistern; pervious pavement.

During the planning process, several above techniques were implemented to the greatest extent possible to replicate the pre-development hydrology conditions after post-development construction.

V. Calculated Flows and Volumes

A. HydroCAD

Drainage analysis for the site has been completed using HydroCAD software, with post-construction calculations prepared assuming surface drainage via overland flow, flow in wetlands and in existing stream channels. Pre- and post-development runoff peak flows for each design point are reported in the following table, Table 1 (see Appendix A for HydroCAD report).

Table 1: Design Point Peak Runoff (cfs) – Pre & Post Development Drainage Areas

DESIGN POINT	1- YEAR	10-YEAR	100-YEAR
DP-1	35.57	101.77	221.02
DP-1P	22.55	66.05	147.33
DP-2	6.44	19.13	42.34
DP-2P	3.04	9.37	21.60
DP-3	4.08	11.18	23.67
DP-3P	4.08	11.18	23.67

Table 1 shows that peak runoff in post-construction conditions is less than or equal to pre-construction conditions for all three design points for the 1-year, 10-year, and 100-year 24-hour storm events.

B. Water Quality Volume (WQv)

WQv has been calculated for each of the developed drainage areas discharging to the design points, based on impervious cover calculated from the site plan layout. Based on the requirements, the WQv will be treated on site via various green infrastructure practices located throughout the site. See

Table 2 below for WQv. As can be seen in the table, the required Water Quality Volume calculated for the project is 0.00 ac-ft because the minor impervious area added by the equipment pads creates a negligeable difference in surface runoff.

C. Runoff Reduction volume (RRv)

The runoff reduction volume has been calculated for the developed impervious area. The runoff reduction volume calculated for the developed area meets the requirements set forth in the stormwater design manual. See

Table 2 below for WQv, RRV minimum and RRv provided. Since the required water quality volume is negligeable (0.00 ac-ft), the RRv also equates to 0.00 ac-ft. As such, the Runoff Reduction Volume provided equates to 0.00 ac-ft, as the project is not required to provide RRv.

Table 2: Green Infrastructure WQv & RRv Summary

WQv Required (ac-ft)	RRv Minimum (ac-ft))	RRv Provided (ac-ft)
0.00	0.00	0.00

D. Stream Channel Protection Volume

The Cpv has been estimated for each of the developed drainage areas, including concrete equipment pads. Channel protection volumes for developed areas can be found in Table 3 below.

E. Over bank Flood Control Volume

The Q_p has been estimated for each of the developed drainage areas, including concrete equipment pads. Over bank flood control volume is summarized in Table 3 below for developed areas only.

F. Extreme Flood Control Volume

The Q_f has been estimated for each of the developed drainage areas, including concrete equipment pads. Extreme flood control volumes are summarized in Table 3 below for developed areas only. The stream channel protection volume may be contained in constructed stormwater ponds or stormwater wetlands.

Table 3: Treatment Runoff Volumes (ac-ft)

Developed Drainage Areas			
VOLUMES	DA-1P	DA-2P	DA-3P
Cpv	.00	0.00	0.00
Qp	.00	0.00	0.00
Qf	.00	0.00	0.00

As shown in the above table, no Stream Channel Protection Volume (Cpv), Over Bank Flood Control Volume (Q_p), or Extreme Flood Control Volume (Q_f) are required for the project. Site improvements such as removing existing impervious access drives and improving ground cover help decrease the runoff from each drainage area, while the minimal amount of proposed impervious area contributes a negligeable amount of increased runoff.

The above calculated flows and volumes support the project in meeting the criteria of Scenario 1 of the NYSDEC memo, erosion and sediment controls required, only. The calculated flows and volumes have been rounded to the nearest hundredth, consistent with NYSDEC standards. The associated TR-55 calculations can be found in Appendix B.

VI. Analysis of Proposed Structures

Although permanent stormwater features are not required, for a conservative approach, it is proposed to manage stormwater runoff from the proposed concrete equipment pads using a Grass Filter Strip.

The following stormwater quantity and quality control systems have been incorporated into the stormwater management plan for this project. Typical details of each practice are provided in Appendix C of this report.

A. Grass Filter Strip

Drainage Area Location: DA-1P

Grass filter strips are vegetated surfaces that are designed to treat sheet flow from adjacent surfaces and remove pollutants through filtration and infiltration. Grass filter strips are typically used to treat small areas of impervious cover (e.g., 5,000 sf) close to the source.

B. Level Spreaders

Drainage Area Location: DA-1P & DA-2P

Level spreaders are flat shallow trenches filled with crushed stone that are designed to slow and evenly distribute runoff to maintain non-erosive velocities and prevent the transformation of sheet flow into shallow concentrated flow. Level spreaders are typically used to treat larger areas to prevent runoff from forming into streams.

VII. Delegated Responsibilities

Below is a summary of responsibilities for all parties involved with the required compliance of the NYSDEC General Permit.

A. Engineer’s Responsibilities

a. Prepare the required SWPPP using best management practices and in compliance with federal, state and local agencies.

b. Complete the NYSDEC Regional process for written approval for > 5 acres of disturbance. The written approval received must be included in the SWPPP at the site prior to soil disturbance. (if applicable)

c. Complete the Notice of Intent (NOI) application along with owner/operator signature and submit to NYSDEC and Town. This must be included in the SWPPP prepared for the site.

d. Complete SWPPP Preparer form. This must be included in the final SWPPP prepared for the site and submitted to the town.

e. Prepare a construction site logbook to be used for all site construction records. This should include inspection reports, correspondences and any changes made during the construction phase.

f. Setup and participate at pre-construction meeting with the town, operator/owner, contractor, and sub-contractors.

g. Prepare the Contractors Certification form and have contractor sign. At this time the contractor should be informed that if sub-contractors are to be used and they are part of the soil disturbance, they should also sign a Contractors Certification form.

h. Inspect the site prior to the commencement of construction and certify in an inspection report that the proper erosion and sediment control practices have been installed.

i. On-site weekly inspections during the disturbance of ≤5 acres and at least once every seven calendar days when soil disturbance is being completed. The written inspection report shall be provided to the owner/operator and the contractor within 24 hours of the site inspection. **Or** On-site inspections bi-weekly during the disturbance of ≥5 acres and at least once every seven calendar days when soil disturbance is < 5 acres. The written inspection report shall be provided to the owner/operator and the contractor within 24 hours of the site inspection.

j. Periodically review the contractor's SWPPP records to ensure compliance with requirements for daily reports.

k. Provide the owner/operator and contractor with a final inspection report that states that all final stabilization has been completed and that all temporary sediment and erosion control practices have been removed.

l. Complete the Notice of Termination (NOT) once construction is completed. Have owner/operator sign form and submit to the NYSDEC.

B. Owner/Operator Responsibilities

a. Sign the NOI and final SWPPP Operator's Certification Form (Included in this SWPPP).

b. Retain the services of a "Qualified Professional", "Qualified Inspector" & "Trained Contractor" to provide services for construction activities.

c. Identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting and maintaining the erosion and sediment control practices and post-construction stormwater management practices included in the SWPPP.

d. Attend the pre-construction meeting setup by the engineer.

e. Require the contractor to fully implement the final SWPPP prepared by the engineer.

f. Forward a copy of the original acknowledgement of receipt of the NOI & written approval of ≥5 acres received from the NYSDEC to the engineer and contractor for records. (if applicable)

g. Keep a copy of the SWPPP and all NOI information received from the NYSDEC, inspection reports and any correspondences on the job site at all times.

h. Require the trained contractor to inspect the erosion and sediment control practices identified within the active work area daily to ensure that they are being maintained in effective operating condition at all times.

i. Notify the Regional Office stormwater contact person in writing prior to reducing the frequency of inspections, where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and temporary stabilization measures have been applied to all disturbed areas.

j. Keep the SWPPP current so that it at all times so that it accurately documents the erosion and sediment control practices are being used or will be used during construction, and all post-construction stormwater management practices will be constructed at the site. At a minimum, the SWPPP shall be amended:

    a. Whenever the current provisions prove to be ineffective in minimizing pollutants into stormwater discharges from site;

    b. Whenever there is a change in design, construction, or operation at the construction site that has or could have an effect on the discharge of pollutants; and

    c. To address issues or deficiencies identified during an inspection by the qualified inspector, the Department or other regulatory agencies.

k. Require that the implementation of the post-construction inspections and maintenance procedures be implemented.

l. Upon request from the NYSDEC, make available within five (5) business days, requested information for determining compliance with the permit. This can include, but is not limited to, the NOI, NOI Acknowledgment Letter, SWPPP, MS4 SWPPP Acceptance form, executed maintenance agreement, and inspection reports.

m. Upon written request from the public, make available within five (5) business days the NOI, SWPPP and inspection reports for review and copying (at requester's expense).

n. Retain a copy of the NOI, NOI Acknowledgement Letter, SWPPP, Contractor(s) Certification Statement, and any inspection reports that were prepared in conjunction with GP-0-20-001 for a period of at least five (5) years from the date that the site achieves final stabilization.

o. Prior to submitting the NOT, ensure one of the following criteria is met for long-term operation and maintenance of stormwater management facilities.

a. The post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain such practice(s) have been deeded to the municipality in which the practice(s) is located,

b. An executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s),

c. For post-construction stormwater management practices that are privately owned, the owner or operator has a mechanism in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the owner or operator's deed of record,

d. For post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university, hospital), government agency or authority, or public utility; the owner or operator has a policy and procedures in place that ensures operation and maintenance of the practices in accordance with the operation and maintenance plan.

C. Contractor's Responsibilities

a. Read SWPPP, sign the Contractor's Certification form, and provide stormwater identification number. Form shall be forwarded to the engineer.

b. Provide the names and contact information for all sub-contractors working on the site. If sub-contractors are involved with major activities such as earth work, have the sub-contractor sign a Contractor's Certification form and provide stormwater identification number and forward to the engineer.

c. Attend the pre-construction meeting set up by the engineer. Require that all sub-contractors attend to discuss their responsibilities.

d. Implement erosion and sediment control practices, and site stabilization prior to commencement of construction activities.

e. Contact engineer to schedule an inspection of implemented practices prior to commencement of construction activities.

f. "Trained Individual" (in this SWPPP for definition) conducts daily inspection and documents. Inspection should describe any repairs/maintenance activities preformed on erosion and sediment control measures.

g. Maintain a record of construction activities such as stabilization measures implemented, grading activities and temporarily or permanently cease on portions of the site until the Notice of Termination is filed with the NYSDEC.

h. Remove all temporary erosion and sediment control practices once Notice of Termination is filed with NYSDEC.

D. Qualified Inspector Inspection Responsibilities

(Note: the trained contractor cannot conduct the qualified inspector site inspection unless they meet qualified inspector qualifications - See GP-0-20-001 included in this SWPPP for definition.)

a. For construction sites where soil disturbance activities are on-going with disturbance acreage less than or equal to 5 acres, the inspector shall conduct site inspections at least once every seven (7) calendar days. For construction activities where soil disturbance is on-going with disturbance greater than or equal to 5 acres and where the site has received prior written authorization from the NYSDEC, the inspector shall conduct site inspections at least two (2) inspections every seven (7) calendar days. The two site inspections shall be separated by a minimum of two (2) full calendar days.

b. For construction sites where soil disturbance activities have been temporary suspended (e.g. winter shutdown) and temporary stabilization measures have been applied to all disturbance areas, the qualified inspector shall conduct at least one site inspection once every thirty (30) calendar days.

c. At a minimum, inspect all erosion and sediment control practices to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure constructed in conformance with SWPPP, all areas of disturbance that have not achieved final stabilization, all points of discharge to natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site, all points of discharge from the construction site.

d. Prepare an inspection report subsequent to each and every inspection. At a minimum, the report shall include and/or address the following:

    a. Date & time of inspection;

    b. Name & title of person(s) performing the inspection;

    c. Description of the weather and soil conditions (e.g. wet, dry, saturated) at time of inspection;

    d. Description of condition of the runoff at all points of discharge from construction site. This shall include identification of any discharges of sediment from construction site. Include discharges from conveyance systems (e.g. pipes, culverts, ditches, etc.) and overland flow;

    e. Description of the condition of all natural waterbodies located within, or immediately adjacent to, the property boundaries of the construction site which receive runoff from disturbed areas. This shall include identification of any discharges of sediment to the surface waterbody;

f. Identification of all erosion and sediment control practices that need repair or maintenance;

g. Identification of all erosion and sediment control practices that were not installed properly or are not functioning as designed and needed to be reinstalled or replaced;

h. Description and sketch of areas that are disturbed at the time of the inspection and areas that have been stabilized (temporary and/or final) since the last inspection;

i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with SWPPP and technical standards;

j. Identify corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s); and

k. Digital photos, with date stamp, clearly show the conditions of all practices that have been identified as needing corrective actions. These shall be attached paper color copies of the digital photos to the inspection report being maintained onsite within seven (7) calendar days of the date of inspection. Digital photos, with date stamp, that clearly show the condition of the practice(s) after corrective action has been completed. These shall be attached paper color copies of the digital photos to the inspection report being maintained onsite within seven (7) calendar days of the date of inspection.

e. Notify the owner or operator and appropriate contractor or subcontractor within one business day of completion of inspection, of any corrective actions that need to be taken. Within one business day of notification, the contractor or subcontractor shall complete the corrective actions in a reasonable time frame.

f. All inspection reports shall be signed by the inspector and a copy shall be maintained onsite with the SWPPP.

E. Trained Contractor Maintenance Inspection Responsibilities

(Note: the trained contractor cannot conduct the qualified inspector site inspection unless they meet qualified inspector qualifications - See GP-0-20-001 included in this SWPPP for definition.)

a. The site contractor shall have a trained individual inspect the erosion and sediment control practices identified within the active work area daily to ensure that they are being maintained in effective operating condition at all times.

b. If deficiencies are identified during daily inspection, the contractor shall begin implementing corrective actions within one business day and shall complete the corrective actions in a reasonable time frame.

c. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, maintenance inspections can be stopped. Daily inspections must commence once soil disturbance activities have resumed.

d. For construction sites where soil disturbance activities have been shut down with partial project completion, maintenance inspections can stop if all areas disturbed as of the project shut down period have achieved "final stabilization" <u>and</u> all post-construction stormwater management practices required for the completion of the project have been constructed in conformance with the SWPPP and are operational.

VIII. Erosion and Sediment Control Measures

During construction and after project completion, the site requires protection from erosion in order to maintain stable slopes and to protect downstream areas from sedimentation.

A. Procedures and Practices

All practices will be in compliance with the New York State Standards and Specifications for Erosion and Sediment Control and the NYSDEC, SPDES General Permit for Stormwater Discharges from Construction Activity Permit No. GP-0-20-001. All erosion and sediment control facilities will be installed according to the plans and properly maintained. A detailed erosion and sediment control plan has been prepared for this project. The plan can be found in Appendix C of this SWPPP. The following practices will be employed by the contractor during all phases of construction as follows:

1. Temporary Erosion/Sediment Control Devices

The following are planned as temporary erosion/sedimentation control measures during construction on the site:

1. Stabilized construction entrance shall be placed at any construction access points from adjacent streets and roads. The location of the construction entrance is shown on the drawings provided in appendix C of this report. The entrance will require that the stone be removed and replaced, as it becomes covered or filled with mud and materials tracked by vehicles exiting the site. This may require periodic top dressing with additional aggregate. All sediment spilled, dropped, or washed onto the public right-of-way must be removed immediately.

   <u>Inspection & Maintenance</u>: inspection of the construction entrance shall be completed daily (prior the commencement of workday and at completion of work day and after each rain event by the *trained individual*) to assure that the facility is in good working condition. Maintenance shall be completed immediately upon notice of the conditions (rutting, ponding of water, stone compacted into subsoil, sediment deposited on public roads, etc.) that will cause tracking of sediment onto public right-of-ways.

2. Silt fence shall be installed along the downstream side of the stockpile areas. The silt shall remain in place and maintained until the site has been accepted by the qualified inspector and owner as re-vegetated (80%). Silt fencing with a maximum stake spacing of 6 feet should be used, unless the fence is supported by wire fence reinforcement of minimum 14 gauge and with a maximum mesh spacing of 6 inches, in which case stakes may be staked at a maximum of 10 feet apart. The bottom of the fence should be properly anchored a minimum of 6" per the detail and backfilled.

   Inspection & Maintenance: inspection of the silt fence shall be completed daily (prior the commencement of workday or at completion of work day) and after each rain event by the *trained individual* to assure that the facility is in good working condition. Maintenance shall be completed immediately upon notice of the conditions (rips and frays, falling fence, broken stakes, etc.) that will cause release of sediment laden water from site.

3. Filter sock shall be installed along the downstream side of the proposed improvement areas. The silt shall remain in place and maintained until the site has been accepted by the qualified inspector and owner as re-vegetated (80%). The filter sock shall be anchored in the earth with 2" x 2" wooden stakes driven 12" into the soil on 10 foot centers on the centerline of the sock. On uneven terrain, effective ground contact can be enhanced by the placement of filter media on the disturbed area side of the filter sock.

   Inspection & Maintenance: inspection of the silt fence shall be completed daily (prior the commencement of workday or at completion of work day) and after each rain event by the *trained individual* to assure that the facility is in good working condition. Maintenance shall be completed immediately upon notice of the conditions (rips and frays, broken stakes, etc.) that will cause release of sediment laden water from site.

4. For all grading activities, the Contractor shall exercise extreme caution not to over expose the site by limiting the disturbance area and shall stabilize steep slopes within 24 hours if final slope grading and stabilization will not be completed within 7 days.

   Any final slopes shall have the specified seeding and mulching installed immediately upon completion or within 7 days of completion.

   Inspection & Maintenance: inspection of the stabilized areas shall be completed daily (prior the commencement of workday or at completion of work day) and after each rain event by the *trained individual* to assure that the facility is in good working condition. Maintenance shall be completed immediately upon notice of the conditions (bare soils, minimal vegetative growth, eroding areas, etc.) that will cause release of sediment laden water from site.

5. Temporary stockpiles shall be protected by a silt fence perimeter that is 10' off the toe of slope. Additionally, inactive stockpiles shall be stabilized within 5 days by either temporarily seeding the stockpile with hydroseed or by covering the stockpile with mulch

or tarp. If necessary, mesh netting shall be installed to prevent wind from removing the mulch.

Inspection & Maintenance: inspection of the stabilized stockpiles shall be completed daily (prior the commencement of workday or at completion of work day) and after each rain event by the *trained individual* to assure that the facility is in good working condition. Maintenance shall be completed immediately upon notice of the conditions that will cause release of sediment laden water from stabilized stockpile area.

6. All soils disturbed between September 15 and April 15 will be covered with mulch within 5 days of disturbance, or prior to work shutdown lasting more than 35 hours (including weekends and holidays). The mulch rate shall be double the normal rate during this time

   Work conducted between September 15 and April 15 of any calendar year, all bare soil areas shall be covered with hay mulch, applied at twice the application rate, and (in areas over 10% grade) anchored with fabric netting or tackifier.

7. All slopes steeper than 4:1 shall receive erosion control mesh.
8. Concentrated runoff shall be diverted away from slopes over 10 percent unless the slope is armored with stone.
9. Underground utilities must be installed in compliance with the following standards and other requirements of this erosion control plan:
   - No more than 500 linear feet of trench may be open at one time;
   - Excavated materials shall be placed on the uphill side of trenches;
   - Dewatering of the trench shall be pumped through a Dirtbag and appropriate sediment control facilities to avoid a turbid discharge; and
   - Stabilization shall occur as soon as practical.
10. Maintenance of the erosion and sediment control facilities must occur until the site is stabilized with permanent erosion control measures. For turf areas, stabilization shall be defined to be the establishment of 80% cover.

2. Permanent Erosion Control Measures

The following permanent erosion and sediment control measures shall be installed and maintained per plans:

1. All areas disturbed during construction, but not subject to restoration (paving, riprap, etc.) shall be decompacted, fertilized, seeded and mulched within 1 to 7 days of completion of final grading.
2. Permanent seeding shall be conducted only in April through May and in late summer until September 15.

Inspection & Maintenance: inspection of the stabilized areas shall be completed daily (prior the commencement of workday or at completion of work day) and after each rain event by the *trained individual* to assure that the facility is in good working condition. Maintenance shall be completed immediately upon notice of the conditions (bare soils, minimal vegetative growth, eroding areas, etc.) that will cause release of sediment laden water from site.

B. Standards for Stabilizing Sites for the Winter

For projects that are anticipated to continue during the winter, additional stabilization measures shall occur. For permitted winter construction, the erosion control measures are substantially more stringent due to cold temperatures and lack of weather conditions which aid in drying the subgrade soils through evaporation.

Construction activities involving earth disturbance continuing past November 15 or beginning before April 1, the following must be incorporated with the erosion control plan implementation:

1. Enlarged access points must be stabilized to provide for snow stockpiling.
2. Limits of disturbance shall be reduced to the extent practical.
3. A snow management plan including adequate storage and control of snowmelt, requiring cleared snow to be stored down gradient of all areas disturbed shall be prepared by the contractor and submitted to the design engineer for review and approval.
4. Snow shall not be stored in sediment basins or to impede drainage structures from operating as intended.
5. A minimum 25-foot buffer maintained from the perimeter controls such as silt fence shall be maintained on the “work area side” to allow for snow clearing and maintenance.
6. Drainage systems intended to operate during winter shall be inspected after each snow removal period to make sure drainage structures are open and free of snow and ice.
7. To ensure cover of disturbed soil in advance of melt event, areas of disturbed soil must be stabilized at the end of each work day, with the following exceptions:
   - If no precipitation within 24 hours is expected and work will resume in the same disturbed area within 24 hours, daily stabilization is not necessary.
   - Disturbed areas that collect and retain runoff, such as house foundations or open utility trenches.
8. Standard for timely stabilization of ditches and channels: The Contractor shall construct and stabilize all stone-lined ditches and channels on the site by September 15. The Contractor shall construct and stabilize grass-lined ditches and channels on the site by September 1. If the Contractor fails to stabilize a ditch or channel to be grass-lined by September 1, then the

Contractor shall either sod lined the ditch by September 15 or install stone lined (must be sized by Professional Engineer) ditch.

9. Standard for timely stabilization of disturbed slopes: The Contractor shall construct and stabilize stone covered slopes by September 15. The Contractor shall seed and mulch all slopes to be vegetated by September 1. If the Contractor fails to stabilize the slopes by vegetating, the contractor shall implement one of the following actions for late fall and winter.
    - Stabilize the soil with temporary vegetation and erosion mesh. By September 15, the contractor shall seed the disturbed slope with winter rye at a seeding rate of 3 pounds per 1,000 s.f. and apply erosion control mats over the mulched slope.
    - Stabilize the site with sod.
    - Stabilize the site with wood waste compost.
    - Stabilize the site with stone rip rap.
10. Standard for timely stabilization of disturbed soils: The Contractor by September 1 shall seed and mulch all disturbed soils on areas having slopes less than 15%. If the contractor fails to stabilize these areas by this date, one of the following actions shall take place for late fall and winter stabilization.
    - Stabilize with temporary vegetation.
    - Stabilize with sod.
    - Stabilize with mulch.
    - Stabilize all stockpiles within 24 hours.

C. Special Measures for Summer Construction

The summer period is generally optimum for construction, but it is also the period of intense short duration storms which make disturbed areas vulnerable to erosion. This is also the time when dust control needs to be most stringent, and the potential to establish vegetation is often restricted due to lack of moisture content. During this period, the contractor shall implement the following:

1. Dust control measures on a daily basis except those days where precipitation exceeds 0.25”. This shall include efforts to extend onto adjacent streets that construction vehicles are using.
2. Spraying mulches with water after anchoring to dampen the soil and encourage early seed growth. Spraying shall occur several times and may require temporary summer seeding procedures until late summer seeding can occur.
3. Mulch, cover, and dampen stockpiles of fine-grained materials. In the summer months, potential for wind erosion is high as well as erosion from short duration storms.

Additionally, some of the above practices maybe required during the spring and fall periods of drier seasons.

D. Construction Phases

The Applicant is proposing to build the site in five phases with an anticipated disturbance of 21.91 acres. At no point shall any phase disturb greater than five (5) acres of land without obtaining the necessary waiver from NYSDEC. Development will include construction and installation of photovoltaic array, gravel driveway, concrete equipment pads, perimeter fence, and stormwater management features. Below is the detailed construction phase sequence for the site. Appendix C of this report includes the phasing plan for the site.

E. Construction Phase Sequence

The contractor will be responsible for implementing the activities listed below. The activities are designated for proper installation of erosion and sediment control practices and must be followed to ensure proper function of the facilities. Designation of the tasks below to sub-contractors by the contractor is permitted. However, the contractor is responsible to oversee that the sub-contractor properly installs and maintains the practices outlined below.

Note:

1. In areas of tree clearing/grubbing, low pressure (tracked) vehicles should be used to limit compaction of in-situ soils.
2. Construction of the panel arrays shall be completed in such a way that limits disturbance and/or compaction of the in-situ land cover (i.e. tracked vehicles in linear paths in and out of rows recommended).
3. Any soil that is inadvertently disturbed must be temporarily stabilized with straw and corrective action taken to prevent further disturbance.

Phase I (4.85 Acres of Disturbance):

1. Stake out limits of disturbance and areas to be protected.
2. Pre-construction meeting that includes the owner/operator, NYSDEC, design engineer/qualified professional, qualified inspector, Town representative, contractor and all sub-contractors involved in land disturbance activities. All permits, written approvals and signed statements shall be on site during pre-construction meeting.
3. Installation of stabilized construction entrance, silt fence/filter sock, concrete washout, and laydown area.
4. Commencement of clearing and grubbing. Designated clearing and grubbing areas are to be stabilized prior to moving to the next phase.
5. Installation of roadways.

6. Installation of concrete equipment pads, utility poles, underground electric.
7. Stabilization of non-working areas, swales with seed and mulch or hydroseed with tackifier.
8. Installation of stormwater management practices, if applicable.

Phase II (4.87 Acres of Disturbance):

1. Clearing and grubbing of existing trees and shrubs.
2. Trenching for conduit and underground electrical equipment.
3. Installation of ground-mounted solar array.
4. Stabilization of non-working areas with seed and mulch or hydroseed with tackifier prior to moving to next phase.

Phase III (4.72 Acres of Disturbance):

1. Clearing and grubbing of existing trees and shrubs.
2. Trenching for conduit and underground electrical equipment.
3. Installation of ground-mounted solar array.
4. Stabilization of non-working areas with seed and mulch or hydroseed with tackifier prior to moving to next phase.

Phase IV (2.96 Acres of Disturbance):

1. Clearing and grubbing of existing trees and shrubs.
2. Trenching for conduit and underground electrical equipment.
3. Installation of ground-mounted solar array.
4. Stabilization of non-working areas with seed and mulch or hydroseed with tackifier prior to moving to next phase.

Phase V (4.54 Acres of Disturbance):

1. Clearing and grubbing of existing trees and shrubs.
2. Trenching for conduit and underground electrical equipment.
3. Installation of ground-mounted solar array.
4. Stabilization of non-working areas with seed and mulch or hydroseed with tackifier.
5. To be determined by the qualified inspector or qualified professional & Town representative: removal of temporary erosion and sediment control practices (silt fence/filter sock, construction entrance) once the site disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) precent over the entire pervious surface or other equivalent stabilization measures, such as permanent landscape mulch, rock rip-rap or washed/crushed stone have been applied on all disturbed areas that are not

covered by permanent structures, concrete or pavement. (**Note:** no ESC practices shall be removed without prior authorization from the Town representative.)

6. Final site inspection by qualified professional, owner/operator, town representative and contractor shall be completed prior to the submission of the Notice of Termination (NOT) to the NYSDEC.

F. Pollution Prevention Measures (Other)

Other than the typical erosion and sediment control practices outlined above, other pollutant controls will be provided by the contractor. The following is a list of other pollutant controls that will be provided by the contractor:

1. Sanitary Facilities

Temporary facilities will be used by all construction personnel and will be serviced by a commercial contractor. The facilities will comply with all sanitary and septic system regulations.

2. Water Sources

Non-stormwater components of site discharge must be clean. Water used for the purpose of construction activities must originate from a public water supply or private well approved by the Health Department.

3. Solid Waste Disposal

Solid and building material will not be allowed to discharge from site via stormwater. All solid waste must be collected and placed in containers on site. The containers will be emptied when needed by a trash disposal service and hauled off site.

In order to control pollution of surface and/or groundwater, substances that have potential for polluting must be contained on-site. Proper containment and disposal of spills that occur on-site must be implemented to ensure flow will not enter the groundwater.

G. Spill Prevention Countermeasures & Control Plan

The Spill Prevention and Control Plan for the site include the following:

1. Contractor Preparation and Training

The general contractor shall require appropriate cleanup materials, apparatus, and personnel to be on-site whenever active construction is occurring. This shall include sorbents for accidental spills, restrictions on certain activities, location of materials and equipment, and a protocol to be followed in the event of an accidental spill. Additionally, the contractor shall be required to document all spill related incidents onsite using the form in Appendix I of this SWPPP.

The general contractor shall include training for spill prevention countermeasures and control as part of the health and safety program for the project.

2. Minimization and Good Housekeeping Techniques

Good housekeeping practices shall include the following measures and be adhered to during site construction:

- An effort will be made to store only enough products required for the job.
- All materials stored onsite will be stored in a neat, orderly manner in their appropriate container and under a roof or other enclosure.
- Products will be kept in their original containers with the original manufacturer's label.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product will be used up before disposing of the container.
- Manufacturers' recommendations for proper use and disposal shall be followed.
- Trash onsite shall be controlled by periodic monitoring and by periodic clean up, and bermed to control runoff.

There are certain requirements that will help reduce the potential for problems with an accidental spill. These include:

- Refueling should occur at locations where site is paved.
- All diesel or gasoline kept onsite should be located near the existing access routes in order to provide access by pickup trucks, refueling trucks and the fire department.
- Diesel or gasoline containers should be kept within sealed protective enclosures.
- The refueling area should be kept a minimum of 100' from wells.
- All septic tanks or other facilities receiving discharge from floor drains shall be plugged after installation, inspected for contaminants with the plug not removed until authorized by owner/operator.

3. Response Techniques

The following practices shall be followed for spill prevention and cleanup:

- Site personnel should be made aware of the recommended procedures and the location of the information and cleanup supplies from prior training.
- Large spills will require an emergency response contractor to be engaged by the site contractor.
- Materials and equipment necessary for spill cleanup shall be kept in the material storage area onsite. Equipment and materials may include, but are not limited to, brooms, dustpans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and trash containers

specifically for the purpose.

- All spills shall be cleaned up immediately after discovery and documented using the Spill Incident or Report form located in Appendix I of this SWPPP.

In the event of an accidental spill or breakage (equipment fueling tanks, hydraulic lines, etc.), the worker(s) shall immediately arrange for shutdown of any equipment that could exacerbate the spill and contact their immediate supervisor.

- Spill area shall be kept well ventilated and personnel shall wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- Spills of toxic or hazardous material will be reported to the appropriate State or local government agency. The contact information is below:
  - NYSDEC Spill Hotline: 1-800-457-7362
  - National Response Center (Water spill): 1-800-424-8802
  - Emergency Management (Water spill): 1-800-258-5990
- The spill prevention plan will be modified to include measures to prevent this type of spill from recurring and how to clean up the spill if there is another one. The modification to the plan shall include a description of the spill, what caused it, and the cleanup measures used.
- The contractor and a party responsible for and present during the day-to-day operations shall be the spill prevention and cleanup coordination team.
- The supervisor should arrange for the accident or spill to be evaluated immediately with efforts taken to minimize and control release of spilled materials into the environment.

As soon as immediate actions have been taken, the Fire Department, and the Owner shall be notified. A decision shall be made whether the NYSDEC and a specialty consultant are contacted. If the activity has the potential of affecting nearby properties, the owners of such properties shall be notified. Additional interested parties shall also be notified at this time.

The contractor shall prepare a remedial action plan and submit it to the owner, Town/City/Village Code enforcement, and Fire Department. The need to prepare, submit, and await approval of the plan shall not prevent the Contractor to take immediate and appropriate steps to mitigate the event.

H. Soil Restoration

Soil restoration is a required practice applied across areas of a development site where soils have been disturbed and will be vegetated in order to recover the original properties and porosity of the soil. This process <u>shall be applied in the cleanup, restoration, and landscaping phase of construction</u>

followed by the permanent establishment of an appropriate, deep-rooted groundcover to help maintain the restored soil structure.

Soil restoration methods shall include but are not limited to the following:

- <u>Aeration</u>-includes the use of machines such as tractor-drawn implements with coulters making a narrow slit in the soil, a roller with many spikes making indentations in the soil, or prongs which function as a mini-subsoiler.
- <u>Tilling</u>-includes the use of a bulldozer-mounted ripper, tractor mounted disc, or tiller in order to expose the compacted soil.
- <u>Full Soil Restoration</u>- includes deep ripping, decompaction, and compost enhancement. Deep ripping includes the use of a bulldozer mounted ripper, and is typically done at 12" to 24" depths. Compost enhancement is done by using a deep subsoiler after topsoil has been applied, Thus mixing the topsoil and compost.

Soil restoration shall be in accordance with Table 4 and per the NYSDEC Deep-Ripping and Decompaction Manual, April 2008 (See appendix G of this SWPPP). At the end of the project and prior to the submission of Notice of Termination, the site inspector shall be able to push a 3/8" metal rod 12 inches into the soil just with body weight.

Table 4: Soil Restoration Requirements

(copied from Table 5.3 of the NYSDEC Stormwater Management Design Manual)

<table>
<tr><th>Type of Soil Disturbance</th><th colspan="2">Soil Restoration Requirement</th><th>Comments/Examples</th></tr>
<tr><td>No soil disturbance</td><td colspan="2">Restoration not permitted</td><td>Preservation of Natural Features</td></tr>
<tr><td>Minimal soil disturbance</td><td colspan="2">Restoration not required</td><td>Clearing and grubbing</td></tr>
<tr><td rowspan="2">Areas where topsoil is stripped only - no change in grade</td><td>HSG A&B</td><td>HSG C&D</td><td>Protect area from any ongoing construction activities.</td></tr>
<tr><td>apply 6 inches of topsoil</td><td>Aerate* and apply 6 inches of topsoil</td><td></td></tr>
<tr><td rowspan="2">Areas of cut or fill</td><td>HSG A &B</td><td colspan="2">HSG C & D</td></tr>
<tr><td>Aerate and apply 6 inches of topsoil</td><td colspan="2">Apply full Soil Restoration **</td></tr>
</table>

Heavy traffic areas on site (especially in a zone 5-25 feet around buildings but not within a 5 foot perimeter around foundation walls)	Apply full Soil Restoration (de-compaction and compost enhancement)	
Areas where Runoff Reduction and/or Infiltration practices are applied	Restoration not required but may be applied to enhance the reduction specified for appropriate practices.	Keep construction equipment from crossing these areas. To protect newly installed practice from any ongoing construction activities construct a single phase operation fence area
Redevelopment projects	Soil Restoration is required on redevelopment projects in areas where existing impervious area will be converted to pervious area.	

*Aeration includes the use of machines such as tractor-drawn implements with coulters making a narrow slit in the soil, a roller with many spikes making indentations in the soil, or prongs which function like a mini-subsoiler.

** Per "Deep Ripping and De-compaction, DEC 2008".

I. Post Construction Operation and Maintenance

Following project completion, all exposed soil, including slopes and the detention basin, will be seeded with a pollinator habitat friendly conservation seed mix (specified on ESC plan). Straw mulch will be applied to seeded areas to cover 90% of the surface area unless otherwise specified by engineer.

Following completion of each phase of the project, the contractor will remove all sediment, debris, trash, etc. from all permanent storm water management devices and ensure that the permanent storm water management measures are constructed as shown on the plans and are in good working order.

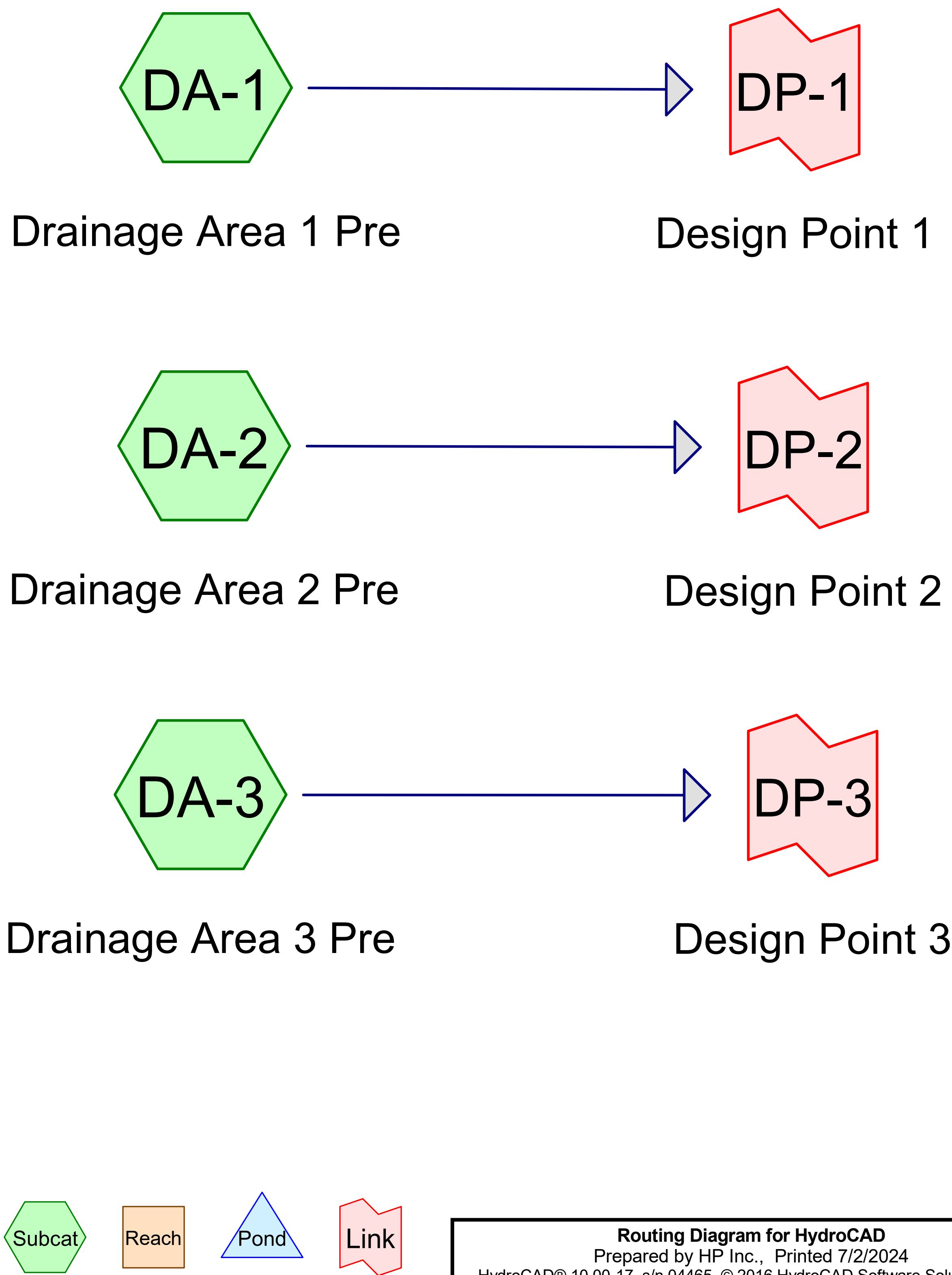
The contractor will ensure that all temporary stabilization measures will remain operational until the permanent stabilization measures are fully developed, the owner assumes responsibility of all permanent stormwater practices onsite and the Notice of Termination has been filed with the NYSDEC.

J. Long Term Operations and Maintenance

The owner of the facility, ELP Marlborough Solar LLC, or most current, will be responsible for the implementation of long-term operation and maintenance of all the structures. A legally binding and enforceable mechanism such as a maintenance agreement, deed covenant or other legal measures must be obtained to protect the implemented practices from neglect, adverse alteration and/or unauthorized removal. The legally binding and enforceable mechanism shall be created and implemented prior to the filing of the Notice of Termination.

Inspections and maintenance activities are considered essential for routine upkeep. The long-term stormwater management maintenance and inspection summary list (see Appendix H of this SWPPP) is derived from a combination of the NYSDEC Stormwater Management Design Manual, August 2015 and the NYS Standards and Specifications for Erosion and Sediment Control, August 2005.

Appendix A: HydroCAD



Routing Diagram for HydroCAD
Prepared by HP Inc., Printed 7/2/2024

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
21.200	71	Meadow, non-grazed, HSG C (DA-1, DA-2, DA-3)
26.370	78	Meadow, non-grazed, HSG D (DA-1, DA-2, DA-3)
1.010	98	Paved roads w/curbs & sewers, HSG C (DA-1, DA-2, DA-3)
1.150	98	Paved roads w/curbs & sewers, HSG D (DA-1, DA-2, DA-3)
4.290	98	Rock outcrop (DA-1)
0.020	98	Roofs, HSG C (DA-1)
0.090	98	Roofs, HSG D (DA-1)
2.430	98	Water Surface, 0% imp, HSG D (DA-1)
0.330	98	Wetland, HSG C (DA-1)
0.640	98	Wetland, HSG D (DA-1)
5.420	70	Woods, Good, HSG C (DA-1)
3.090	77	Woods, Good, HSG D (DA-1)
66.040	**78**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
27.980	HSG C	DA-1, DA-2, DA-3
33.770	HSG D	DA-1, DA-2, DA-3
4.290	Other	DA-1
66.040		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	21.200	26.370	0.000	47.570	Meadow, non-grazed	DA -1, DA -2, DA -3
0.000	0.000	1.010	1.150	0.000	2.160	Paved roads w/curbs & sewers	DA -1, DA -2, DA -3
0.000	0.000	0.000	0.000	4.290	4.290	Rock outcrop	DA -1
0.000	0.000	0.020	0.090	0.000	0.110	Roofs	DA -1
0.000	0.000	0.000	2.430	0.000	2.430	Water Surface, 0% imp	DA -1
0.000	0.000	0.330	0.640	0.000	0.970	Wetland	DA -1
0.000	0.000	5.420	3.090	0.000	8.510	Woods, Good	DA -1
0.000	**0.000**	**27.980**	**33.770**	**4.290**	**66.040**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA-1: Drainage Area 1 Pre Runoff Area=51.090 ac 12.76% Impervious Runoff Depth>0.76"
Flow Length=1,829' Tc=16.9 min CN=78 Runoff=35.57 cfs 3.216 af

Subcatchment DA-2: Drainage Area 2 Pre Runoff Area=10.110 ac 6.63% Impervious Runoff Depth>0.71"
Flow Length=1,499' Tc=17.4 min CN=77 Runoff=6.44 cfs 0.597 af

Subcatchment DA-3: Drainage Area 3 Pre Runoff Area=4.840 ac 7.02% Impervious Runoff Depth>0.81"
Flow Length=703' Tc=13.0 min CN=79 Runoff=4.08 cfs 0.325 af

Link DP-1: Design Point 1 Inflow=35.57 cfs 3.216 af
Primary=35.57 cfs 3.216 af

Link DP-2: Design Point 2 Inflow=6.44 cfs 0.597 af
Primary=6.44 cfs 0.597 af

Link DP-3: Design Point 3 Inflow=4.08 cfs 0.325 af
Primary=4.08 cfs 0.325 af

Total Runoff Area = 66.040 ac Runoff Volume = 4.138 af Average Runoff Depth = 0.75"
88.60% Pervious = 58.510 ac 11.40% Impervious = 7.530 ac

Summary for Subcatchment DA-1: Drainage Area 1 Pre

Existing agricultural land (orchard) modeled conservatively taken as meadow, per New York State Stormwater Management Design Manual.

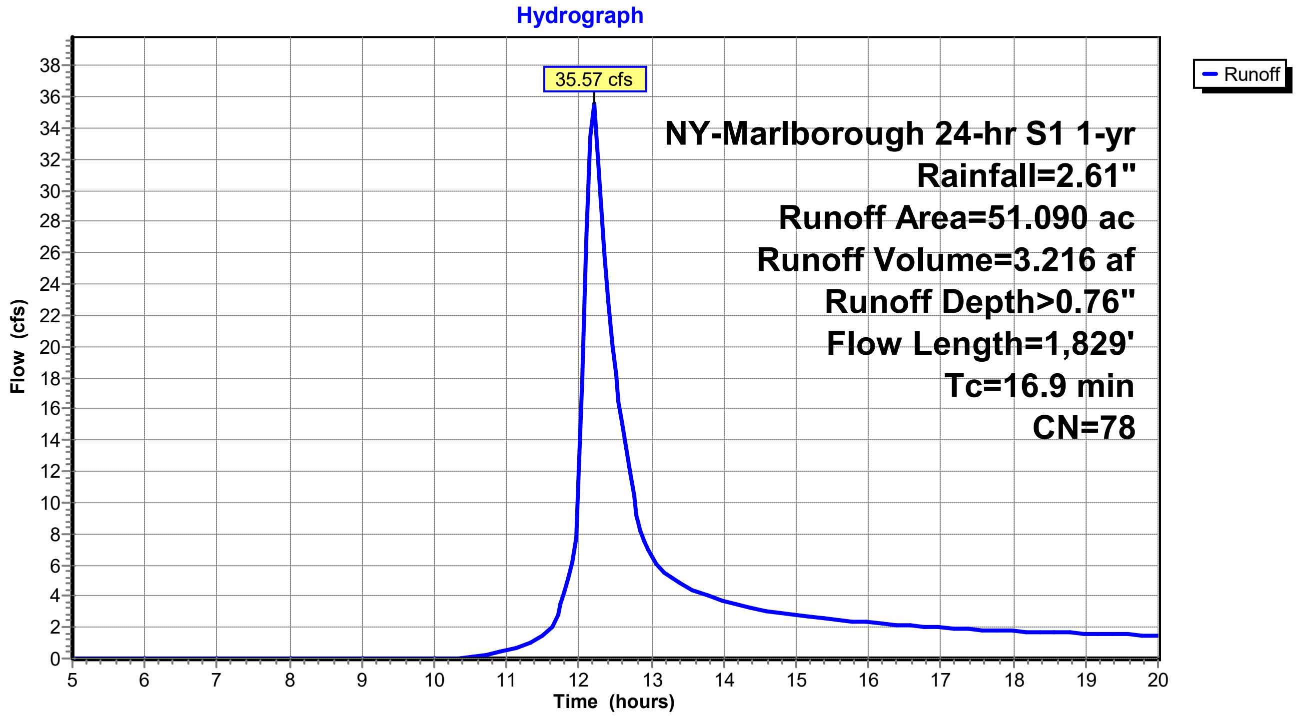
Runoff = 35.57 cfs @ 12.20 hrs, Volume= 3.216 af, Depth> 0.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NY-Marlborough 24-hr S1 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
	18.060	71	Meadow, non-grazed, HSG C
	5.420	70	Woods, Good, HSG C
	0.490	98	Paved roads w/curbs & sewers, HSG C
	0.020	98	Roofs, HSG C
*	0.330	98	Wetland, HSG C
	15.570	78	Meadow, non-grazed, HSG D
	3.090	77	Woods, Good, HSG D
	0.660	98	Paved roads w/curbs & sewers, HSG D
	0.080	98	Roofs, HSG D
*	0.640	98	Wetland, HSG D
*	1.330	98	Rock outcrop
*	2.960	98	Rock outcrop
	0.010	98	Roofs, HSG D
	2.430	98	Water Surface, 0% imp, HSG D
	51.090	78	Weighted Average
	44.570		87.24% Pervious Area
	6.520		12.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	101	0.0597	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
2.8	305	0.0656	1.79		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	16	0.0883	4.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.0798	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	164	0.0817	4.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.0	248	0.0912	2.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	10	0.1392	6.01		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	198	0.1436	2.65		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	65	0.3083	3.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	54	0.1393	2.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	9	0.0814	4.59		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	17	0.1948	3.09		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	41	0.1346	1.83		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.2	119	0.0336	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	123		11.35		**Lake or Reservoir, wetland** Mean Depth= 4.00'
0.3	349		17.94		**Lake or Reservoir, lake** Mean Depth= 10.00'
16.9	1,829	Total			

Subcatchment DA-1: Drainage Area 1 Pre



Summary for Subcatchment DA-2: Drainage Area 2 Pre

Existing agricultural land (orchard) modeled conservatively taken as meadow, per New York State Stormwater Management Design Manual.

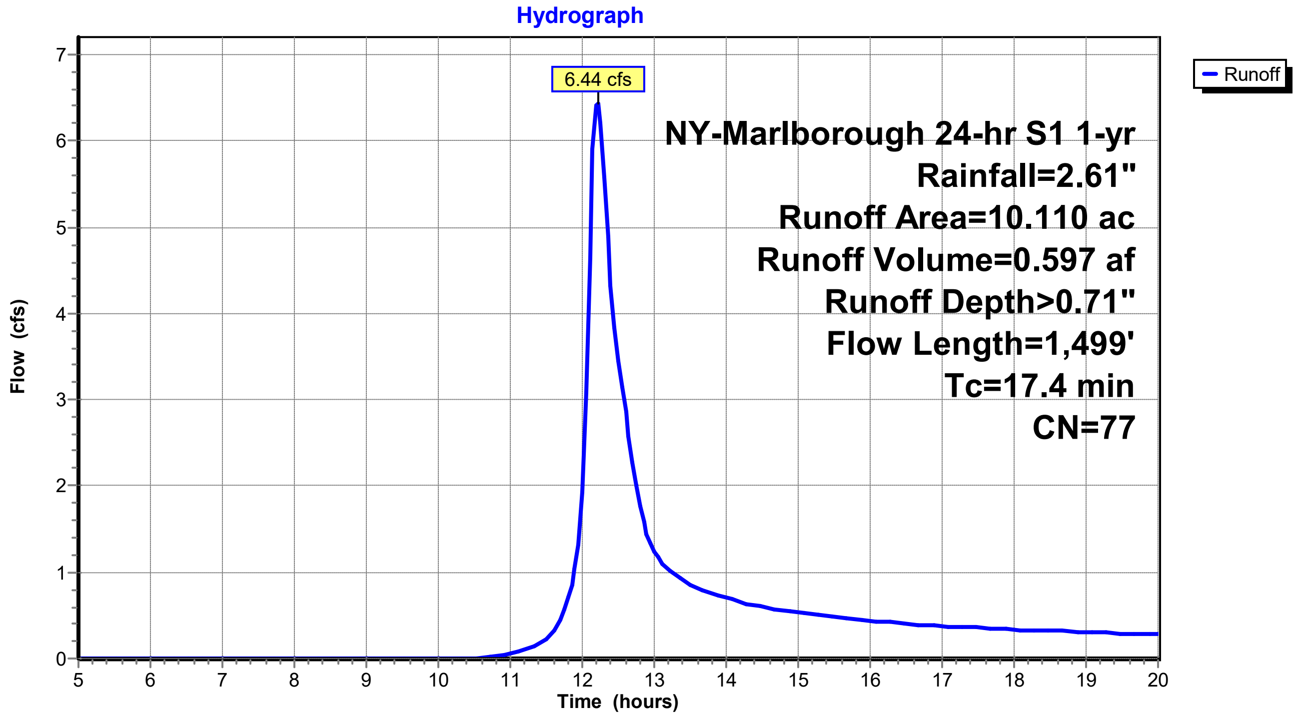
Runoff = 6.44 cfs @ 12.21 hrs, Volume= 0.597 af, Depth> 0.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NY-Marlborough 24-hr S1 1-yr Rainfall=2.61"

Area (ac)	CN	Description
3.090	71	Meadow, non-grazed, HSG C
0.490	98	Paved roads w/curbs & sewers, HSG C
6.350	78	Meadow, non-grazed, HSG D
0.180	98	Paved roads w/curbs & sewers, HSG D
10.110	77	Weighted Average
9.440		93.37% Pervious Area
0.670		6.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	101	0.1191	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
3.8	414	0.0676	1.82		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	9	0.0556	3.80		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.8	242	0.0971	2.18		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	81	0.0840	4.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	9	0.0444	3.39		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.0	239	0.0787	1.96		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.3	217	0.0507	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	170	0.0353	1.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	17	0.0585	3.89		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
17.4	1,499	Total			

Subcatchment DA-2: Drainage Area 2 Pre



Summary for Subcatchment DA-3: Drainage Area 3 Pre

Existing agricultural land (orchard) modeled conservatively taken as meadow, per New York State Stormwater Management Design Manual.

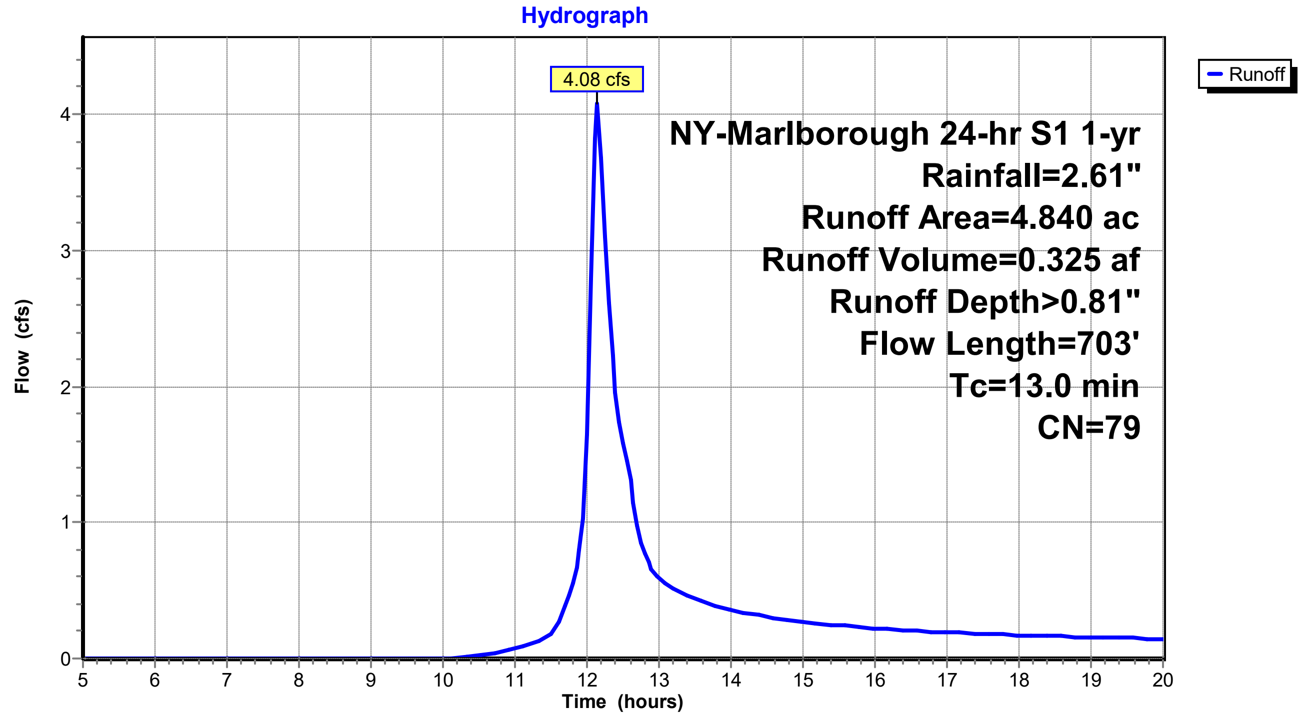
Runoff = 4.08 cfs @ 12.14 hrs, Volume= 0.325 af, Depth> 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NY-Marlborough 24-hr S1 1-yr Rainfall=2.61"

Area (ac)	CN	Description
0.050	71	Meadow, non-grazed, HSG C
0.030	98	Paved roads w/curbs & sewers, HSG C
4.450	78	Meadow, non-grazed, HSG D
0.310	98	Paved roads w/curbs & sewers, HSG D
4.840	79	Weighted Average
4.500		92.98% Pervious Area
0.340		7.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	100	0.0380	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.2	585	0.0712	1.87		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0396	3.20		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	8	0.1144	2.37		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.0	703	Total			

Subcatchment DA-3: Drainage Area 3 Pre

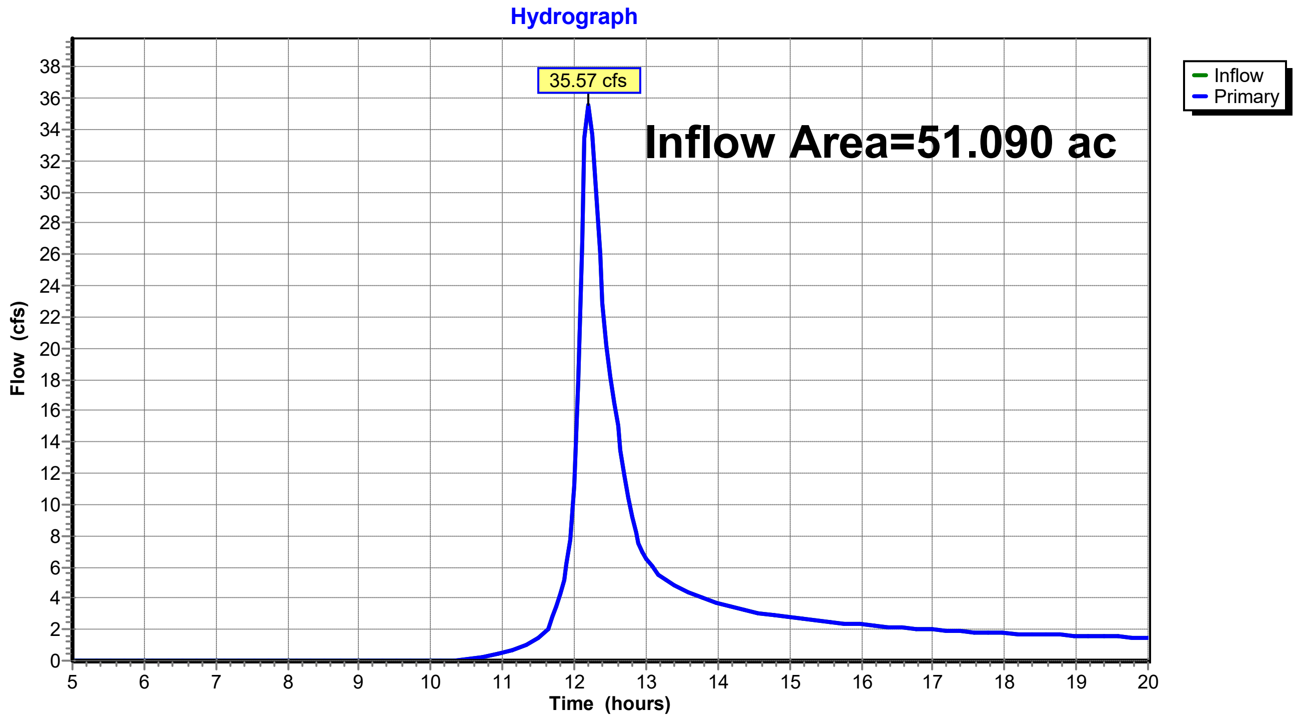


Summary for Link DP-1: Design Point 1

Inflow Area = 51.090 ac, 12.76% Impervious, Inflow Depth > 0.76" for 1-yr event
Inflow = 35.57 cfs @ 12.20 hrs, Volume= 3.216 af
Primary = 35.57 cfs @ 12.20 hrs, Volume= 3.216 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP-1: Design Point 1

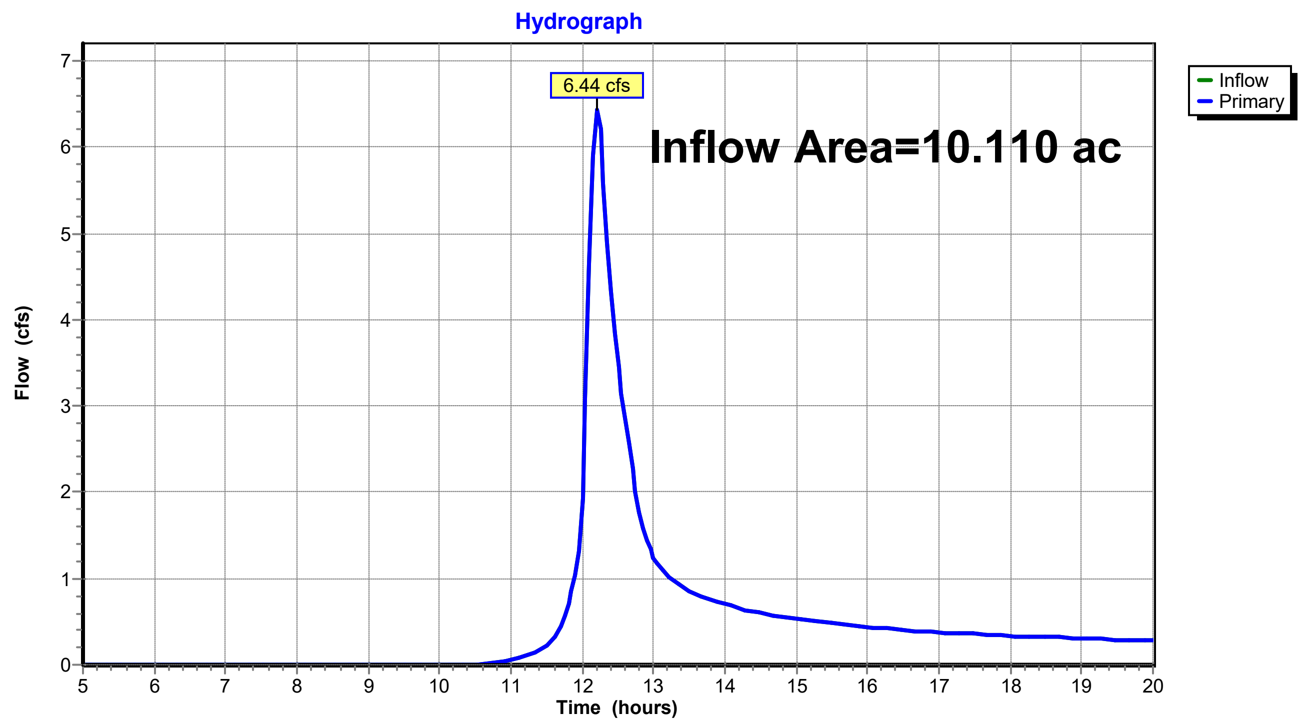


Summary for Link DP-2: Design Point 2

Inflow Area =	10.110 ac,	6.63% Impervious,	Inflow Depth > 0.71"	for 1-yr event	
Inflow =	6.44 cfs @	12.21 hrs,	Volume=	0.597 af	
Primary =	6.44 cfs @	12.21 hrs,	Volume=	0.597 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP-2: Design Point 2

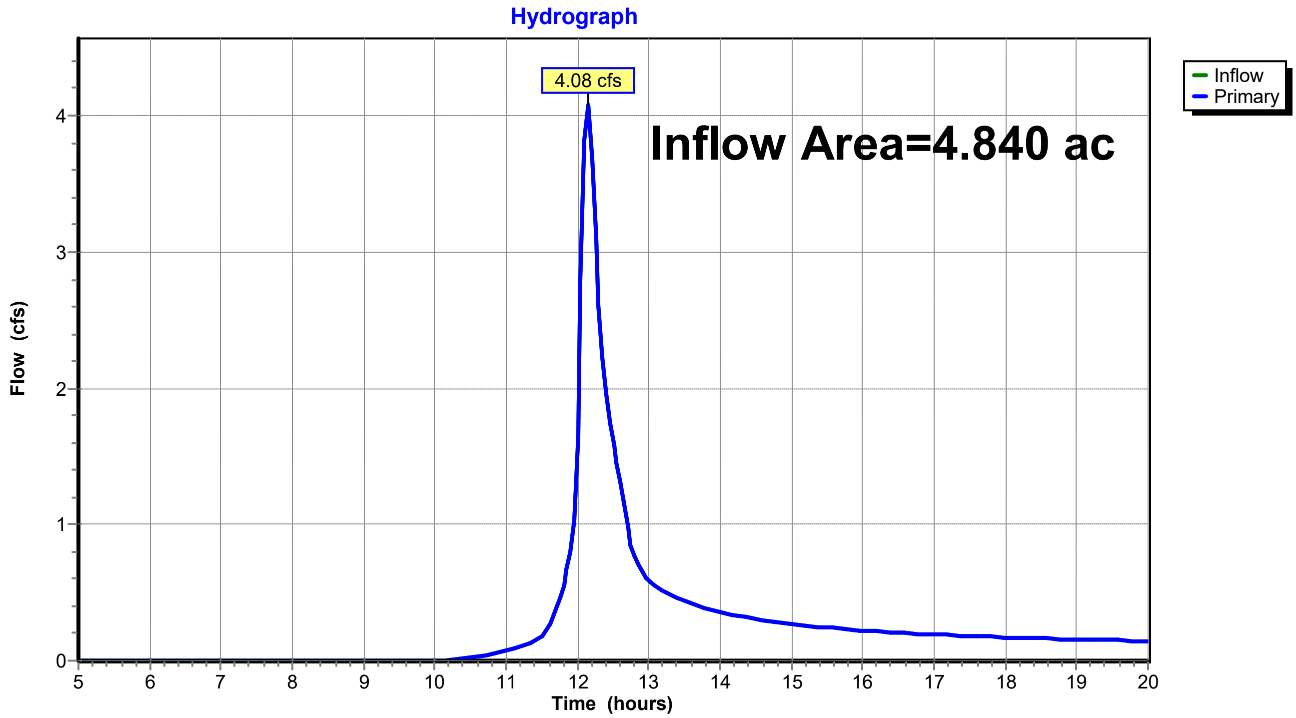


Summary for Link DP-3: Design Point 3

Inflow Area = 4.840 ac, 7.02% Impervious, Inflow Depth > 0.81" for 1-yr event
Inflow = 4.08 cfs @ 12.14 hrs, Volume= 0.325 af
Primary = 4.08 cfs @ 12.14 hrs, Volume= 0.325 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP-3: Design Point 3



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA-1: Drainage Area 1 Pre Runoff Area=51.090 ac 12.76% Impervious Runoff Depth>2.18"
Flow Length=1,829' Tc=16.9 min CN=78 Runoff=101.77 cfs 9.285 af

Subcatchment DA-2: Drainage Area 2 Pre Runoff Area=10.110 ac 6.63% Impervious Runoff Depth>2.10"
Flow Length=1,499' Tc=17.4 min CN=77 Runoff=19.13 cfs 1.769 af

Subcatchment DA-3: Drainage Area 3 Pre Runoff Area=4.840 ac 7.02% Impervious Runoff Depth>2.27"
Flow Length=703' Tc=13.0 min CN=79 Runoff=11.18 cfs 0.914 af

Link DP-1: Design Point 1 Inflow=101.77 cfs 9.285 af
Primary=101.77 cfs 9.285 af

Link DP-2: Design Point 2 Inflow=19.13 cfs 1.769 af
Primary=19.13 cfs 1.769 af

Link DP-3: Design Point 3 Inflow=11.18 cfs 0.914 af
Primary=11.18 cfs 0.914 af

Total Runoff Area = 66.040 ac Runoff Volume = 11.969 af Average Runoff Depth = 2.17"
88.60% Pervious = 58.510 ac 11.40% Impervious = 7.530 ac

Summary for Subcatchment DA-1: Drainage Area 1 Pre

Existing agricultural land (orchard) modeled conservatively taken as meadow, per New York State Stormwater Management Design Manual.

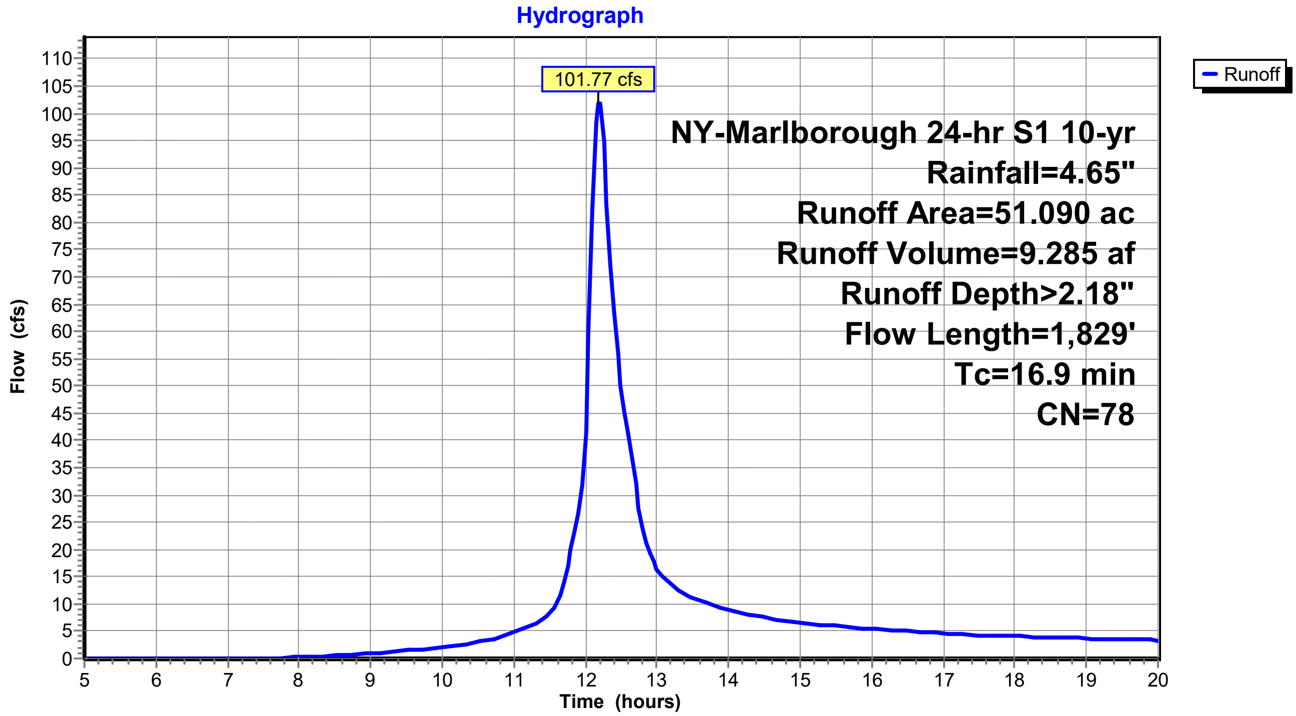
Runoff = 101.77 cfs @ 12.19 hrs, Volume= 9.285 af, Depth> 2.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NY-Marlborough 24-hr S1 10-yr Rainfall=4.65"

	Area (ac)	CN	Description
	18.060	71	Meadow, non-grazed, HSG C
	5.420	70	Woods, Good, HSG C
	0.490	98	Paved roads w/curbs & sewers, HSG C
	0.020	98	Roofs, HSG C
*	0.330	98	Wetland, HSG C
	15.570	78	Meadow, non-grazed, HSG D
	3.090	77	Woods, Good, HSG D
	0.660	98	Paved roads w/curbs & sewers, HSG D
	0.080	98	Roofs, HSG D
*	0.640	98	Wetland, HSG D
*	1.330	98	Rock outcrop
*	2.960	98	Rock outcrop
	0.010	98	Roofs, HSG D
	2.430	98	Water Surface, 0% imp, HSG D
	51.090	78	Weighted Average
	44.570		87.24% Pervious Area
	6.520		12.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	101	0.0597	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
2.8	305	0.0656	1.79		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	16	0.0883	4.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.0798	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	164	0.0817	4.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.0	248	0.0912	2.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	10	0.1392	6.01		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	198	0.1436	2.65		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	65	0.3083	3.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	54	0.1393	2.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	9	0.0814	4.59		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	17	0.1948	3.09		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	41	0.1346	1.83		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.2	119	0.0336	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	123		11.35		**Lake or Reservoir, wetland** Mean Depth= 4.00'
0.3	349		17.94		**Lake or Reservoir, lake** Mean Depth= 10.00'
16.9	1,829	Total			

Subcatchment DA-1: Drainage Area 1 Pre



Summary for Subcatchment DA-2: Drainage Area 2 Pre

Existing agricultural land (orchard) modeled conservatively taken as meadow, per New York State Stormwater Management Design Manual.

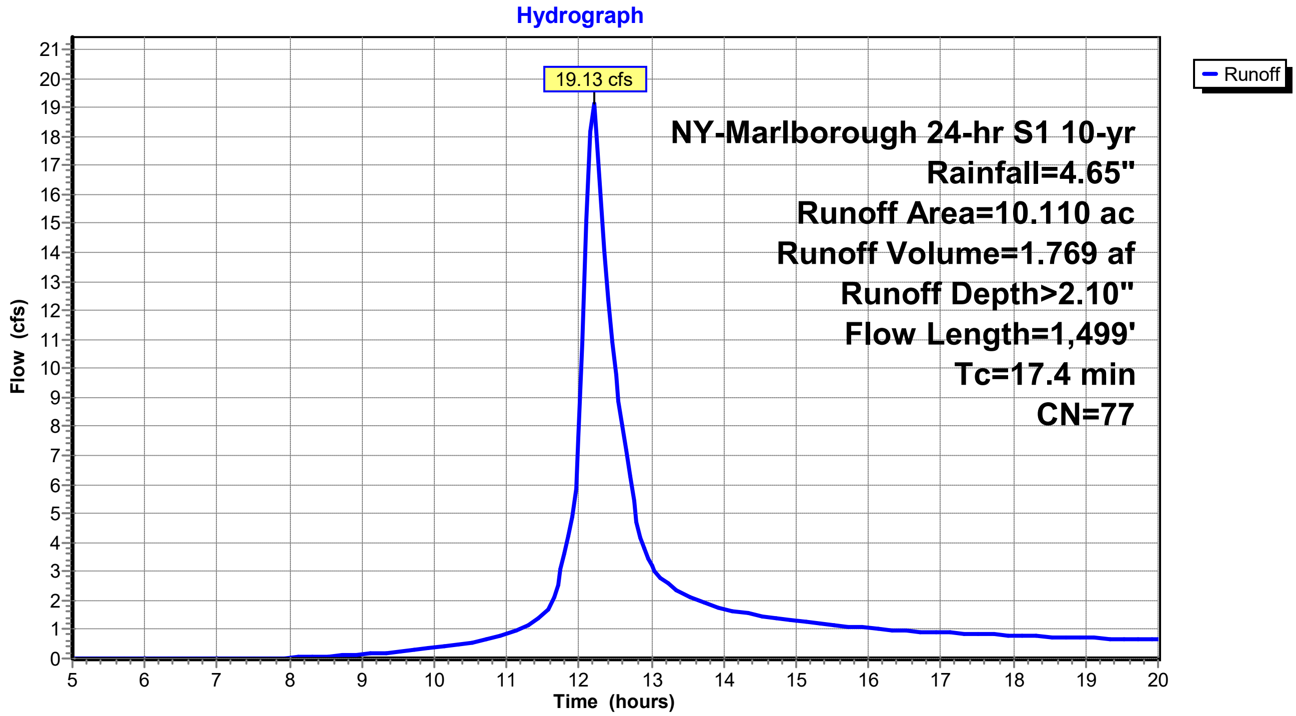
Runoff = 19.13 cfs @ 12.20 hrs, Volume= 1.769 af, Depth> 2.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NY-Marlborough 24-hr S1 10-yr Rainfall=4.65"

Area (ac)	CN	Description
3.090	71	Meadow, non-grazed, HSG C
0.490	98	Paved roads w/curbs & sewers, HSG C
6.350	78	Meadow, non-grazed, HSG D
0.180	98	Paved roads w/curbs & sewers, HSG D
10.110	77	Weighted Average
9.440		93.37% Pervious Area
0.670		6.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	101	0.1191	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
3.8	414	0.0676	1.82		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	9	0.0556	3.80		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.8	242	0.0971	2.18		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	81	0.0840	4.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	9	0.0444	3.39		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.0	239	0.0787	1.96		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.3	217	0.0507	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	170	0.0353	1.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	17	0.0585	3.89		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
17.4	1,499	Total			

Subcatchment DA-2: Drainage Area 2 Pre



Summary for Subcatchment DA-3: Drainage Area 3 Pre

Existing agricultural land (orchard) modeled conservatively taken as meadow, per New York State Stormwater Management Design Manual.

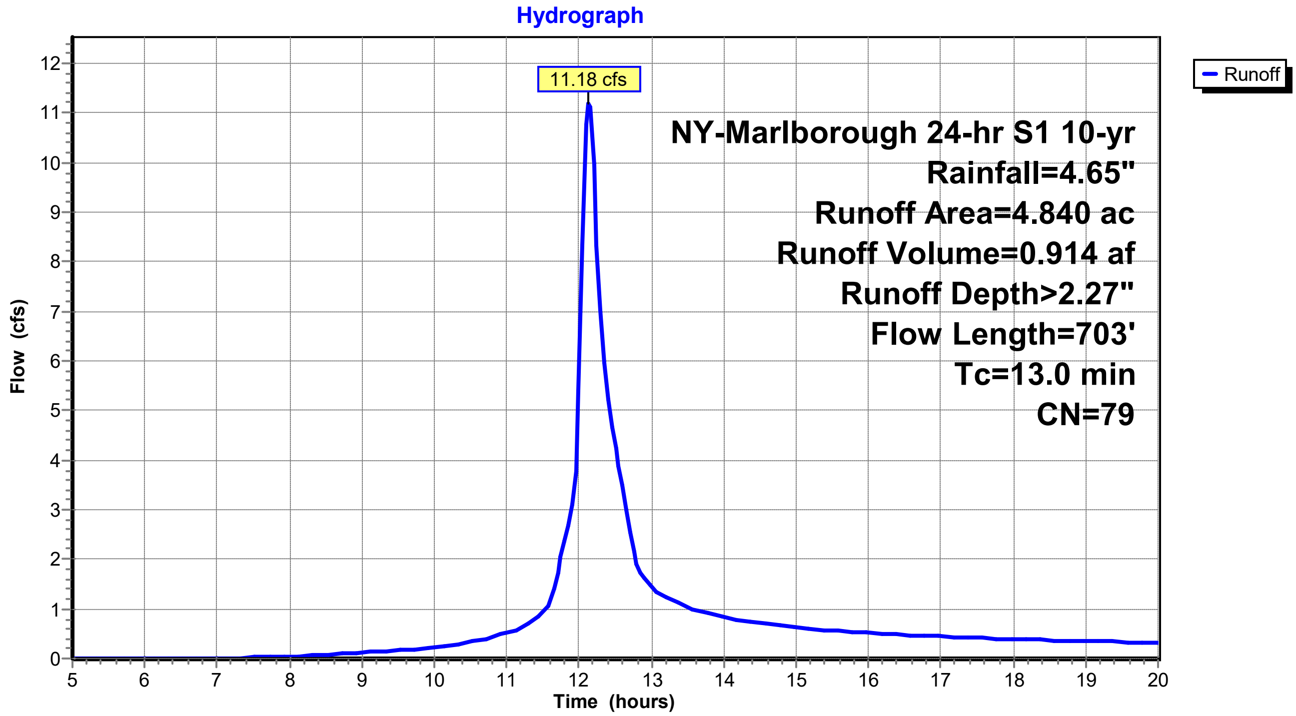
Runoff = 11.18 cfs @ 12.14 hrs, Volume= 0.914 af, Depth> 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NY-Marlborough 24-hr S1 10-yr Rainfall=4.65"

Area (ac)	CN	Description
0.050	71	Meadow, non-grazed, HSG C
0.030	98	Paved roads w/curbs & sewers, HSG C
4.450	78	Meadow, non-grazed, HSG D
0.310	98	Paved roads w/curbs & sewers, HSG D
4.840	79	Weighted Average
4.500		92.98% Pervious Area
0.340		7.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	100	0.0380	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.2	585	0.0712	1.87		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0396	3.20		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	8	0.1144	2.37		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.0	703	Total			

Subcatchment DA-3: Drainage Area 3 Pre

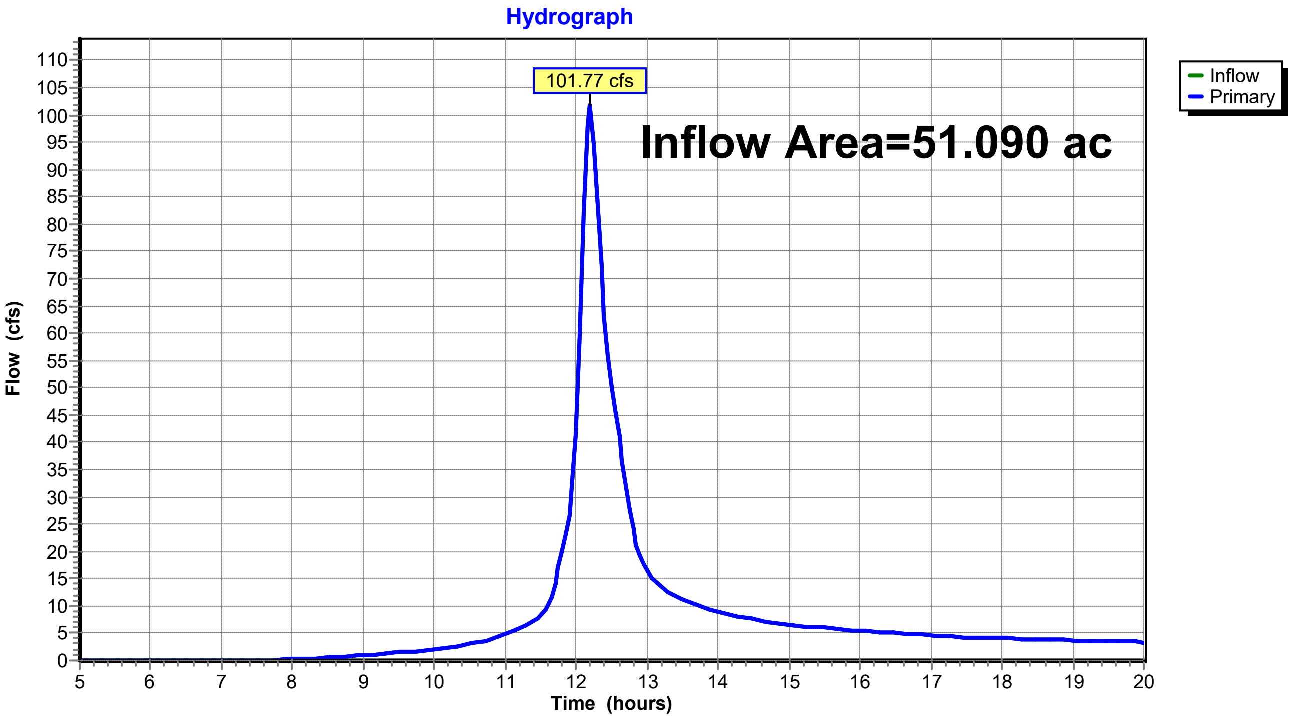


Summary for Link DP-1: Design Point 1

Inflow Area = 51.090 ac, 12.76% Impervious, Inflow Depth > 2.18" for 10-yr event
Inflow = 101.77 cfs @ 12.19 hrs, Volume= 9.285 af
Primary = 101.77 cfs @ 12.19 hrs, Volume= 9.285 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP-1: Design Point 1

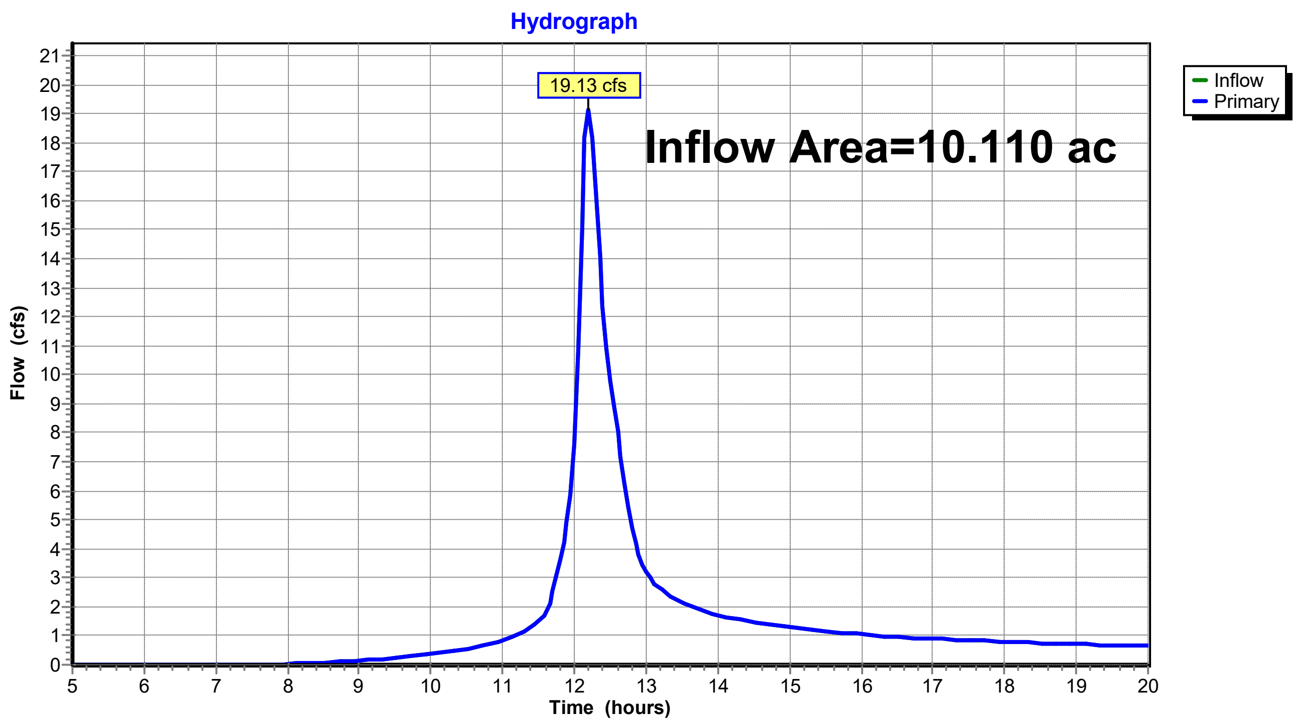


Summary for Link DP-2: Design Point 2

Inflow Area = 10.110 ac, 6.63% Impervious, Inflow Depth > 2.10" for 10-yr event
Inflow = 19.13 cfs @ 12.20 hrs, Volume= 1.769 af
Primary = 19.13 cfs @ 12.20 hrs, Volume= 1.769 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP-2: Design Point 2

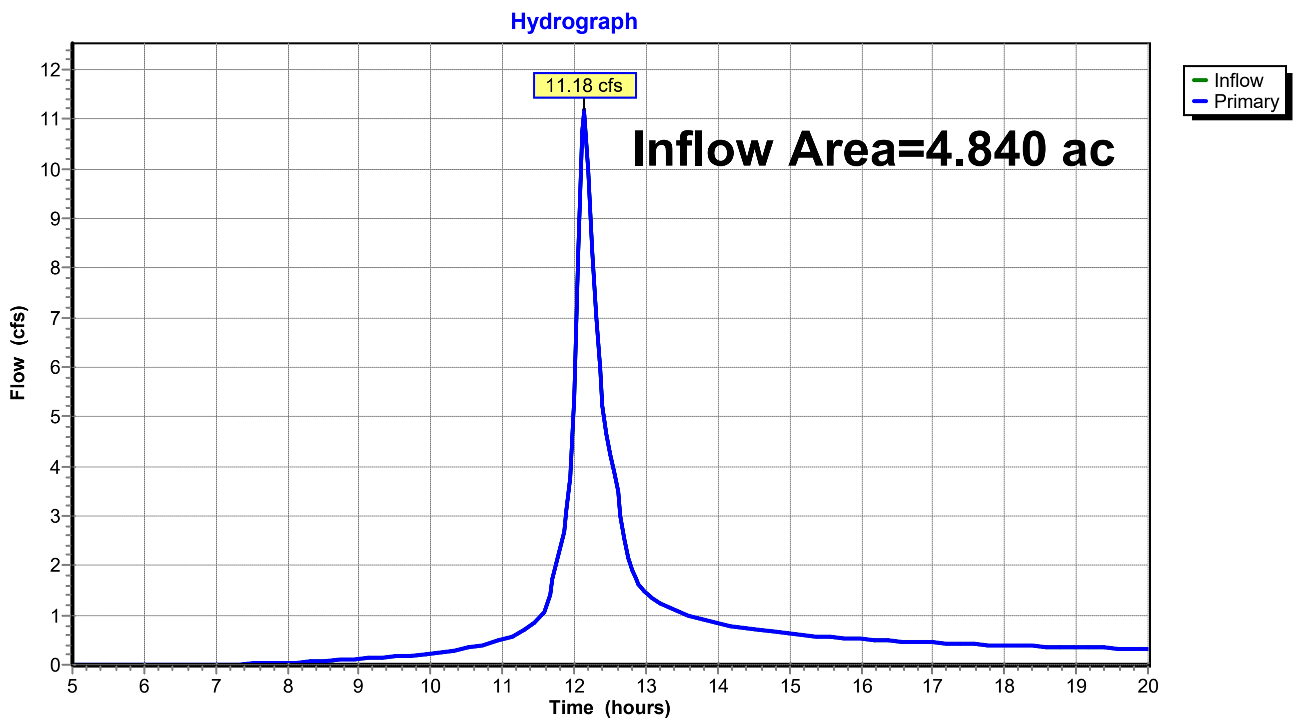


Summary for Link DP-3: Design Point 3

Inflow Area = 4.840 ac, 7.02% Impervious, Inflow Depth > 2.27" for 10-yr event
Inflow = 11.18 cfs @ 12.14 hrs, Volume= 0.914 af
Primary = 11.18 cfs @ 12.14 hrs, Volume= 0.914 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP-3: Design Point 3



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA-1: Drainage Area 1 Pre Runoff Area=51.090 ac 12.76% Impervious Runoff Depth>5.07"
Flow Length=1,829' Tc=16.9 min CN=78 Runoff=221.02 cfs 21.566 af

Subcatchment DA-2: Drainage Area 2 Pre Runoff Area=10.110 ac 6.63% Impervious Runoff Depth>4.95"
Flow Length=1,499' Tc=17.4 min CN=77 Runoff=42.34 cfs 4.171 af

Subcatchment DA-3: Drainage Area 3 Pre Runoff Area=4.840 ac 7.02% Impervious Runoff Depth>5.19"
Flow Length=703' Tc=13.0 min CN=79 Runoff=23.67 cfs 2.092 af

Link DP-1: Design Point 1 Inflow=221.02 cfs 21.566 af
Primary=221.02 cfs 21.566 af

Link DP-2: Design Point 2 Inflow=42.34 cfs 4.171 af
Primary=42.34 cfs 4.171 af

Link DP-3: Design Point 3 Inflow=23.67 cfs 2.092 af
Primary=23.67 cfs 2.092 af

Total Runoff Area = 66.040 ac Runoff Volume = 27.829 af Average Runoff Depth = 5.06"
88.60% Pervious = 58.510 ac 11.40% Impervious = 7.530 ac

Summary for Subcatchment DA-1: Drainage Area 1 Pre

Existing agricultural land (orchard) modeled conservatively taken as meadow, per New York State Stormwater Management Design Manual.

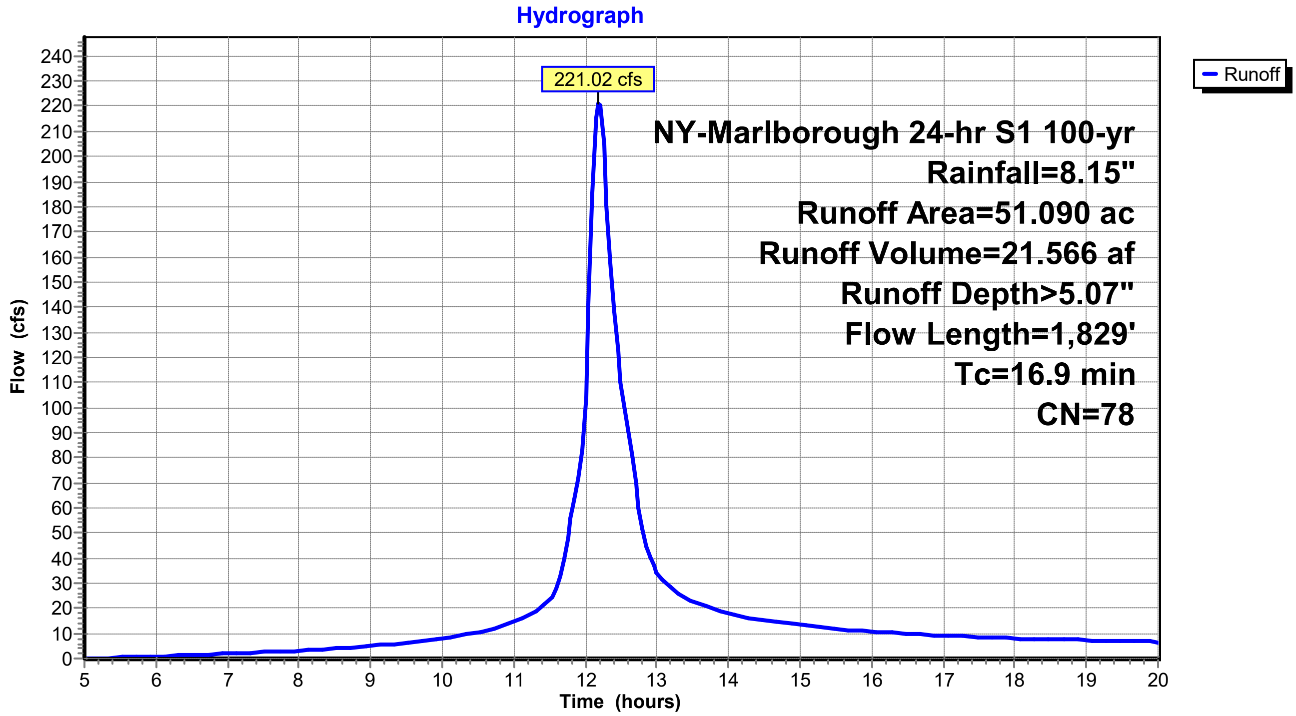
Runoff = 221.02 cfs @ 12.19 hrs, Volume= 21.566 af, Depth> 5.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NY-Marlborough 24-hr S1 100-yr Rainfall=8.15"

	Area (ac)	CN	Description
	18.060	71	Meadow, non-grazed, HSG C
	5.420	70	Woods, Good, HSG C
	0.490	98	Paved roads w/curbs & sewers, HSG C
	0.020	98	Roofs, HSG C
*	0.330	98	Wetland, HSG C
	15.570	78	Meadow, non-grazed, HSG D
	3.090	77	Woods, Good, HSG D
	0.660	98	Paved roads w/curbs & sewers, HSG D
	0.080	98	Roofs, HSG D
*	0.640	98	Wetland, HSG D
*	1.330	98	Rock outcrop
*	2.960	98	Rock outcrop
	0.010	98	Roofs, HSG D
	2.430	98	Water Surface, 0% imp, HSG D
	51.090	78	Weighted Average
	44.570		87.24% Pervious Area
	6.520		12.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	101	0.0597	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
2.8	305	0.0656	1.79		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	16	0.0883	4.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.0798	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	164	0.0817	4.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.0	248	0.0912	2.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	10	0.1392	6.01		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	198	0.1436	2.65		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	65	0.3083	3.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	54	0.1393	2.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	9	0.0814	4.59		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	17	0.1948	3.09		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	41	0.1346	1.83		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.2	119	0.0336	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	123		11.35		**Lake or Reservoir, wetland** Mean Depth= 4.00'
0.3	349		17.94		**Lake or Reservoir, lake** Mean Depth= 10.00'
16.9	1,829	Total			

Subcatchment DA-1: Drainage Area 1 Pre



Summary for Subcatchment DA-2: Drainage Area 2 Pre

Existing agricultural land (orchard) modeled conservatively taken as meadow, per New York State Stormwater Management Design Manual.

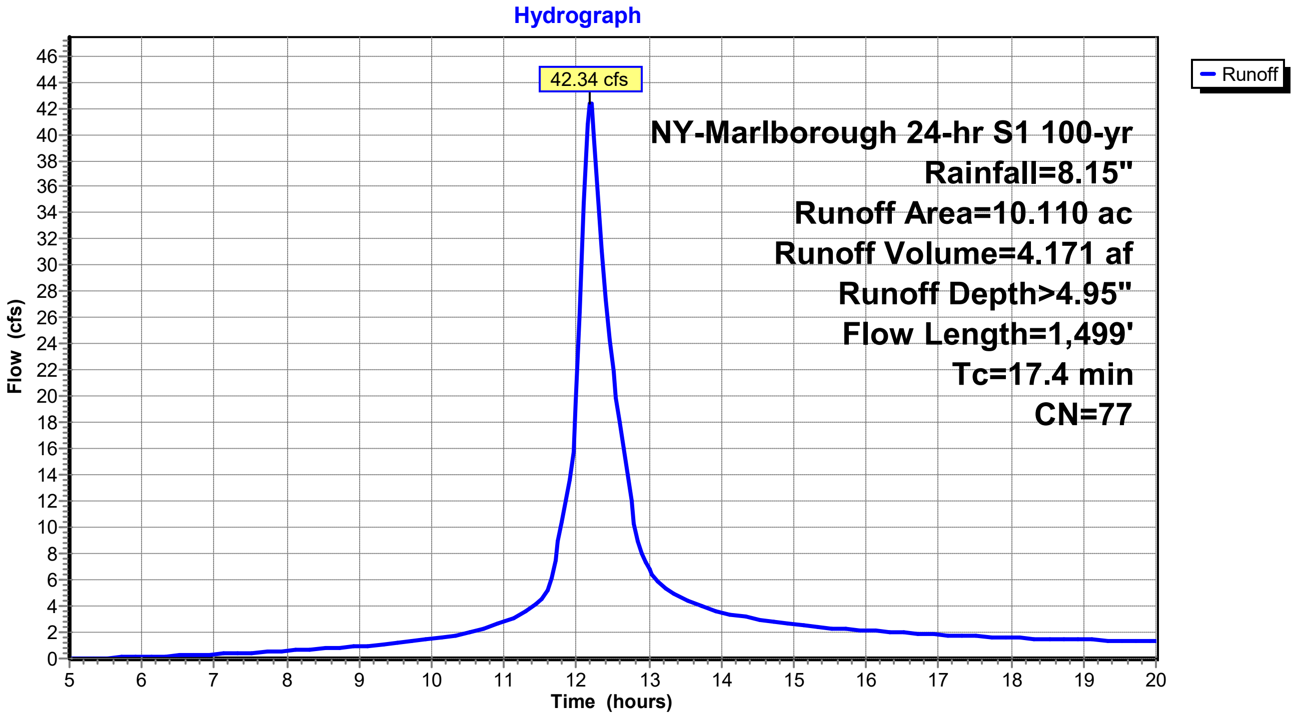
Runoff = 42.34 cfs @ 12.20 hrs, Volume= 4.171 af, Depth> 4.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NY-Marlborough 24-hr S1 100-yr Rainfall=8.15"

Area (ac)	CN	Description
3.090	71	Meadow, non-grazed, HSG C
0.490	98	Paved roads w/curbs & sewers, HSG C
6.350	78	Meadow, non-grazed, HSG D
0.180	98	Paved roads w/curbs & sewers, HSG D
10.110	77	Weighted Average
9.440		93.37% Pervious Area
0.670		6.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	101	0.1191	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
3.8	414	0.0676	1.82		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	9	0.0556	3.80		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.8	242	0.0971	2.18		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	81	0.0840	4.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	9	0.0444	3.39		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.0	239	0.0787	1.96		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.3	217	0.0507	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	170	0.0353	1.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	17	0.0585	3.89		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
17.4	1,499	Total			

Subcatchment DA-2: Drainage Area 2 Pre



Summary for Subcatchment DA-3: Drainage Area 3 Pre

Existing agricultural land (orchard) modeled conservatively taken as meadow, per New York State Stormwater Management Design Manual.

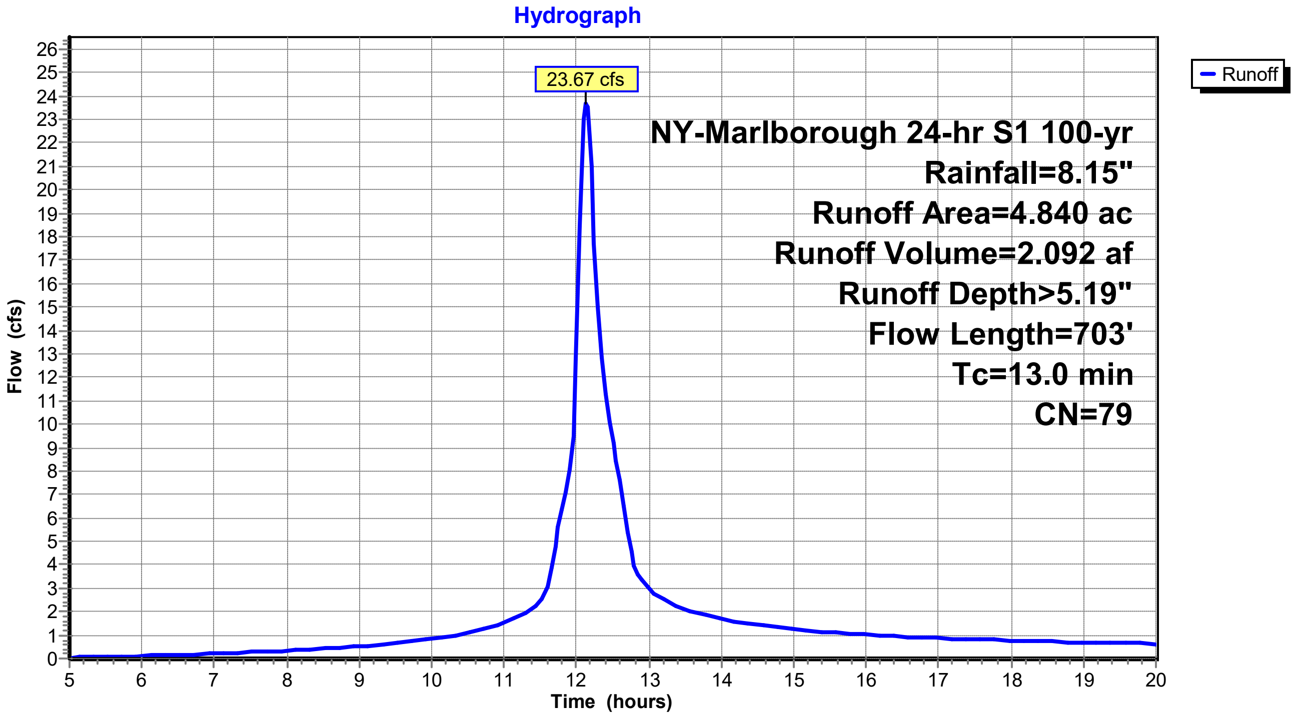
Runoff = 23.67 cfs @ 12.13 hrs, Volume= 2.092 af, Depth> 5.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NY-Marlborough 24-hr S1 100-yr Rainfall=8.15"

Area (ac)	CN	Description
0.050	71	Meadow, non-grazed, HSG C
0.030	98	Paved roads w/curbs & sewers, HSG C
4.450	78	Meadow, non-grazed, HSG D
0.310	98	Paved roads w/curbs & sewers, HSG D
4.840	79	Weighted Average
4.500		92.98% Pervious Area
0.340		7.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	100	0.0380	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.2	585	0.0712	1.87		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0396	3.20		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	8	0.1144	2.37		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.0	703	Total			

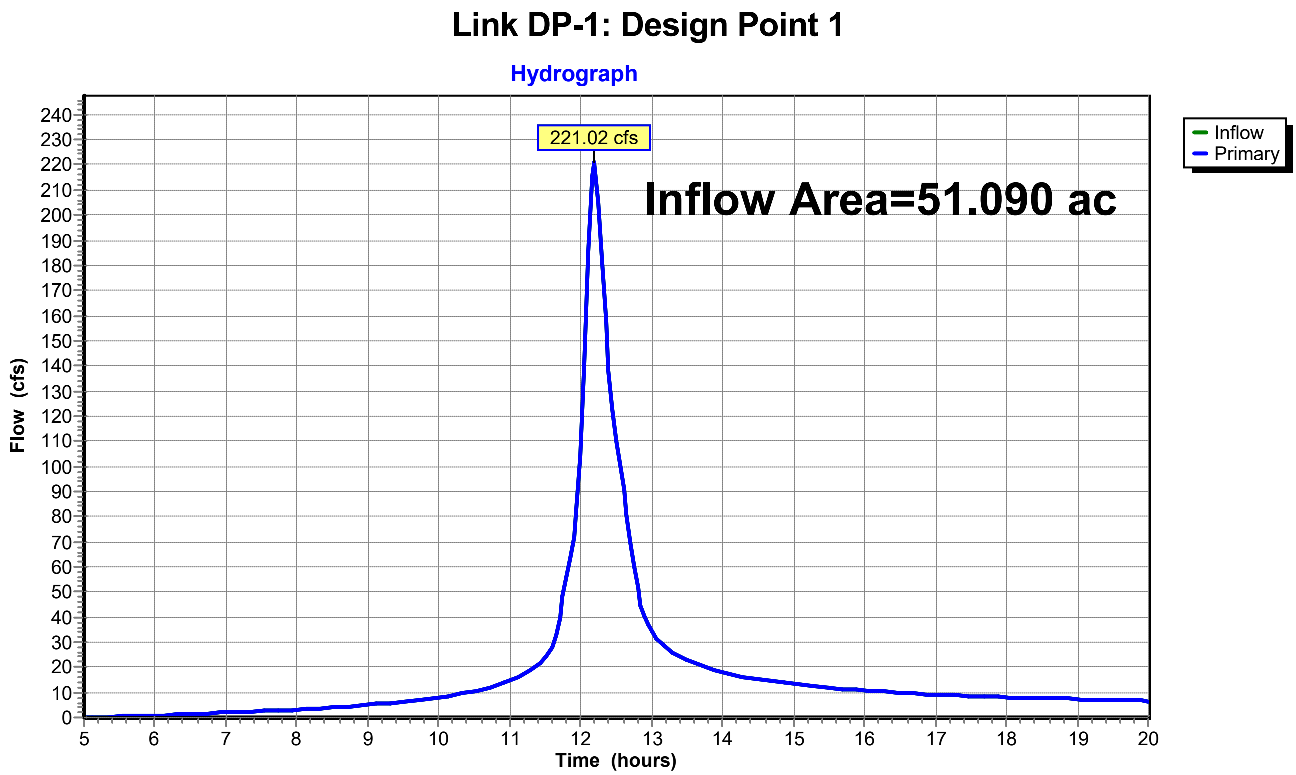
Subcatchment DA-3: Drainage Area 3 Pre



Summary for Link DP-1: Design Point 1

Inflow Area = 51.090 ac, 12.76% Impervious, Inflow Depth > 5.07" for 100-yr event
Inflow = 221.02 cfs @ 12.19 hrs, Volume= 21.566 af
Primary = 221.02 cfs @ 12.19 hrs, Volume= 21.566 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

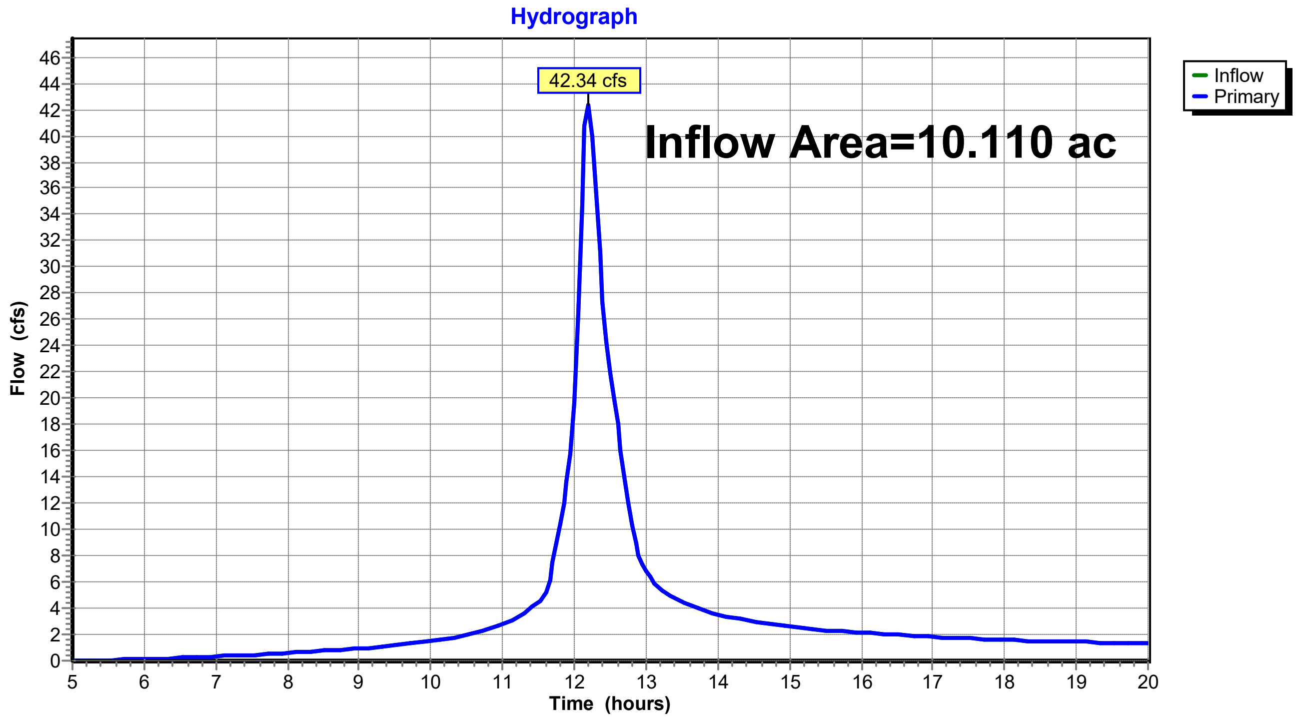


Summary for Link DP-2: Design Point 2

Inflow Area =	10.110 ac,	6.63% Impervious,	Inflow Depth > 4.95"	for 100-yr event
Inflow =	42.34 cfs @	12.20 hrs, Volume=	4.171 af	
Primary =	42.34 cfs @	12.20 hrs, Volume=	4.171 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP-2: Design Point 2

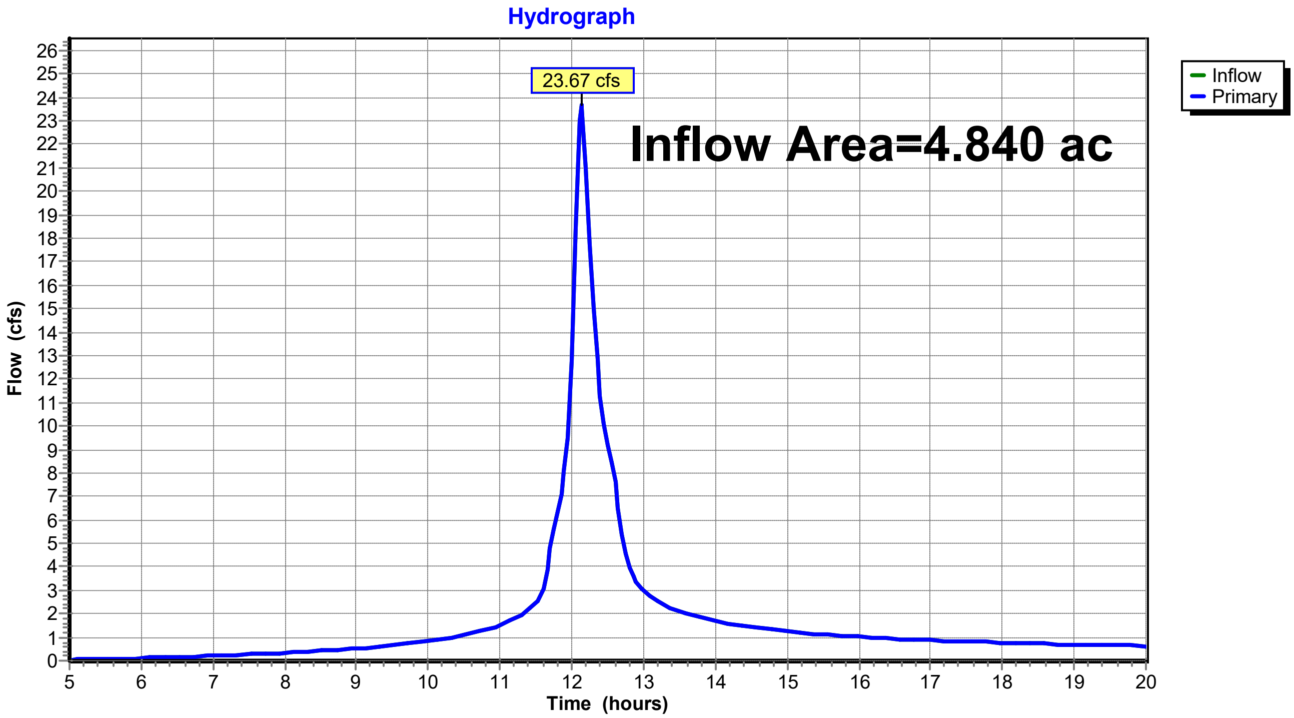


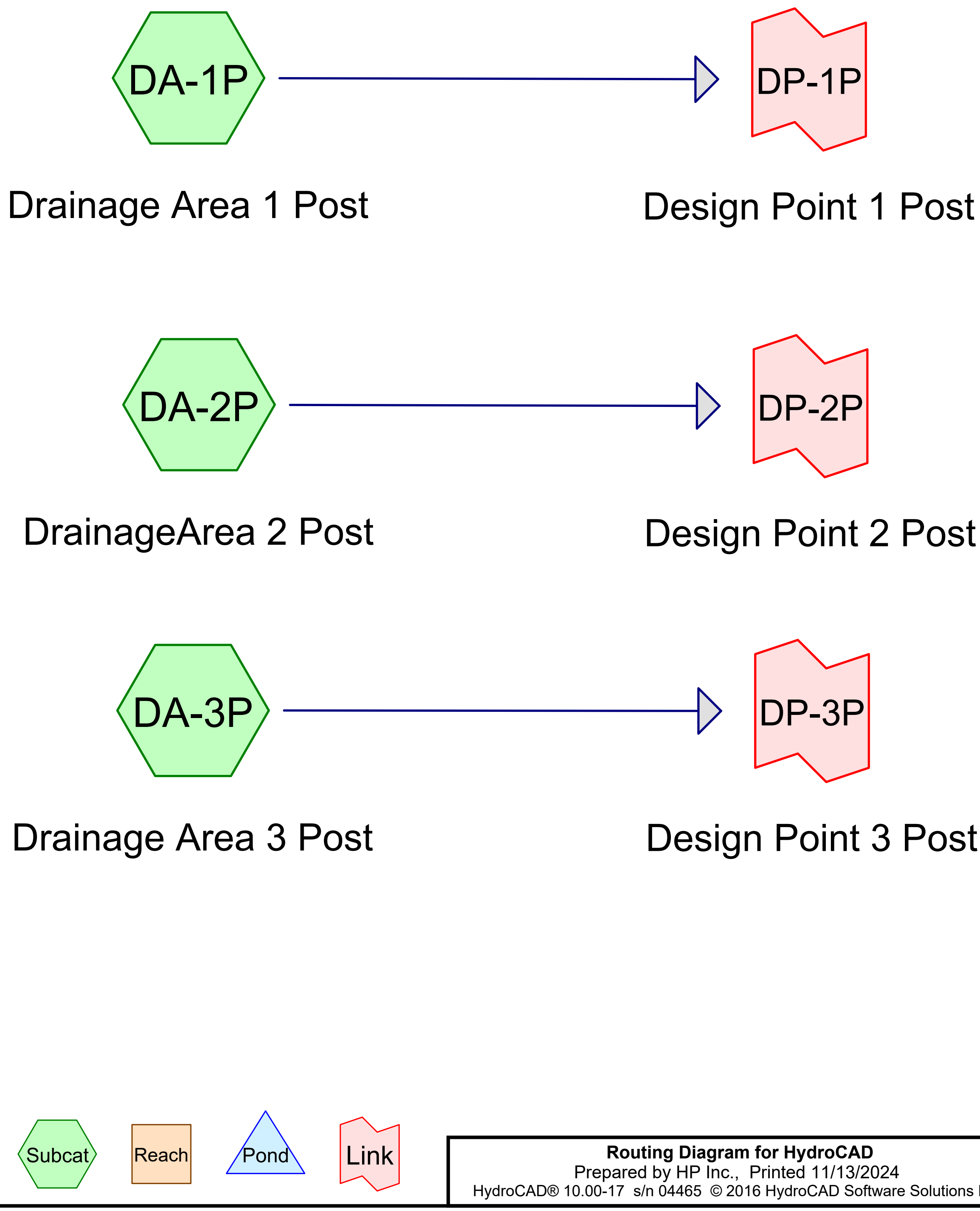
Summary for Link DP-3: Design Point 3

Inflow Area = 4.840 ac, 7.02% Impervious, Inflow Depth > 5.19" for 100-yr event
Inflow = 23.67 cfs @ 12.13 hrs, Volume= 2.092 af
Primary = 23.67 cfs @ 12.13 hrs, Volume= 2.092 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP-3: Design Point 3





Routing Diagram for HydroCAD
Prepared by HP Inc., Printed 11/13/2024
HydroCAD® 10.00-17 s/n 04465 © 2016 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
21.280	71	Meadow, non-grazed, HSG C (DA-1P, DA-2P, DA-3P)
26.930	78	Meadow, non-grazed, HSG D (DA-1P, DA-2P, DA-3P)
0.150	98	Paved parking, HSG D (DA-1P, DA-2P)
0.710	98	Paved roads w/curbs & sewers, HSG C (DA-1P, DA-2P, DA-3P)
0.660	98	Paved roads w/curbs & sewers, HSG D (DA-1P, DA-2P, DA-3P)
4.290	98	Rock outcrop (DA-1P)
0.020	98	Roofs, HSG C (DA-1P)
0.090	98	Roofs, HSG D (DA-1P)
2.430	98	Water Surface, 0% imp, HSG D (DA-1P)
0.970	98	Wetland (DA-1P)
5.420	70	Woods, Good, HSG C (DA-1P)
3.090	77	Woods, Good, HSG D (DA-1P)
66.040	**78**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
27.430	HSG C	DA-1P, DA-2P, DA-3P
33.350	HSG D	DA-1P, DA-2P, DA-3P
5.260	Other	DA-1P
66.040		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	21.280	26.930	0.000	48.210	Meadow, non-grazed	DA -1P , DA -2P , DA -3P
0.000	0.000	0.000	0.150	0.000	0.150	Paved parking	DA -1P , DA -2P
0.000	0.000	0.710	0.660	0.000	1.370	Paved roads w/curbs & sewers	DA -1P , DA -2P , DA -3P
0.000	0.000	0.000	0.000	4.290	4.290	Rock outcrop	DA -1P
0.000	0.000	0.020	0.090	0.000	0.110	Roofs	DA -1P
0.000	0.000	0.000	2.430	0.000	2.430	Water Surface, 0% imp	DA -1P
0.000	0.000	0.000	0.000	0.970	0.970	Wetland	DA -1P
0.000	0.000	5.420	3.090	0.000	8.510	Woods, Good	DA -1P
0.000	**0.000**	**27.430**	**33.350**	**5.260**	**66.040**	**TOTAL AREA**	

Summary for Subcatchment DA-1P: Drainage Area 1 Post

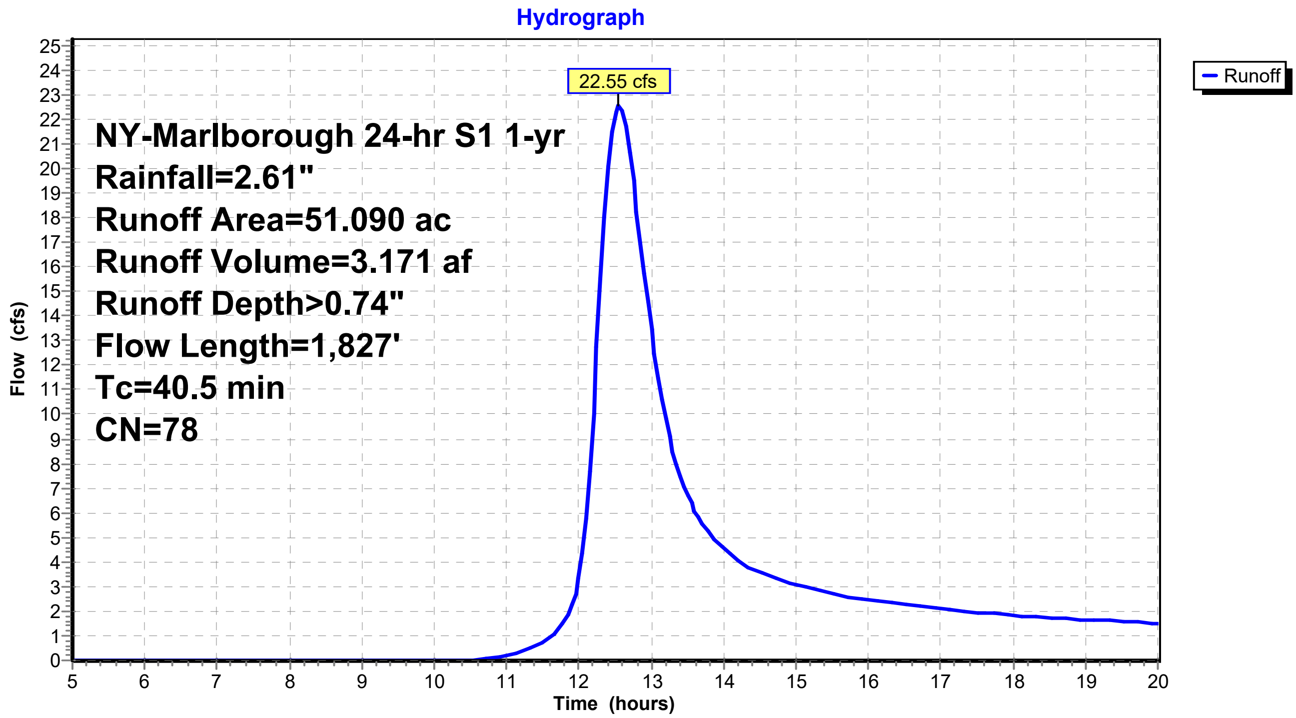
Runoff = 22.55 cfs @ 12.55 hrs, Volume= 3.171 af, Depth> 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NY-Marlborough 24-hr S1 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
	16.560	71	Meadow, non-grazed, HSG C
	5.420	70	Woods, Good, HSG C
	0.270	98	Paved roads w/curbs & sewers, HSG C
	0.020	98	Roofs, HSG C
*	0.330	98	Wetland
	1.400	71	Meadow, non-grazed, HSG C
	0.100	98	Paved roads w/curbs & sewers, HSG C
	5.500	78	Meadow, non-grazed, HSG D
	3.090	77	Woods, Good, HSG D
	0.080	98	Roofs, HSG D
*	0.640	98	Wetland
	10.540	78	Meadow, non-grazed, HSG D
	0.350	98	Paved roads w/curbs & sewers, HSG D
	0.060	98	Paved parking, HSG D
*	1.330	98	Rock outcrop
*	2.960	98	Rock outcrop
	0.010	98	Roofs, HSG D
	2.430	98	Water Surface, 0% imp, HSG D
	51.090	78	Weighted Average
	44.940		87.96% Pervious Area
	6.150		12.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0597	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
1.7	179	0.0622	1.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	42	0.0714	1.87		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.3	100	0.8000	0.74		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
0.0	3	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.7	100	0.0800	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
4.4	74	0.0810	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
4.7	82	0.0854	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
4.1	71	0.0902	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.7	100	0.0800	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
0.2	28	0.1072	2.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	138	0.1522	2.73		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	98	0.2650	3.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	54	0.1481	2.69		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	9	0.0814	2.00		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	17	0.1948	3.09		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	41	0.1346	1.83		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.2	119	0.0336	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	123		11.35		**Lake or Reservoir,** Mean Depth= 4.00'
0.3	349		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
40.5	1,827	Total			

Subcatchment DA-1P: Drainage Area 1 Post



Hydrograph for Subcatchment DA-1P: Drainage Area 1 Post

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.20	0.00	0.00
5.25	0.21	0.00	0.00
5.50	0.22	0.00	0.00
5.75	0.23	0.00	0.00
6.00	0.25	0.00	0.00
6.25	0.26	0.00	0.00
6.50	0.27	0.00	0.00
6.75	0.29	0.00	0.00
7.00	0.30	0.00	0.00
7.25	0.32	0.00	0.00
7.50	0.34	0.00	0.00
7.75	0.35	0.00	0.00
8.00	0.37	0.00	0.00
8.25	0.39	0.00	0.00
8.50	0.41	0.00	0.00
8.75	0.43	0.00	0.00
9.00	0.45	0.00	0.00
9.25	0.47	0.00	0.00
9.50	0.49	0.00	0.00
9.75	0.52	0.00	0.00
10.00	0.55	0.00	0.00
10.25	0.58	0.00	0.00
10.50	0.61	0.00	0.01
10.75	0.65	0.00	0.06
11.00	0.69	0.01	0.20
11.25	0.75	0.01	0.41
11.50	0.81	0.02	0.73
11.75	0.96	0.05	1.36
12.00	1.44	0.21	3.36
12.25	1.68	0.32	12.75
12.50	1.81	0.38	**22.26**
12.75	1.87	0.42	**19.48**
13.00	1.93	0.44	13.48
13.25	1.97	0.47	9.11
13.50	2.00	0.49	6.70
13.75	2.04	0.51	5.35
14.00	2.07	0.52	4.53
14.25	2.09	0.54	3.96
14.50	2.12	0.55	3.57
14.75	2.14	0.57	3.28
15.00	2.17	0.58	3.06
15.25	2.19	0.59	2.87
15.50	2.21	0.60	2.71
15.75	2.22	0.62	2.57
16.00	2.24	0.63	2.45
16.25	2.26	0.64	2.35
16.50	2.28	0.65	2.25
16.75	2.29	0.66	2.17
17.00	2.31	0.67	2.09
17.25	2.32	0.68	2.02
17.50	2.34	0.68	1.95
17.75	2.35	0.69	1.89
18.00	2.36	0.70	1.84
18.25	2.38	0.71	1.79
18.50	2.39	0.72	1.74
18.75	2.40	0.73	1.70
19.00	2.41	0.73	1.66
19.25	2.43	0.74	1.62
19.50	2.44	0.75	1.58
19.75	2.45	0.76	1.55
20.00	**2.46**	**0.76**	1.51

Summary for Subcatchment DA-2P: DrainageArea 2 Post

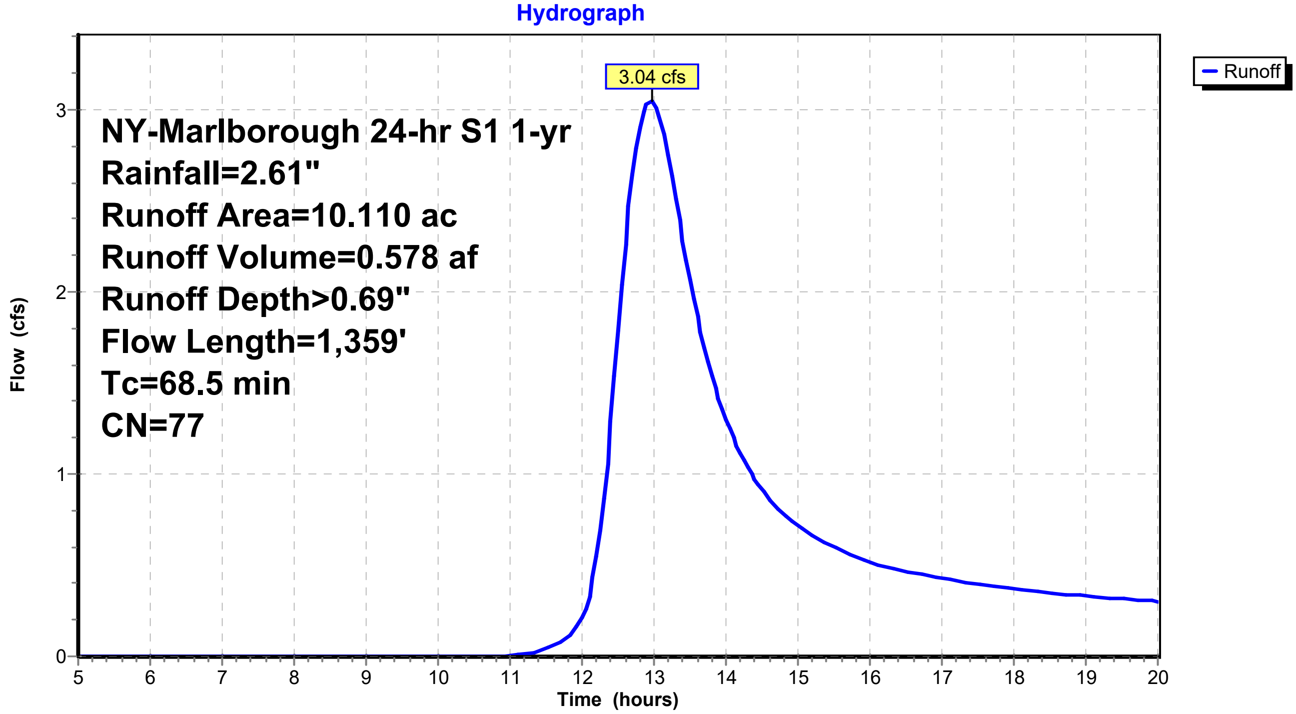
Runoff = 3.04 cfs @ 12.96 hrs, Volume= 0.578 af, Depth> 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NY-Marlborough 24-hr S1 1-yr Rainfall=2.61"

Area (ac)	CN	Description
2.360	71	Meadow, non-grazed, HSG C
0.210	98	Paved roads w/curbs & sewers, HSG C
0.910	71	Meadow, non-grazed, HSG C
5.100	78	Meadow, non-grazed, HSG D
0.090	98	Paved parking, HSG D
1.290	78	Meadow, non-grazed, HSG D
0.100	98	Paved roads w/curbs & sewers, HSG C
0.050	98	Paved roads w/curbs & sewers, HSG D
10.110	77	Weighted Average
9.660		95.55% Pervious Area
0.450		4.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	43	0.1191	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
3.5	67	0.1194	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
3.7	70	0.1143	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
4.8	94	0.1064	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.4	100	0.0900	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
3.8	69	0.1014	0.30		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.3	100	0.0950	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
0.1	8	0.0950	2.16		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.9	92	0.0978	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.4	100	0.0900	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
0.1	12	0.0900	2.10		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.4	96	0.0833	0.30		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.9	99	0.0707	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
6.4	95	0.0526	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
6.8	100	0.0500	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
0.1	10	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.2	99	0.0404	1.41		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.4	20	0.0200	0.14		**Shallow Concentrated Flow,** Kv= 1.0 fps
0.6	67	0.0640	1.77		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	8	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
68.5	1,359	Total			

Subcatchment DA-2P: DrainageArea 2 Post



Hydrograph for Subcatchment DA-2P: DrainageArea 2 Post

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.20	0.00	0.00
5.25	0.21	0.00	0.00
5.50	0.22	0.00	0.00
5.75	0.23	0.00	0.00
6.00	0.25	0.00	0.00
6.25	0.26	0.00	0.00
6.50	0.27	0.00	0.00
6.75	0.29	0.00	0.00
7.00	0.30	0.00	0.00
7.25	0.32	0.00	0.00
7.50	0.34	0.00	0.00
7.75	0.35	0.00	0.00
8.00	0.37	0.00	0.00
8.25	0.39	0.00	0.00
8.50	0.41	0.00	0.00
8.75	0.43	0.00	0.00
9.00	0.45	0.00	0.00
9.25	0.47	0.00	0.00
9.50	0.49	0.00	0.00
9.75	0.52	0.00	0.00
10.00	0.55	0.00	0.00
10.25	0.58	0.00	0.00
10.50	0.61	0.00	0.00
10.75	0.65	0.00	0.00
11.00	0.69	0.00	0.00
11.25	0.75	0.01	0.01
11.50	0.81	0.01	0.04
11.75	0.96	0.04	0.09
12.00	1.44	0.18	0.21
12.25	1.68	0.29	0.69
12.50	1.81	0.35	1.79
12.75	1.87	0.38	**2.78**
13.00	1.93	0.41	**3.04**
13.25	1.97	0.43	2.63
13.50	2.00	0.45	2.06
13.75	2.04	0.47	1.61
14.00	2.07	0.48	1.30
14.25	2.09	0.50	1.07
14.50	2.12	0.51	0.91
14.75	2.14	0.53	0.80
15.00	2.17	0.54	0.71
15.25	2.19	0.55	0.65
15.50	2.21	0.56	0.60
15.75	2.22	0.57	0.55
16.00	2.24	0.58	0.52
16.25	2.26	0.59	0.49
16.50	2.28	0.60	0.47
16.75	2.29	0.61	0.45
17.00	2.31	0.62	0.43
17.25	2.32	0.63	0.41
17.50	2.34	0.64	0.40
17.75	2.35	0.65	0.38
18.00	2.36	0.66	0.37
18.25	2.38	0.66	0.36
18.50	2.39	0.67	0.35
18.75	2.40	0.68	0.34
19.00	2.41	0.69	0.33
19.25	2.43	0.69	0.32
19.50	2.44	0.70	0.31
19.75	2.45	0.71	0.31
20.00	**2.46**	**0.72**	0.30

Summary for Subcatchment DA-3P: Drainage Area 3 Post

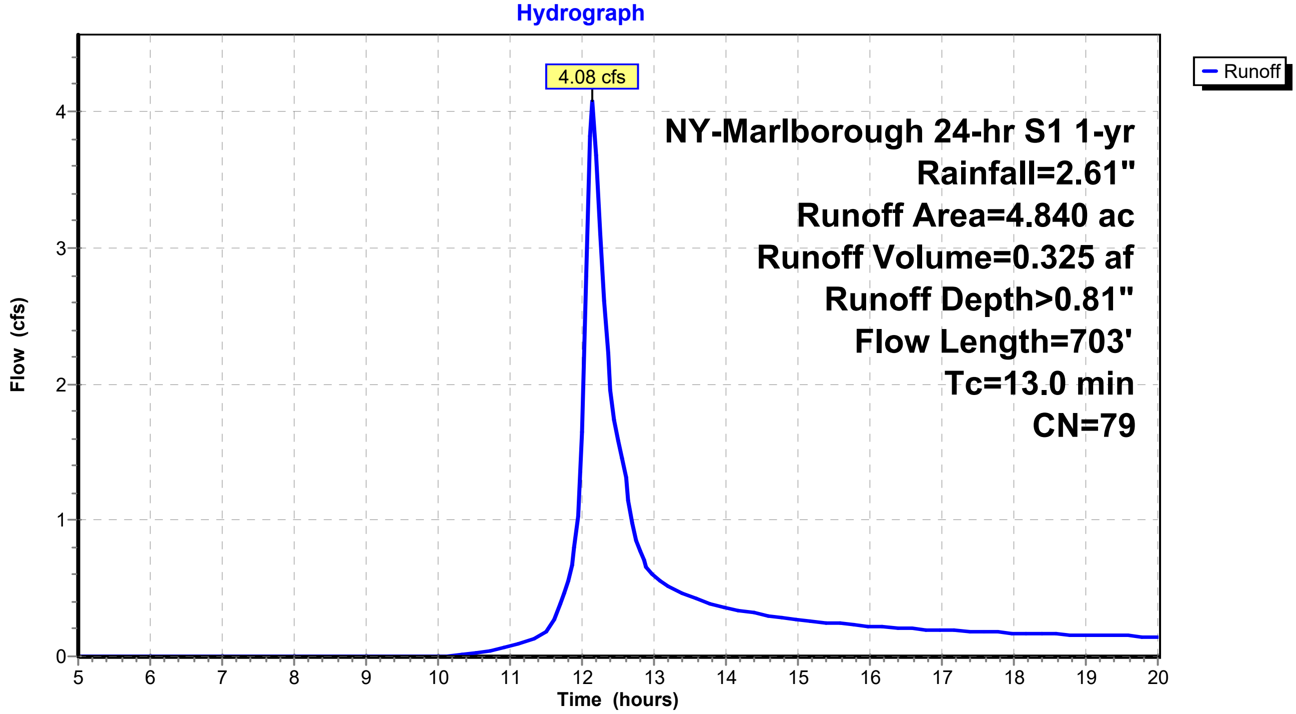
Runoff = 4.08 cfs @ 12.14 hrs, Volume= 0.325 af, Depth> 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NY-Marlborough 24-hr S1 1-yr Rainfall=2.61"

Area (ac)	CN	Description
0.050	71	Meadow, non-grazed, HSG C
0.030	98	Paved roads w/curbs & sewers, HSG C
1.270	78	Meadow, non-grazed, HSG D
0.260	98	Paved roads w/curbs & sewers, HSG D
3.230	78	Meadow, non-grazed, HSG D
4.840	79	Weighted Average
4.550		94.01% Pervious Area
0.290		5.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	100	0.0380	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.2	585	0.0712	1.87		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0396	3.20		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	8	0.1144	2.37		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.0	703	Total			

Subcatchment DA-3P: Drainage Area 3 Post



Hydrograph for Subcatchment DA-3P: Drainage Area 3 Post

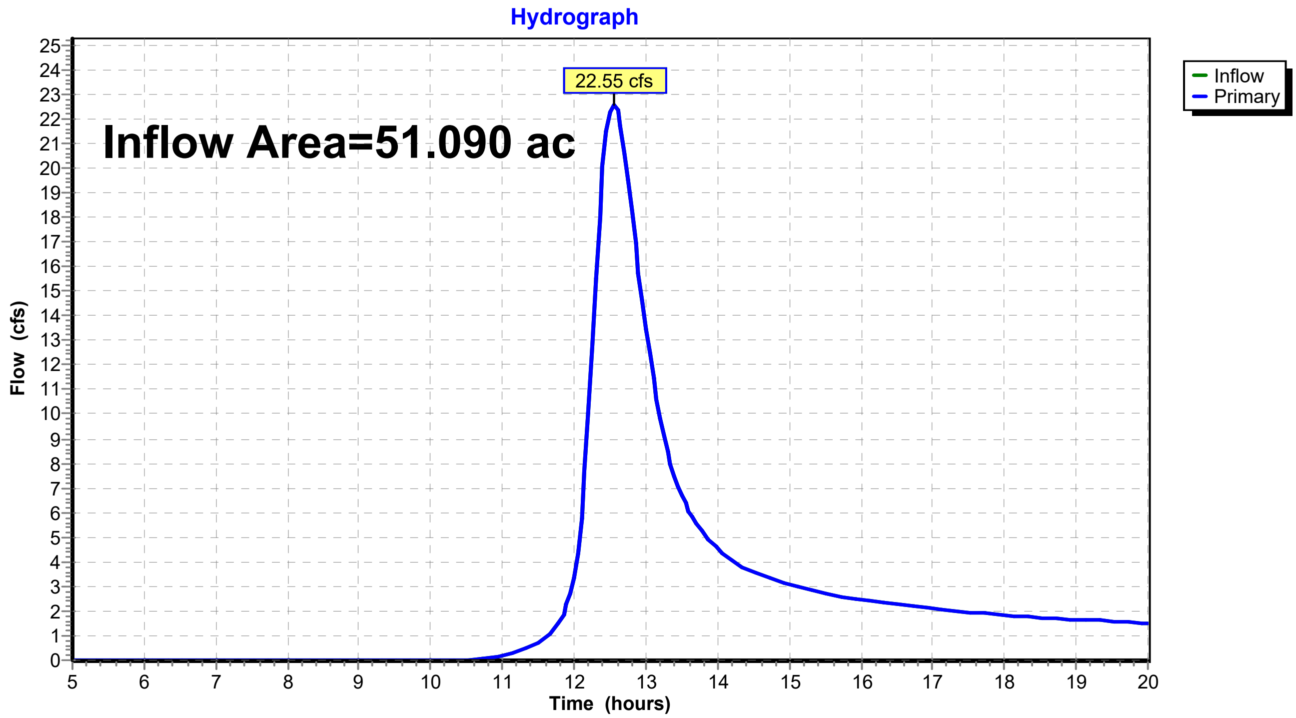
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.20	0.00	0.00
5.25	0.21	0.00	0.00
5.50	0.22	0.00	0.00
5.75	0.23	0.00	0.00
6.00	0.25	0.00	0.00
6.25	0.26	0.00	0.00
6.50	0.27	0.00	0.00
6.75	0.29	0.00	0.00
7.00	0.30	0.00	0.00
7.25	0.32	0.00	0.00
7.50	0.34	0.00	0.00
7.75	0.35	0.00	0.00
8.00	0.37	0.00	0.00
8.25	0.39	0.00	0.00
8.50	0.41	0.00	0.00
8.75	0.43	0.00	0.00
9.00	0.45	0.00	0.00
9.25	0.47	0.00	0.00
9.50	0.49	0.00	0.00
9.75	0.52	0.00	0.00
10.00	0.55	0.00	0.00
10.25	0.58	0.00	0.01
10.50	0.61	0.00	0.02
10.75	0.65	0.00	0.04
11.00	0.69	0.01	0.07
11.25	0.75	0.02	0.11
11.50	0.81	0.03	0.18
11.75	0.96	0.06	0.47
12.00	1.44	0.23	**1.64**
12.25	1.68	0.35	**3.11**
12.50	1.81	0.42	1.58
12.75	1.87	0.45	0.85
13.00	1.93	0.48	0.59
13.25	1.97	0.50	0.50
13.50	2.00	0.53	0.43
13.75	2.04	0.54	0.39
14.00	2.07	0.56	0.35
14.25	2.09	0.58	0.33
14.50	2.12	0.59	0.30
14.75	2.14	0.61	0.29
15.00	2.17	0.62	0.27
15.25	2.19	0.63	0.26
15.50	2.21	0.65	0.24
15.75	2.22	0.66	0.23
16.00	2.24	0.67	0.22
16.25	2.26	0.68	0.21
16.50	2.28	0.69	0.21
16.75	2.29	0.70	0.20
17.00	2.31	0.71	0.19
17.25	2.32	0.72	0.19
17.50	2.34	0.73	0.18
17.75	2.35	0.74	0.18
18.00	2.36	0.75	0.17
18.25	2.38	0.76	0.17
18.50	2.39	0.76	0.16
18.75	2.40	0.77	0.16
19.00	2.41	0.78	0.16
19.25	2.43	0.79	0.15
19.50	2.44	0.80	0.15
19.75	2.45	0.80	0.15
20.00	**2.46**	**0.81**	0.14

Summary for Link DP-1P: Design Point 1 Post

Inflow Area = 51.090 ac, 12.04% Impervious, Inflow Depth > 0.74" for 1-yr event
Inflow = 22.55 cfs @ 12.55 hrs, Volume= 3.171 af
Primary = 22.55 cfs @ 12.55 hrs, Volume= 3.171 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP-1P: Design Point 1 Post



Hydrograph for Link DP-1P: Design Point 1 Post

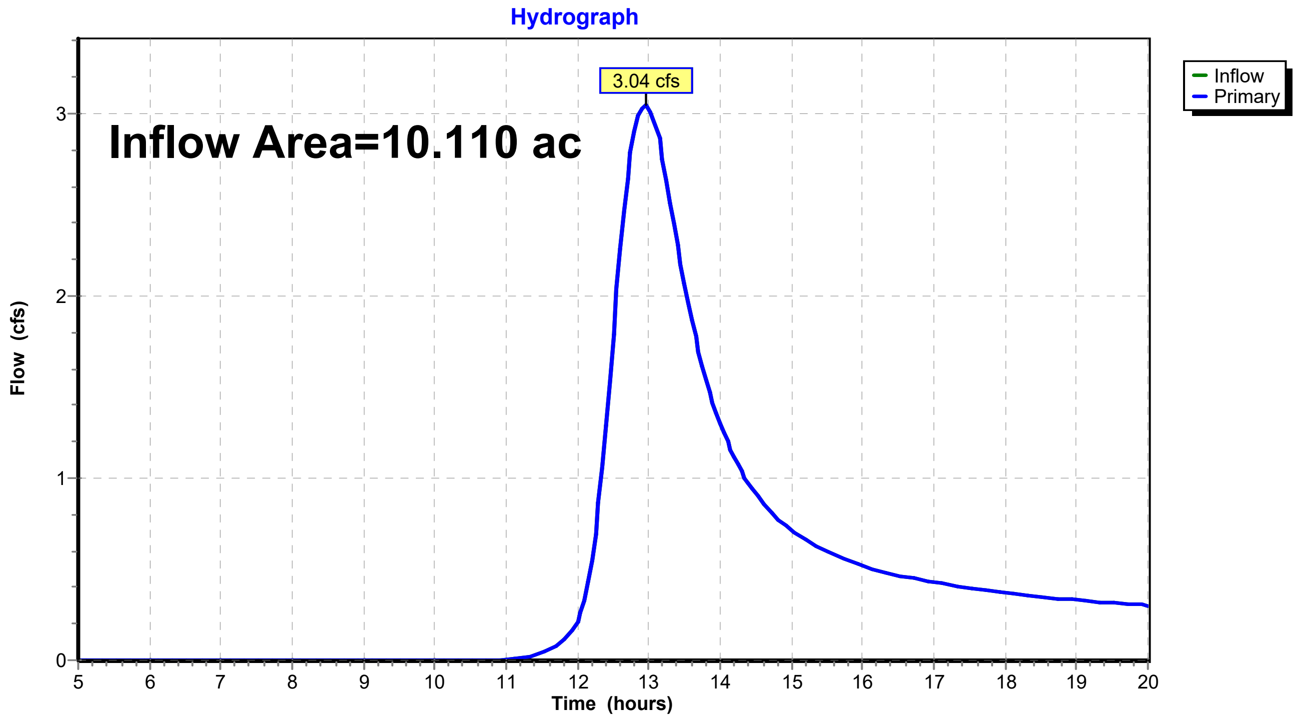
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.25	0.00	0.00	0.00
5.50	0.00	0.00	0.00
5.75	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.25	0.00	0.00	0.00
6.50	0.00	0.00	0.00
6.75	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.25	0.00	0.00	0.00
7.50	0.00	0.00	0.00
7.75	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.25	0.00	0.00	0.00
8.50	0.00	0.00	0.00
8.75	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.25	0.00	0.00	0.00
9.50	0.00	0.00	0.00
9.75	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.25	0.00	0.00	0.00
10.50	0.01	0.00	0.01
10.75	0.06	0.00	0.06
11.00	0.20	0.00	0.20
11.25	0.41	0.00	0.41
11.50	0.73	0.00	0.73
11.75	1.36	0.00	1.36
12.00	3.36	0.00	3.36
12.25	12.75	0.00	12.75
12.50	**22.26**	0.00	**22.26**
12.75	**19.48**	0.00	**19.48**
13.00	13.48	0.00	13.48
13.25	9.11	0.00	9.11
13.50	6.70	0.00	6.70
13.75	5.35	0.00	5.35
14.00	4.53	0.00	4.53
14.25	3.96	0.00	3.96
14.50	3.57	0.00	3.57
14.75	3.28	0.00	3.28
15.00	3.06	0.00	3.06
15.25	2.87	0.00	2.87
15.50	2.71	0.00	2.71
15.75	2.57	0.00	2.57
16.00	2.45	0.00	2.45
16.25	2.35	0.00	2.35
16.50	2.25	0.00	2.25
16.75	2.17	0.00	2.17
17.00	2.09	0.00	2.09
17.25	2.02	0.00	2.02
17.50	1.95	0.00	1.95
17.75	1.89	0.00	1.89
18.00	1.84	0.00	1.84
18.25	1.79	0.00	1.79
18.50	1.74	0.00	1.74
18.75	1.70	0.00	1.70
19.00	1.66	0.00	1.66
19.25	1.62	0.00	1.62
19.50	1.58	0.00	1.58
19.75	1.55	0.00	1.55
20.00	1.51	0.00	1.51

Summary for Link DP-2P: Design Point 2 Post

Inflow Area =	10.110 ac,	4.45% Impervious,	Inflow Depth > 0.69"	for 1-yr event
Inflow =	3.04 cfs @	12.96 hrs,	Volume=	0.578 af
Primary =	3.04 cfs @	12.96 hrs,	Volume=	0.578 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP-2P: Design Point 2 Post



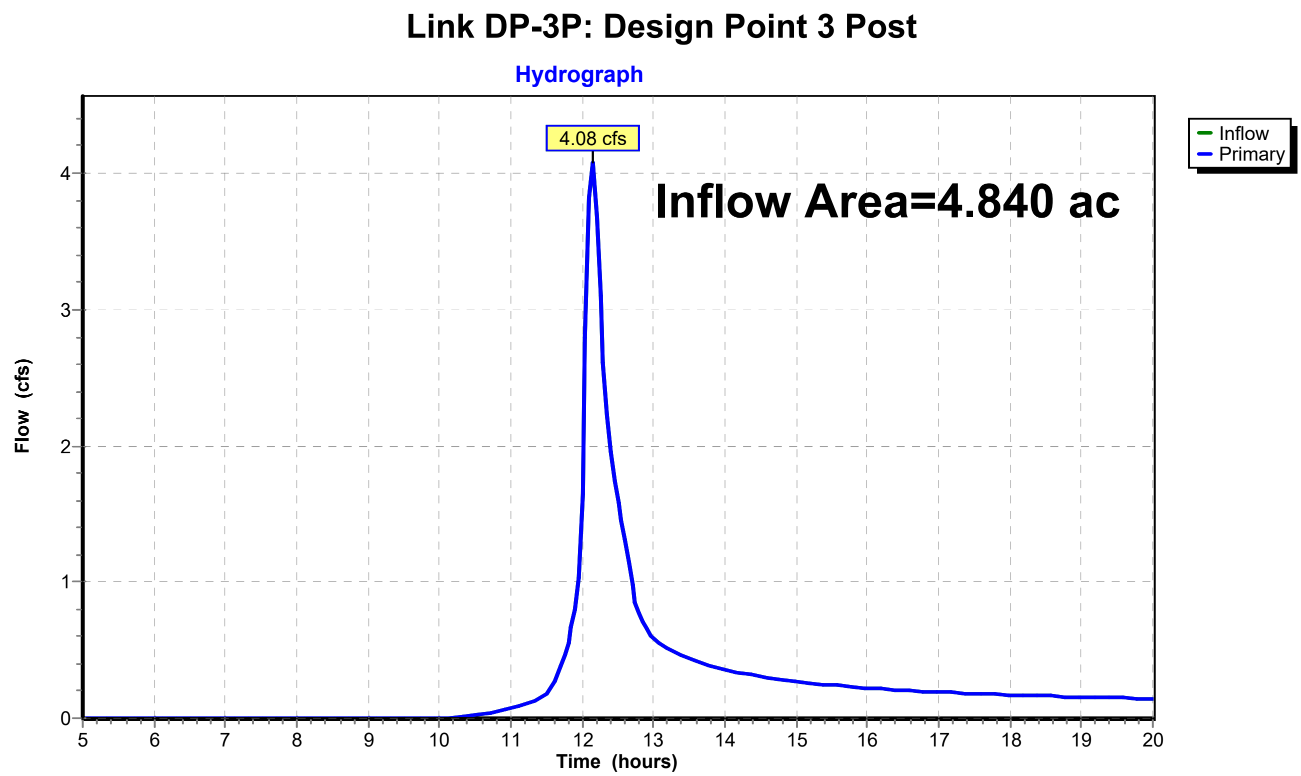
Hydrograph for Link DP-2P: Design Point 2 Post

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.25	0.00	0.00	0.00
5.50	0.00	0.00	0.00
5.75	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.25	0.00	0.00	0.00
6.50	0.00	0.00	0.00
6.75	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.25	0.00	0.00	0.00
7.50	0.00	0.00	0.00
7.75	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.25	0.00	0.00	0.00
8.50	0.00	0.00	0.00
8.75	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.25	0.00	0.00	0.00
9.50	0.00	0.00	0.00
9.75	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.25	0.00	0.00	0.00
10.50	0.00	0.00	0.00
10.75	0.00	0.00	0.00
11.00	0.00	0.00	0.00
11.25	0.01	0.00	0.01
11.50	0.04	0.00	0.04
11.75	0.09	0.00	0.09
12.00	0.21	0.00	0.21
12.25	0.69	0.00	0.69
12.50	1.79	0.00	1.79
12.75	**2.78**	0.00	**2.78**
13.00	**3.04**	0.00	**3.04**
13.25	2.63	0.00	2.63
13.50	2.06	0.00	2.06
13.75	1.61	0.00	1.61
14.00	1.30	0.00	1.30
14.25	1.07	0.00	1.07
14.50	0.91	0.00	0.91
14.75	0.80	0.00	0.80
15.00	0.71	0.00	0.71
15.25	0.65	0.00	0.65
15.50	0.60	0.00	0.60
15.75	0.55	0.00	0.55
16.00	0.52	0.00	0.52
16.25	0.49	0.00	0.49
16.50	0.47	0.00	0.47
16.75	0.45	0.00	0.45
17.00	0.43	0.00	0.43
17.25	0.41	0.00	0.41
17.50	0.40	0.00	0.40
17.75	0.38	0.00	0.38
18.00	0.37	0.00	0.37
18.25	0.36	0.00	0.36
18.50	0.35	0.00	0.35
18.75	0.34	0.00	0.34
19.00	0.33	0.00	0.33
19.25	0.32	0.00	0.32
19.50	0.31	0.00	0.31
19.75	0.31	0.00	0.31
20.00	0.30	0.00	0.30

Summary for Link DP-3P: Design Point 3 Post

Inflow Area =	4.840 ac,	5.99% Impervious,	Inflow Depth > 0.81"	for 1-yr event	
Inflow =	4.08 cfs @	12.14 hrs,	Volume=	0.325 af	
Primary =	4.08 cfs @	12.14 hrs,	Volume=	0.325 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



Hydrograph for Link DP-3P: Design Point 3 Post

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.25	0.00	0.00	0.00
5.50	0.00	0.00	0.00
5.75	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.25	0.00	0.00	0.00
6.50	0.00	0.00	0.00
6.75	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.25	0.00	0.00	0.00
7.50	0.00	0.00	0.00
7.75	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.25	0.00	0.00	0.00
8.50	0.00	0.00	0.00
8.75	0.00	0.00	0.00
9.00	0.00	0.00	0.00
9.25	0.00	0.00	0.00
9.50	0.00	0.00	0.00
9.75	0.00	0.00	0.00
10.00	0.00	0.00	0.00
10.25	0.01	0.00	0.01
10.50	0.02	0.00	0.02
10.75	0.04	0.00	0.04
11.00	0.07	0.00	0.07
11.25	0.11	0.00	0.11
11.50	0.18	0.00	0.18
11.75	0.47	0.00	0.47
12.00	**1.64**	0.00	**1.64**
12.25	**3.11**	0.00	**3.11**
12.50	1.58	0.00	1.58
12.75	0.85	0.00	0.85
13.00	0.59	0.00	0.59
13.25	0.50	0.00	0.50
13.50	0.43	0.00	0.43
13.75	0.39	0.00	0.39
14.00	0.35	0.00	0.35
14.25	0.33	0.00	0.33
14.50	0.30	0.00	0.30
14.75	0.29	0.00	0.29
15.00	0.27	0.00	0.27
15.25	0.26	0.00	0.26
15.50	0.24	0.00	0.24
15.75	0.23	0.00	0.23
16.00	0.22	0.00	0.22
16.25	0.21	0.00	0.21
16.50	0.21	0.00	0.21
16.75	0.20	0.00	0.20
17.00	0.19	0.00	0.19
17.25	0.19	0.00	0.19
17.50	0.18	0.00	0.18
17.75	0.18	0.00	0.18
18.00	0.17	0.00	0.17
18.25	0.17	0.00	0.17
18.50	0.16	0.00	0.16
18.75	0.16	0.00	0.16
19.00	0.16	0.00	0.16
19.25	0.15	0.00	0.15
19.50	0.15	0.00	0.15
19.75	0.15	0.00	0.15
20.00	0.14	0.00	0.14

Summary for Subcatchment DA-1P: Drainage Area 1 Post

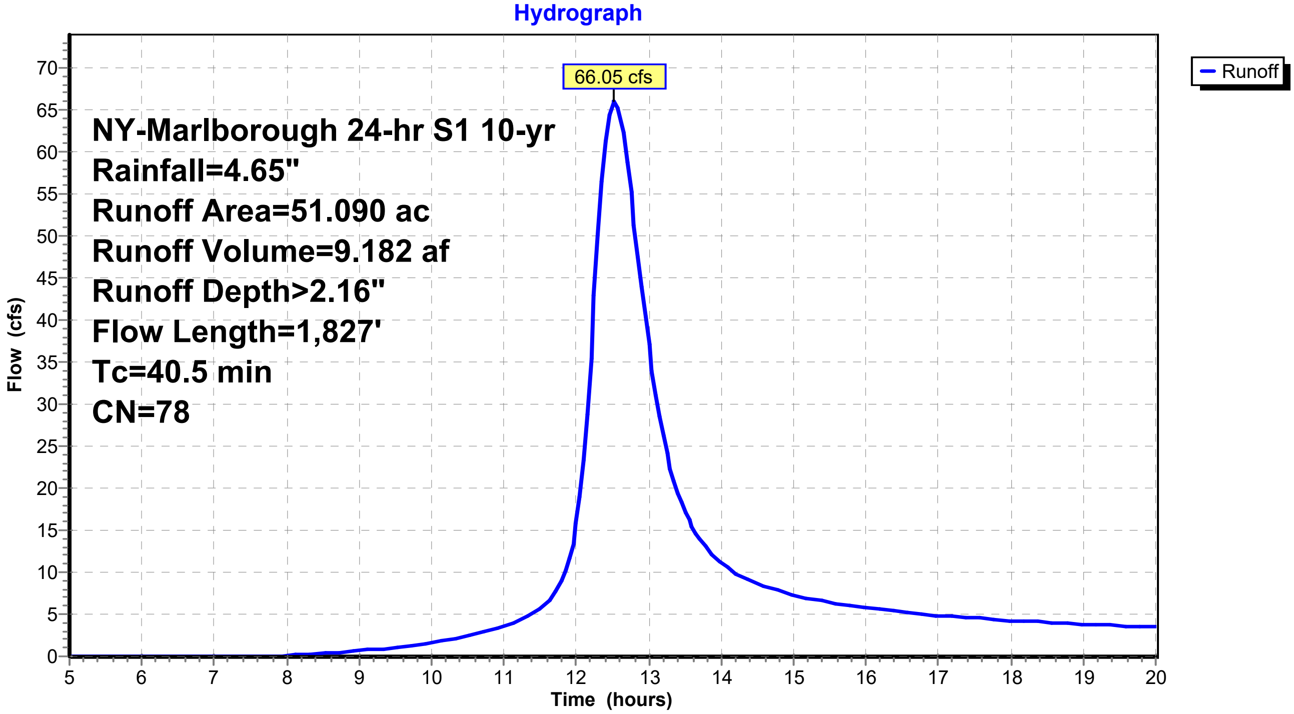
Runoff = 66.05 cfs @ 12.53 hrs, Volume= 9.182 af, Depth> 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NY-Marlborough 24-hr S1 10-yr Rainfall=4.65"

	Area (ac)	CN	Description
	16.560	71	Meadow, non-grazed, HSG C
	5.420	70	Woods, Good, HSG C
	0.270	98	Paved roads w/curbs & sewers, HSG C
	0.020	98	Roofs, HSG C
*	0.330	98	Wetland
	1.400	71	Meadow, non-grazed, HSG C
	0.100	98	Paved roads w/curbs & sewers, HSG C
	5.500	78	Meadow, non-grazed, HSG D
	3.090	77	Woods, Good, HSG D
	0.080	98	Roofs, HSG D
*	0.640	98	Wetland
	10.540	78	Meadow, non-grazed, HSG D
	0.350	98	Paved roads w/curbs & sewers, HSG D
	0.060	98	Paved parking, HSG D
*	1.330	98	Rock outcrop
*	2.960	98	Rock outcrop
	0.010	98	Roofs, HSG D
	2.430	98	Water Surface, 0% imp, HSG D
	51.090	78	Weighted Average
	44.940		87.96% Pervious Area
	6.150		12.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0597	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
1.7	179	0.0622	1.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	42	0.0714	1.87		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.3	100	0.8000	0.74		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
0.0	3	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.7	100	0.0800	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
4.4	74	0.0810	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
4.7	82	0.0854	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
4.1	71	0.0902	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.7	100	0.0800	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
0.2	28	0.1072	2.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	138	0.1522	2.73		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	98	0.2650	3.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	54	0.1481	2.69		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	9	0.0814	2.00		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	17	0.1948	3.09		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	41	0.1346	1.83		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.2	119	0.0336	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	123		11.35		**Lake or Reservoir,** Mean Depth= 4.00'
0.3	349		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
40.5	1,827	Total			

Subcatchment DA-1P: Drainage Area 1 Post



Hydrograph for Subcatchment DA-1P: Drainage Area 1 Post

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.35	0.00	0.00
5.25	0.37	0.00	0.00
5.50	0.39	0.00	0.00
5.75	0.42	0.00	0.00
6.00	0.44	0.00	0.00
6.25	0.46	0.00	0.00
6.50	0.49	0.00	0.00
6.75	0.52	0.00	0.00
7.00	0.54	0.00	0.00
7.25	0.57	0.00	0.00
7.50	0.60	0.00	0.00
7.75	0.63	0.00	0.03
8.00	0.66	0.00	0.11
8.25	0.69	0.01	0.22
8.50	0.72	0.01	0.35
8.75	0.76	0.01	0.50
9.00	0.80	0.02	0.67
9.25	0.84	0.02	0.86
9.50	0.88	0.03	1.08
9.75	0.93	0.04	1.33
10.00	0.98	0.05	1.61
10.25	1.03	0.07	1.95
10.50	1.09	0.08	2.36
10.75	1.16	0.10	2.87
11.00	1.23	0.13	3.51
11.25	1.33	0.16	4.39
11.50	1.45	0.21	5.65
11.75	1.72	0.34	8.11
12.00	2.53	0.81	15.75
12.25	2.97	1.11	42.88
12.50	3.23	1.29	**65.85**
12.75	3.34	1.38	**55.19**
13.00	3.43	1.44	37.08
13.25	3.50	1.50	24.14
13.50	3.57	1.55	17.19
13.75	3.63	1.60	13.41
14.00	3.68	1.64	11.15
14.25	3.73	1.67	9.62
14.50	3.78	1.71	8.62
14.75	3.82	1.74	7.88
15.00	3.86	1.77	7.31
15.25	3.89	1.80	6.84
15.50	3.93	1.83	6.43
15.75	3.96	1.86	6.08
16.00	3.99	1.88	5.78
16.25	4.03	1.91	5.52
16.50	4.06	1.93	5.28
16.75	4.08	1.95	5.06
17.00	4.11	1.98	4.87
17.25	4.14	2.00	4.70
17.50	4.16	2.02	4.54
17.75	4.19	2.04	4.39
18.00	4.21	2.06	4.25
18.25	4.23	2.08	4.13
18.50	4.26	2.09	4.01
18.75	4.28	2.11	3.90
19.00	4.30	2.13	3.80
19.25	4.32	2.15	3.71
19.50	4.34	2.16	3.62
19.75	4.36	2.18	3.54
20.00	**4.38**	**2.20**	3.46

Summary for Subcatchment DA-2P: DrainageArea 2 Post

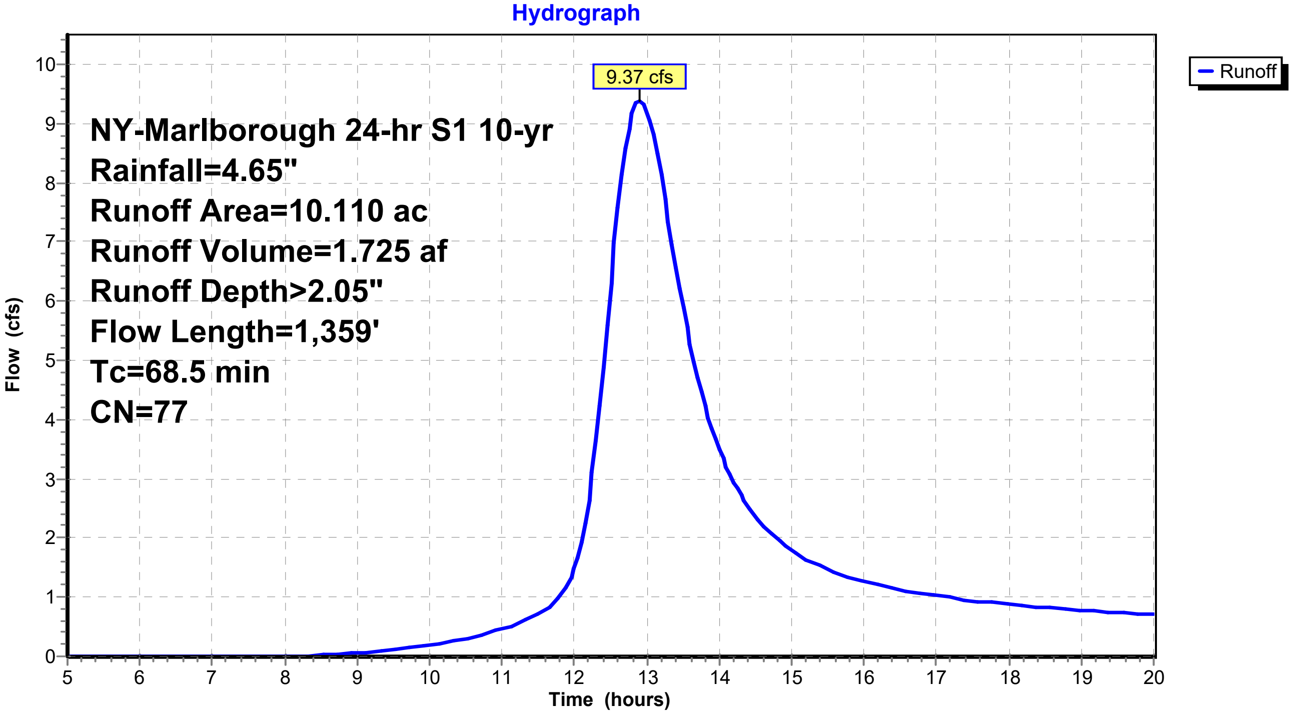
Runoff = 9.37 cfs @ 12.90 hrs, Volume= 1.725 af, Depth> 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NY-Marlborough 24-hr S1 10-yr Rainfall=4.65"

Area (ac)	CN	Description
2.360	71	Meadow, non-grazed, HSG C
0.210	98	Paved roads w/curbs & sewers, HSG C
0.910	71	Meadow, non-grazed, HSG C
5.100	78	Meadow, non-grazed, HSG D
0.090	98	Paved parking, HSG D
1.290	78	Meadow, non-grazed, HSG D
0.100	98	Paved roads w/curbs & sewers, HSG C
0.050	98	Paved roads w/curbs & sewers, HSG D
10.110	77	Weighted Average
9.660		95.55% Pervious Area
0.450		4.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	43	0.1191	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
3.5	67	0.1194	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
3.7	70	0.1143	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
4.8	94	0.1064	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.4	100	0.0900	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
3.8	69	0.1014	0.30		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.3	100	0.0950	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
0.1	8	0.0950	2.16		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.9	92	0.0978	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.4	100	0.0900	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
0.1	12	0.0900	2.10		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.4	96	0.0833	0.30		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.9	99	0.0707	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
6.4	95	0.0526	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
6.8	100	0.0500	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
0.1	10	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.2	99	0.0404	1.41		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.4	20	0.0200	0.14		**Shallow Concentrated Flow,** Kv= 1.0 fps
0.6	67	0.0640	1.77		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	8	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
68.5	1,359	Total			

Subcatchment DA-2P: DrainageArea 2 Post



Hydrograph for Subcatchment DA-2P: DrainageArea 2 Post

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.35	0.00	0.00
5.25	0.37	0.00	0.00
5.50	0.39	0.00	0.00
5.75	0.42	0.00	0.00
6.00	0.44	0.00	0.00
6.25	0.46	0.00	0.00
6.50	0.49	0.00	0.00
6.75	0.52	0.00	0.00
7.00	0.54	0.00	0.00
7.25	0.57	0.00	0.00
7.50	0.60	0.00	0.00
7.75	0.63	0.00	0.00
8.00	0.66	0.00	0.00
8.25	0.69	0.00	0.01
8.50	0.72	0.01	0.02
8.75	0.76	0.01	0.03
9.00	0.80	0.01	0.06
9.25	0.84	0.02	0.08
9.50	0.88	0.02	0.11
9.75	0.93	0.03	0.15
10.00	0.98	0.04	0.19
10.25	1.03	0.05	0.24
10.50	1.09	0.07	0.30
10.75	1.16	0.09	0.37
11.00	1.23	0.11	0.46
11.25	1.33	0.14	0.57
11.50	1.45	0.19	0.72
11.75	1.72	0.31	0.95
12.00	2.53	0.76	1.46
12.25	2.97	1.05	3.10
12.50	3.23	1.23	6.29
12.75	3.34	1.31	**8.90**
13.00	3.43	1.38	**9.24**
13.25	3.50	1.43	7.73
13.50	3.57	1.48	5.88
13.75	3.63	1.53	4.47
14.00	3.68	1.57	3.49
14.25	3.73	1.60	2.83
14.50	3.78	1.64	2.36
14.75	3.82	1.67	2.03
15.00	3.86	1.70	1.79
15.25	3.89	1.73	1.60
15.50	3.93	1.76	1.46
15.75	3.96	1.78	1.35
16.00	3.99	1.81	1.25
16.25	4.03	1.83	1.18
16.50	4.06	1.86	1.12
16.75	4.08	1.88	1.07
17.00	4.11	1.90	1.02
17.25	4.14	1.92	0.98
17.50	4.16	1.94	0.94
17.75	4.19	1.96	0.91
18.00	4.21	1.98	0.88
18.25	4.23	2.00	0.85
18.50	4.26	2.02	0.82
18.75	4.28	2.03	0.80
19.00	4.30	2.05	0.78
19.25	4.32	2.07	0.76
19.50	4.34	2.08	0.74
19.75	4.36	2.10	0.72
20.00	**4.38**	**2.12**	0.70

Summary for Subcatchment DA-3P: Drainage Area 3 Post

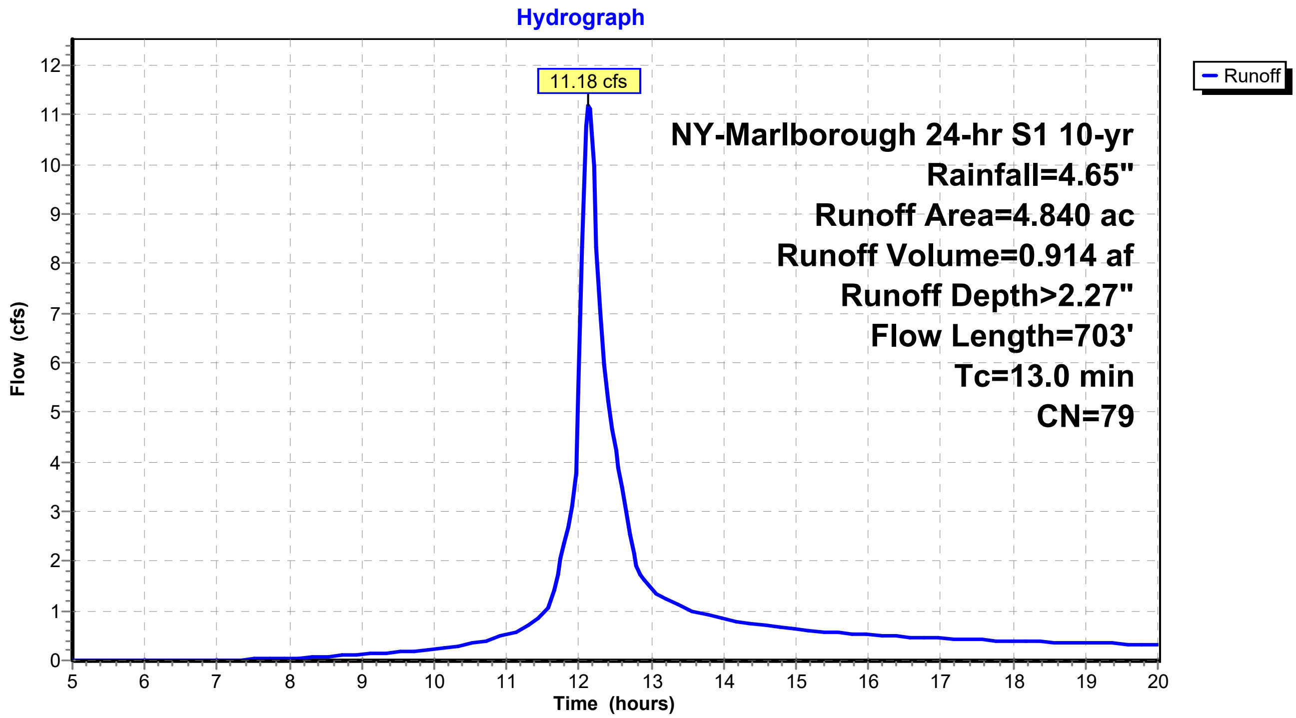
Runoff = 11.18 cfs @ 12.14 hrs, Volume= 0.914 af, Depth> 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NY-Marlborough 24-hr S1 10-yr Rainfall=4.65"

Area (ac)	CN	Description
0.050	71	Meadow, non-grazed, HSG C
0.030	98	Paved roads w/curbs & sewers, HSG C
1.270	78	Meadow, non-grazed, HSG D
0.260	98	Paved roads w/curbs & sewers, HSG D
3.230	78	Meadow, non-grazed, HSG D
4.840	79	Weighted Average
4.550		94.01% Pervious Area
0.290		5.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	100	0.0380	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.2	585	0.0712	1.87		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0396	3.20		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	8	0.1144	2.37		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.0	703	Total			

Subcatchment DA-3P: Drainage Area 3 Post



Hydrograph for Subcatchment DA-3P: Drainage Area 3 Post

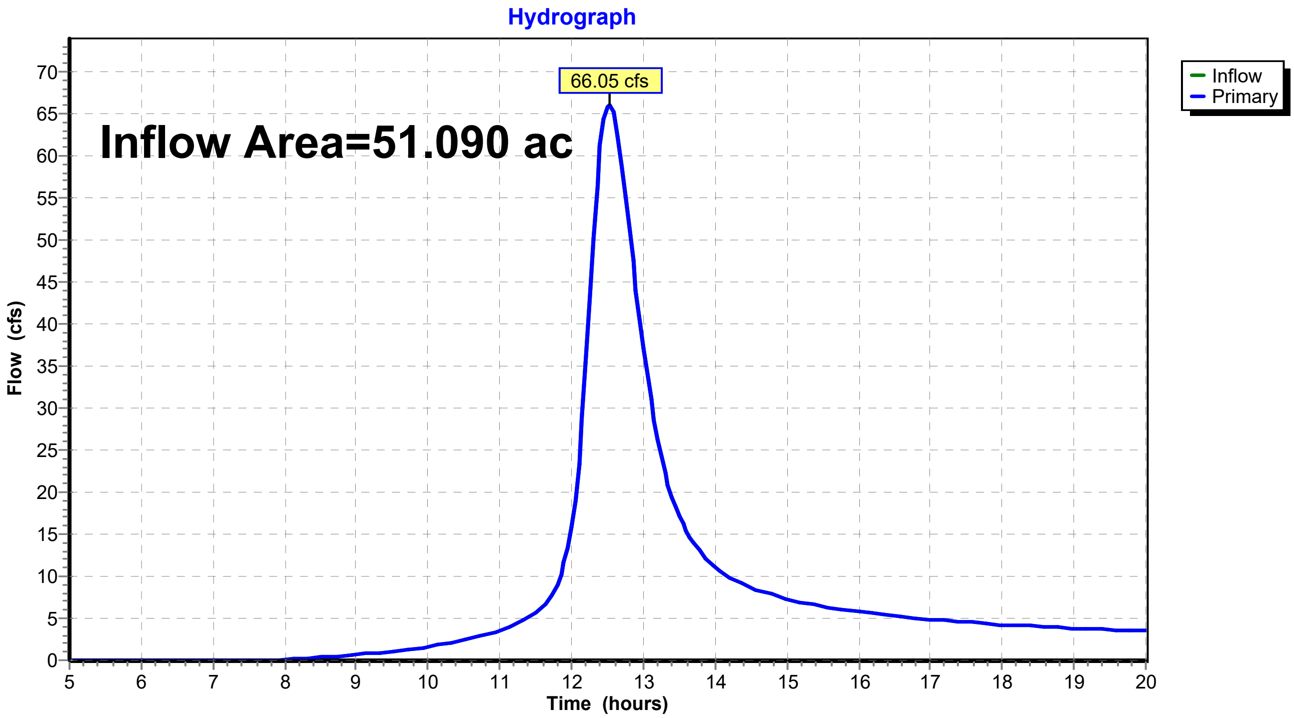
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.35	0.00	0.00
5.25	0.37	0.00	0.00
5.50	0.39	0.00	0.00
5.75	0.42	0.00	0.00
6.00	0.44	0.00	0.00
6.25	0.46	0.00	0.00
6.50	0.49	0.00	0.00
6.75	0.52	0.00	0.00
7.00	0.54	0.00	0.00
7.25	0.57	0.00	0.01
7.50	0.60	0.00	0.02
7.75	0.63	0.00	0.03
8.00	0.66	0.01	0.04
8.25	0.69	0.01	0.06
8.50	0.72	0.01	0.07
8.75	0.76	0.02	0.09
9.00	0.80	0.02	0.11
9.25	0.84	0.03	0.14
9.50	0.88	0.04	0.16
9.75	0.93	0.05	0.19
10.00	0.98	0.06	0.23
10.25	1.03	0.08	0.28
10.50	1.09	0.10	0.33
10.75	1.16	0.12	0.41
11.00	1.23	0.15	0.51
11.25	1.33	0.18	0.66
11.50	1.45	0.23	0.90
11.75	1.72	0.37	2.05
12.00	2.53	0.86	**5.40**
12.25	2.97	1.17	**8.34**
12.50	3.23	1.36	4.22
12.75	3.34	1.44	2.16
13.00	3.43	1.51	1.45
13.25	3.50	1.57	1.20
13.50	3.57	1.62	1.04
13.75	3.63	1.67	0.93
14.00	3.68	1.71	0.84
14.25	3.73	1.75	0.77
14.50	3.78	1.78	0.71
14.75	3.82	1.82	0.67
15.00	3.86	1.85	0.63
15.25	3.89	1.88	0.59
15.50	3.93	1.91	0.56
15.75	3.96	1.93	0.54
16.00	3.99	1.96	0.51
16.25	4.03	1.98	0.49
16.50	4.06	2.01	0.47
16.75	4.08	2.03	0.46
17.00	4.11	2.05	0.44
17.25	4.14	2.08	0.43
17.50	4.16	2.10	0.41
17.75	4.19	2.12	0.40
18.00	4.21	2.14	0.39
18.25	4.23	2.16	0.38
18.50	4.26	2.17	0.37
18.75	4.28	2.19	0.36
19.00	4.30	2.21	0.35
19.25	4.32	2.23	0.34
19.50	4.34	2.25	0.33
19.75	4.36	2.26	0.33
20.00	**4.38**	**2.28**	0.32

Summary for Link DP-1P: Design Point 1 Post

Inflow Area =	51.090 ac,	12.04% Impervious,	Inflow Depth > 2.16"	for 10-yr event
Inflow =	66.05 cfs @	12.53 hrs, Volume=	9.182 af	
Primary =	66.05 cfs @	12.53 hrs, Volume=	9.182 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP-1P: Design Point 1 Post



Hydrograph for Link DP-1P: Design Point 1 Post

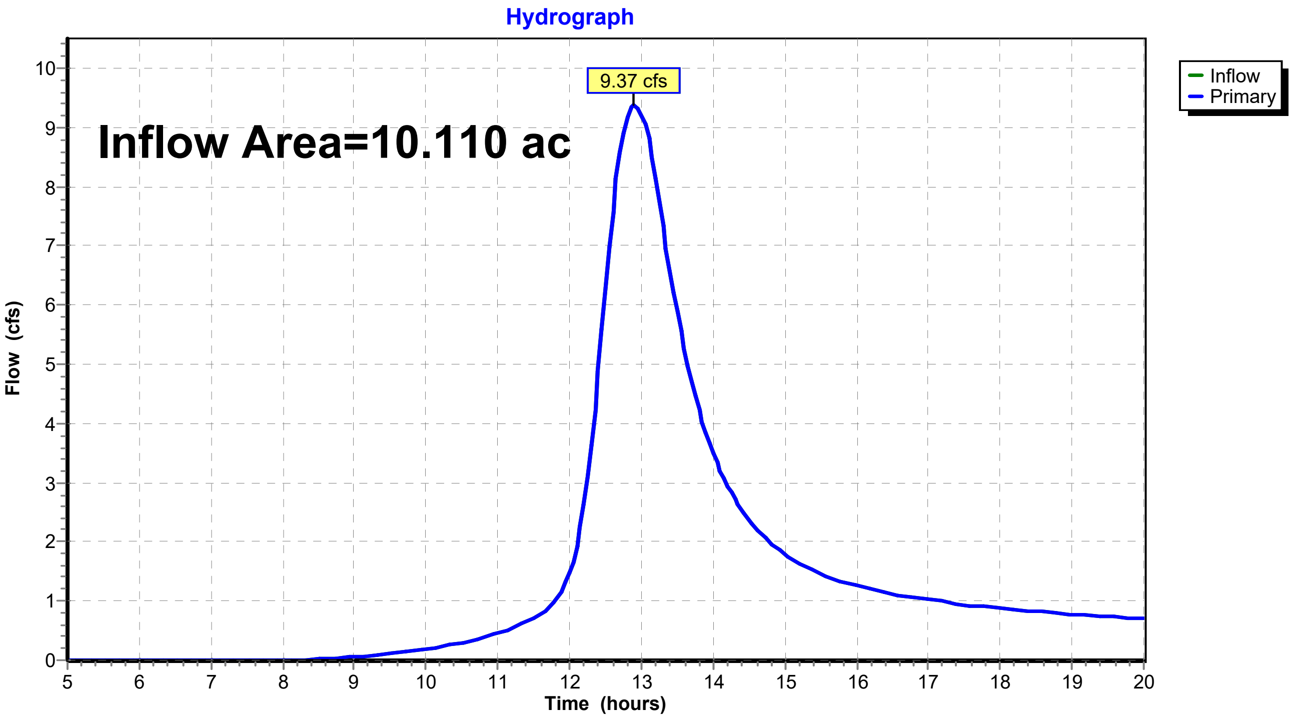
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.25	0.00	0.00	0.00
5.50	0.00	0.00	0.00
5.75	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.25	0.00	0.00	0.00
6.50	0.00	0.00	0.00
6.75	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.25	0.00	0.00	0.00
7.50	0.00	0.00	0.00
7.75	0.03	0.00	0.03
8.00	0.11	0.00	0.11
8.25	0.22	0.00	0.22
8.50	0.35	0.00	0.35
8.75	0.50	0.00	0.50
9.00	0.67	0.00	0.67
9.25	0.86	0.00	0.86
9.50	1.08	0.00	1.08
9.75	1.33	0.00	1.33
10.00	1.61	0.00	1.61
10.25	1.95	0.00	1.95
10.50	2.36	0.00	2.36
10.75	2.87	0.00	2.87
11.00	3.51	0.00	3.51
11.25	4.39	0.00	4.39
11.50	5.65	0.00	5.65
11.75	8.11	0.00	8.11
12.00	15.75	0.00	15.75
12.25	42.88	0.00	42.88
12.50	**65.85**	0.00	**65.85**
12.75	**55.19**	0.00	**55.19**
13.00	37.08	0.00	37.08
13.25	24.14	0.00	24.14
13.50	17.19	0.00	17.19
13.75	13.41	0.00	13.41
14.00	11.15	0.00	11.15
14.25	9.62	0.00	9.62
14.50	8.62	0.00	8.62
14.75	7.88	0.00	7.88
15.00	7.31	0.00	7.31
15.25	6.84	0.00	6.84
15.50	6.43	0.00	6.43
15.75	6.08	0.00	6.08
16.00	5.78	0.00	5.78
16.25	5.52	0.00	5.52
16.50	5.28	0.00	5.28
16.75	5.06	0.00	5.06
17.00	4.87	0.00	4.87
17.25	4.70	0.00	4.70
17.50	4.54	0.00	4.54
17.75	4.39	0.00	4.39
18.00	4.25	0.00	4.25
18.25	4.13	0.00	4.13
18.50	4.01	0.00	4.01
18.75	3.90	0.00	3.90
19.00	3.80	0.00	3.80
19.25	3.71	0.00	3.71
19.50	3.62	0.00	3.62
19.75	3.54	0.00	3.54
20.00	3.46	0.00	3.46

Summary for Link DP-2P: Design Point 2 Post

Inflow Area =	10.110 ac,	4.45% Impervious, Inflow Depth > 2.05"	for 10-yr event	
Inflow =	9.37 cfs @	12.90 hrs, Volume=	1.725 af	
Primary =	9.37 cfs @	12.90 hrs, Volume=	1.725 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP-2P: Design Point 2 Post



Hydrograph for Link DP-2P: Design Point 2 Post

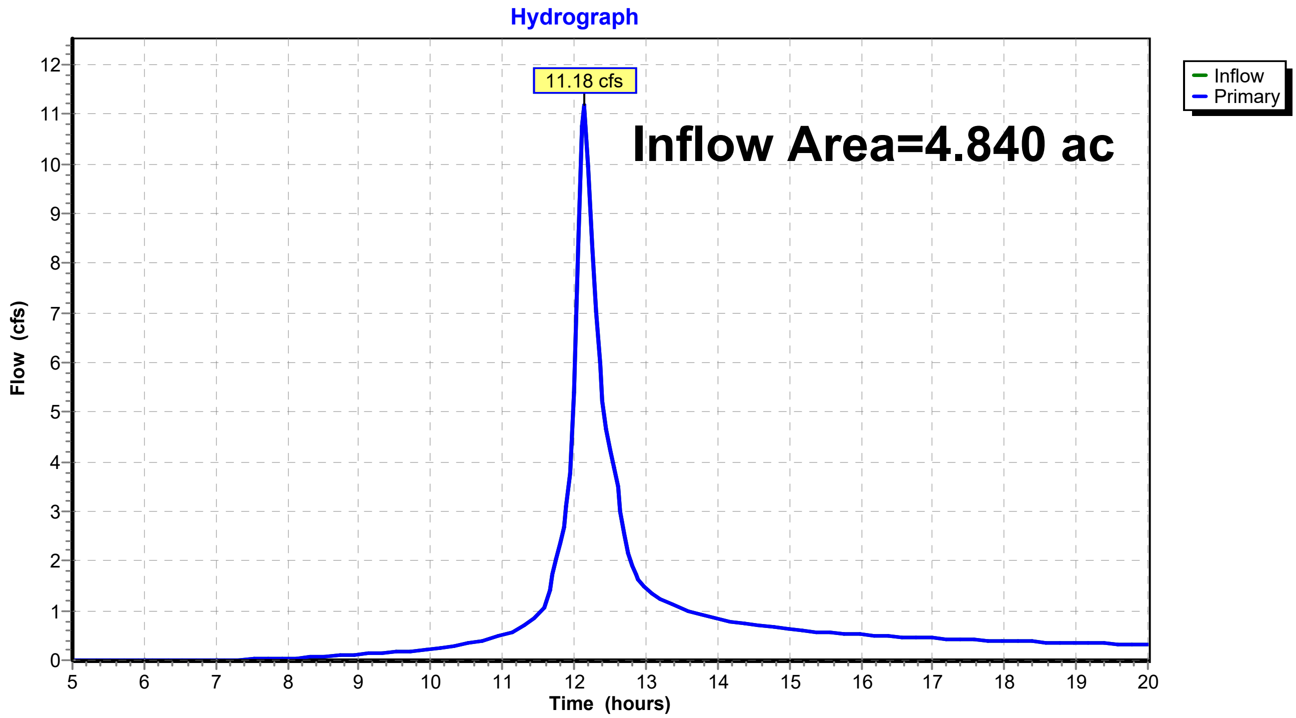
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.25	0.00	0.00	0.00
5.50	0.00	0.00	0.00
5.75	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.25	0.00	0.00	0.00
6.50	0.00	0.00	0.00
6.75	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.25	0.00	0.00	0.00
7.50	0.00	0.00	0.00
7.75	0.00	0.00	0.00
8.00	0.00	0.00	0.00
8.25	0.01	0.00	0.01
8.50	0.02	0.00	0.02
8.75	0.03	0.00	0.03
9.00	0.06	0.00	0.06
9.25	0.08	0.00	0.08
9.50	0.11	0.00	0.11
9.75	0.15	0.00	0.15
10.00	0.19	0.00	0.19
10.25	0.24	0.00	0.24
10.50	0.30	0.00	0.30
10.75	0.37	0.00	0.37
11.00	0.46	0.00	0.46
11.25	0.57	0.00	0.57
11.50	0.72	0.00	0.72
11.75	0.95	0.00	0.95
12.00	1.46	0.00	1.46
12.25	3.10	0.00	3.10
12.50	6.29	0.00	6.29
12.75	**8.90**	0.00	**8.90**
13.00	**9.24**	0.00	**9.24**
13.25	7.73	0.00	7.73
13.50	5.88	0.00	5.88
13.75	4.47	0.00	4.47
14.00	3.49	0.00	3.49
14.25	2.83	0.00	2.83
14.50	2.36	0.00	2.36
14.75	2.03	0.00	2.03
15.00	1.79	0.00	1.79
15.25	1.60	0.00	1.60
15.50	1.46	0.00	1.46
15.75	1.35	0.00	1.35
16.00	1.25	0.00	1.25
16.25	1.18	0.00	1.18
16.50	1.12	0.00	1.12
16.75	1.07	0.00	1.07
17.00	1.02	0.00	1.02
17.25	0.98	0.00	0.98
17.50	0.94	0.00	0.94
17.75	0.91	0.00	0.91
18.00	0.88	0.00	0.88
18.25	0.85	0.00	0.85
18.50	0.82	0.00	0.82
18.75	0.80	0.00	0.80
19.00	0.78	0.00	0.78
19.25	0.76	0.00	0.76
19.50	0.74	0.00	0.74
19.75	0.72	0.00	0.72
20.00	0.70	0.00	0.70

Summary for Link DP-3P: Design Point 3 Post

Inflow Area =	4.840 ac,	5.99% Impervious, Inflow Depth > 2.27"	for 10-yr event	
Inflow =	11.18 cfs @	12.14 hrs, Volume=	0.914 af	
Primary =	11.18 cfs @	12.14 hrs, Volume=	0.914 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP-3P: Design Point 3 Post



Hydrograph for Link DP-3P: Design Point 3 Post

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.25	0.00	0.00	0.00
5.50	0.00	0.00	0.00
5.75	0.00	0.00	0.00
6.00	0.00	0.00	0.00
6.25	0.00	0.00	0.00
6.50	0.00	0.00	0.00
6.75	0.00	0.00	0.00
7.00	0.00	0.00	0.00
7.25	0.01	0.00	0.01
7.50	0.02	0.00	0.02
7.75	0.03	0.00	0.03
8.00	0.04	0.00	0.04
8.25	0.06	0.00	0.06
8.50	0.07	0.00	0.07
8.75	0.09	0.00	0.09
9.00	0.11	0.00	0.11
9.25	0.14	0.00	0.14
9.50	0.16	0.00	0.16
9.75	0.19	0.00	0.19
10.00	0.23	0.00	0.23
10.25	0.28	0.00	0.28
10.50	0.33	0.00	0.33
10.75	0.41	0.00	0.41
11.00	0.51	0.00	0.51
11.25	0.66	0.00	0.66
11.50	0.90	0.00	0.90
11.75	2.05	0.00	2.05
12.00	**5.40**	0.00	**5.40**
12.25	**8.34**	0.00	**8.34**
12.50	4.22	0.00	4.22
12.75	2.16	0.00	2.16
13.00	1.45	0.00	1.45
13.25	1.20	0.00	1.20
13.50	1.04	0.00	1.04
13.75	0.93	0.00	0.93
14.00	0.84	0.00	0.84
14.25	0.77	0.00	0.77
14.50	0.71	0.00	0.71
14.75	0.67	0.00	0.67
15.00	0.63	0.00	0.63
15.25	0.59	0.00	0.59
15.50	0.56	0.00	0.56
15.75	0.54	0.00	0.54
16.00	0.51	0.00	0.51
16.25	0.49	0.00	0.49
16.50	0.47	0.00	0.47
16.75	0.46	0.00	0.46
17.00	0.44	0.00	0.44
17.25	0.43	0.00	0.43
17.50	0.41	0.00	0.41
17.75	0.40	0.00	0.40
18.00	0.39	0.00	0.39
18.25	0.38	0.00	0.38
18.50	0.37	0.00	0.37
18.75	0.36	0.00	0.36
19.00	0.35	0.00	0.35
19.25	0.34	0.00	0.34
19.50	0.33	0.00	0.33
19.75	0.33	0.00	0.33
20.00	0.32	0.00	0.32

Summary for Subcatchment DA-1P: Drainage Area 1 Post

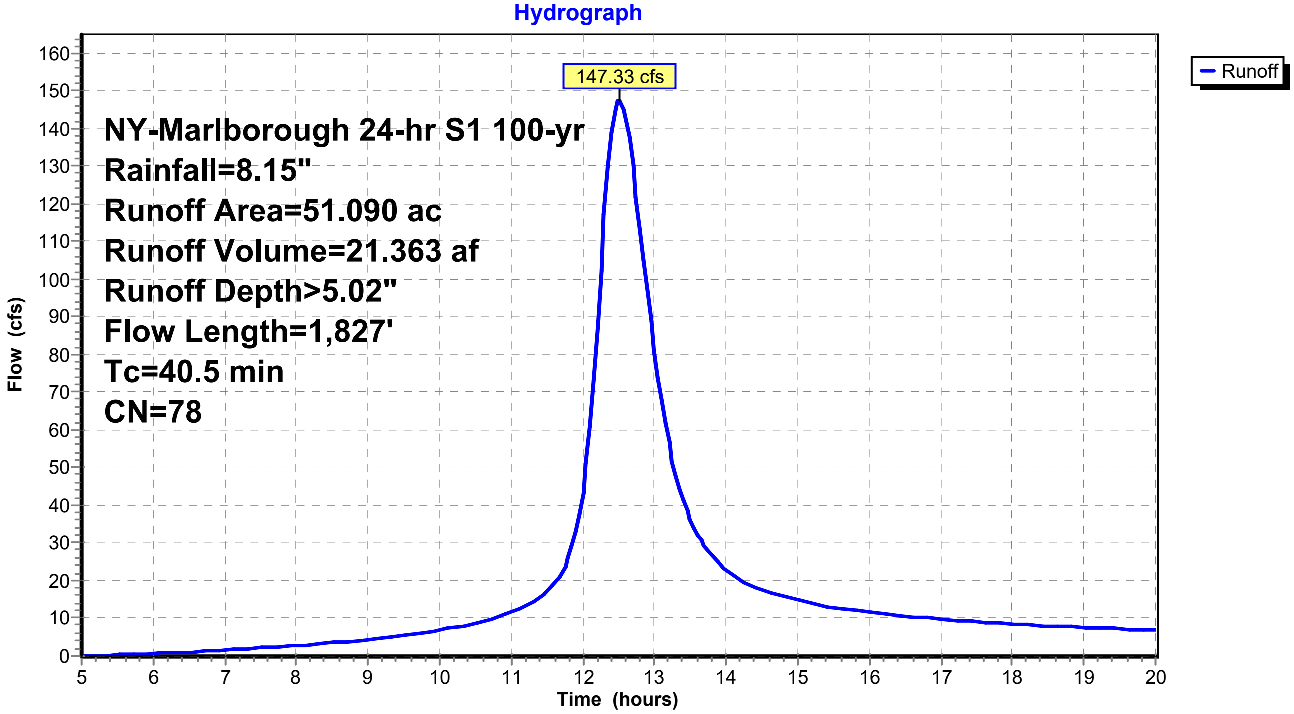
Runoff = 147.33 cfs @ 12.51 hrs, Volume= 21.363 af, Depth> 5.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NY-Marlborough 24-hr S1 100-yr Rainfall=8.15"

	Area (ac)	CN	Description
	16.560	71	Meadow, non-grazed, HSG C
	5.420	70	Woods, Good, HSG C
	0.270	98	Paved roads w/curbs & sewers, HSG C
	0.020	98	Roofs, HSG C
*	0.330	98	Wetland
	1.400	71	Meadow, non-grazed, HSG C
	0.100	98	Paved roads w/curbs & sewers, HSG C
	5.500	78	Meadow, non-grazed, HSG D
	3.090	77	Woods, Good, HSG D
	0.080	98	Roofs, HSG D
*	0.640	98	Wetland
	10.540	78	Meadow, non-grazed, HSG D
	0.350	98	Paved roads w/curbs & sewers, HSG D
	0.060	98	Paved parking, HSG D
*	1.330	98	Rock outcrop
*	2.960	98	Rock outcrop
	0.010	98	Roofs, HSG D
	2.430	98	Water Surface, 0% imp, HSG D
	51.090	78	Weighted Average
	44.940		87.96% Pervious Area
	6.150		12.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0597	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
1.7	179	0.0622	1.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	42	0.0714	1.87		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.3	100	0.8000	0.74		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
0.0	3	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.7	100	0.0800	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
4.4	74	0.0810	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
4.7	82	0.0854	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
4.1	71	0.0902	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.7	100	0.0800	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
0.2	28	0.1072	2.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	138	0.1522	2.73		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	98	0.2650	3.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	54	0.1481	2.69		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	9	0.0814	2.00		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	17	0.1948	3.09		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	41	0.1346	1.83		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.2	119	0.0336	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	123		11.35		**Lake or Reservoir,** Mean Depth= 4.00'
0.3	349		17.94		**Lake or Reservoir,** Mean Depth= 10.00'
40.5	1,827	Total			

Subcatchment DA-1P: Drainage Area 1 Post



Hydrograph for Subcatchment DA-1P: Drainage Area 1 Post

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.62	0.00	0.01
5.25	0.65	0.00	0.08
5.50	0.69	0.01	0.22
5.75	0.73	0.01	0.40
6.00	0.77	0.01	0.60
6.25	0.82	0.02	0.81
6.50	0.86	0.03	1.04
6.75	0.91	0.04	1.28
7.00	0.95	0.05	1.54
7.25	1.00	0.06	1.80
7.50	1.05	0.07	2.09
7.75	1.10	0.09	2.39
8.00	1.16	0.10	2.72
8.25	1.21	0.12	3.07
8.50	1.27	0.14	3.45
8.75	1.34	0.17	3.87
9.00	1.40	0.19	4.33
9.25	1.47	0.22	4.85
9.50	1.55	0.25	5.43
9.75	1.63	0.29	6.08
10.00	1.71	0.33	6.83
10.25	1.81	0.38	7.72
10.50	1.91	0.44	8.79
10.75	2.03	0.50	10.10
11.00	2.17	0.58	11.74
11.25	2.33	0.68	13.95
11.50	2.54	0.81	17.11
11.75	3.04	1.16	23.49
12.00	4.39	2.21	43.43
12.25	5.18	2.87	102.46
12.50	5.65	3.27	**147.22**
12.75	5.85	3.44	121.96
13.00	6.01	3.58	81.23
13.25	6.14	3.70	51.81
13.50	6.25	3.80	36.22
13.75	6.36	3.89	27.85
14.00	6.45	3.98	22.93
14.25	6.53	4.05	19.66
14.50	6.61	4.13	17.53
14.75	6.69	4.19	15.99
15.00	6.76	4.25	14.79
15.25	6.82	4.31	13.80
15.50	6.88	4.37	12.96
15.75	6.94	4.42	12.23
16.00	7.00	4.47	11.60
16.25	7.05	4.52	11.06
16.50	7.10	4.57	10.57
16.75	7.15	4.61	10.12
17.00	7.20	4.66	9.72
17.25	7.25	4.70	9.37
17.50	7.29	4.74	9.04
17.75	7.34	4.78	8.73
18.00	7.38	4.82	8.45
18.25	7.42	4.86	8.20
18.50	7.46	4.89	7.97
18.75	7.50	4.93	7.74
19.00	7.54	4.96	7.53
19.25	7.57	5.00	7.34
19.50	7.61	5.03	7.16
19.75	7.65	5.06	6.99
20.00	**7.68**	**5.10**	6.83

Summary for Subcatchment DA-2P: DrainageArea 2 Post

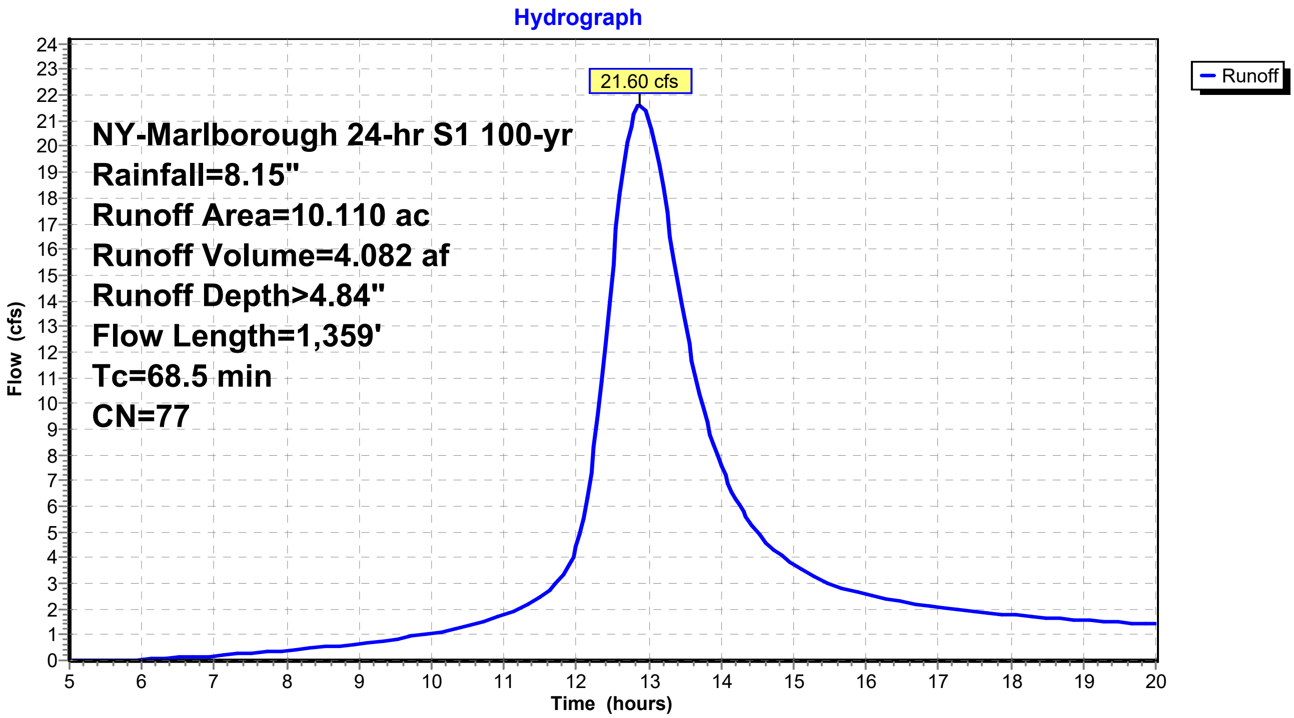
Runoff = 21.60 cfs @ 12.88 hrs, Volume= 4.082 af, Depth> 4.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NY-Marlborough 24-hr S1 100-yr Rainfall=8.15"

Area (ac)	CN	Description
2.360	71	Meadow, non-grazed, HSG C
0.210	98	Paved roads w/curbs & sewers, HSG C
0.910	71	Meadow, non-grazed, HSG C
5.100	78	Meadow, non-grazed, HSG D
0.090	98	Paved parking, HSG D
1.290	78	Meadow, non-grazed, HSG D
0.100	98	Paved roads w/curbs & sewers, HSG C
0.050	98	Paved roads w/curbs & sewers, HSG D
10.110	77	Weighted Average
9.660		95.55% Pervious Area
0.450		4.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	43	0.1191	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
3.5	67	0.1194	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
3.7	70	0.1143	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
4.8	94	0.1064	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.4	100	0.0900	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
3.8	69	0.1014	0.30		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.3	100	0.0950	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
0.1	8	0.0950	2.16		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.9	92	0.0978	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.4	100	0.0900	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
0.1	12	0.0900	2.10		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.4	96	0.0833	0.30		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.9	99	0.0707	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
6.4	95	0.0526	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
6.8	100	0.0500	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
0.1	10	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.2	99	0.0404	1.41		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.4	20	0.0200	0.14		**Shallow Concentrated Flow,** Kv= 1.0 fps
0.6	67	0.0640	1.77		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	8	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
68.5	1,359	Total			

Subcatchment DA-2P: DrainageArea 2 Post



Hydrograph for Subcatchment DA-2P: DrainageArea 2 Post

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.62	0.00	0.00
5.25	0.65	0.00	0.00
5.50	0.69	0.00	0.00
5.75	0.73	0.01	0.02
6.00	0.77	0.01	0.04
6.25	0.82	0.01	0.06
6.50	0.86	0.02	0.10
6.75	0.91	0.03	0.14
7.00	0.95	0.04	0.18
7.25	1.00	0.05	0.23
7.50	1.05	0.06	0.28
7.75	1.10	0.07	0.33
8.00	1.16	0.09	0.38
8.25	1.21	0.11	0.44
8.50	1.27	0.12	0.51
8.75	1.34	0.15	0.58
9.00	1.40	0.17	0.65
9.25	1.47	0.20	0.74
9.50	1.55	0.23	0.83
9.75	1.63	0.26	0.93
10.00	1.71	0.30	1.05
10.25	1.81	0.35	1.19
10.50	1.91	0.40	1.35
10.75	2.03	0.47	1.54
11.00	2.17	0.54	1.77
11.25	2.33	0.64	2.06
11.50	2.54	0.77	2.45
11.75	3.04	1.10	3.06
12.00	4.39	2.13	4.42
12.25	5.18	2.78	8.34
12.50	5.65	3.18	15.38
12.75	5.85	3.35	**20.79**
13.00	6.01	3.48	**21.11**
13.25	6.14	3.60	17.42
13.50	6.25	3.70	13.09
13.75	6.36	3.79	9.81
14.00	6.45	3.87	7.55
14.25	6.53	3.95	6.04
14.50	6.61	4.02	4.98
14.75	6.69	4.09	4.24
15.00	6.76	4.15	3.71
15.25	6.82	4.21	3.31
15.50	6.88	4.26	3.00
15.75	6.94	4.31	2.75
16.00	7.00	4.36	2.55
16.25	7.05	4.41	2.40
16.50	7.10	4.46	2.27
16.75	7.15	4.50	2.16
17.00	7.20	4.55	2.06
17.25	7.25	4.59	1.98
17.50	7.29	4.63	1.90
17.75	7.34	4.67	1.83
18.00	7.38	4.71	1.76
18.25	7.42	4.75	1.70
18.50	7.46	4.78	1.65
18.75	7.50	4.82	1.60
19.00	7.54	4.85	1.55
19.25	7.57	4.88	1.51
19.50	7.61	4.92	1.47
19.75	7.65	4.95	1.43
20.00	**7.68**	**4.98**	1.40

Summary for Subcatchment DA-3P: Drainage Area 3 Post

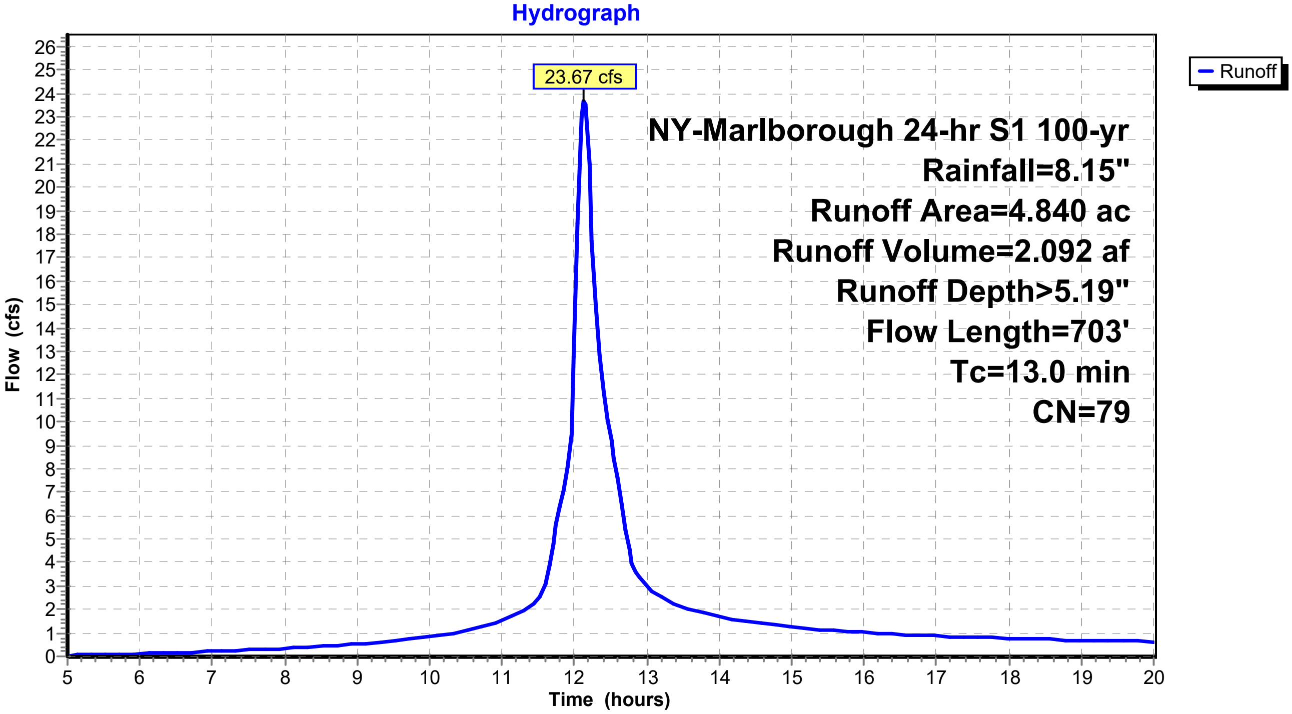
Runoff = 23.67 cfs @ 12.13 hrs, Volume= 2.092 af, Depth> 5.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NY-Marlborough 24-hr S1 100-yr Rainfall=8.15"

Area (ac)	CN	Description
0.050	71	Meadow, non-grazed, HSG C
0.030	98	Paved roads w/curbs & sewers, HSG C
1.270	78	Meadow, non-grazed, HSG D
0.260	98	Paved roads w/curbs & sewers, HSG D
3.230	78	Meadow, non-grazed, HSG D
4.840	79	Weighted Average
4.550		94.01% Pervious Area
0.290		5.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	100	0.0380	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.15"
5.2	585	0.0712	1.87		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0396	3.20		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	8	0.1144	2.37		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.0	703	Total			

Subcatchment DA-3P: Drainage Area 3 Post



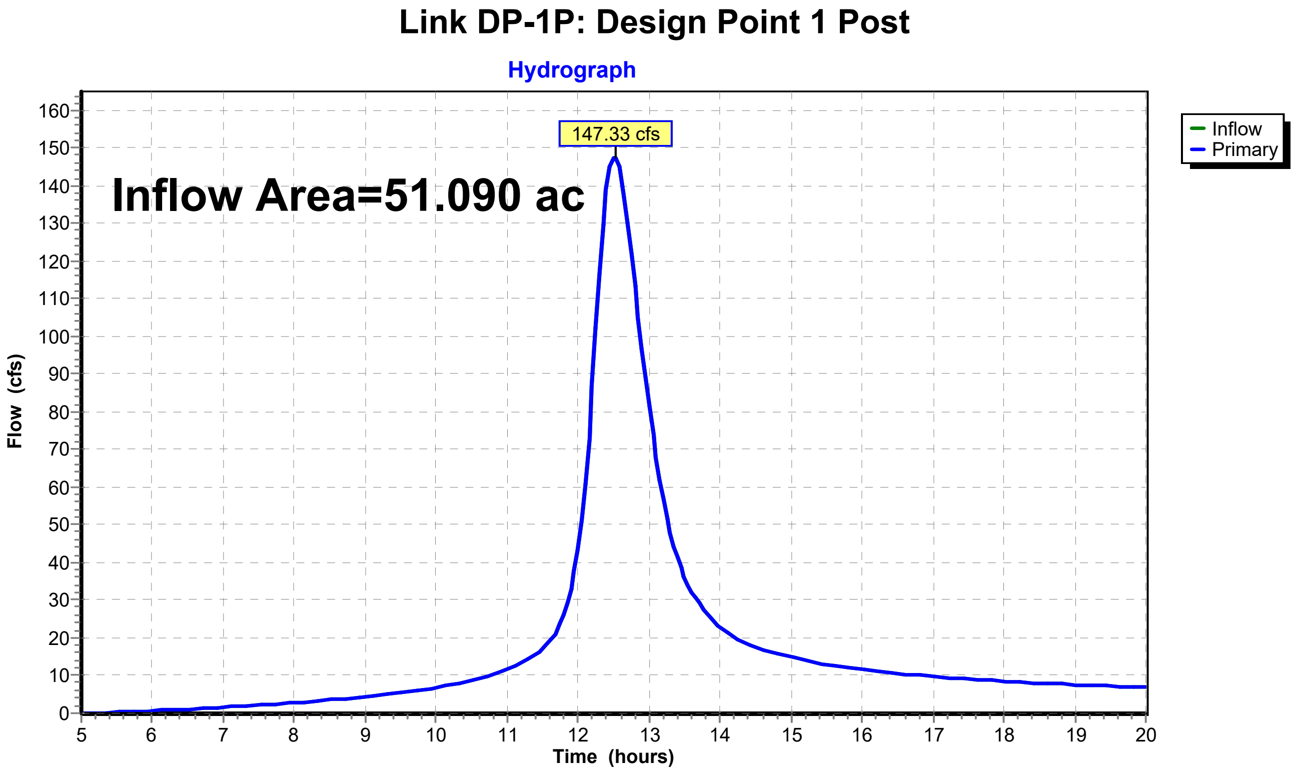
Hydrograph for Subcatchment DA-3P: Drainage Area 3 Post

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.62	0.00	0.03
5.25	0.65	0.01	0.05
5.50	0.69	0.01	0.07
5.75	0.73	0.01	0.09
6.00	0.77	0.02	0.11
6.25	0.82	0.03	0.14
6.50	0.86	0.04	0.16
6.75	0.91	0.05	0.19
7.00	0.95	0.06	0.21
7.25	1.00	0.07	0.24
7.50	1.05	0.08	0.27
7.75	1.10	0.10	0.31
8.00	1.16	0.12	0.34
8.25	1.21	0.14	0.38
8.50	1.27	0.16	0.43
8.75	1.34	0.19	0.47
9.00	1.40	0.21	0.53
9.25	1.47	0.25	0.59
9.50	1.55	0.28	0.66
9.75	1.63	0.32	0.74
10.00	1.71	0.36	0.83
10.25	1.81	0.41	0.95
10.50	1.91	0.47	1.09
10.75	2.03	0.54	1.27
11.00	2.17	0.62	1.52
11.25	2.33	0.73	1.88
11.50	2.54	0.86	2.46
11.75	3.04	1.22	5.58
12.00	4.39	2.29	**12.74**
12.25	5.18	2.96	**17.72**
12.50	5.65	3.37	9.20
12.75	5.85	3.54	4.55
13.00	6.01	3.68	2.96
13.25	6.14	3.80	2.43
13.50	6.25	3.91	2.10
13.75	6.36	4.00	1.87
14.00	6.45	4.08	1.69
14.25	6.53	4.16	1.55
14.50	6.61	4.23	1.43
14.75	6.69	4.30	1.33
15.00	6.76	4.36	1.25
15.25	6.82	4.42	1.18
15.50	6.88	4.48	1.12
15.75	6.94	4.53	1.07
16.00	7.00	4.58	1.02
16.25	7.05	4.63	0.98
16.50	7.10	4.68	0.94
16.75	7.15	4.73	0.90
17.00	7.20	4.77	0.87
17.25	7.25	4.81	0.84
17.50	7.29	4.85	0.81
17.75	7.34	4.89	0.79
18.00	7.38	4.93	0.77
18.25	7.42	4.97	0.74
18.50	7.46	5.01	0.72
18.75	7.50	5.04	0.71
19.00	7.54	5.08	0.69
19.25	7.57	5.11	0.67
19.50	7.61	5.15	0.66
19.75	7.65	5.18	0.64
20.00	**7.68**	**5.21**	0.63

Summary for Link DP-1P: Design Point 1 Post

Inflow Area = 51.090 ac, 12.04% Impervious, Inflow Depth > 5.02" for 100-yr event
Inflow = 147.33 cfs @ 12.51 hrs, Volume= 21.363 af
Primary = 147.33 cfs @ 12.51 hrs, Volume= 21.363 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



Hydrograph for Link DP-1P: Design Point 1 Post

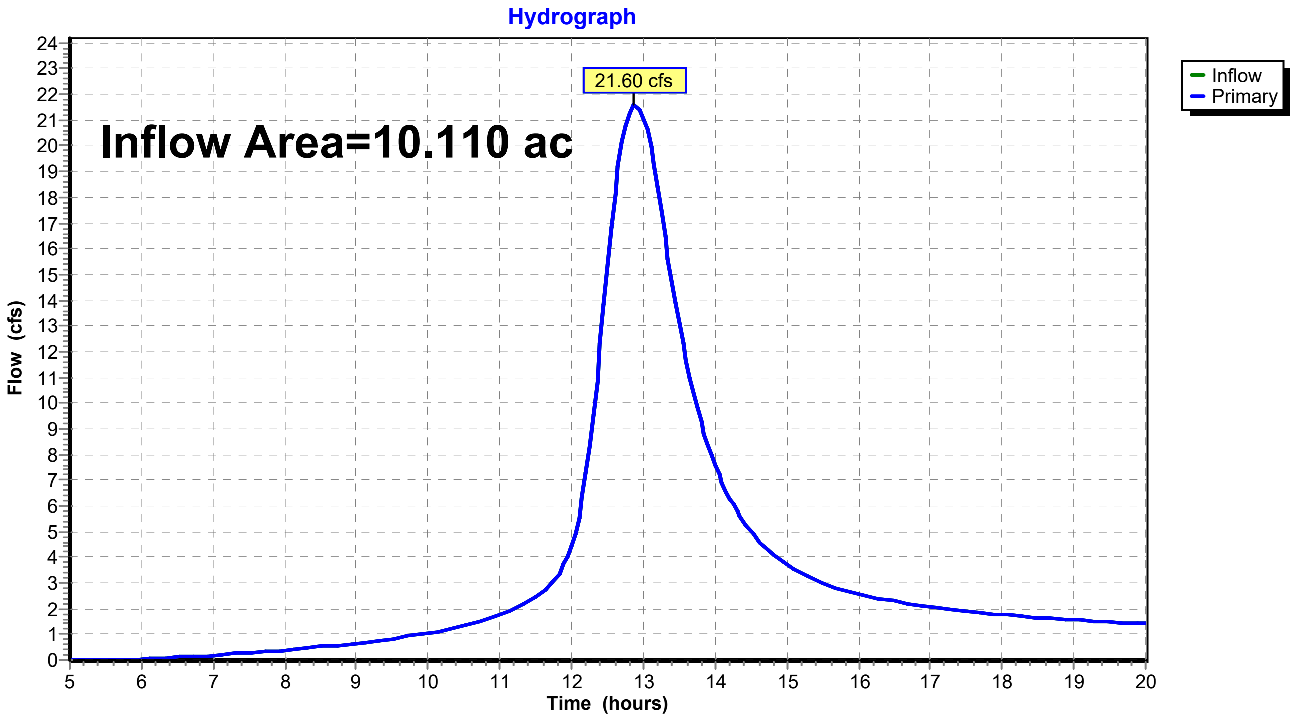
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.01	**0.00**	0.01
5.25	0.08	0.00	0.08
5.50	0.22	0.00	0.22
5.75	0.40	0.00	0.40
6.00	0.60	0.00	0.60
6.25	0.81	0.00	0.81
6.50	1.04	0.00	1.04
6.75	1.28	0.00	1.28
7.00	1.54	0.00	1.54
7.25	1.80	0.00	1.80
7.50	2.09	0.00	2.09
7.75	2.39	0.00	2.39
8.00	2.72	0.00	2.72
8.25	3.07	0.00	3.07
8.50	3.45	0.00	3.45
8.75	3.87	0.00	3.87
9.00	4.33	0.00	4.33
9.25	4.85	0.00	4.85
9.50	5.43	0.00	5.43
9.75	6.08	0.00	6.08
10.00	6.83	0.00	6.83
10.25	7.72	0.00	7.72
10.50	8.79	0.00	8.79
10.75	10.10	0.00	10.10
11.00	11.74	0.00	11.74
11.25	13.95	0.00	13.95
11.50	17.11	0.00	17.11
11.75	23.49	0.00	23.49
12.00	43.43	0.00	43.43
12.25	102.46	0.00	102.46
12.50	**147.22**	0.00	**147.22**
12.75	121.96	0.00	121.96
13.00	81.23	0.00	81.23
13.25	51.81	0.00	51.81
13.50	36.22	0.00	36.22
13.75	27.85	0.00	27.85
14.00	22.93	0.00	22.93
14.25	19.66	0.00	19.66
14.50	17.53	0.00	17.53
14.75	15.99	0.00	15.99
15.00	14.79	0.00	14.79
15.25	13.80	0.00	13.80
15.50	12.96	0.00	12.96
15.75	12.23	0.00	12.23
16.00	11.60	0.00	11.60
16.25	11.06	0.00	11.06
16.50	10.57	0.00	10.57
16.75	10.12	0.00	10.12
17.00	9.72	0.00	9.72
17.25	9.37	0.00	9.37
17.50	9.04	0.00	9.04
17.75	8.73	0.00	8.73
18.00	8.45	0.00	8.45
18.25	8.20	0.00	8.20
18.50	7.97	0.00	7.97
18.75	7.74	0.00	7.74
19.00	7.53	0.00	7.53
19.25	7.34	0.00	7.34
19.50	7.16	0.00	7.16
19.75	6.99	0.00	6.99
20.00	6.83	0.00	6.83

Summary for Link DP-2P: Design Point 2 Post

Inflow Area =	10.110 ac,	4.45% Impervious, Inflow Depth > 4.84"	for 100-yr event	
Inflow =	21.60 cfs @	12.88 hrs, Volume=	4.082 af	
Primary =	21.60 cfs @	12.88 hrs, Volume=	4.082 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP-2P: Design Point 2 Post



Hydrograph for Link DP-2P: Design Point 2 Post

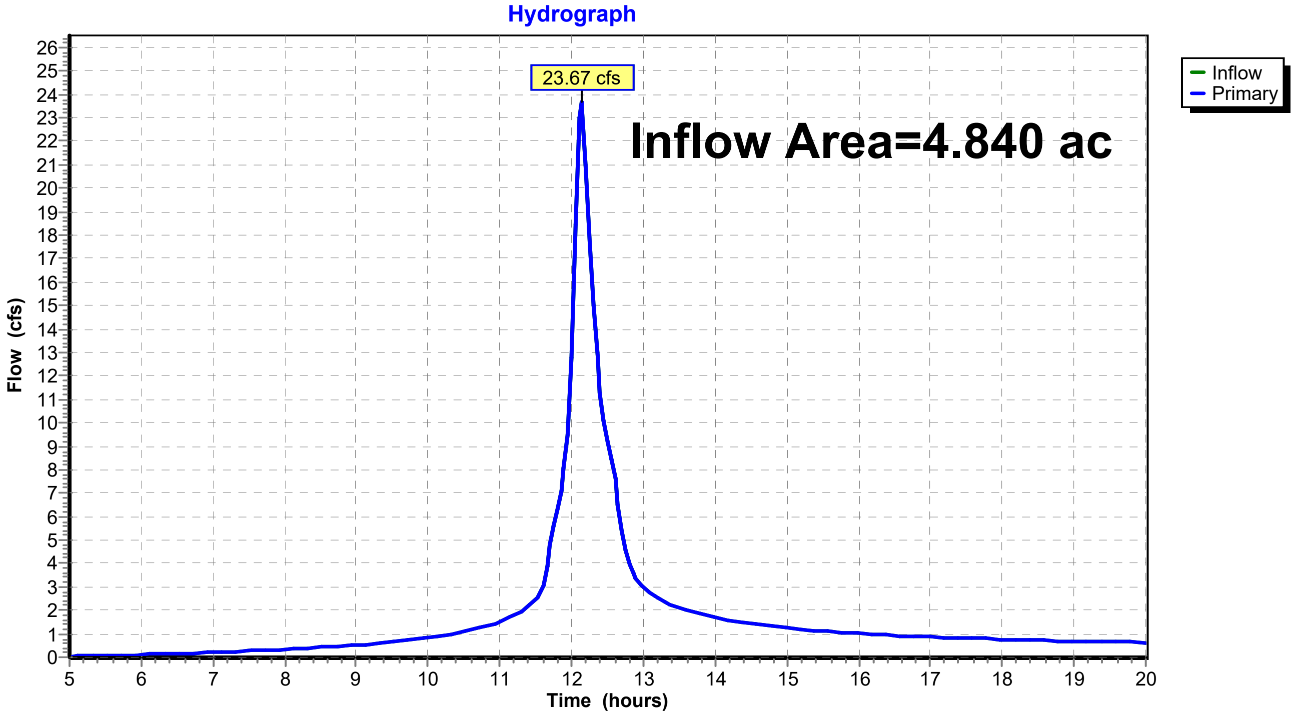
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.00	**0.00**	0.00
5.25	0.00	0.00	0.00
5.50	0.00	0.00	0.00
5.75	0.02	0.00	0.02
6.00	0.04	0.00	0.04
6.25	0.06	0.00	0.06
6.50	0.10	0.00	0.10
6.75	0.14	0.00	0.14
7.00	0.18	0.00	0.18
7.25	0.23	0.00	0.23
7.50	0.28	0.00	0.28
7.75	0.33	0.00	0.33
8.00	0.38	0.00	0.38
8.25	0.44	0.00	0.44
8.50	0.51	0.00	0.51
8.75	0.58	0.00	0.58
9.00	0.65	0.00	0.65
9.25	0.74	0.00	0.74
9.50	0.83	0.00	0.83
9.75	0.93	0.00	0.93
10.00	1.05	0.00	1.05
10.25	1.19	0.00	1.19
10.50	1.35	0.00	1.35
10.75	1.54	0.00	1.54
11.00	1.77	0.00	1.77
11.25	2.06	0.00	2.06
11.50	2.45	0.00	2.45
11.75	3.06	0.00	3.06
12.00	4.42	0.00	4.42
12.25	8.34	0.00	8.34
12.50	15.38	0.00	15.38
12.75	**20.79**	0.00	**20.79**
13.00	**21.11**	0.00	**21.11**
13.25	17.42	0.00	17.42
13.50	13.09	0.00	13.09
13.75	9.81	0.00	9.81
14.00	7.55	0.00	7.55
14.25	6.04	0.00	6.04
14.50	4.98	0.00	4.98
14.75	4.24	0.00	4.24
15.00	3.71	0.00	3.71
15.25	3.31	0.00	3.31
15.50	3.00	0.00	3.00
15.75	2.75	0.00	2.75
16.00	2.55	0.00	2.55
16.25	2.40	0.00	2.40
16.50	2.27	0.00	2.27
16.75	2.16	0.00	2.16
17.00	2.06	0.00	2.06
17.25	1.98	0.00	1.98
17.50	1.90	0.00	1.90
17.75	1.83	0.00	1.83
18.00	1.76	0.00	1.76
18.25	1.70	0.00	1.70
18.50	1.65	0.00	1.65
18.75	1.60	0.00	1.60
19.00	1.55	0.00	1.55
19.25	1.51	0.00	1.51
19.50	1.47	0.00	1.47
19.75	1.43	0.00	1.43
20.00	1.40	0.00	1.40

Summary for Link DP-3P: Design Point 3 Post

Inflow Area = 4.840 ac, 5.99% Impervious, Inflow Depth > 5.19" for 100-yr event
Inflow = 23.67 cfs @ 12.13 hrs, Volume= 2.092 af
Primary = 23.67 cfs @ 12.13 hrs, Volume= 2.092 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP-3P: Design Point 3 Post



Hydrograph for Link DP-3P: Design Point 3 Post

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
5.00	0.03	**0.00**	0.03
5.25	0.05	0.00	0.05
5.50	0.07	0.00	0.07
5.75	0.09	0.00	0.09
6.00	0.11	0.00	0.11
6.25	0.14	0.00	0.14
6.50	0.16	0.00	0.16
6.75	0.19	0.00	0.19
7.00	0.21	0.00	0.21
7.25	0.24	0.00	0.24
7.50	0.27	0.00	0.27
7.75	0.31	0.00	0.31
8.00	0.34	0.00	0.34
8.25	0.38	0.00	0.38
8.50	0.43	0.00	0.43
8.75	0.47	0.00	0.47
9.00	0.53	0.00	0.53
9.25	0.59	0.00	0.59
9.50	0.66	0.00	0.66
9.75	0.74	0.00	0.74
10.00	0.83	0.00	0.83
10.25	0.95	0.00	0.95
10.50	1.09	0.00	1.09
10.75	1.27	0.00	1.27
11.00	1.52	0.00	1.52
11.25	1.88	0.00	1.88
11.50	2.46	0.00	2.46
11.75	5.58	0.00	5.58
12.00	**12.74**	0.00	**12.74**
12.25	**17.72**	0.00	**17.72**
12.50	9.20	0.00	9.20
12.75	4.55	0.00	4.55
13.00	2.96	0.00	2.96
13.25	2.43	0.00	2.43
13.50	2.10	0.00	2.10
13.75	1.87	0.00	1.87
14.00	1.69	0.00	1.69
14.25	1.55	0.00	1.55
14.50	1.43	0.00	1.43
14.75	1.33	0.00	1.33
15.00	1.25	0.00	1.25
15.25	1.18	0.00	1.18
15.50	1.12	0.00	1.12
15.75	1.07	0.00	1.07
16.00	1.02	0.00	1.02
16.25	0.98	0.00	0.98
16.50	0.94	0.00	0.94
16.75	0.90	0.00	0.90
17.00	0.87	0.00	0.87
17.25	0.84	0.00	0.84
17.50	0.81	0.00	0.81
17.75	0.79	0.00	0.79
18.00	0.77	0.00	0.77
18.25	0.74	0.00	0.74
18.50	0.72	0.00	0.72
18.75	0.71	0.00	0.71
19.00	0.69	0.00	0.69
19.25	0.67	0.00	0.67
19.50	0.66	0.00	0.66
19.75	0.64	0.00	0.64
20.00	0.63	0.00	0.63

Appendix B: Calculations

4996.26 ELP Marlborough Solar **Date: 8/7/24 TSB C&A #4996.26**
Concrete Equipment Pad TR-55 Calcs within DA-1P

1-year, 24 hour storm	INPUTS FROM TR-55 PRINTOUT					RESULTS USING CH. 2 TR-55 MANUAL				
	A (acres)	CN	Tc (hr)	P	q (cfs)	Ia	Ia/P	Q (in)	Vr (ac.ft)	Vr (cu.ft)
Pre-construction	0.04	78	0.10	2.61	0.05	0.56	0.22	0.86	0.00	125
Post -construction	0.04	98	0.10	2.61	0.14	0.04	0.02	2.38	0.01	346
										221

10-year, 24 hour storm	INPUTS FROM TR-55 PRINTOUT					RESULTS USING CH. 2 TR-55 MANUAL				
	A (acres)	CN	Tc	P	q (cfs)	Ia	Ia/P	Q (in)	Vr (ac.ft)	Vr (cu.ft)
Pre-construction	0.04	78	0.10	4.65	0.14	0.56	0.12	2.42	0.01	351
Post -construction	0.04	98	0.10	4.65	0.23	0.04	0.01	4.41	0.01	641
										290

25-year, 24 hour storm	INPUTS FROM TR-55 PRINTOUT					RESULTS USING CH. 2 TR-55 MANUAL				
	A (acres)	CN	Tc	P	q (cfs)	Ia	Ia/P	Q (in)	Vr (ac.ft)	Vr (cu.ft)
Pre-construction	0.04	78	0.10	5.81	0.19	0.56	0.10	3.41	0.01	495
Post -construction	0.04	98	0.10	5.81	0.28	0.04	0.01	5.57	0.02	809
										314

100-year, 24 hour storm	INPUTS FROM TR-55 PRINTOUT					RESULTS USING CH. 2 TR-55 MANUAL				
	A (acres)	CN	Tc	P	q (cfs)	Ia	Ia/P	Q (in)	Vr (ac.ft)	Vr (cu.ft)
Pre-construction	0.04	78.0	0.10	8.15	0.30	0.56	0.07	5.53	0.02	803
Post -construction	0.04	98.0	0.10	8.15	0.37	0.04	0.01	7.91	0.03	1149
										346

storage calculations	q_o/q_i	V_s/V_r*	Vs (ac-ft)
WQv	N/A	N/A	0.0044
1-yr/24 hour (Cpv)	0.4	0.342	0.0031
10-yr/24 hr(Qp)	0.609	0.230	0.0039
25-yr/24-hr (Flood Protection)	0.679	0.204	0.0044
100-yr/24-hr(Qf))	0.811	0.153	0.0046

FORMULAS USED

Ia= (200/CN) - 2

S= (1000/CN) - 10

Q= (P -I a)^ /(P - Ia) - S

Vr= (Q) (A)/12

*Refer to Table 6-1 in TR-55 Manual or Table 8.6 in NYS Stormwater Design Manual to find vs/vr when qo/qi is known. Table is derived from equation:
$vs/vr=0.682-1.43(qo/qi)+1.64(qo/qi)^2- 0.804(qo/qi)^3$

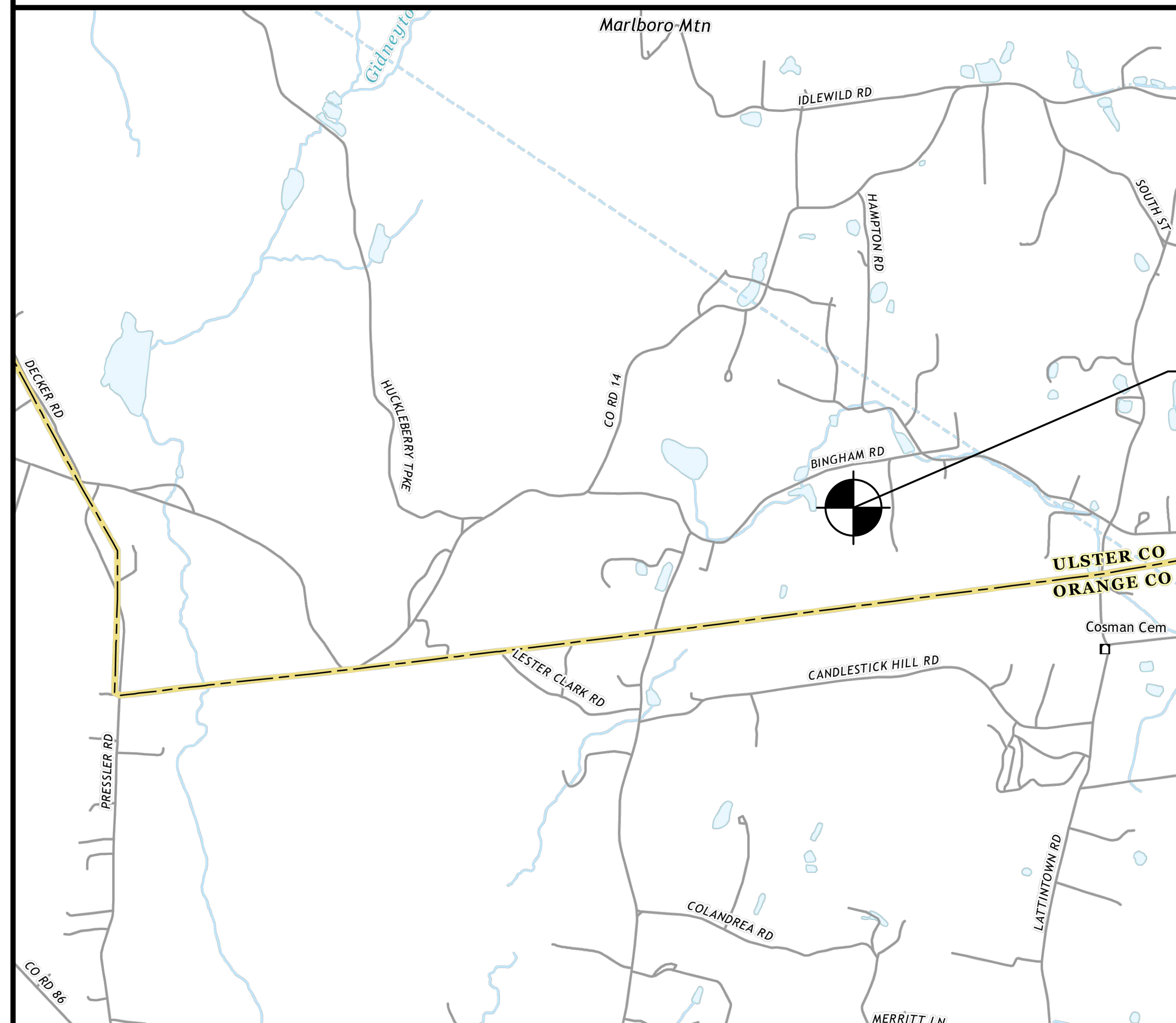
WQv = (PRvA)/12
Rv=0.05+0.009(I)

site, post construction

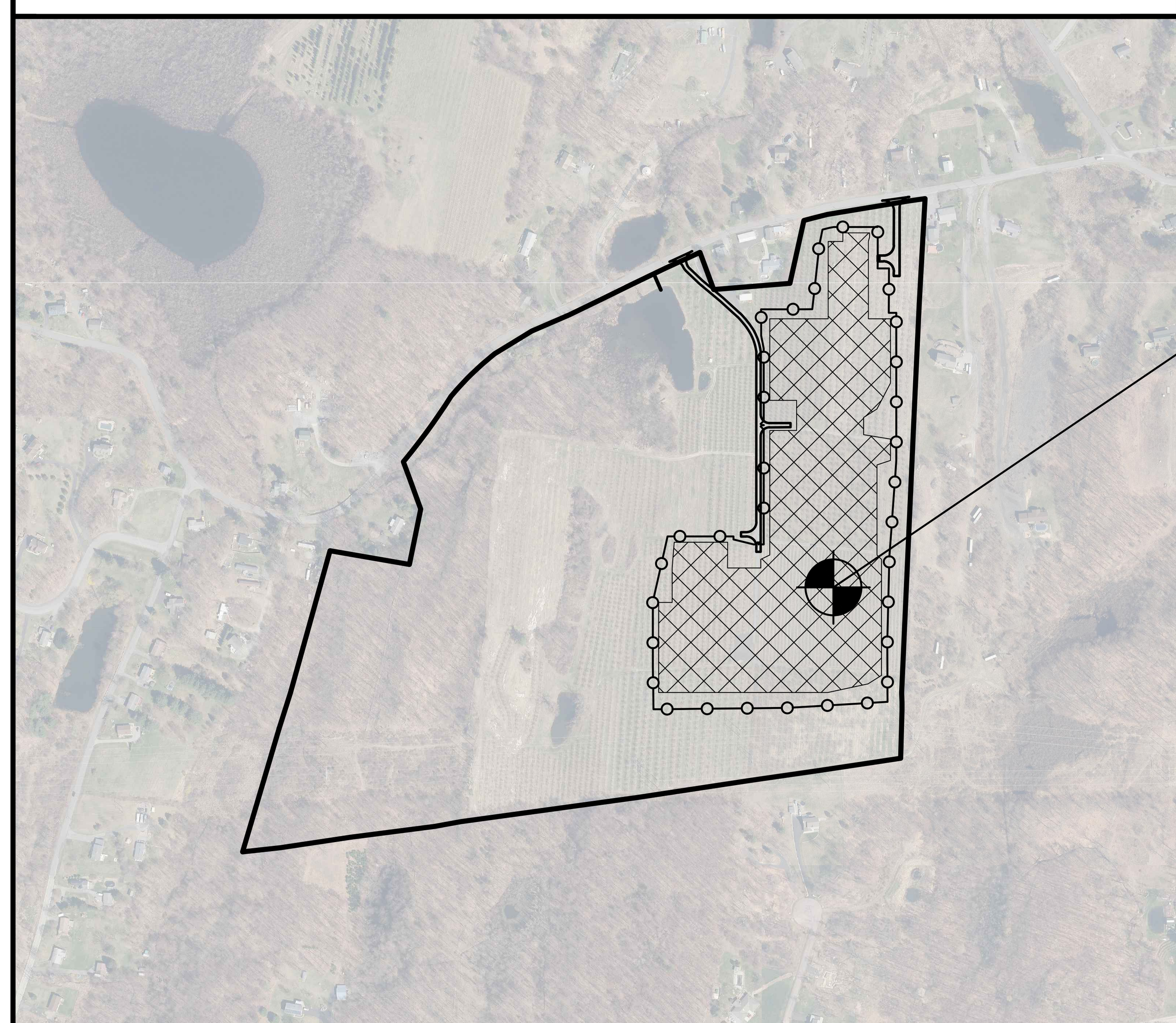
Square Ft.	1,742
Square Ft., Impervious area	1,742
Square ft, Semi-pervious	0
A (Acreage)	0.04
I (Impervious Area, %)	100.000
P (from 90% map)	1.40
Rv=	0.95
(acre-ft) WQv=	0.00

Appendix C: Drawings

LOCATION MAP SCALE: 1"=2000'



LOCATION MAP SCALE: 1"=500'



ELP MARLBOROUGH SOLAR

SITE ADDRESS: 335 BINGHAM ROAD, MARLBOROUGH, NY 12542
TAX MAP ID: 108.3-3-21
PROPOSED USE: LARGE SCALE SOLAR ENERGY SYSTEM (5MW-AC)

DEVELOPER:

ELP MARLBOROUGH SOLAR LLC
14 ARROW STREET, SUITE 22
CAMBRIDGE, MA 02138

ENGINEER:

CRAWFORD & ASSOCIATES
ENGINEERING & LAND SURVEYING, PC
1 Hudson City Centre #300, Hudson New York 12534 tel: (518) 828-2700
www.crawfordandassociates.com fax: (518) 828-2723

C&A #: 4996.26

DATE: APRIL 5, 2024
REVISED: JULY 3, 2024
REVISED: SEPTEMBER 6, 2024
REVISED: OCTOBER 25, 2024
REVISED: NOVEMBER 22, 2024

DRAWINGS:

LEGEND

- EXISTING PROPERTY LINE
- PROPOSED LOT LINE
- EXISTING/PROPOSED EASEMENT / RIGHT OF WAY
- EXISTING/PROPOSED ZONING SETBACK
- EXISTING/PROPOSED ZONING / JURISDICTIONAL BOUNDARY
- PROPOSED LIMITS OF DISTURBANCE
- STA — EXISTING SURVEY STATION (HORIZONTAL DATUM)
- BM 1208.50 — EXISTING SURVEY BENCHMARK (VERTICAL DATUM)
- 1208 — EXISTING CONTOUR MINOR INTERVAL
- 1210 — EXISTING CONTOUR MAJOR INTERVAL
- 1208 — PROPOSED CONTOUR MINOR INTERVAL
- 1210 — PROPOSED CONTOUR MAJOR INTERVAL
- 1208.75 / 1210.25 — EXISTING/PROPOSED SPOT ELEVATION
- EXISTING SOILS
- PT1 — EXISTING SOIL PERCOLATION TEST
- DT1 — EXISTING SOIL DEEP TEST PIT
- SB1 — EXISTING SOIL BORING
- EXISTING WATERBODY
- PROPOSED WATERBODY
- EXISTING FLOODWAY
- EXISTING 100 YEAR FLOODPLAIN
- EXISTING 500 YEAR FLOODPLAIN
- EXISTING FEDERAL WETLAND BOUNDARY
- EXISTING STATE WETLAND BOUNDARY
- EXISTING STATE WETLAND 100' ADJACENT AREA
- EXISTING STATE WETLAND 500' CHECKZONE
- EXISTING WETLAND HATCH
- PROPOSED WETLAND/100' ADJACENT AREA IMPACT HATCH
- PROPOSED WETLAND MITIGATION HATCH
- PRE/POST- DEVELOPMENT DRAINAGE AREAS
- PRE/POST- DEVELOPMENT TIME OF CONCENTRATION
- EXISTING/PROPOSED SWALE CENTERLINE
- ST — EXISTING/PROPOSED CULVERT W/ FLARED END SECTION
- ST — EXISTING/PROPOSED STORMWATER LINE
- CB — EXISTING/PROPOSED STORMWATER CATCH BASIN
- MH — EXISTING/PROPOSED STORMWATER MANHOLE
- YD — EXISTING/PROPOSED STORMWATER YARD DRAIN
- PROPOSED SILT FENCE
- PROPOSED FILTER SOCK
- EXISTING/PROPOSED TREELINE
- EXISTING/PROPOSED CONIFER TREE
- EXISTING/PROPOSED DECIDUOUS TREE
- EXISTING/PROPOSED RAILROAD TRACK
- EXISTING/PROPOSED ROAD EDGE
- EXISTING/PROPOSED ROAD CENTERLINE
- EXISTING/PROPOSED ROAD FOGLINE
- EXISTING/PROPOSED PARKING LOT EDGE
- EXISTING/PROPOSED PARKING LOT STRIPING
- EXISTING/PROPOSED DRIVEWAY
- EXISTING/PROPOSED PAVEMENT HATCH
- EXISTING/PROPOSED SIDEWALK
- EXISTING/PROPOSED CURB
- EXISTING/PROPOSED SIGN
- EXISTING/PROPOSED FENCE
- EXISTING/PROPOSED BOLLARD
- EXISTING/PROPOSED UTILITY MARKER
- EXISTING/PROPOSED STONE WALL
- EXISTING/PROPOSED CONCRETE
- EXISTING BUILDING
- PROPOSED BUILDING
- RW — EXISTING/PROPOSED RAW WATER LINE
- W — EXISTING/PROPOSED WATER LINE
- W — EXISTING/PROPOSED WATER WELL
- H — EXISTING/PROPOSED WATER HYDRANT
- S — EXISTING/PROPOSED SANITARY SEWER LINE
- FM — EXISTING/PROPOSED SANITARY FORCEMAIN
- S — EXISTING/PROPOSED SANITARY SEWER MANHOLE
- CO — EXISTING/PROPOSED SANITARY SEWER CLEANOUT
- E — EXISTING/PROPOSED ELECTRIC
- DC — EXISTING/PROPOSED DIRECT CURRENT ELECTRIC
- OE — EXISTING/PROPOSED OVERHEAD ELECTRIC
- UE — EXISTING/PROPOSED UNDERGROUND ELECTRIC
- D — EXISTING/PROPOSED DATA/COMM ELECTRIC
- EXISTING/PROPOSED UTILITY POLE
- T — EXISTING/PROPOSED ELECTRIC TRANSFORMER
- PB — EXISTING/PROPOSED ELECTRIC PULL BOX
- G — EXISTING/PROPOSED NATURAL GAS LINE
- P — EXISTING/PROPOSED PROPANE LINE
- U — EXISTING/PROPOSED UNDERGROUND UTILITY
- M — EXISTING/PROPOSED UTILITY METER
- R — EXISTING/PROPOSED UTILITY REGULATOR
- EXISTING/PROPOSED UTILITY VALVE
- EXISTING/PROPOSED UTILITY CHECK VALVE
- PROPOSED SCREENING STRIP HATCH
- PROPOSED LEVEL SPREADER

SITE PLAN NOTES:

1. ORTHOGRAPHIC IMAGERY DOWNLOADED FROM NYS GIS CLEARINGHOUSE. IMAGERY PUBLISHED SEPTEMBER 2023, ACCESSED BY C&A NOVEMBER 2023.
2. BACKGROUND DRAWING & TOPOGRAPHIC CONTOURS TAKEN FROM SURVEY TITLED "MAP OF A PORTION OF LANDS OF TRUNCALI PREPARED FOR ELP MARLBOROUGH SOLAR LLC, SBL:108.3-3-21, ULSTER COUNTY, STATE OF NY" DATED APRIL 22, 2024, PREPARED BY CONTROL POINT ASSOCIATES, INC., P.C.
3. ADJACENT PROPERTY BOUNDARIES DOWNLOADED FROM ULSTER COUNTY GIS DATABASE IN AUGUST 2023. SELECT BOUNDARIES ADJUSTED BY C&A TO REFLECT EXPECTED LOCATIONS OF INTERSECTION WITH SURVEYED BOUNDARY LINE.
4. EXISTING SITE FEATURES SUCH AS BUILDING LOCATIONS, DRIVEWAYS, ROADS, OVERHEAD UTILITIES, AND TREELINES OUTSIDE SURVEY AREA ESTIMATED FROM ORTHOGRAPHIC IMAGERY.
5. NWI POTENTIAL WETLAND BOUNDARIES DOWNLOADED FROM NATIONAL WETLANDS INVENTORY, ACCESSED NOVEMBER 2023.
6. FEMA NFHL CHECKED IN JANUARY 2024 AND NO FLOOD HAZARDS WERE IDENTIFIED WITHIN THE PROJECT AREA. PROJECT FALLS WITHIN FIRM PANEL #36111C0900F.
7. PROPOSED SOLAR FACILITY LAYOUT FROM DRAWING TITLED "PRELIMINARY PV SITE PLAN" PREPARED BY CS ENERGY DATED MARCH 2, 2023, AMENDED BY C&A PER VCR MARKUP PROVIDED ON 8/23/24.

PROPOSED SITE PLAN NOTES:

1. THE PROPOSED SOLAR ENERGY SYSTEM INSTALLATION SHALL BE PERFORMED BY A QUALIFIED SOLAR INSTALLER.
2. THE PROPOSED SOLAR ENERGY SYSTEM WILL MEET NEW YORK'S UNIFORM FIRE PREVENTION AND BUILDING CODE AND NATIONAL ELECTRICAL CODE STANDARDS.
3. PRIOR TO OPERATION OF THE SOLAR ENERGY SYSTEM, WRITTEN PROOF THAT ELECTRICAL CONNECTIONS HAVE BEEN INSPECTED AND APPROVED BY AN APPROPRIATE ELECTRICAL INSPECTION PERSON OR AGENCY, AS DETERMINED BY THE TOWN OF MARLBOROUGH WILL BE PROVIDED.
4. A MAP SHOWING THE LOCATIONS OF THE MAJOR COMPONENTS OF THE SOLAR SYSTEM INCLUDING THE LOCATION OF THE ARRAY, EQUIPMENT PADS, MAIN TRENCH LOCATIONS, AND DISCONNECTS SHALL BE POSTED AT THE FACILITIES ENTRANCE AND PROVIDED TO THE LOCAL FIRE DEPARTMENT OBLIGATED TO RESPOND TO A CALL AT THE FACILITY.
5. THE SOLAR PANELS SHALL NOT EXCEED 15' IN HEIGHT.
6. BUILDING SETBACK REQUIREMENTS SHALL BE AS STATED FOR THE RAG-1 (RURAL AGRICULTURAL DISTRICT) AS SHOWN IN THE ZONING TABLE BELOW. INVERTERS SHALL BE SET BACK THE LESSER OF 100 FEET OR UNTIL THE ELECTROMAGNETIC FIELD (EMF) MEETS BACKGROUND LEVEL, AS DETERMINED BY THE WORLD HEALTH ORGANIZATION (WHO).
7. COMMERCIAL SOLAR FACILITY'S AREA OF USE, AS DEFINED IN CODE SECTION 155-32.2 (B) EQUATES TO APPROXIMATELY 16.2 ACRES.
8. NONINVASIVE GROUND COVER UNDER AND BETWEEN THE ROWS OF SOLAR PANELS SHALL BE LOW-MAINTENANCE, DROUGHT-RESISTANT, AND NON-FERTILIZER-DEPENDENT. SEE SEEDING PLAN ON C-501 FOR MORE DETAILS.
9. THE SOLAR ENERGY SYSTEM SHALL BE ENCLOSED BY A MINIMUM 8' TALL PERIMETER FENCE AND SHALL BE AN AGRICULTURAL STYLE FENCE CONSISTING OF WOODEN POSTS AND WOVEN WIRE. WARNING SIGNS WITH THE OWNER'S CONTACT INFORMATION WILL BE PLACED ON THE ENTRANCE AND PERIMETER OF THE FENCING.
10. A SIGN NO GREATER THAN TWO SQUARE FEET INDICATING THE NAME OF THE FACILITY OWNER(S) AND A TWENTY-FOUR-HOUR EMERGENCY TELEPHONE NUMBER SHALL BE POSTED. IN ADDITION, "NO TRESPASSING" OR OTHER WARNING SIGNS MAY BE POSTED.
11. THE OWNER WILL BE RESPONSIBLE FOR UPKEEP OF THE SOLAR FACILITY, INCLUDING ALL NECESSARY MAINTENANCE OF THE SYSTEM & PROPERTY INCLUDING MOWING AND TRIMMING IN AND AROUND THE FACILITY.
12. THE OWNER SHALL PREPARE AND COMPLY WITH A DECOMMISSIONING PLAN AS DETAILED IN THE TOWN OF MARLBOROUGH, NY SUPPLEMENTARY REGULATIONS SECTION 155-32.2J.
13. ALL TEMPORARILY STOCKPILED MATERIAL GENERATED BY CONSTRUCTION OF THE FACILITY WILL BE REMOVED FROM THE SITE IN A TIMELY MANNER.

E&SC PLAN AND CONSTRUCTION NOTES:

1. CONSTRUCTION SHALL NOT COMMENCE UNTIL APPROPRIATE PERMIT COVERAGE HAS BEEN OBTAINED UNDER NYSDEC SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITY, GP-0-20-001.
2. TOTAL LIMITS OF DISTURBANCE (LOD), AS SHOWN, TOTALS 21.91 ACRES. LOD INCLUDES LAND CLEARING/GRUBBING, MINOR GRADING FOR ACCESS DRIVE AND EQUIPMENT PADS, TRENCHING, AND TEMPORARY E&SC MEASURES.
3. CONSTRUCTION SHALL BE COMMENCED IN ACCORDANCE WITH THE PHASING PLAN TO LIMIT DISTURBANCE OF GREATER THAN 5 ACRES, PER PHASE:
   - 3.1. PHASE 1: APPROXIMATELY 4.85 ACRES OF DISTURBANCE, NOT LIMITED TO BUT INCLUDING: ESTABLISHMENT OF E&SC MEASURES (STABILIZED CONSTRUCTION ENTRANCE, SILT FENCE, FILTER SOCK, ETC.), CLEARING/GRUBBING OF EXISTING TREES AND SHRUBS, INSTALLATION OF TEMPORARY LAYDOWN AREA, ACCESS DRIVE, UNDERGROUND ELECTRIC, UTILITY POLES, EQUIPMENT PADS AND PANEL ARRAY.
   - 3.2. PHASE 2: APPROXIMATELY 4.87 ACRES OF DISTURBANCE, NOT LIMITED TO BUT INCLUDING: CLEARING/GRUBBING OF EXISTING TREES AND SHRUBS, INSTALLATION OF UNDERGROUND ELECTRIC AND PANEL ARRAY.
   - 3.3. PHASE 3: APPROXIMATELY 4.72 ACRES OF DISTURBANCE, NOT LIMITED TO BUT INCLUDING: CLEARING/GRUBBING OF EXISTING TREES AND SHRUBS, INSTALLATION OF UNDERGROUND ELECTRIC AND PANEL ARRAY.
   - 3.4. PHASE 4: APPROXIMATELY 2.96 ACRES OF DISTURBANCE, NOT LIMITED TO BUT INCLUDING: CLEARING/GRUBBING OF EXISTING TREES AND SHRUBS, INSTALLATION OF UNDERGROUND ELECTRIC AND PANEL ARRAY.
   - 3.5. PHASE 5: APPROXIMATELY 4.54 ACRES OF DISTURBANCE, NOT LIMITED TO BUT INCLUDING: CLEARING/GRUBBING OF EXISTING TREES AND SHRUBS, INSTALLATION OF UNDERGROUND ELECTRIC, PANEL ARRAY AND FINAL STABILIZATION OF THE SITE.
4. EACH PHASE SHALL BE TEMPORARILY STABILIZED BEFORE PROCEEDING TO A SUBSEQUENT PHASE.
5. THE TEMPORARY E&SC PLAN MEASURES SHOWN HEREIN, SHALL BE PUT IN PLACE AT THE BEGINNING OF CONSTRUCTION AND REMOVED UPON FINAL STABILIZATION OF THE SITE.
6. CONSTRUCTION OF THE PANEL ARRAYS SHALL BE COMPLETED IN SUCH A WAY THAT NULLIFIES DISTURBANCE AND/OR COMPACTION OF THE IN-SITU LAND COVER (I.E. TRACKED VEHICLE TRAVELING IN AND OUT OF ROWS IS RECOMMENDED). EXISTING GROUND COVER IN THE AREA OF THE PANEL ARRAY SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION.
7. ALL DISTURBED AREAS SHALL BE SEEDED AND MULCHED AS DETAILED IN THE SEEDING PLAN ON DRAWING C-501.
8. THE TEMPORARY PARKING AND STAGING AREA FOR CONSTRUCTION EQUIPMENT AND MATERIALS SHALL CONSISTS OF STONE DUST OR A SIMILAR MATERIAL. UPON COMPLETION OF CONSTRUCTION, THE STONE DUST, OR SIMILAR, SHALL BE REMOVED UP TO BUT NOT INCLUDING REMOVAL OF THE COVERED TOPSOIL. THE AREA SHALL BE SEEDED AND MULCHED ACCORDING TO THE SEED AND MULCH SPECIFICATIONS DETAILED ON THE E&SC NOTES SHEET.

SITE DATA / ZONING SUMMARY

TAX ID NUMBER: 108.3-3-21 (+/- 80 ACRES)

ZONING DISTRICT	RAG-1 (RURAL AGRICULTURAL DISTRICT)	
USE CLASSIFICATION	LARGE SCALE SOLAR ENERGY SYSTEM (5 MW-AC)	
	REQUIRED	PROPOSED
MINIMUM LOT SIZE	1 ACRE	+/- 80 ACRES
LOT COVERAGE, MAX.	50%[1]	10.5%[3]
LOT WIDTH (FT)	150'	1845'
LOT DEPTH (FT)	200'	1480'
BUILDING HEIGHT (FT), MAX	15'[1]	<15'
YARD SETBACKS - MINIMUM (FT)		
FRONT	50'	50'[2]
SIDE (ONE)	35'	35'
SIDE (BOTH)	80'	80'
REAR	75'	>100'

[1] REQUIREMENT ALTERED FROM ZONING SCHEDULE I "LOT, YARD, AND HEIGHT REGULATIONS" PER TOWN OF MARLBOROUGH CODE 155-32.2I "STANDARDS FOR LARGE-SCALE SOLAR SYSTEMS AS A SPECIAL USE".

[2] AN EXISTING, NON-CONFORMING, BUILDING TO REMAIN IS LOCATED APPROXIMATELY 24' FROM THE BOUNDARY LINE. THE PROPOSED SOLAR PROJECT SHALL RESPECT THE 50' ZONING SETBACK.

[3] PROPOSED LOT COVERAGE CALCULATION INCLUDES PROPOSED DRIVEWAYS, CONCRETE EQUIPMENT PADS & MODULE AREA

REV #	DESCRIPTION	DATE	BY
4	REVISED PER PB COMMENT – SCREENING & HYDRANT	11/22/24	ETY

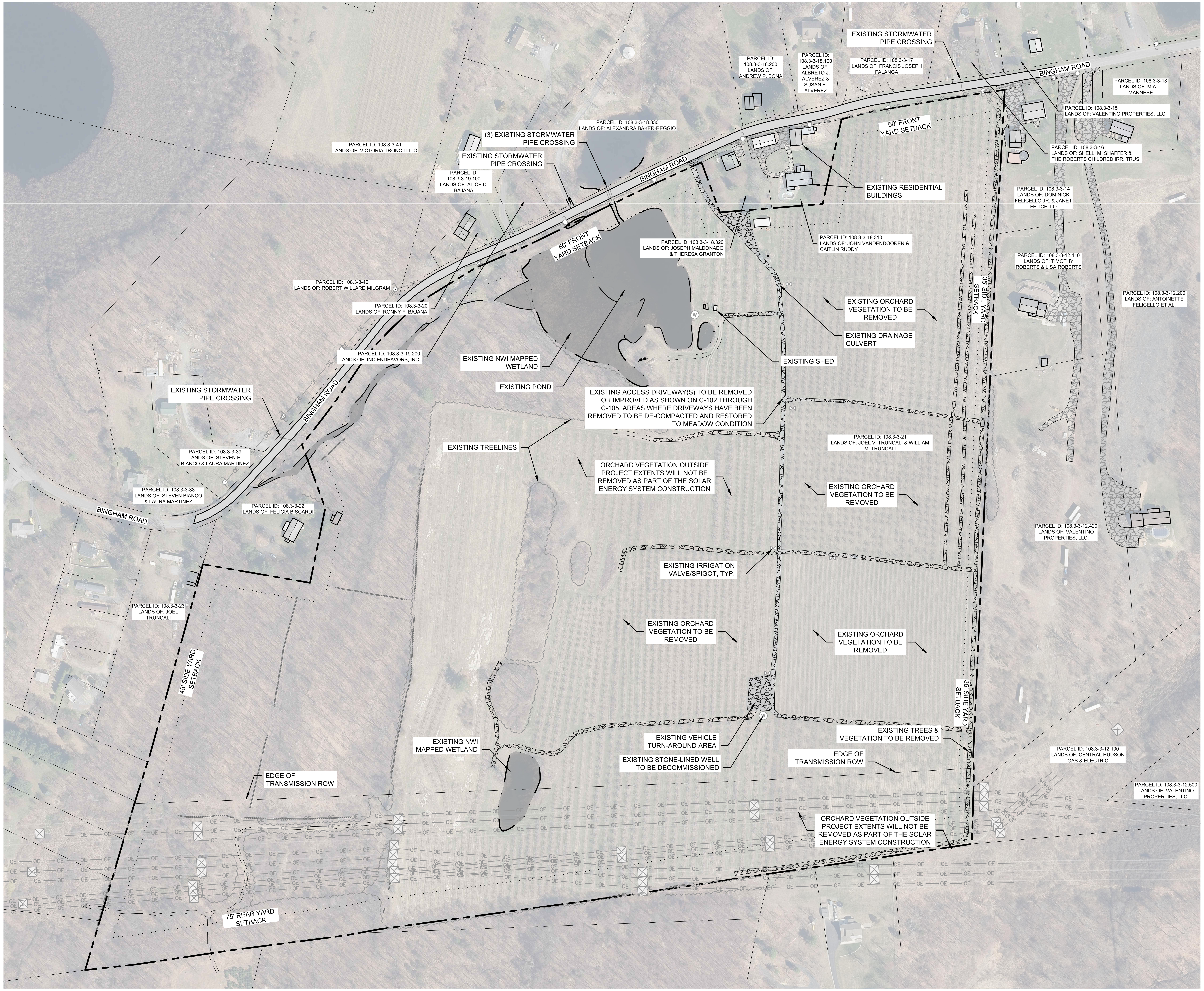
ELP MARLBOROUGH SOLAR
335 BINGHAM ROAD

TOWN OF MARLBOROUGH — ULSTER COUNTY, NY

LEGEND & NOTES

CRAWFORD & ASSOCIATES
ENGINEERING & LAND SURVEYING, PC
4411 Route 9, Suite 200, Hudson New York 12534 tel: (518) 828-2700
www.crawfordandassociates.com fax: (518) 828-2723

DATE: 4/5/2024	DRAWN BY: TSB/DPB	H:\WORK\4996.26 Marlborough\DWG\4996.26 TITLE & NOTES.dwg	
	DESIGNED BY: TSB/DPB	C&A JOB# 4996.26	DRAWING: C-002
SCALE: AS SHOWN	CHECKED BY: CJK		
	APPROVED BY: CJK		



EXISTING CONDITIONS & DEMO

SCALE: 1"=120'

GRAPHIC SCALE

120 0 60 120 240 480

(IN FEET)
1 inch = 120 ft.

NAD 83
NY STATE PLANE EAST ZONE

SITE PLAN NOTES:

1. ORTHOGRAPHIC IMAGERY DOWNLOADED FROM NYS GIS CLEARINGHOUSE. IMAGERY PUBLISHED SEPTEMBER 2023, ACCESSED BY C&A NOVEMBER 2023.
2. BACKGROUND DRAWING & TOPOGRAPHIC CONTOURS TAKEN FROM SURVEY TITLED "MAP OF A PORTION OF LANDS OF TRUNCALI PREPARED FOR ELP MARLBOROUGH SOLAR LLC, SBL:108.3-3-21, ULSTER COUNTY, STATE OF NY" DATED APRIL 22, 2024, PREPARED BY CONTROL POINT ASSOCIATES, INC., P.C.
3. ADJACENT PROPERTY BOUNDARIES DOWNLOADED FROM ULSTER COUNTY GIS DATABASE IN AUGUST 2023. SELECT BOUNDARIES ADJUSTED BY C&A TO REFLECT EXPECTED LOCATIONS OF INTERSECTION WITH SURVEYED BOUNDARY LINE.
4. EXISTING SITE FEATURES SUCH AS BUILDING LOCATIONS, DRIVEWAYS, ROADS, OVERHEAD UTILITIES, AND TREELINES OUTSIDE SURVEY AREA ESTIMATED FROM ORTHOGRAPHIC IMAGERY.
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REV #	DESCRIPTION	DATE	BY
4	REVISED PER PB COMMENT – SCREENING & HYDRANT	11/22/24	ETY

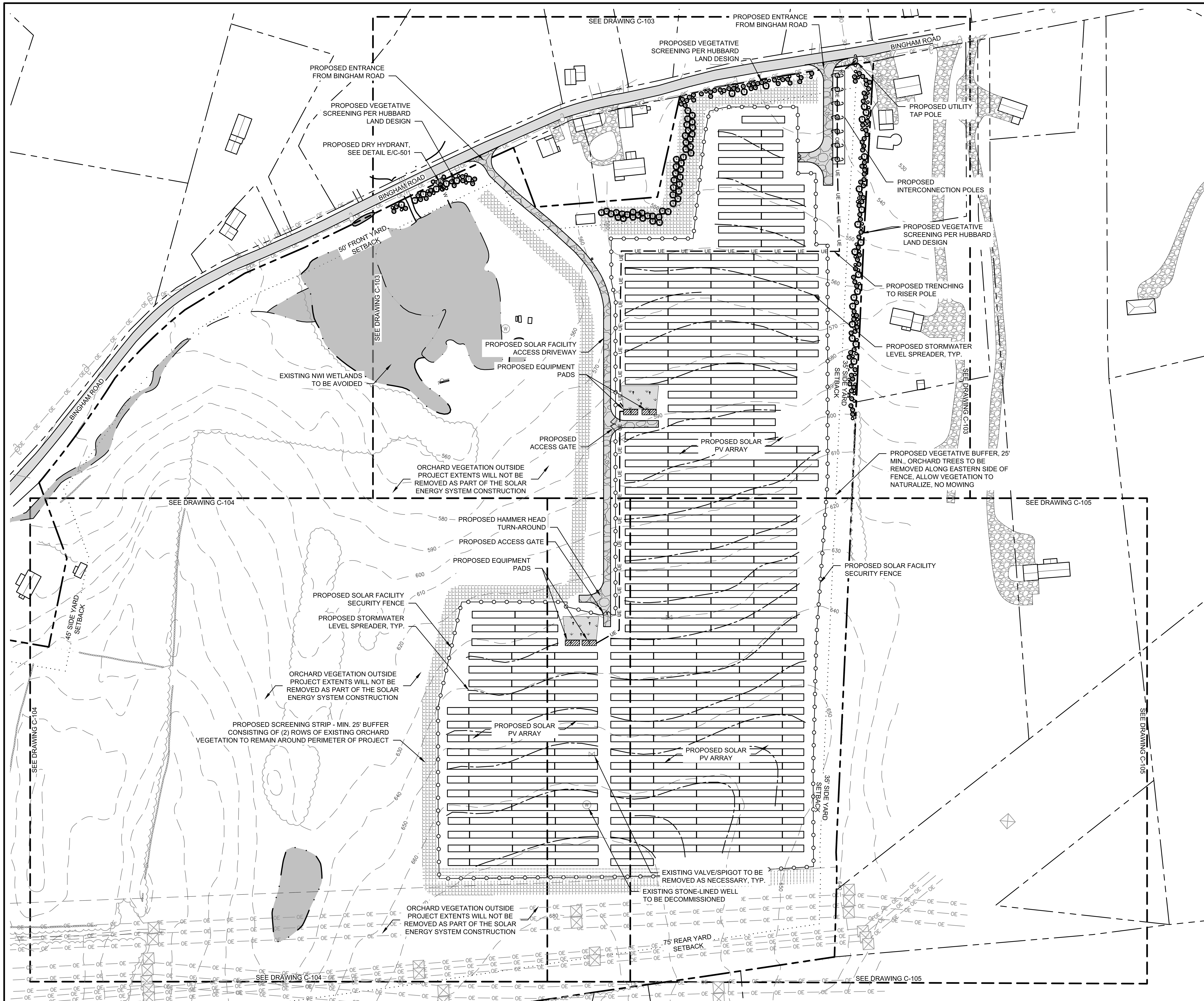
ELP MARLBOROUGH SOLAR
335 BINGHAM ROAD

TOWN OF MARLBOROUGH ULSTER COUNTY, NY

SITE PLAN
EXISTING CONDITIONS & DEMO

CRAWFORD & ASSOCIATES
ENGINEERING & LAND SURVEYING, PC
4411 Route 9, Suite 200, Hudson New York 12534 tel: (518) 828-2700
www.crawfordandassociates.com fax: (518) 828-2723

DATE 4/5/2024	DRAWN BY: TSB/DPB	H:\WORK\4996.26 Marlborough\DWG\4996.26 SITE.dwg	
	DESIGNED BY: TSB/DPB	C&A JOB# 4996.26	DRAWING: C–101
SCALE AS SHOWN	CHECKED BY: CJK		
	APPROVED BY: CJK		



PROPOSED OVERALL LAYOUT
SCALE: 1"=100'

GRAPHIC SCALE
100 0 50 100 200 400
(IN FEET)
1 inch = 100 ft.

NAD 83
NY STATE PLANE EAST ZONE

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7. COMMERCIAL SOLAR FACILITY'S AREA OF USE, AS DEFINED IN CODE SECTION 155-32.2 (B) EQUATES TO APPROXIMATELY 16.2 ACRES.
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SITE DATA / ZONING SUMMARY

TAX ID NUMBER: 108.3-3-21 (+/- 80 ACRES)

ZONING DISTRICT	RAG-1 (RURAL AGRICULTURAL DISTRICT)	
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LOT WIDTH (FT)	150'	1845'
LOT DEPTH (FT)	200'	1480'
BUILDING HEIGHT (FT), MAX	15'[1]	<15'
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FRONT	50'	50'[2]
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REV #	DESCRIPTION	DATE	BY
4	REVISED PER PB COMMENT – SCREENING & HYDRANT	11/22/24	ETY

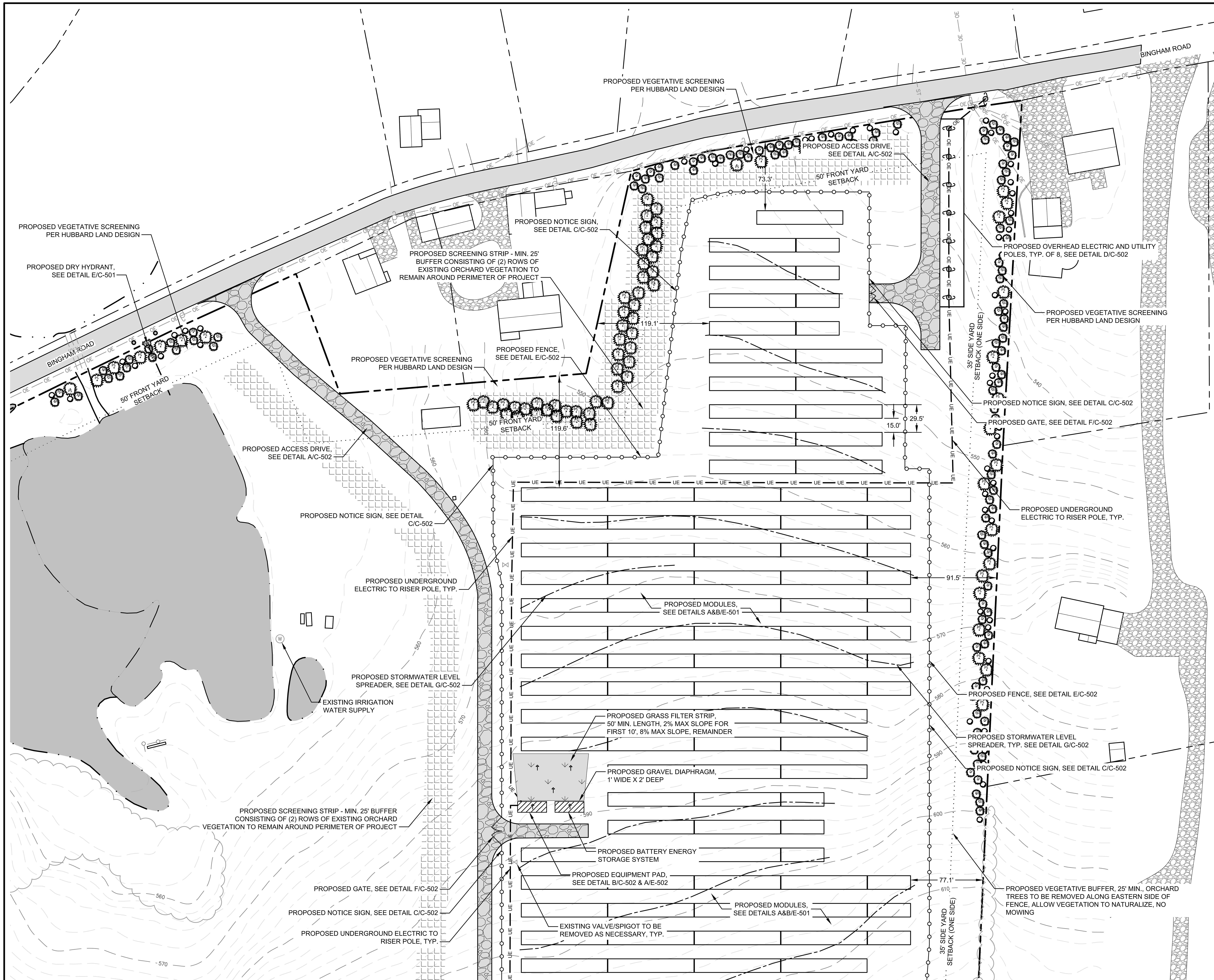
ELP MARLBOROUGH SOLAR
335 BINGHAM ROAD

TOWN OF MARLBOROUGH — ULSTER COUNTY, NY

SITE PLAN
PROPOSED OVERALL LAYOUT

CRAWFORD & ASSOCIATES
ENGINEERING & LAND SURVEYING, PC
4411 Route 9, Suite 200, Hudson New York 12534 tel: (518) 828-2700
www.crawfordandassociates.com fax: (518) 828-2723

DATE: 4/5/2024	DRAWN BY: TSB/DPB	C&A JOB#: 4996.26	DRAWING: C-102
SCALE: AS SHOWN	DESIGNED BY: TSB/DPB		
	CHECKED BY: CJK		
	APPROVED BY: CJK		



PROPOSED GRADING & UTILITIES - 1

SCALE: 1"=50'

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

NAD 83
NY STATE PLANE EAST ZONE

SITE PLAN NOTES:

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2. BACKGROUND DRAWING & TOPOGRAPHIC CONTOURS TAKEN FROM SURVEY TITLED "MAP OF A PORTION OF LANDS OF TRUNCALI PREPARED FOR ELP MARLBOROUGH SOLAR LLC, SBL:108.3-3-21, ULSTER COUNTY, STATE OF NY" DATED APRIL 22, 2024, PREPARED BY CONTROL POINT ASSOCIATES, INC., P.C.
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REV #	DESCRIPTION	DATE	BY
4	REVISED PER PB COMMENT – SCREENING & HYDRANT	11/22/24	ETY

ELP MARLBOROUGH SOLAR
335 BINGHAM ROAD

TOWN OF MARLBOROUGH — ULSTER COUNTY, NY

SITE PLAN
PROPOSED GRADING & UTILITIES - 1

CRAWFORD & ASSOCIATES
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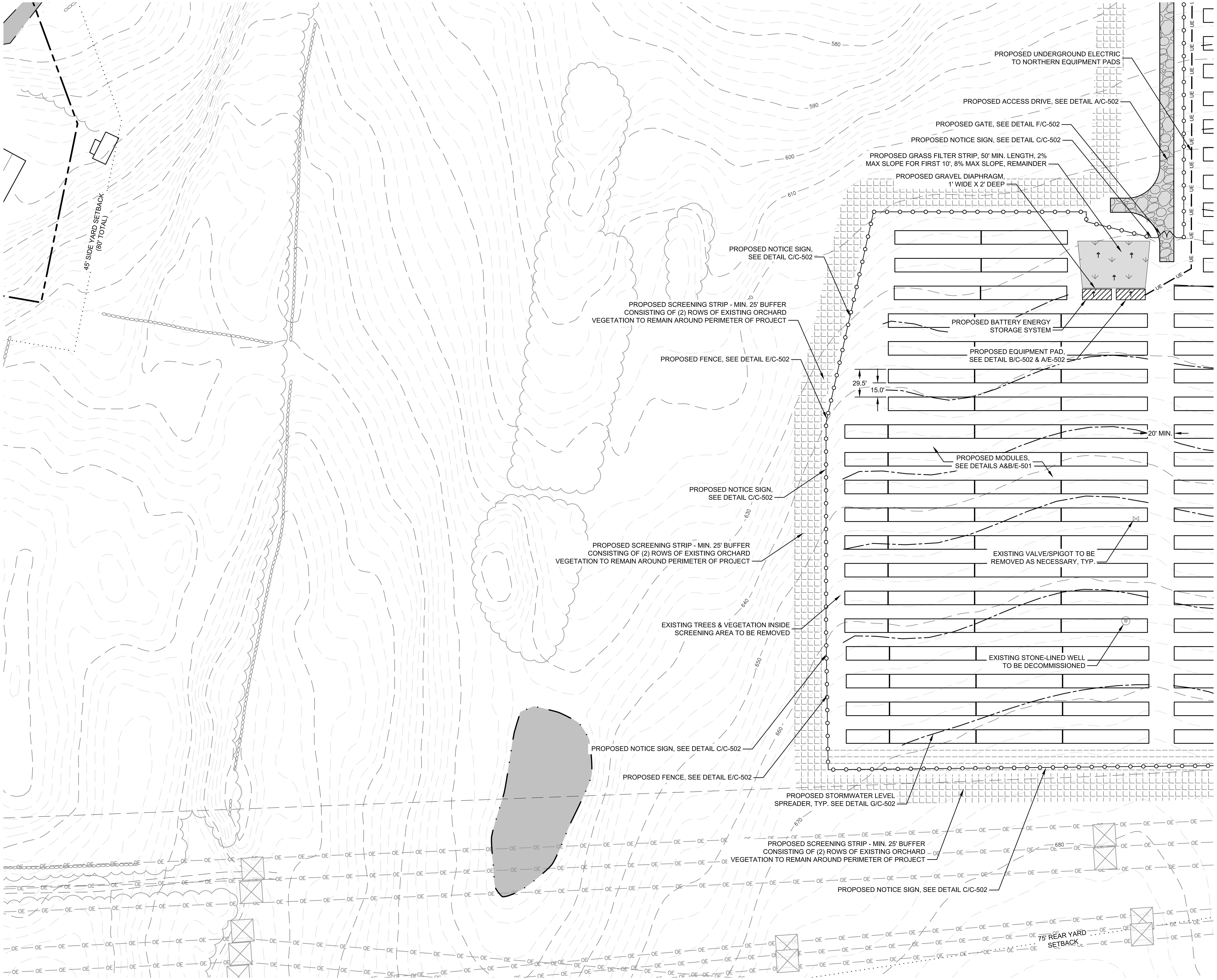
www.crawfordandassociates.com fax: (518) 828-2723

DATE 4/5/2024	DRAWN BY: TSB/DPB	H:\WORK\4996.26 Marlborough\DWG\4996.26 SITE.dwg	
	DESIGNED BY: TSB/DPB	C&A JOB# 4996.26	DRAWING: C–103
SCALE AS SHOWN	CHECKED BY: CJK		
	APPROVED BY: CJK		



PROPOSED GRADING & UTILITIES - 2

SCALE: 1"=40'

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

NAD 83
NY STATE PLANE EAST ZONE

SITE PLAN NOTES:

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PROPOSED SITE PLAN NOTES:

1. THE PROPOSED SOLAR ENERGY SYSTEM INSTALLATION SHALL BE PERFORMED BY A QUALIFIED SOLAR INSTALLER.
2. THE PROPOSED SOLAR ENERGY SYSTEM WILL MEET NEW YORK'S UNIFORM FIRE PREVENTION AND BUILDING CODE AND NATIONAL ELECTRICAL CODE STANDARDS.
3. PRIOR TO OPERATION OF THE SOLAR ENERGY SYSTEM, WRITTEN PROOF THAT ELECTRICAL CONNECTIONS HAVE BEEN INSPECTED AND APPROVED BY AN APPROPRIATE ELECTRICAL INSPECTION PERSON OR AGENCY, AS DETERMINED BY THE TOWN OF MARLBOROUGH WILL BE PROVIDED.
4. A MAP SHOWING THE LOCATIONS OF THE MAJOR COMPONENTS OF THE SOLAR SYSTEM INCLUDING THE LOCATION OF THE ARRAY, EQUIPMENT PADS, MAIN TRENCH LOCATIONS, AND DISCONNECTS SHALL BE POSTED AT THE FACILITIES ENTRANCE AND PROVIDED TO THE LOCAL FIRE DEPARTMENT OBLIGATED TO RESPOND TO A CALL AT THE FACILITY.
5. THE SOLAR PANELS SHALL NOT EXCEED 15' IN HEIGHT.
6. BUILDING SETBACK REQUIREMENTS SHALL BE AS STATED FOR THE RAG-1 (RURAL AGRICULTURAL DISTRICT) AS SHOWN IN THE ZONING TABLE BELOW. INVERTERS SHALL BE SET BACK THE LESSER OF 100 FEET OR UNTIL THE ELECTROMAGNETIC FIELD (EMF) MEETS BACKGROUND LEVEL, AS DETERMINED BY THE WORLD HEALTH ORGANIZATION (WHO).
7. COMMERCIAL SOLAR FACILITY'S AREA OF USE, AS DEFINED IN CODE SECTION 155-32.2 (B) EQUATES TO APPROXIMATELY 16.2 ACRES.
8. NONINVASIVE GROUND COVER UNDER AND BETWEEN THE ROWS OF SOLAR PANELS SHALL BE LOW-MAINTENANCE, DROUGHT-RESISTANT, AND NON-FERTILIZER-DEPENDENT. SEE SEEDING PLAN ON C-501 FOR MORE DETAILS.
9. THE SOLAR ENERGY SYSTEM SHALL BE ENCLOSED BY A MINIMUM 8' TALL PERIMETER FENCE AND SHALL BE AN AGRICULTURAL STYLE FENCE CONSISTING OF WOODEN POSTS AND WOVEN WIRE. WARNING SIGNS WITH THE OWNER'S CONTACT INFORMATION WILL BE PLACED ON THE ENTRANCE AND PERIMETER OF THE FENCING.
10. A SIGN NO GREATER THAN TWO SQUARE FEET INDICATING THE NAME OF THE FACILITY OWNER(S) AND A TWENTY-FOUR-HOUR EMERGENCY TELEPHONE NUMBER SHALL BE POSTED. IN ADDITION, "NO TRESPASSING" OR OTHER WARNING SIGNS MAY BE POSTED.
11. THE OWNER WILL BE RESPONSIBLE FOR UPKEEP OF THE SOLAR FACILITY, INCLUDING ALL NECESSARY MAINTENANCE OF THE SYSTEM & PROPERTY INCLUDING MOWING AND TRIMMING IN AND AROUND THE FACILITY.
12. THE OWNER SHALL PREPARE AND COMPLY WITH A DECOMMISSIONING PLAN AS DETAILED IN THE TOWN OF MARLBOROUGH, NY SUPPLEMENTARY REGULATIONS SECTION 155-32.2J.
13. ALL TEMPORARILY STOCKPILED MATERIAL GENERATED BY CONSTRUCTION OF THE FACILITY WILL BE REMOVED FROM THE SITE IN A TIMELY MANNER.

REV #	DESCRIPTION	DATE	BY
4	REVISED PER PB COMMENT - SCREENING & HYDRANT	11/22/24	ETY

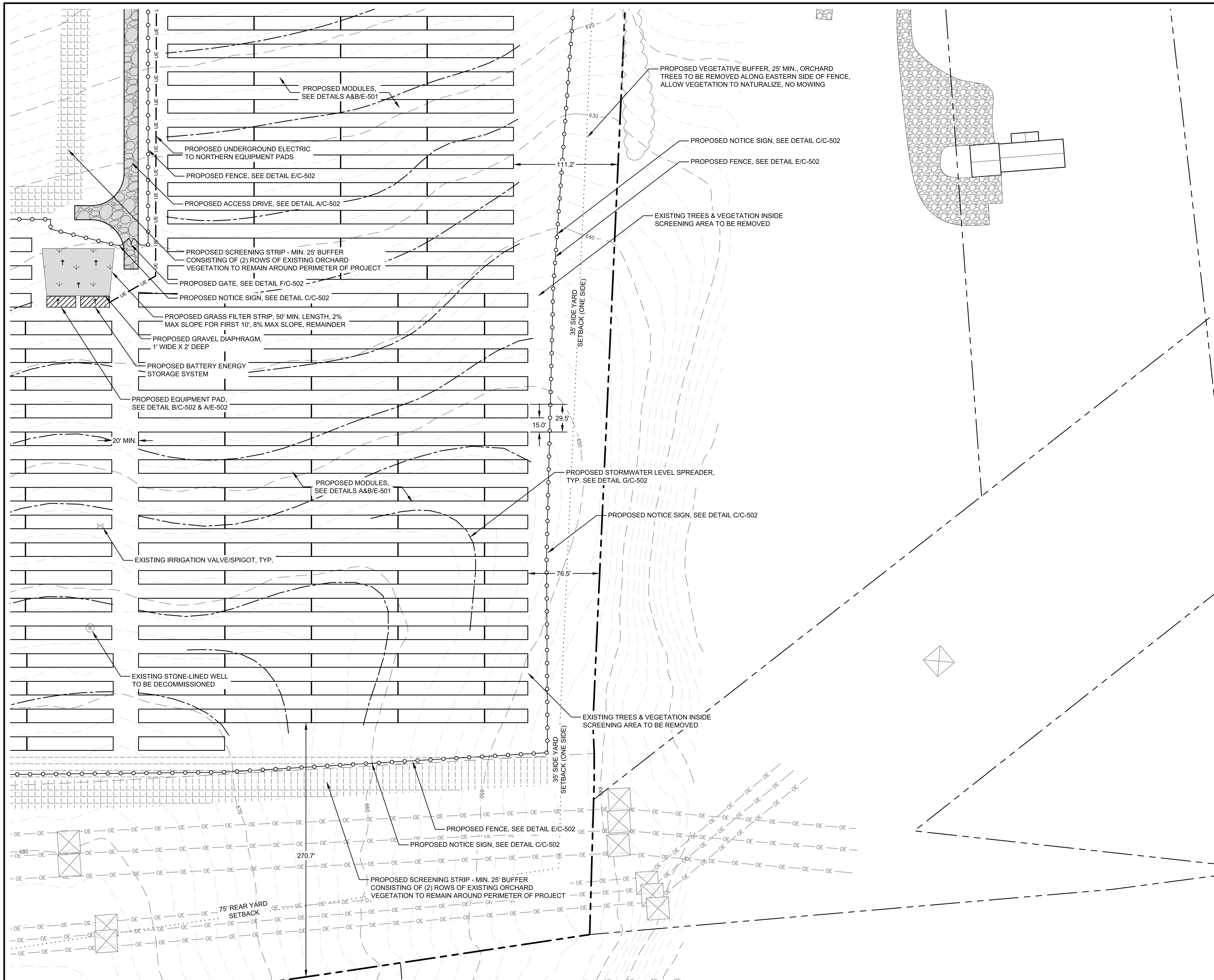
ELP MARLBOROUGH SOLAR
335 BINGHAM ROAD

TOWN OF MARLBOROUGH — ULSTER COUNTY, NY

SITE PLAN
PROPOSED GRADING & UTILITIES - 2

CRAWFORD & ASSOCIATES
ENGINEERING & LAND SURVEYING, PC
4411 Route 9, Suite 200, Hudson New York 12534 tel: (518) 828-2700 fax: (518) 828-2723
www.crawfordandassociates.com

DATE	DRAWN BY: TSB/DPB	C&A JOB#	DRAWING:
4/5/2024	DESIGNED BY: TSB/DPB	4996.26	C-104
SCALE	CHECKED BY: CJK		
AS SHOWN	APPROVED BY: CJK		



PROPOSED GRADING & UTILITIES - 3

SCALE: 1"=40'

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

NAD 83
NY STATE PLANE EAST ZONE

SITE PLAN NOTES:

1. ORTHOGRAPHIC IMAGERY DOWNLOADED FROM NYS GIS CLEARINGHOUSE. IMAGERY PUBLISHED SEPTEMBER 2023, ACCESSED BY C&A NOVEMBER 2023.
2. BACKGROUND DRAWING & TOPOGRAPHIC CONTOURS TAKEN FROM SURVEY TITLED "MAP OF A PORTION OF LANDS OF TRUNCALI PREPARED FOR ELP MARLBOROUGH SOLAR LLC, SBL:108.3-3-21, ULSTER COUNTY, STATE OF NY" DATED APRIL 22, 2024, PREPARED BY CONTROL POINT ASSOCIATES, INC., P.C.
3. ADJACENT PROPERTY BOUNDARIES DOWNLOADED FROM ULSTER COUNTY GIS DATABASE IN AUGUST 2023. SELECT BOUNDARIES ADJUSTED BY C&A TO REFLECT EXPECTED LOCATIONS OF INTERSECTION WITH SURVEYED BOUNDARY LINE.
4. EXISTING SITE FEATURES SUCH AS BUILDING LOCATIONS, DRIVEWAYS, ROADS, OVERHEAD UTILITIES, AND TREELINES OUTSIDE SURVEY AREA ESTIMATED FROM ORTHOGRAPHIC IMAGERY.
5. NWI POTENTIAL WETLAND BOUNDARIES DOWNLOADED FROM NATIONAL WETLANDS INVENTORY, ACCESSED NOVEMBER 2023.
6. FEMA NFHL CHECKED IN JANUARY 2024 AND NO FLOOD HAZARDS WERE IDENTIFIED WITHIN THE PROJECT AREA. PROJECT FALLS WITHIN FIRM PANEL #36111C0900F.
7. PROPOSED SOLAR FACILITY LAYOUT FROM DRAWING TITLED "PRELIMINARY PV SITE PLAN" PREPARED BY CS ENERGY DATED MARCH 2, 2023, AMENDED BY C&A PER VCR MARKUP PROVIDED ON 8/23/24.

PROPOSED SITE PLAN NOTES:

1. THE PROPOSED SOLAR ENERGY SYSTEM INSTALLATION SHALL BE PERFORMED BY A QUALIFIED SOLAR INSTALLER.
2. THE PROPOSED SOLAR ENERGY SYSTEM WILL MEET NEW YORK'S UNIFORM FIRE PREVENTION AND BUILDING CODE AND NATIONAL ELECTRICAL CODE STANDARDS.
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12. THE OWNER SHALL PREPARE AND COMPLY WITH A DECOMMISSIONING PLAN AS DETAILED IN THE TOWN OF MARLBOROUGH, NY SUPPLEMENTARY REGULATIONS SECTION 155-32.2J.
13. ALL TEMPORARILY STOCKPILED MATERIAL GENERATED BY CONSTRUCTION OF THE FACILITY WILL BE REMOVED FROM THE SITE IN A TIMELY MANNER.

REV #	DESCRIPTION	DATE	BY
4	REVISED PER PB COMMENT – SCREENING & HYDRANT	11/22/24	ETY

ELP MARLBOROUGH SOLAR
335 BINGHAM ROAD

TOWN OF MARLBOROUGH — ULSTER COUNTY, NY

SITE PLAN
PROPOSED GRADING & UTILITIES - 3

CRAWFORD & ASSOCIATES
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www.crawfordandassociates.com fax: (518) 828-2723

DATE 4/5/2024	DRAWN BY: TSB/DPB	H:\WORK\4996.26 Marlborough\DWG\4996.26 SITE.dwg	
	DESIGNED BY: TSB/DPB	C&A JOB# 4996.26	DRAWING: C–105
SCALE AS SHOWN	CHECKED BY: CJK		
	APPROVED BY: CJK		

PROPOSED EROSION & SEDIMENT CONTROL PLAN

SCALE: 1"=100'

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

NAD 83
NY STATE PLANE EAST ZONE

EROSION & SEDIMENT CONTROL GENERAL NOTES:

1. ALL EROSION AND SEDIMENT CONTROL PRACTICES SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST VERSION OF THE NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL. (REFERRED TO IN REMAINING TEXT AS "THE NEW YORK GUIDELINES".)
2. THE SEDIMENT MEASURES DETAILED ON THE EROSION AND SEDIMENT CONTROL PLAN SHALL BE IN PLACE PRIOR TO CONSTRUCTION STARTUP OF CONSTRUCTION. ONCE MEASURES ARE IN PLACE, ALL MEASURES SHALL BE PROPERLY MAINTAINED AND/OR REPLACED AS NECESSARY, AND THEN REMOVED FROM THE SITE BY THE CONTRACTOR ONCE SITE IS STABILIZED.
3. FOLLOWING THE COMMENCEMENT OF CONSTRUCTION, INSPECTIONS SHALL BE CONDUCTED PER THE FOLLOWING SCHEDULE. CONTRACTORS AND SUB CONTRACTORS ARE RESPONSIBLE FOR HAVING A "TRAINED INDIVIDUAL(S)" ON SITE DAILY WHEN SOIL DISTURBANCE ACTIVITIES ARE BEING PERFORMED TO INSPECT EROSION AND SEDIMENT CONTROL MEASURES. "TRAINED INDIVIDUAL" MEANING AN EMPLOYEE FROM A CONSTRUCTION FIRM THAT HAS RECEIVED FOUR (4) HOURS OF TRAINING, WHICH HAS BEEN ENDORSED BY THE NYS DEC, SOIL AND WATER CONSERVATION DISTRICT, CPESC INC. THE TRAINED INDIVIDUAL SHALL RECEIVE FOUR (4) HOURS OF TRAINING EVERY THREE (3) YEARS.
   - FOR CONSTRUCTION SITES WHERE SOIL DISTURBANCE ACTIVITIES ARE ON-GOING, THE QUALIFIED INSPECTOR SHALL CONDUCT A SITE INSPECTION AT LEAST ONCE EVERY SEVEN (7) CALENDAR DAYS.
   - FOR CONSTRUCTION SITES WHERE SOIL DISTURBANCE ACTIVITIES ARE ON-GOING AND THE OWNER OR OPERATOR HAS RECEIVED AUTHORIZATION IN ACCORDANCE WITH PART II.C.3 TO DISTURB GREATER THAN FIVE (5) ACRES OF SOIL AT ANY ONE TIME, THE QUALIFIED INSPECTOR SHALL CONDUCT AT LEAST TWO (2) SITE INSPECTIONS EVERY SEVEN (7) CALENDAR DAYS.
   - THE TWO (2) INSPECTIONS SHALL BE SEPARATED BY A MINIMUM OF TWO (2) FULL CALENDAR DAYS.
5. BASED ON THE BI-WEEKLY SITE INSPECTIONS, THE EROSION AND SEDIMENT CONTROL MEASURES IDENTIFIED IN THE SHALL BE REVISED AS SITE CONDITIONS WARRANT. THE CONTRACTOR SHALL IMPLEMENT THESE REVISIONS AS SOON AS PRACTICABLE.
6. THE EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED BY THE CONTRACTOR UNTIL THE FINAL SURFACE TREATMENTS ARE INSTALLED AND THE VEGETATED AREAS HAVE BEEN STABILIZED WITH AT LEAST 80% VEGETATIVE COVER. THE PROPERTY OWNER WILL ASSUME RESPONSIBILITY FOR MAINTAINING THE EROSION AND SEDIMENT SYSTEM(S) THEREAFTER.
7. INLET PROTECTION MEASURES SHALL BE INSTALLED AROUND STORM DRAIN INLETS TO PREVENT SEDIMENT LADEN WATER FROM ENTERING.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL TEMPORARY EROSION AND SEDIMENT CONTROL PRACTICES ONCE THE CONSTRUCTION PHASE HAS BEEN STABILIZED AND FUNCTIONING PROPERLY AS ACCEPTED BY THE ENGINEER.
9. DUST CONTROL AT DRIVING AREAS - THE SITE MAY BE SPRAYED WITH WATER UNTIL THE SURFACE IS WET. THIS IS ESPECIALLY EFFECTIVE ON HAUL ROADS AND ACCESS ROUTES.
10. THE LOCAL AHJ, NYSDEC, NYSDEP, OR THE SITE ENGINEER MAY REQUEST ADDITIONAL MEASURES TO MINIMIZE THE POTENTIAL FOR ONSITE OR OFFSITE EROSION PROBLEMS THAT MAY OCCUR DURING CONSTRUCTION.
11. COPIES OF THE SOIL EROSION AND SEDIMENT CONTROL PLANS AND SWPPP, IF APPLICABLE, MUST BE MAINTAINED ON SITE UNTIL THE SITE HAS BEEN STABILIZED.

MAINTENANCE PLAN:

1. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OPERATION AND MAINTENANCE OF THE NEW DEVELOPMENT PROJECT AND PROJECT ACCESS DURING CONSTRUCTION.
2. NO EARTHWORK ACTIVITIES SHALL COMMENCE UNTIL SILT FENCES AND SILT SOCKS HAVE BEEN INSTALLED AS SHOWN ON DRAWINGS.
3. AREAS TO BE LEFT EXPOSED TO EROSION FOR MORE THAN 14 DAYS SHALL BE TEMPORARILY STABILIZED.
4. PAVED AREAS SHALL BE KEPT FREE OF SEDIMENT, AND SHALL BE CLEANED PERIODICALLY AS REQUIRED BY CONSTRUCTION ACTIVITIES.
5. CATCH BASINS, IF ANY,SHALL BE PERIODICALLY INSPECTED FOR ACCUMULATION OF SEDIMENT. ALL CATCH BASINS WITHIN THE PROJECT SHALL BE CLEANED.
6. THE CONTRACTOR IS RESPONSIBLE TO INSPECT AND REPAIR EROSION AND SEDIMENT CONTROL MEASURES AS REQUIRED TO PREVENT DAMAGE OR SEDIMENTATION.
7. UPON COMPLETION OF CONSTRUCTION AND ESTABLISHMENT OF PERMANENT GROUND COVER, REMOVE AND DISPOSE OF TEMPORARY EROSION CONTROL MEASURES. CLEAN SEDIMENT AND DEBRIS FROM TEMPORARY MEASURES AND FROM PERMANENT STORM DRAIN AND SANITARY SEWER SYSTEMS.

E&SC PLAN AND CONSTRUCTION NOTES:

1. CONSTRUCTION SHALL NOT COMMENCE UNTIL APPROPRIATE PERMIT COVERAGE HAS BEEN OBTAINED UNDER NYSDEC SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITY, GP-0-20-001.
2. TOTAL LIMITS OF DISTURBANCE (LOD), AS SHOWN, TOTALS 21.91 ACRES. LOD INCLUDES LAND CLEARING/GRUBBING, MINOR GRADING FOR ACCESS DRIVE AND EQUIPMENT PADS, TRENCHING, AND TEMPORARY E&SC MEASURES.
3. CONSTRUCTION SHALL BE COMMENCED IN ACCORDANCE WITH THE PHASING PLAN TO LIMIT DISTURBANCE OF GREATER THAN 5 ACRES, PER PHASE:
   3.1. PHASE 1: APPROXIMATELY 4.85 ACRES OF DISTURBANCE, NOT LIMITED TO BUT INCLUDING: ESTABLISHMENT OF E&SC MEASURES (STABILIZED CONSTRUCTION ENTRANCE, SILT FENCE, FILTER SOCK, ETC.), CLEARING/GRUBBING OF EXISTING TREES AND SHRUBS, INSTALLATION OF TEMPORARY LAYDOWN AREA, ACCESS DRIVE, UNDERGROUND ELECTRIC, UTILITY POLES, EQUIPMENT PADS AND PANEL ARRAY.
   3.2. PHASE 2: APPROXIMATELY 4.87 ACRES OF DISTURBANCE, NOT LIMITED TO BUT INCLUDING: CLEARING/GRUBBING OF EXISTING TREES AND SHRUBS, INSTALLATION OF UNDERGROUND ELECTRIC AND PANEL ARRAY.
   3.3. PHASE 3: APPROXIMATELY 4.72 ACRES OF DISTURBANCE, NOT LIMITED TO BUT INCLUDING: CLEARING/GRUBBING OF EXISTING TREES AND SHRUBS, INSTALLATION OF UNDERGROUND ELECTRIC AND PANEL ARRAY.
   3.4. PHASE 4: APPROXIMATELY 2.96 ACRES OF DISTURBANCE, NOT LIMITED TO BUT INCLUDING: CLEARING/GRUBBING OF EXISTING TREES AND SHRUBS, INSTALLATION OF UNDERGROUND ELECTRIC AND PANEL ARRAY.
   3.5. PHASE 5: APPROXIMATELY 4.54 ACRES OF DISTURBANCE, NOT LIMITED TO BUT INCLUDING: CLEARING/GRUBBING OF EXISTING TREES AND SHRUBS, INSTALLATION OF UNDERGROUND ELECTRIC, PANEL ARRAY AND FINAL STABILIZATION OF THE SITE.
4. EACH PHASE SHALL BE TEMPORARILY STABILIZED BEFORE PROCEEDING TO A SUBSEQUENT PHASE.
5. THE TEMPORARY E&SC PLAN MEASURES SHOWN HEREIN, SHALL BE PUT IN PLACE AT THE BEGINNING OF CONSTRUCTION AND REMOVED UPON FINAL STABILIZATION OF THE SITE.
6. CONSTRUCTION OF THE PANEL ARRAYS SHALL BE COMPLETED IN SUCH A WAY THAT NULLIFIES DISTURBANCE AND/OR COMPACTION OF THE IN-SITU LAND COVER (I.E. TRACKED VEHICLE TRAVELING IN AND OUT OF ROWS IS RECOMMENDED). EXISTING GROUND COVER IN THE AREA OF THE PANEL ARRAY SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION.
7. ALL DISTURBED AREAS SHALL BE SEEDED AND MULCHED AS DETAILED IN THE SEEDING PLAN ON DRAWING C-501.
8. THE TEMPORARY PARKING AND STAGING AREA FOR CONSTRUCTION EQUIPMENT AND MATERIALS SHALL CONSISTS OF STONE DUST OR A SIMILAR MATERIAL. UPON COMPLETION OF CONSTRUCTION, THE STONE DUST, OR SIMILAR, SHALL BE REMOVED UP TO BUT NOT INCLUDING REMOVAL OF THE COVERED TOPSOIL. THE AREA SHALL BE SEEDED AND MULCHED ACCORDING TO THE SEED AND MULCH SPECIFICATIONS DETAILED ON THE E&SC NOTES SHEET.
9. IN HIGH TRAFFIC AREAS, THE AREA SHALL BE DE-COMPACTED PRIOR TO SEEDING TO ENSURE GROWTH OF VEGETATIVE COVER. THE AREA(S) SHALL BE DE-COMPACTED ACCORDING TO NYSDEC EROSION AND SEDIMENT CONTROL DE-COMPACTION GUIDELINES.

REV #	DESCRIPTION	DATE	BY
4	REVISED PER PB COMMENT – SCREENING & HYDRANT	11/22/24	ETY

ELP MARLBOROUGH SOLAR
335 BINGHAM ROAD

TOWN OF MARLBOROUGH ULSTER COUNTY, NY

PROPOSED EROSION & SEDIMENT CONTROL PLAN

CRAWFORD & ASSOCIATES
ENGINEERING & LAND SURVEYING, PC
4411 Route 9, Suite 200, Hudson New York 12534 tel: (518) 828-2700
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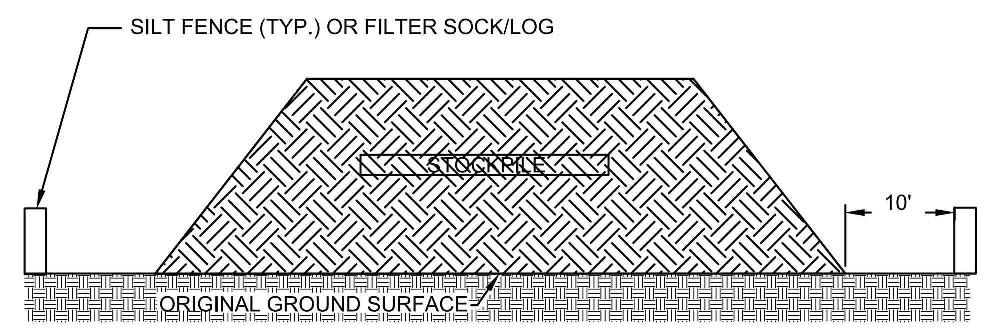
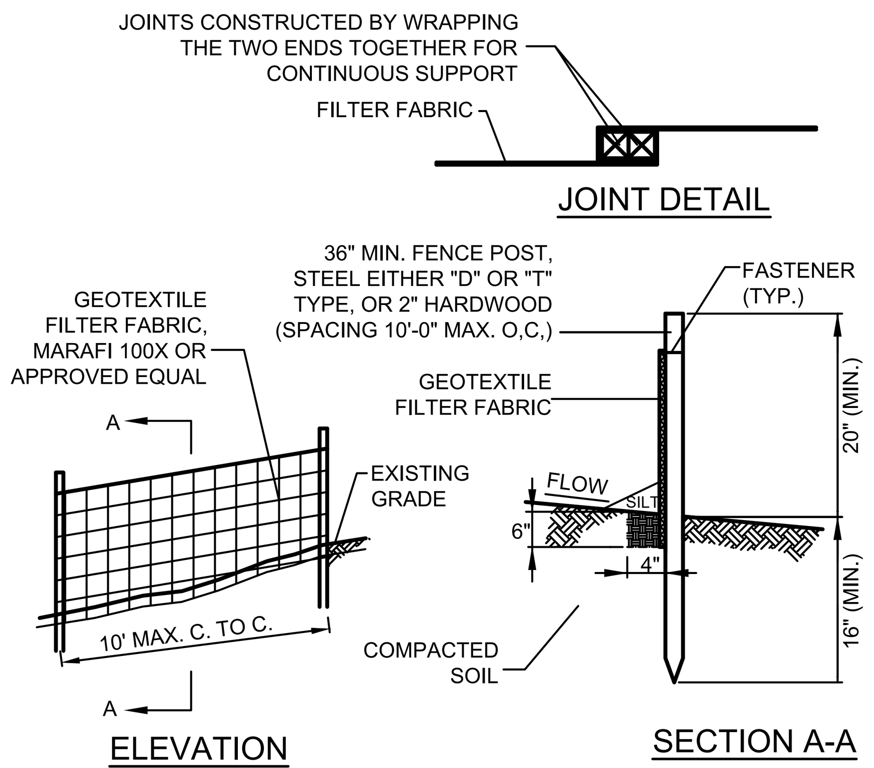
DATE	DRAWN BY: TSB/DPB	H:\WORK\4996.26 Marlborough\DWG\4996.26 SITE.dwg	
4/5/2024	DESIGNED BY: TSB/DPB	C&A JOB#	DRAWING:
SCALE	CHECKED BY: CJK	4996.26	C–106
AS SHOWN	APPROVED BY: CJK		



NOTES:
1. AREA CHOSEN FOR STOCKPILING OPERATIONS SHALL BE DRY AND STABLE. IN NO CASE SHALL MATERIALS BE STOCKPILED WITHIN 25 FEET OF ANY DITCH, STREAM, OR OTHER SURFACE WATER.
2. MAXIMUM SLOPE OF STOCKPILE SHALL BE 1:2.
3. UPON COMPLETION OF SOIL STOCKPILIN, EACH PILE SHALL BE SURROUNDED WITH EITHER SILT FENCING OR STRAWBALES, THEN STABILIZED WITH VEGETATION OR COVERED. SILT FENCE OR FILTER SOCK/LOG ARE TO REMAIN IN PLACE UNTIL SUCH TIME AS SAID STOCKPILES ARE REMOVED.
4. SILT FENCE OR FILTER SOCK/LOG TO EXTEND AROUND ENTIRE PERIMETER OF STOCKPILE OR TO EXTEND AROUND DOWNSTREAM PORTION IF STOCKPILE IS ON SLOPE.

A / C-501 STABILIZED STOCKPILE DETAIL

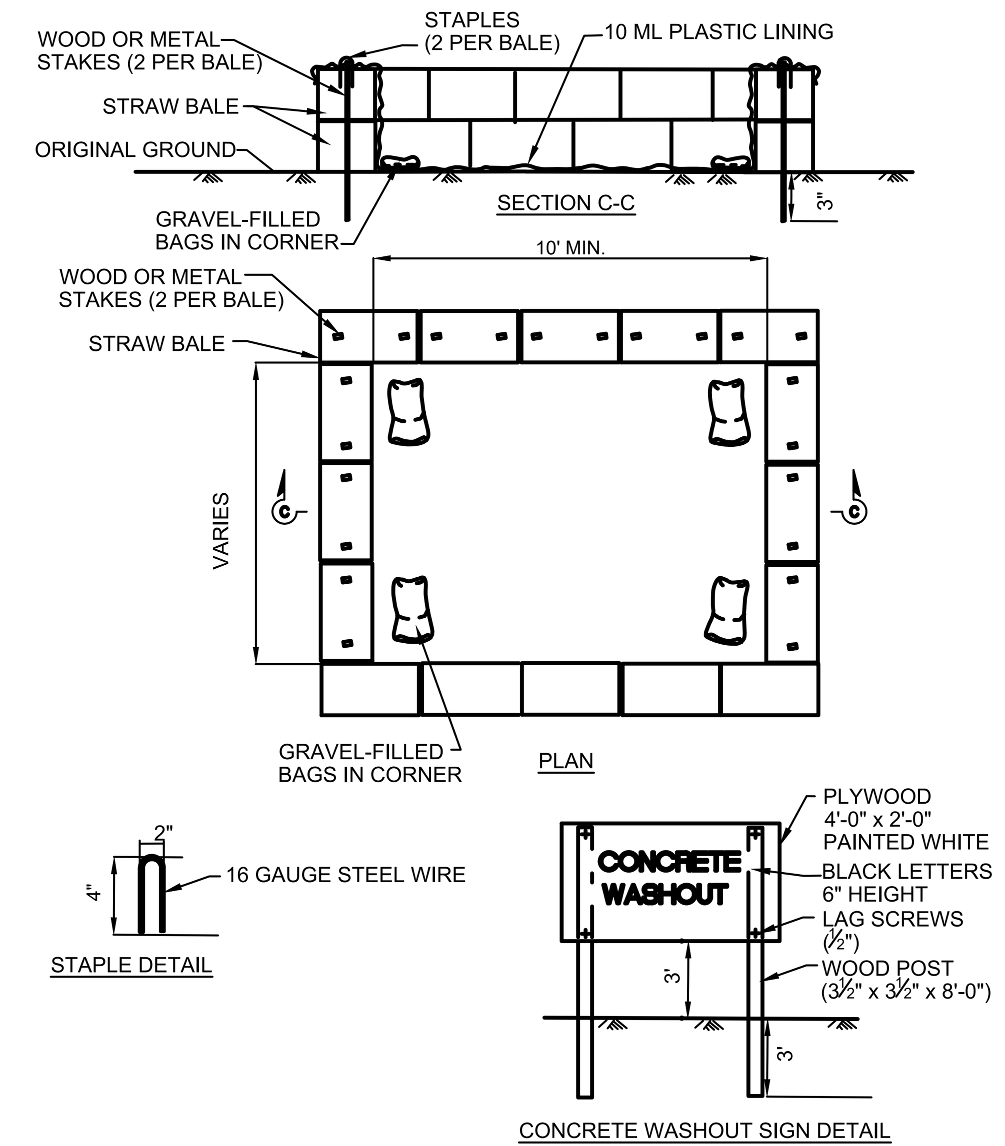
SCALE: N.T.S.



NOTES:
1. SILT FENCE SHALL BE INSTALLED PRIOR TO COMMENCEMENT OF CONSTRUCTION.
2. SILT FENCE SHALL BE PLACED ON THE DOWN SLOPE SIDE OF EXCAVATED AREAS AND AROUND SOIL STOCKPILES. SILT FENCE SHALL ALSO BE PLACED AROUND THE BOUNDARY OF WETLANDS ADJACENT TO THE WORK AREA AND AT THE EDGE OF THE WETLANDS AFTER CONSTRUCTION IS COMPLETE. WITHIN RESIDENTIAL AREAS THE SILT FENCE SHALL BE INSTALLED ALONG THE PERIMETER OF THE ENTIRE WORK AREA.
3. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP.
4. SILT FENCE MUST BE REPAIRED OR REPLACED WHEN THE ENDS ARE FRAYED OR WORN, AND THE FENCE IS NOT ANCHORED 6" INTO THE GROUND. WHEN ACCUMULATED SEDIMENT REACHES 33% OF THE SILT FENCE HEIGHT, THE SEDIMENT SHALL BE REMOVED AND DISPOSED OF IN AN APPROPRIATE UPLAND AREA.

B / C-501 SILT FENCE DETAIL

SCALE: N.T.S.

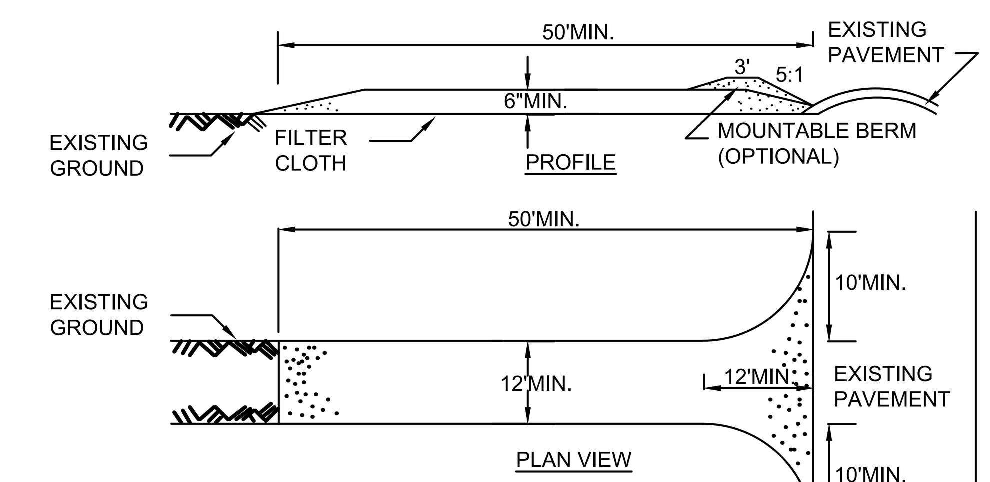


NOTES:

1. TEMPORARY CONCRETE WASHOUT FACILITIES SHOULD BE LOCATED A MINIMUM OF 100 FEET FROM STORM DRAIN INLETS, OPEN DRAINAGE FACILITIES, AND WATER COURSES. EACH FACILITY SHOULD BE LOCATED AWAY FROM CONSTRUCTION TRAFFIC OR ACCESS AREAS TO PREVENT DISTURBANCE OR TRACKING.
2. A SIGN SHOULD BE INSTALLED ADJACENT TO EACH WASHOUT FACILITY TO INFORM CONCRETE EQUIPMENT OPERATORS TO UTILIZE THE PROPER FACILITIES.
3. TEMPORARY CONCRETE WASHOUT FACILITIES SHOULD BE CONSTRUCTED ABOVE GRADE. TEMPORARY CONCRETE WASHOUT FACILITIES SHOULD BE CONSTRUCTED AND MAINTAINED IN SUFFICIENT QUANTITY AND SIZE TO CONTAIN ALL LIQUID AND CONCRETE WASTE GENERATED BY WASHOUT OPERATIONS.
4. TEMPORARY WASHOUT FACILITIES SHOULD HAVE A TEMPORARY PIT OR BERMED AREAS OF SUFFICIENT VOLUME TO COMPLETELY CONTAIN ALL LIQUID AND WASTE CONCRETE MATERIALS GENERATED DURING WASHOUT PROCEDURES.
5. WASHOUT OF CONCRETE TRUCKS SHOULD BE PERFORMED IN DESIGNATED AREAS ONLY.
6. ONLY CONCRETE FROM MIXER TRUCK CHUTES SHOULD BE WASHED INTO CONCRETE WASH OUT.
7. ONCE CONCRETE WASTES ARE WASHED INTO THE DESIGNATED AREA AND ALLOWED TO HARDEN, THE CONCRETE SHOULD BE BROKEN UP, REMOVED, AND DISPOSED OF PER SOLID WASTE MANAGEMENT STANDARDS. DISPOSE OF HARDENED CONCRETE ON A REGULAR BASIS.
8. TEMPORARY ABOVE GRADE WASHOUT FACILITIES SHOULD BE CONSTRUCTED AS SHOWN IN THIS DETAIL.

C / C-501 CONCRETE WASHOUT DETAIL

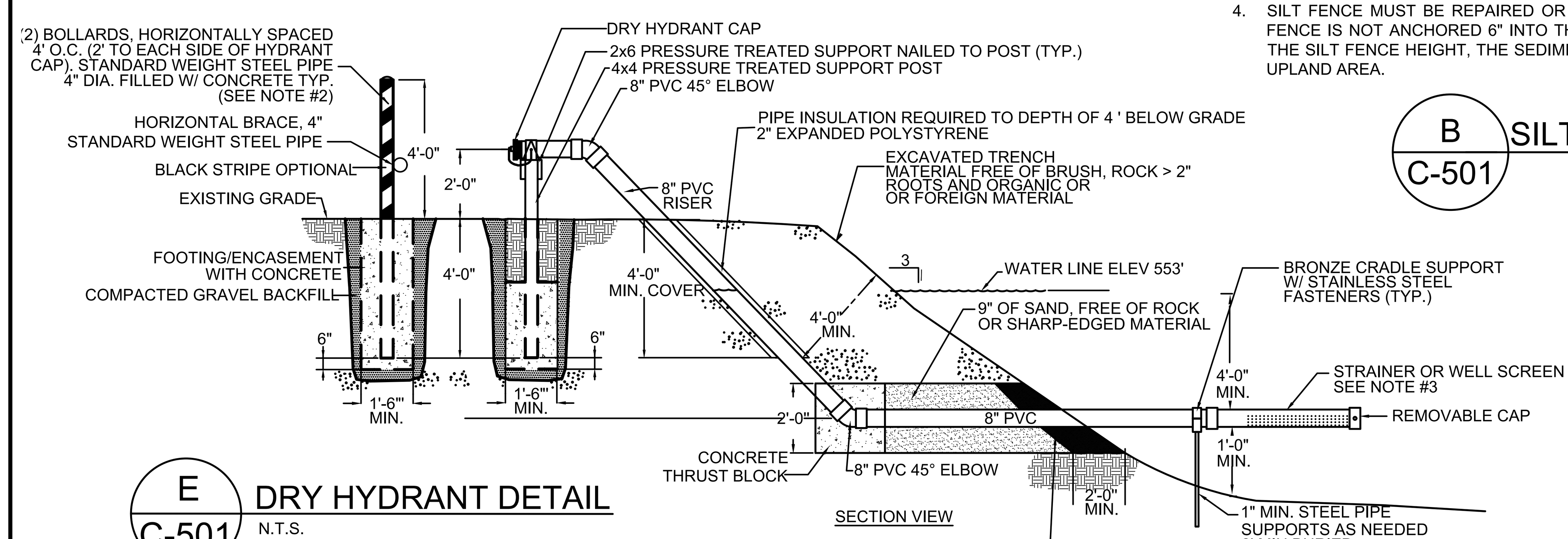
SCALE: N.T.S.



NOTES:
1. WHERE NECESSARY: STABILIZED CONSTRUCTION ENTRANCES SHALL BE INSTALLED TO PREVENT SOIL AND SEDIMENT FROM BEING TRACKED ON TO ROADWAYS.
2. PERMANENT TRAFFIC CORRIDORS SHALL BE ESTABLISHED AND "ROUTES OF CONVENIENCE" SHALL BE AVOIDED. CONSTRUCTION TRAFFIC SHALL NOT CROSS STREAMS OR DITCHES EXCEPT AT SUITABLE CROSSING FACILITIES, AND SHALL NOT OPERATE UNNECESSARILY WITHIN WATERWAYS OR DRAINAGE DITCHES.
3. IF INTERNAL CONSTRUCTION ROADS ARE A SOURCE OF SEDIMENT-LADEN RUNOFF TO SENSITIVE AREAS, MEASURES SHALL BE TAKEN TO STABILIZE THE INTERNAL ROADWAYS AS SOON AS PRACTICABLE.
4. STONE SIZE - USE 1" - 4" STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
5. LENGTH - NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
6. THICKNESS - NOT LESS THAN SIX (6) INCHES.
7. WIDTH - TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
8. FILTER CLOTH - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
9. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
10. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY, ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACTED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
11. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
12. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

D / C-501 CONSTRUCTION ENTRANCE DETAIL

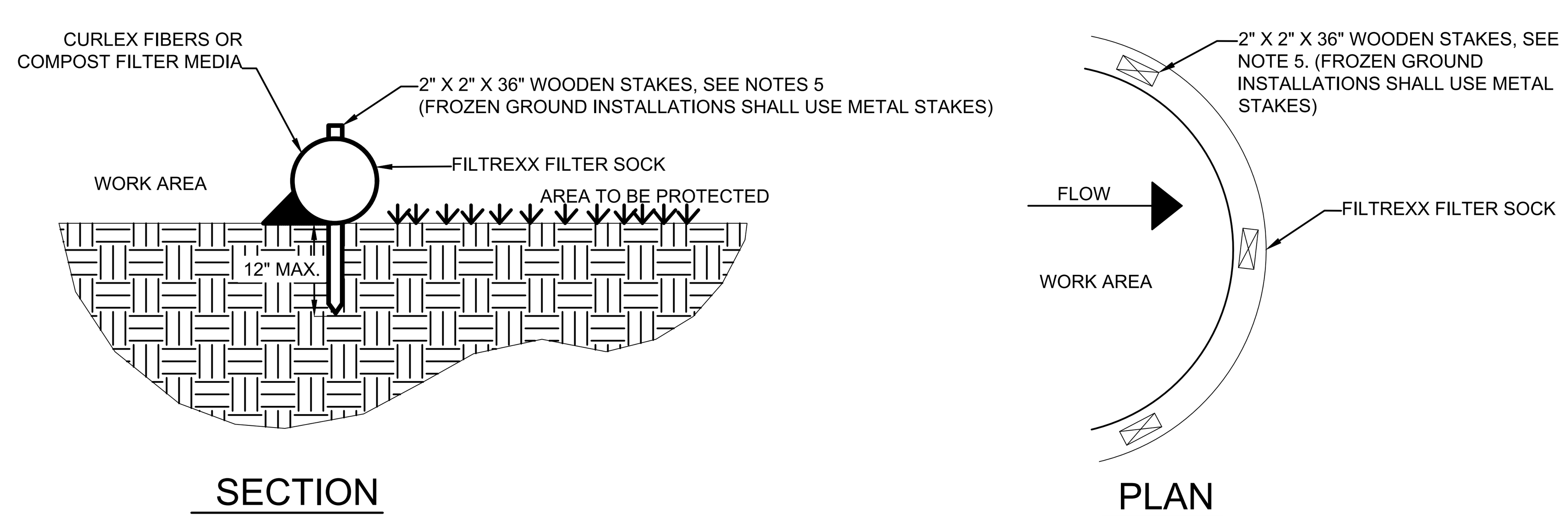
SCALE: N.T.S.



E / C-501 DRY HYDRANT DETAIL

N.T.S.

NOTES:
1. THE SOURCE DRY HYDRANT SHALL HAVE ONLY ONE CONNECTION AND NO VALVE.
2. HYDRANT BOLLARD PROTECTION SHALL BE PLACED NEAR DRY HYDRANT TO PREVENT ACCIDENTAL DAMAGE FROM VEHICLES. PROTECTION SHALL BE IN THE FORM OF TWO STEEL/CONCRETE BOLLARDS, INSTALLED WITH FOOTINGS BELOW FROST LINE AS SHOWN.
3. THE TOTAL AREA OF THE STRAINER OR WELL SCREEN SHALL EXCEED FOUR TIMES THE CROSS-SECTIONAL AREA OF THE PIPELINE. A 4-INCH WIDE STRIP OF NON-PERFORATED AREA IS REQUIRED.
4. ALL CONCRETE SHALL BE 2500 PSI (MIN.).
5. ALL PVC SHALL BE SCHEDULE 40, 8" AS REQUIRED.
6. ALL PVC PIPE ABOVE GROUND SHALL BE PRIMED AND PAINTED WITH EXTERIOR LATEX PAINT TO PREVENT UV DAMAGE.
7. HYDRANT TO BE FITTED WITH 6" NH (NST) FEMALE SWIVEL CONNECTION.

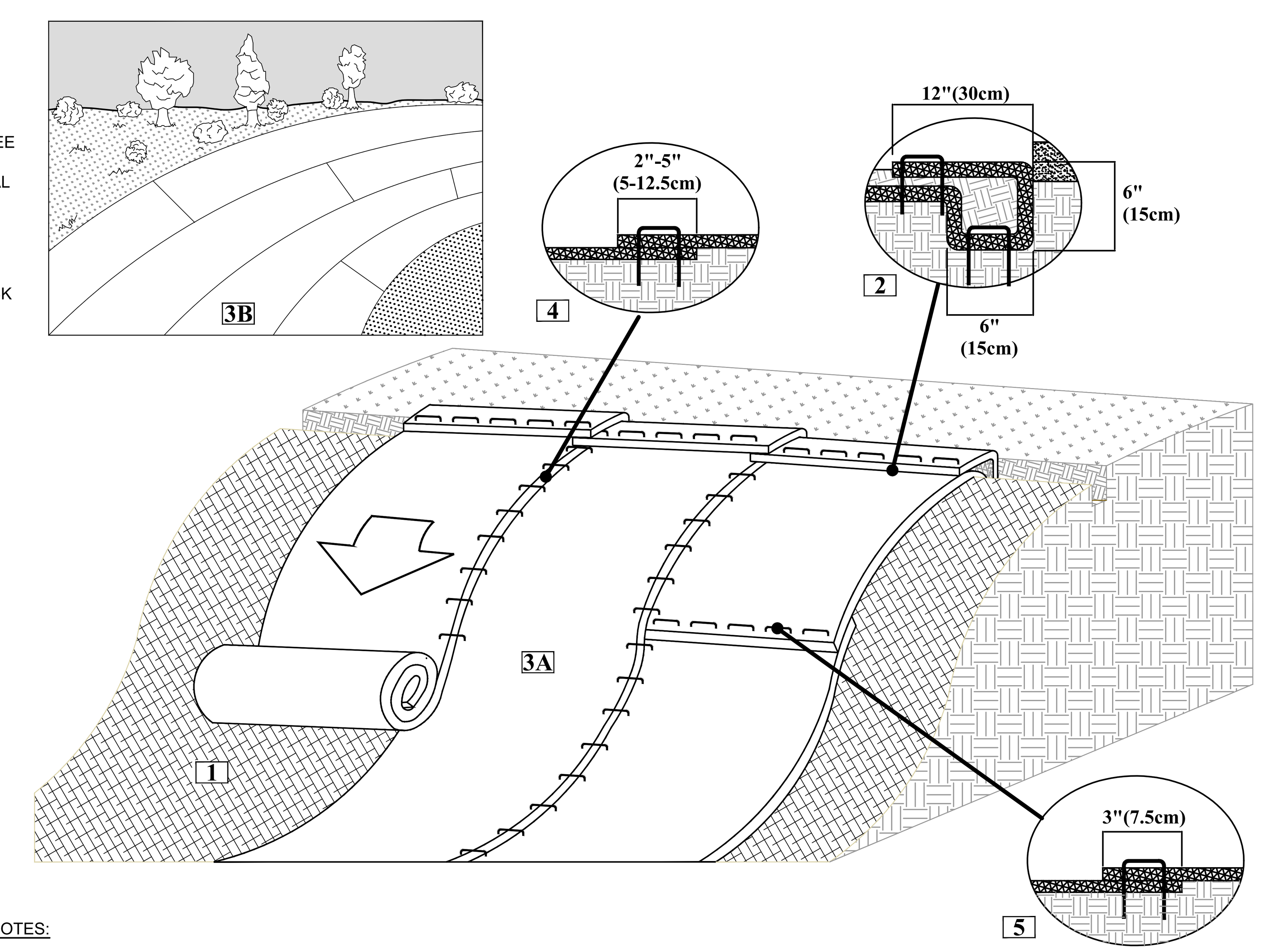


INSTALLATION NOTES:
1. COMPOSITE FILTER SOCKS SHALL BE FILTREXX(R) SILT SOXX (TM) OR APPROVED EQUAL.
2. LAND SURFACE SHOULD BE PREPARED BY MOWING GRASS OR MAKING SOIL OR PAVED SURFACES SMOOTH.
3. COMPOSITE FILTER SOCKS SHALL BE PLACED PERPENDICULAR TO STORM WATER FLOW, ACROSS THE SLOPE, SWALE, DITCH OR CHANNEL.
4. COMPOSITE FILTER SOCKS SHALL BE PLACED ON CONTOURS.
5. ON SOIL AND VEGETATED SURFACES, UNDER SHEET FLOW CONDITIONS, COMPOSITE FILTER SOCKS SHALL BE STAKED ON 10-FT CENTERS. UNDER CONCENTRATED FLOW CONDITIONS COMPOSITE FILTER SOCKS SHALL BE STAKED ON 5-FT CENTERS.
6. STAKES SHALL BE DRIVEN THROUGH THE CENTER OF THE COMPOSITE FILTER SOCK AND INSTALLED A MINIMUM OF 8 INCHES AND A MAXIMUM OF 12 INCHES INTO THE EXISTING SOIL, LEAVING A MINIMUM STAKE HEIGHT OF 2 INCHES ABOVE THE COMPOSITE FILTER SOCK.
7. EDGES OF THE COMPOSITE FILTER SOCKS SHALL BE TURNED UPSLOPE TO PREVENT SLOW AROUND THE ENDS OF THE COMPOSITE FILTER SOCKS.
8. FILTER SOCKS SHALL BE SIZED APPROPRIATELY, ACCORDING TO NYSDEC STANDARDS & SPECIFICATIONS FOR EROSION & SEDIMENT CONTROL.

REMOVAL NOTES:
1. UPON REMOVAL OF THE COMPOSITE FILTER SOCK, THE CONTRACTOR SHALL REMOVE ALL SEDIMENT ACCUMULATION PRIOR TO THE REMOVAL OF THE COMPOSITE FILTER SOCK. THE COMPOSITE FILTER SOCKS SHALL BE REMOVED IN THEIR ENTIRETY.
2. THE DISTURBED AREA SHALL BE SEEDED, FERTILIZED, AND MULCHED TO ENSURE THE VEGETATIVE COVER IS FULLY RESTORED.
3. MONITOR THE VEGETATIVE RESTORATION AREA UNTIL EXPOSED AREAS ARE FULLY STABILIZED WITH VEGETATIVE COVER.
4. THE COMPOSITE MATERIAL MAY BE SPREAD OVER THE LANDSCAPE OR INCORPORATED INTO THE SOIL AT THE END OF THE PROJECT, THEREBY INCREASING SOIL QUALITY AND REDUCING WASTE.
5. THE SOCK MESH SHALL BE PROPERLY DISPOSED.

F / C-501 FILTER SOCK DETAIL

SCALE: N.T.S.



SLOPE INSTALLATION

1. Prepare soil before installing rolled erosion control products (RECPs), including any necessary application of lime, fertilizer, and seed.
2. Begin at the top of the slope by anchoring the RECPs in a 6"(15cm) deep X 6"(15cm) wide trench with approximately 12" (30cm) of RECPs extended beyond the up-slope portion of the trench. Anchor the RECPs with a row of staples/stakes approximately 12" (30cm) apart in the bottom of the trench. Backfill and compact the trench after stapling. Apply seed to the compacted soil and fold the remaining 12"(30cm) portion of RECPs back over the seed and compacted soil. Secure RECPs over compacted soil with a row of staples/stakes spaced approximately 12"(30cm) apart across the width of the RECPs.
3. Roll the RECPs (A) down or (B) horizontally across the slope. RECPs will unroll with appropriate side against the soil surface. All RECPs must be securely fastened to soil surface by placing staples/stakes in appropriate locations as shown in the staple pattern guide.
4. The edges of parallel RECPs must be stapled with approximately 2" - 5" (5-12.5cm) overlap depending on the RECPs type.
5. Consecutive RECPs spliced down the slope must be end over end (Shingle style) with an approximate 3"(7.5cm) overlap. Staple through overlapped area, approximately 12"(30cm) apart across entire RECPs width.

*NOTE:
In loose soil conditions, the use of staple or stake lengths greater than 6"(15cm) may be necessary to properly secure the RECP's.

NOTES:

1. SLOPE STABILIZATION MATTING SHALL BE PLACED ON ALL DISTURBED SLOPES GREATER THAN 10 PERCENT SLOPE.
2. MATTING SHALL CONSIST OF NORTH AMERICAN GREEN ROLLMAX ROLLED EROSION CONTROL PRODUCT S150BN, WOVEN BIODEGRADABLE JUTE TOP AND BOTTOM NET, 100% STRAW FIBER MATRIX, OR SIMILAR.
3. ALL ROLLED EROSION CONTROL PRODUCT SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.

G / C-501 ROLLED EROSION CONTROL PRODUCT DETAIL

SCALE: N.T.S.

MULCHING AND SEEDING NOTES:
1. STABILIZING MEASURES SHALL BE INITIATED AS SOON AS PRACTICAL IN PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED, BUT NOT MORE THAN 14 DAYS SHALL ELAPSE WITHOUT STABILIZATION AFTER WORK HAS CEASED. ACCEPTABLE TEMPORARY STABILIZATION INCLUDES MULCH, STRAW, HAY, EROSION CONTROL FABRIC, OR OTHER FUNCTIONAL EQUIVALENT.
2. TEMPORARY EROSION CONTROL PROTECTION BY MULCHING SHALL BE CARRIED OUT WITHIN 14 DAYS OF FILL PLACEMENT TO FINAL FINISHED GRADE IN ORDER TO AVOID ALL POSSIBLE CONTAMINATION OF PONDS, STREAMS, OR OTHER WATERCOURSES. PLACEMENT OF JUTE MESH OVER THE MULCH IS RECOMMENDED TO PROVIDE POSITIVE "TRACKING" OF THE MULCH AND INCREASED PROTECTION AGAINST EROSION.
3. DISTURBED AREAS SHALL BE REVEGETATED IN ACCORDANCE WITH RECOMMENDATIONS CONTAINED IN THE LATEST VERSION OF THE NEW YORK GUIDELINES.
4. UNDISTURBED "MEADOW" AREAS WITHIN THE FENCED IN AREA SHALL BE OVER SEEDED ACCORDING TO THE SEEDING PLAN.
5. SEED MIX TO BE NY POLLINATOR HABITAT FRIENDLY. MIX NOT TO INCLUDE TURF GRASS AND AVOID NON-NATIVE SPECIES.

SEEDING PLAN:
SEEDING TO REDUCE EROSION AND SEDIMENT TRANSPORT AFTER CONSTRUCTION COMPLETION.

SEED APPLICATION: 260 LBS. PER ACRE MINIMUM.
ERNST SOLAR FARM SEED MIX:
35% FESTUCA RUBRA (CREEPING RED FESCUE)
35% FESTUCA RUBRA SSP. COMMUTATA (CHEWINGS FESCUE)
10% FESTUCA BREVIPILA, 'BEACON' (HARD FESCUE, 'BEACON')
10% FESTUCA OVINA VAR. DURIUSCULA (F. LONGIFOLIA), 'JETTY' (HARD FESCUE, 'JETTY')
5% POA PRATENSIS, 'CORSAIR' (KENTUCKY BLUEGRASS, 'CORSAIR')
5% POA PRATENSIS, 'SHAMROCK' (KENTUCKY BLUEGRESS, 'SHAMROCK')

TEMPORARY SEEDING:
PER THE LATEST VERSION OF THE NEW YORK STANDARDS AND SPECIFICATION FOR EROSION AND SEDIMENT CONTROL, "SPRING OR LATE SUMMER OR FALL, THEN SEED THE AREA WITH RYEGRASS AT THIRTY (30)LBS. PER ACRE. LATE FALL OR EARLY WINTER, THEN SEED CERTIFIED "AROOSTOCK" WINTER RYE AT ONE HUNDRED (100)LBS PER ACRE. MULCH AREA WITH HAY OR STRAW AT TWO (2) TONS PER ACRE.

TURF ESTABLISHMENT:
1. TOP SOIL (4 INCHES MINIMUM) SHALL CONSIST OF NATURAL LOAM TOPSOIL, FREE FROM SUBSOIL. TOPSOIL SHALL BE OF UNIFORM QUALITY, FREE FROM HARD CLODS, STIFF CLAY, HARD PAN, SODS, PARTIALLY DISINTEGRATED STONE, OR ANY OTHER UNDESIRABLE MATERIAL.
2. THE CONTRACTOR SHALL PROVIDE NECESSARY WATERING, FERTILIZER, MULCHING, ETC., REQUIRED TO ESTABLISH AND MAINTAIN SEEDED AREAS UNTIL SAME ARE ACCEPTED BY THE OWNER'S FIELD REPRESENTATIVE.

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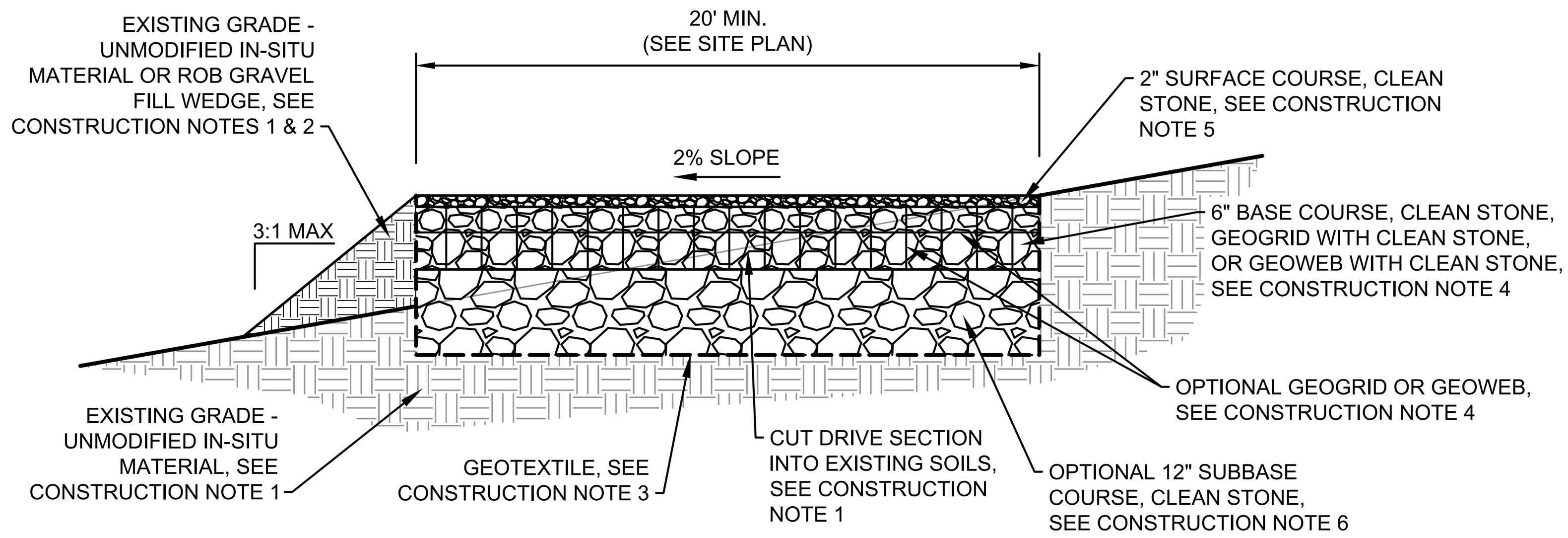


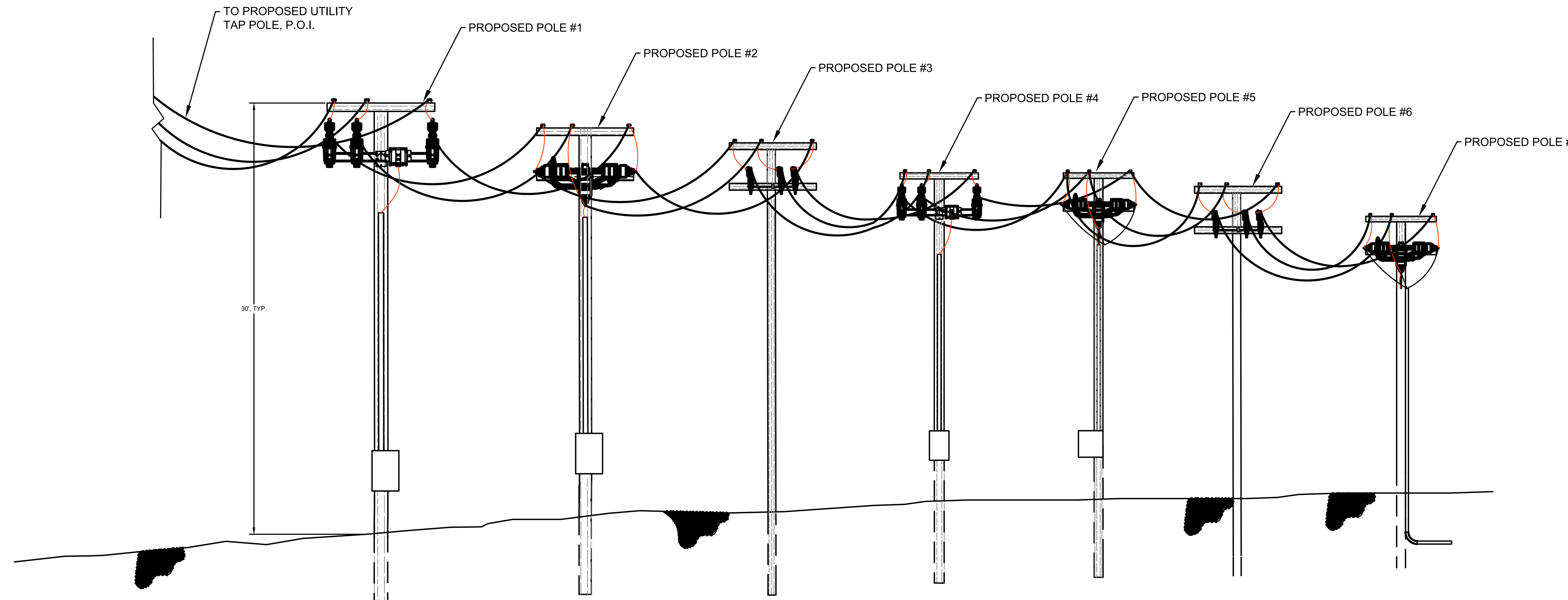
GENERAL NOTES:

1. THIS DETAIL IS LIMITED TO CONSTRUCTION AND OCCASIONAL MAINTENANCE FOR SOLAR FACILITY PROJECTS IN NEW YORK STATE.
2. THE DRIVE SHALL NOT BE CONSTRUCTED ON NYSDOT SUBBASE MATERIAL OR EQUIVALENT.
3. CLEAN STONE SHALL NOT BE COMPACTED WITH A VIBRATORY ROLLER, PLATE COMPACTOR, OR EQUIVALENT. STONE MAY BE DEPOSITED AND SPREAD BY A TRACKED VEHICLE. COMPACTION FOR ALL COURSES MAY BE PROVIDED BY A NON-VIBRATORY VEHICLE.
4. DO NOT OIL, WATER BIND, SEALCOAT, CHOKE STONE, OR OVERLAY WITH CONCRETE, ASPHALT PAVEMENT, OR ANY MATERIAL THAT WILL CREATE AN IMPERVIOUS SURFACE.
5. APPROPRIATE EROSION AND SEDIMENT CONTROL TECHNIQUES SHALL BE USED DURING CONSTRUCTION TO ENSURE THAT SEDIMENT FINES ARE NOT DEPOSITED WITHIN THE VOIDS OF THE CLEAN STONE.
6. INSTALL ALL GEOTEXTILE AND GEOWEB COMPONENTS PER MANUFACTURER. CAREFULLY PLACE MATERIAL ATOP GEOTEXTILE AND/OR FOR INFILL OF GEOWEB TO PREVENT DISTORTION AND/OR COLLAPSE OF CELLS. UTILIZE KEY CONNECTORS TO JOIN ALL GEOWEB SECTIONS. UTILIZE ANCHORS TO STABILIZE GEOWEB DURING INFILL.
7. ALL CLEAN STONE TO BE WASHED, NO FINES, SHARP-ANGLED, UNIFORM QUALITY, CRUSHED STONE PER NYSDOT SPECIFICATIONS SECTION 703-02, TABLE 703-4, SIZE DESIGNATION AS INDICATED.

CONSTRUCTION NOTES:
1. THE DRIVE SECTION SHALL BE CUT INTO UN-COMPACTED IN-SITU SOIL MATERIAL. IN AREAS OF EVEN EXISTING GRADE, CUT IN SHALL BE OPTIONAL AND LIMITED TO 4" MAXIMUM. WHERE REQUIRED FOR LEVELING UNEVEN AREAS TO PROVIDE 2% CROSS SLOPE, A NATIVE SOIL OR ROB GRAVEL WEDGE, COMPACTED TO 80% MDD, MAY BE INSTALLED. WHERE DRIVE SECTION IS TO BE BUILT UP FROM EXISTING GRADE (SUCH AS FOR ATOP CULVERT CROSSINGS), NATIVE SOIL OR ROB GRAVEL FILL, COMPACTED TO 80% MDD, MAY BE INSTALLED BENEATH BASE / SUBBASE. COMPACTION FOR ALL COURSES MAY BE PROVIDED BY A NON-VIBRATORY VEHICLE.
2. AT LOW POINTS ALONG THE DRIVE ALIGNMENT AND/OR AT LOCATIONS INDICATED BY THE SITE PLAN, THE DRIVE SHALL BE CONSTRUCTED WITH A ROB GRAVEL FILL WEDGE ON THE DOWNSLOPE SIDE FOR DRAINAGE OF THE DRIVE SECTION.
3. GEOTEXTILE SHALL BE MIRAFI TENCATE RS 280i (OR APPROVED EQUAL) ALONG THE ENTIRE DRIVE ALIGNMENT.
4. BASE COURSE SHALL BE AS FOLLOWS:
   4.1. IN AREAS OF STRAIGHT ALIGNMENT AND RUNNING SLOPES LESS THAN 5%,
      4.1.1. PROVIDE 6" THICKNESS NYSDOT #3 CLEAN STONE WHERE EXISTING SOILS EXHIBIT ADEQUATE DRAINAGE AND/OR STABILITY.
      4.1.2. PROVIDE 6" THICKNESS CLEAN GABION STONE, SIZE 4"-6" WHERE EXISTING SOILS EXHIBIT FREQUENT SATURATION, SETTLING, AND/OR HEAVING.
      4.1.3. GEOGRID MAY BE ADDED TO EITHER OF THE ABOVE BASE COURSE OPTIONS AT LOCATIONS OF DESIRED INCREASED STABILIZATION. GEOGRID SHALL BE ADS BX124GG (OR APPROVED EQUAL). GEOGRID SHALL BE PLACED APPROXIMATELY MID-BASE COURSE DEPTH (APPROXIMATELY 3" THICKNESS BASE MATERIAL BELOW AND ABOVE GEOGRID, MINIMUM 4" TOTAL MATERIAL COVER ABOVE GEOGRID).
   4.2. IN AREAS OF CURVED ALIGNMENT, TURNAROUNDS, RUNNING SLOPES GREATER THAN 5%, AT LOCATIONS OF DESIRED INCREASED STABILIZATION, AND/OR AT LOCATIONS INDICATED BY THE SITE PLAN, PROVIDE 6" THICKNESS PRESTO GEOSYSTEMS GEOWEB GW30V6 (OR APPROVED EQUAL) AND INFILL WITH 6" THICKNESS NYSDOT #2 CLEAN STONE.
5. SURFACE COURSE SHALL BE 2" THICKNESS NYSDOT #1 CLEAN STONE.
6. IN AREAS WHERE EXISTING SOILS EXHIBIT FREQUENT SATURATION, SETTLING, AND/OR HEAVING, AN OPTIONAL SUBBASE COURSE MAY BE IMPLEMENTED TO IMPROVE STABILITY. OPTIONAL SUBBASE COURSE SHALL BE 12" THICKNESS CLEAN GABION STONE, SIZE 6" - 12".

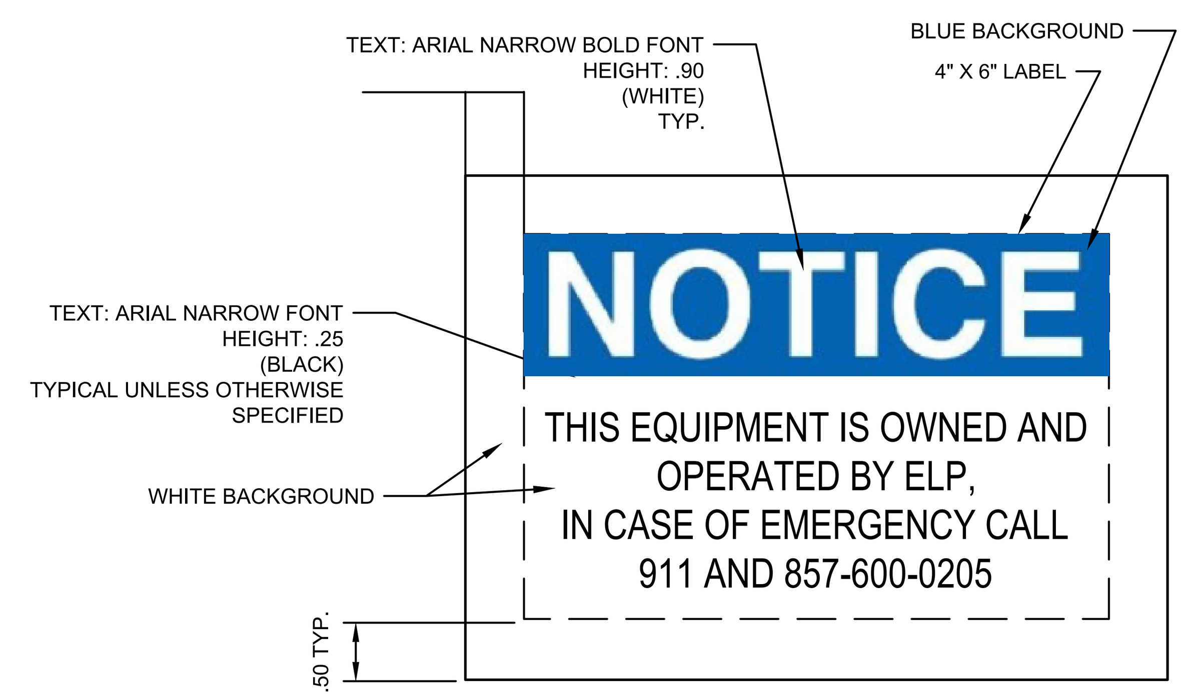
A / C-502 PERVIOUS ACCESS DRIVE DETAIL

SCALE: N.T.S.



D / C-502 OVERHEAD SPAN DETAIL

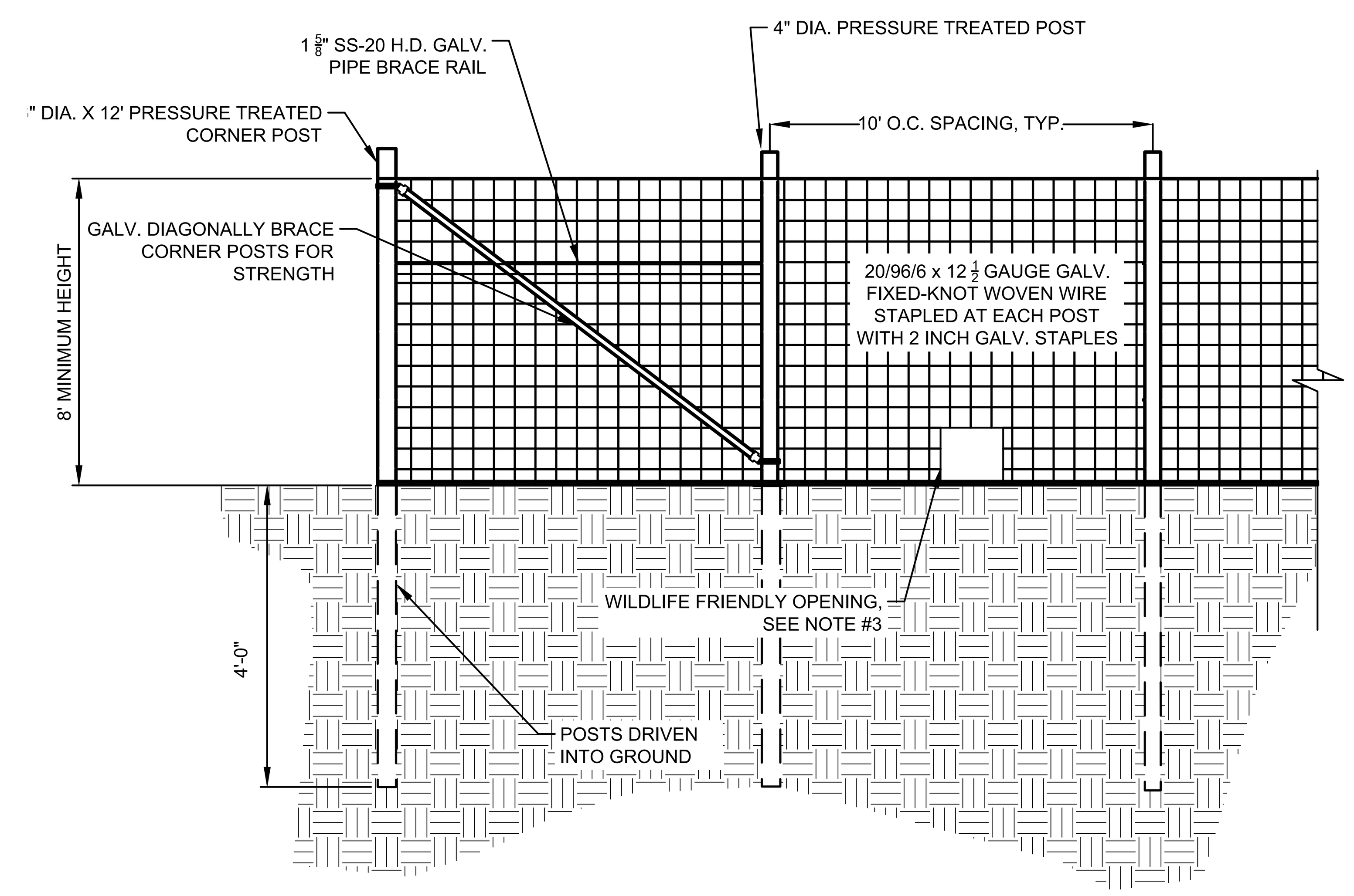
SCALE: N.T.S.



NOTES:
1. TO BE POSTED AT ENTRANCES AND PERIMETER OF FENCING.

C / C-502 NOTICE SIGN DETAIL

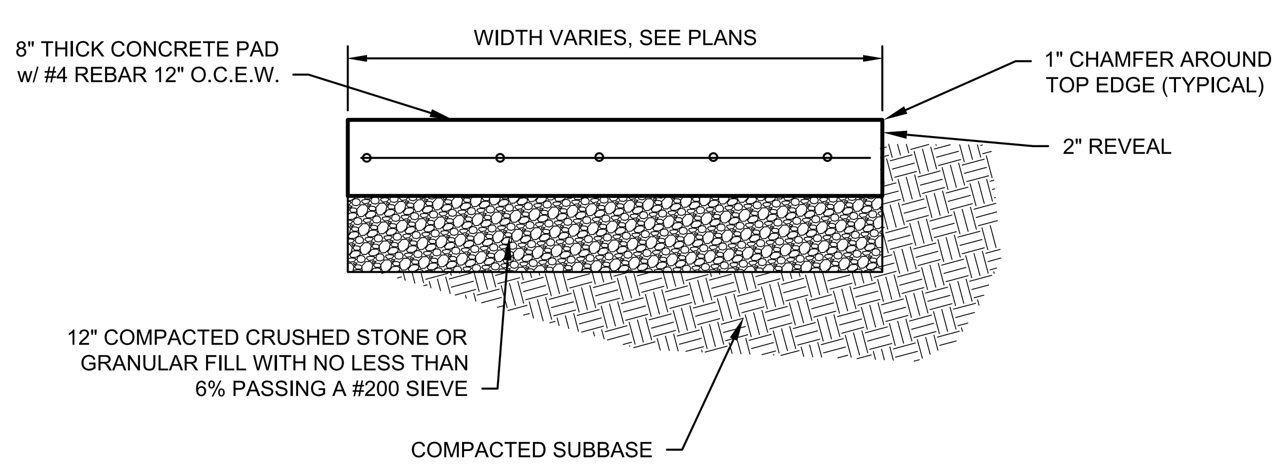
SCALE: N.T.S.



NOTES:
1. FENCE MATERIAL SHALL BE DARK OR NON-REFLECTIVE.
2. A GATE SHALL BE INSTALLED WHERE FENCE MEETS THE ACCESS DRIVE.
3. A WILDLIFE FRIENDLY OPENING, MEASURING 1 FOOT X 1 FOOT, MINIMUM, SHALL BE INSTALLED AT THE BOTTOM OF FENCE, SPACED EVERY 100 LF, MINIMUM.

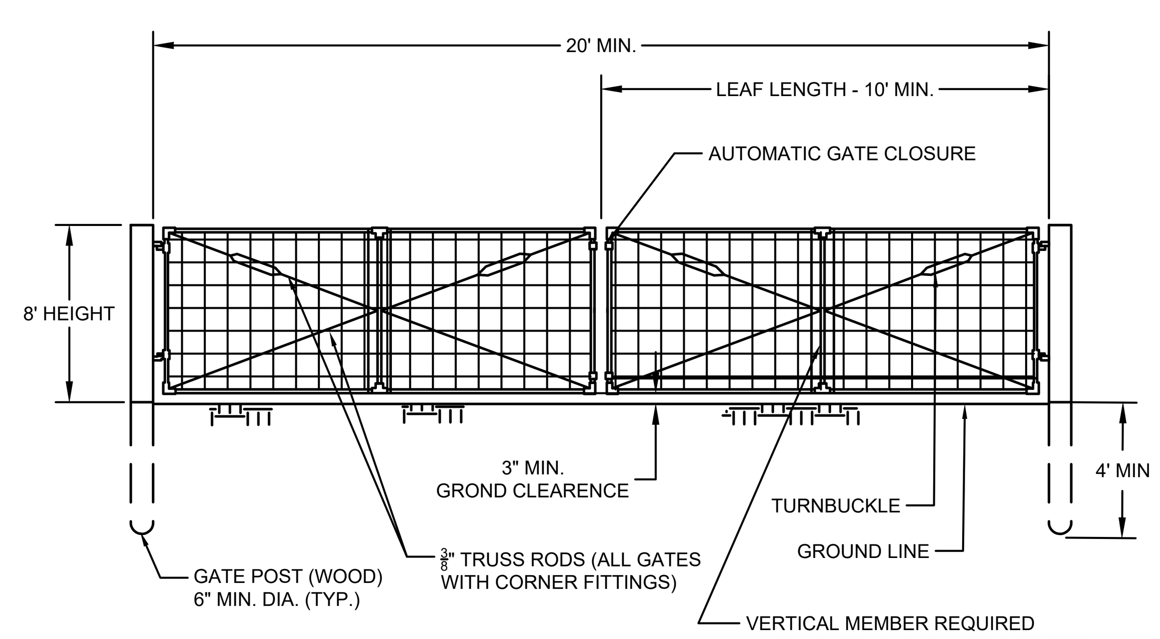
E / C-502 POST-DRIVEN FENCE DETAIL

SCALE: N.T.S.



B / C-502 CONCRETE PAD DETAIL

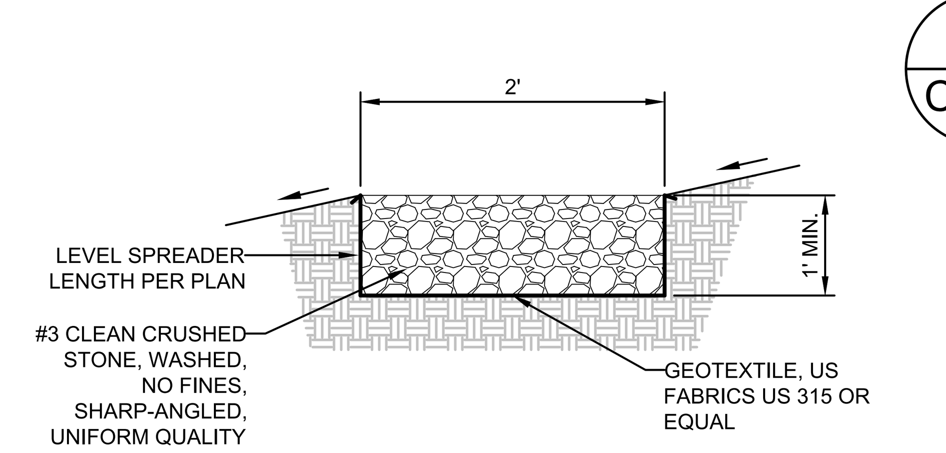
SCALE: N.T.S.



F / C-502 GATE DETAIL

SCALE: N.T.S.

NOTES:
1. COORDINATE KNOX BOX OR SIMILAR WITH LOCAL FIRE DEPARTMENT AS NEEDED.



NOTES:
1. PROVIDE HEAVY DUTY EROSION CONTROL BLANKETS FOR DISTURBED AREAS WITH SLOPES 3:1 OR GREATER. SEE EROSION CONTROL BLANKET DETAIL.
2. TO PREVENT SEDIMENT LOADING OF CLEAN STONE, INSTALL LEVEL SPREADER AFTER UPSLOPE AREAS HAVE BEEN FULLY STABILIZED AND/OR UTILIZE TEMPORARY GEOTEXTILE COVERING. GEOTEXTILE COVERING SHALL BE US FABRICS US 315 OR EQUAL, EMBEDDED 6" MIN. ON UPSLOPE SIDE, DRAPED OVER ENTIRE LEVEL SPREADER SURFACE, EXTEND TO 1' MIN. PAST DOWNSLOPE SIDE AND STAKE / FASTEN SECURELY, REMOVE WHEN SITE IS FULLY STABILIZED.

G / C-502 LEVEL SPREADER DETAIL

SCALE: NTS

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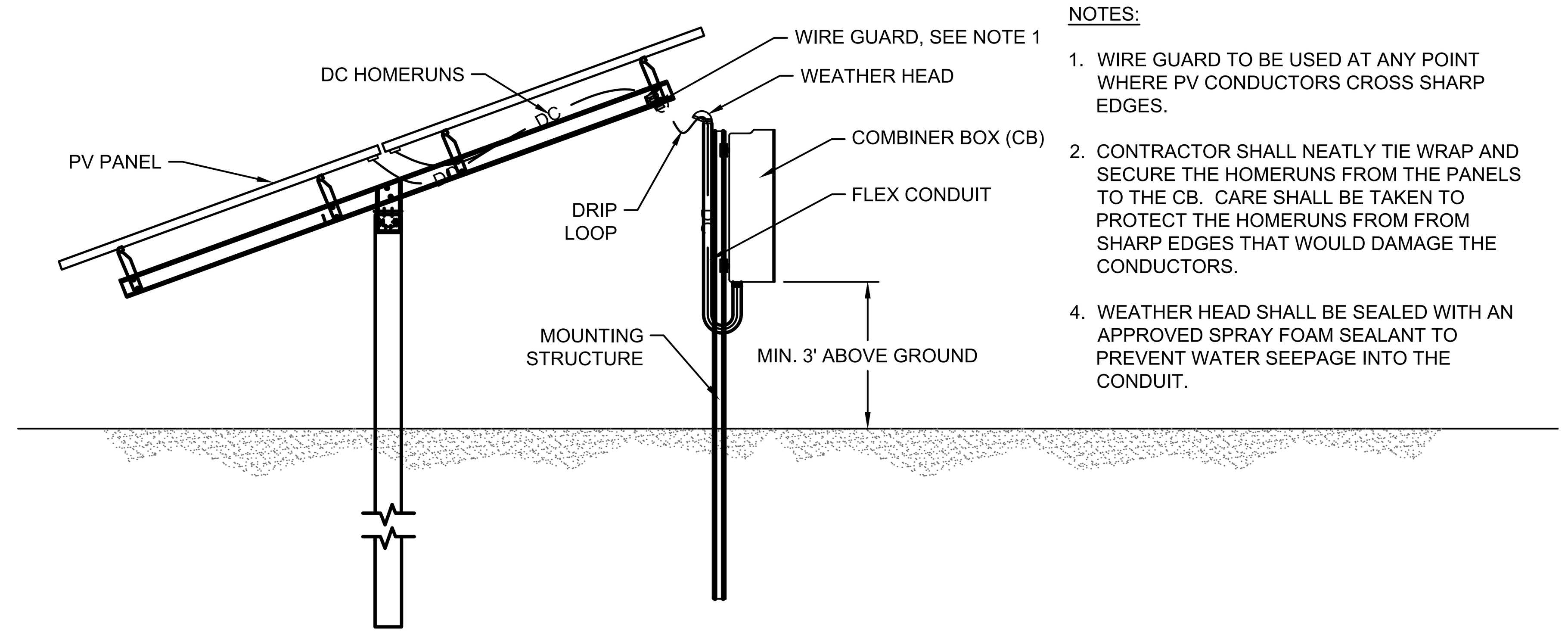
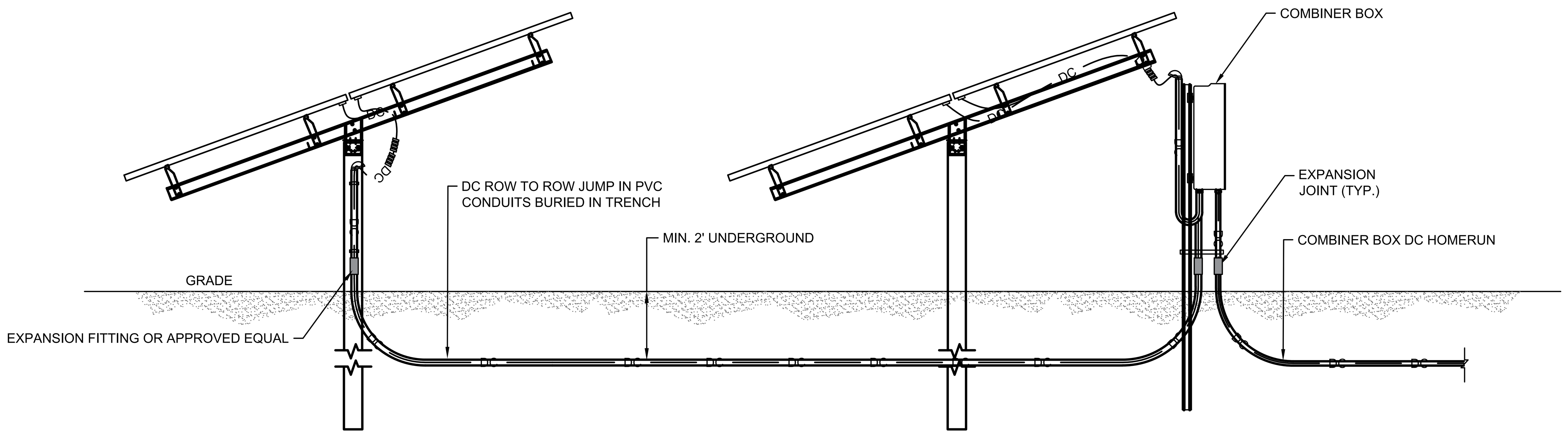


NOTES:

1. WIRE GUARD TO BE USED AT ANY POINT WHERE PV CONDUCTORS CROSS SHARP EDGES.
2. CONTRACTOR SHALL NEATLY TIE WRAP AND SECURE THE HOMERUNS FROM THE PANELS TO THE CB. CARE SHALL BE TAKEN TO PROTECT THE HOMERUNS FROM FROM SHARP EDGES THAT WOULD DAMAGE THE CONDUCTORS.
4. WEATHER HEAD SHALL BE SEALED WITH AN APPROVED SPRAY FOAM SEALANT TO PREVENT WATER SEEPAGE INTO THE CONDUIT.

A / E-501 FIXED TILT DC CONDUCTORS WIRE MANAGEMENT DETAIL

SCALE: N.T.S.

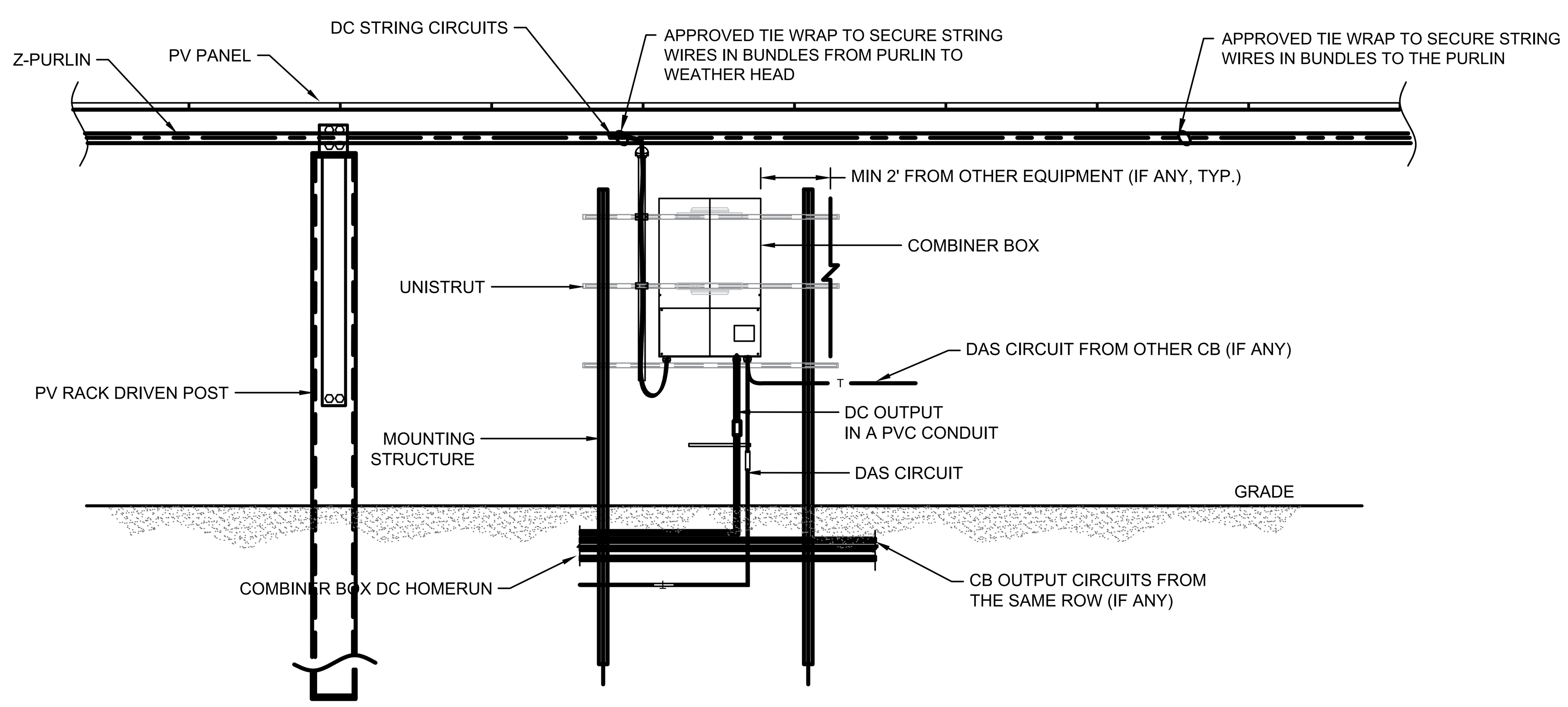


NOTE:

1. ELECTRICIANS TO PROVIDE CONDUIT FITTINGS, EXPANSION FITTINGS, AND PROTECTIVE BUSHINGS AS REQUIRED
2. A WIRE MANAGEMENT TRAY OR APPROVED EQUIVALENT SHALL BE PROVIDED TO HOUSE THE EXPOSED DC CONDUCTORS AT THE COMBINER BOX RACKING STRUCTURE
3. SPLIT-WIRE LOOM SHALL BE PROVIDED WHERE CABLES COME IN CONTACT WITH SHARP EDGES, IN CASE OF LARGER GAPS BETWEEN RACKING TABLES, AND FOR ADDITIONAL PROTECTION OF EXPOSED PV WIRES AT THE COMBINER BOX MOUNTING STRUCTURE
4. COMMUNICATION CONDUITS SHALL BE PLACED AT LEAST 1' FROM EITHER AC OR DC CIRCUITS

B / E-501 ROW TO ROW JUMPING DETAIL

SCALE: N.T.S.



C / E-501 EQUIPMENT MOUNTING DETAIL FRONT VIEW

SCALE: N.T.S.

ELECTRICAL DETAIL NOTES:

1. ALL ELECTRICAL DETAILS SHOWN HAVE BEEN INCLUDED FOR GENERAL REFERENCE AND DOES NOT REPRESENT THE SPECIFIC DESIGN OF ALL ELECTRICAL AND/OR RACKING COMPONENTS. THE ELECTRICAL DESIGN AND CONSTRUCTION DRAWINGS SHALL BE REFERENCED FOR ALL ELECTRICAL COMPONENTS DURING CONSTRUCTION OF THIS PROJECT.

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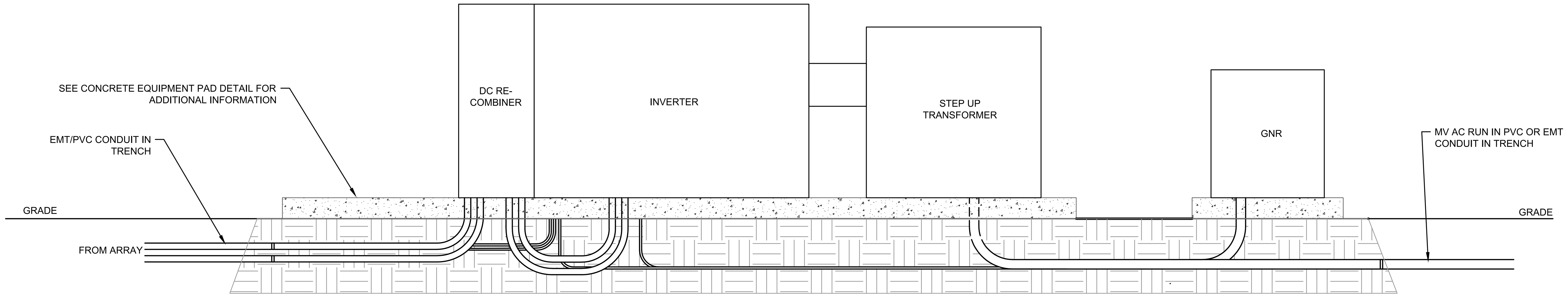
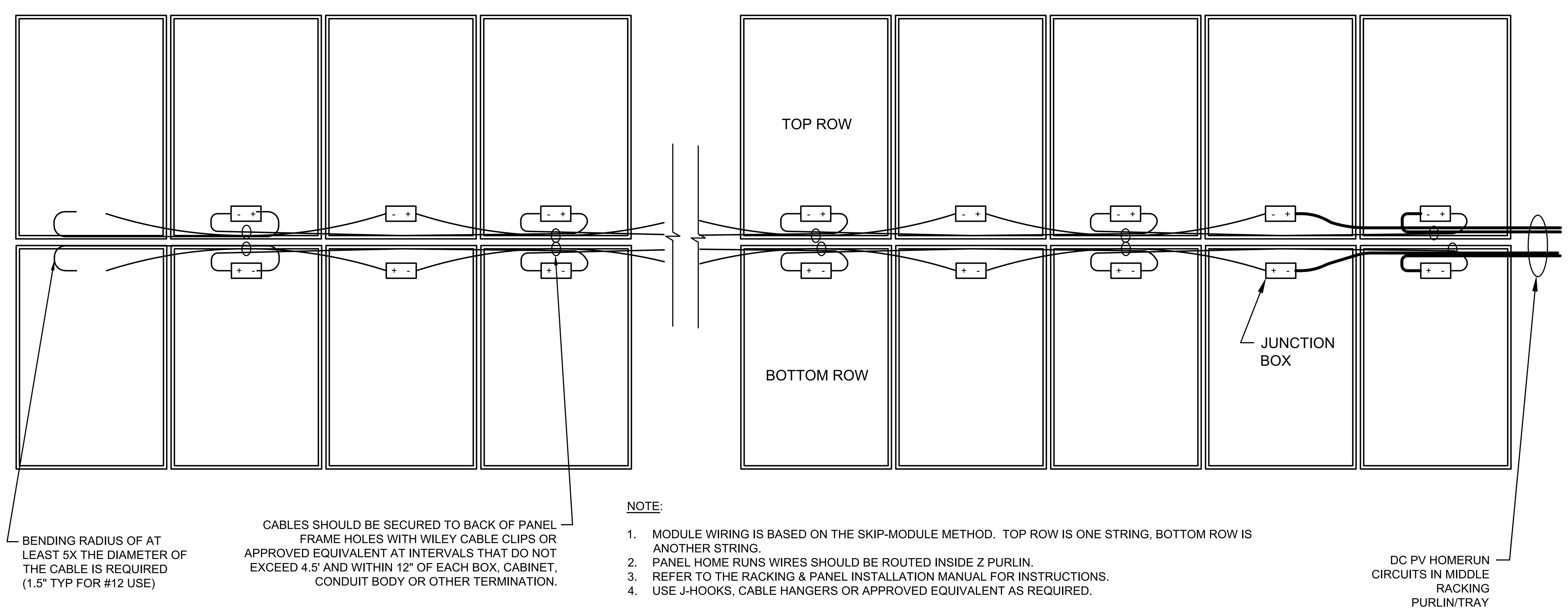


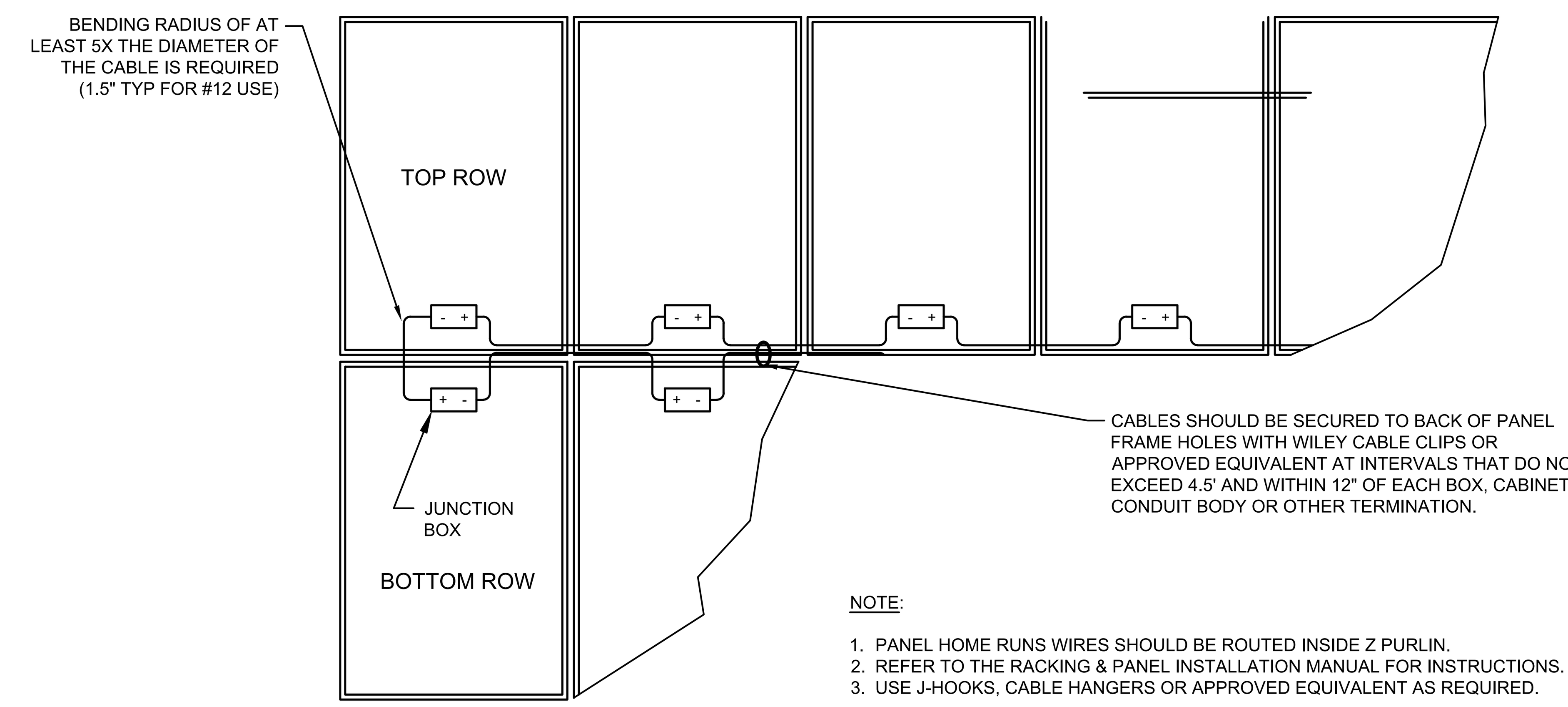
A
E-502
EQUIPMENT PAD WIRING MANAGEMENT
SCALE: N.T.S.



NOTE:

1. MODULE WIRING IS BASED ON THE SKIP-MODULE METHOD. TOP ROW IS ONE STRING, BOTTOM ROW IS ANOTHER STRING.
2. PANEL HOME RUNS WIRES SHOULD BE ROUTED INSIDE Z PURLIN.
3. REFER TO THE RACKING & PANEL INSTALLATION MANUAL FOR INSTRUCTIONS.
4. USE J-HOOKS, CABLE HANGERS OR APPROVED EQUIVALENT AS REQUIRED.

B
E-502
PANEL WIRING MANAGEMENT DETAIL (FULL RACK WITH SKIP WIRING)
SCALE: N.T.S.



NOTE:

1. PANEL HOME RUNS WIRES SHOULD BE ROUTED INSIDE Z PURLIN.
2. REFER TO THE RACKING & PANEL INSTALLATION MANUAL FOR INSTRUCTIONS.
3. USE J-HOOKS, CABLE HANGERS OR APPROVED EQUIVALENT AS REQUIRED.

C
E-502
PANEL WIRING MANAGEMENT DETAIL (HALF RACK)
SCALE: N.T.S.

ELECTRICAL DETAIL NOTES:

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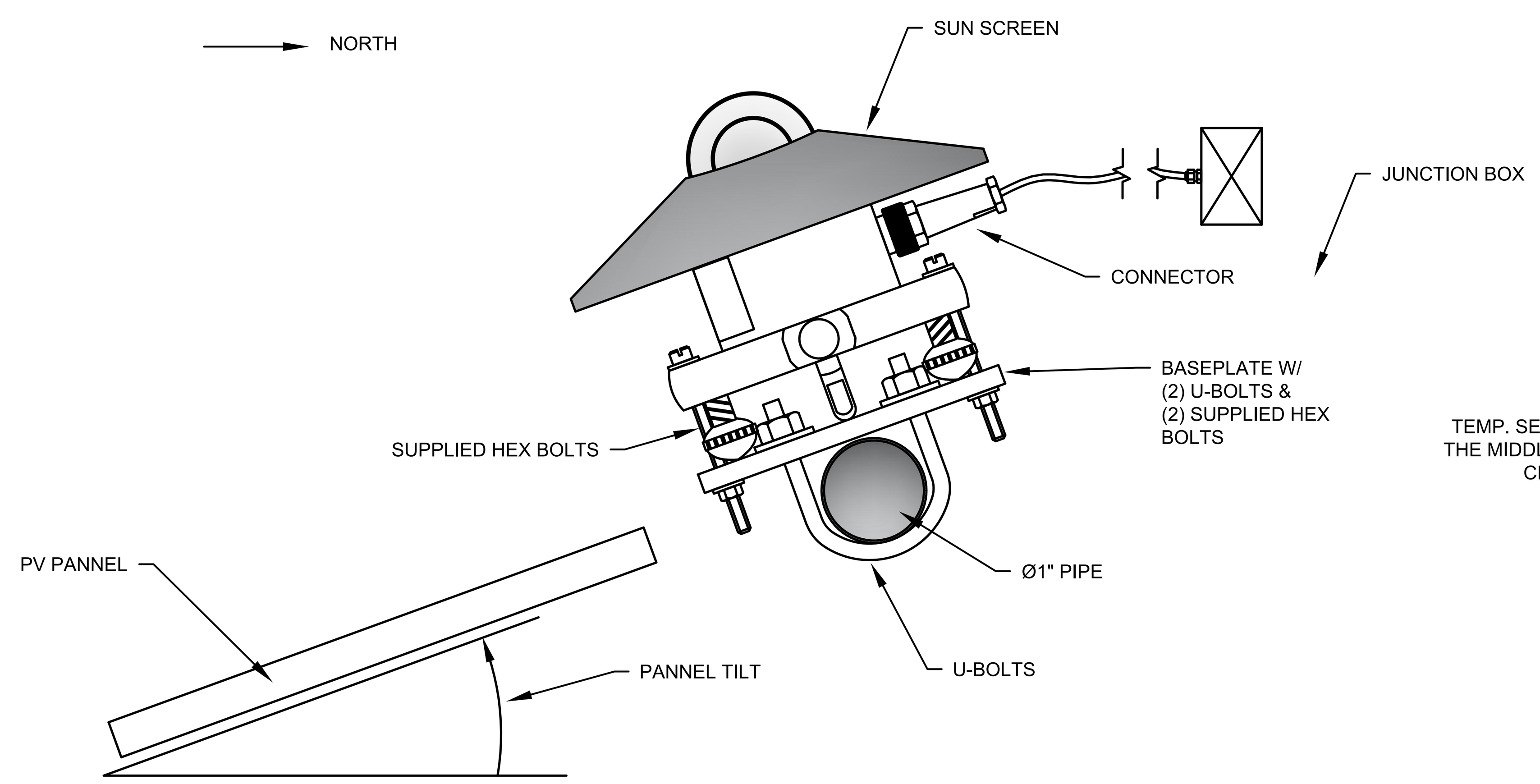
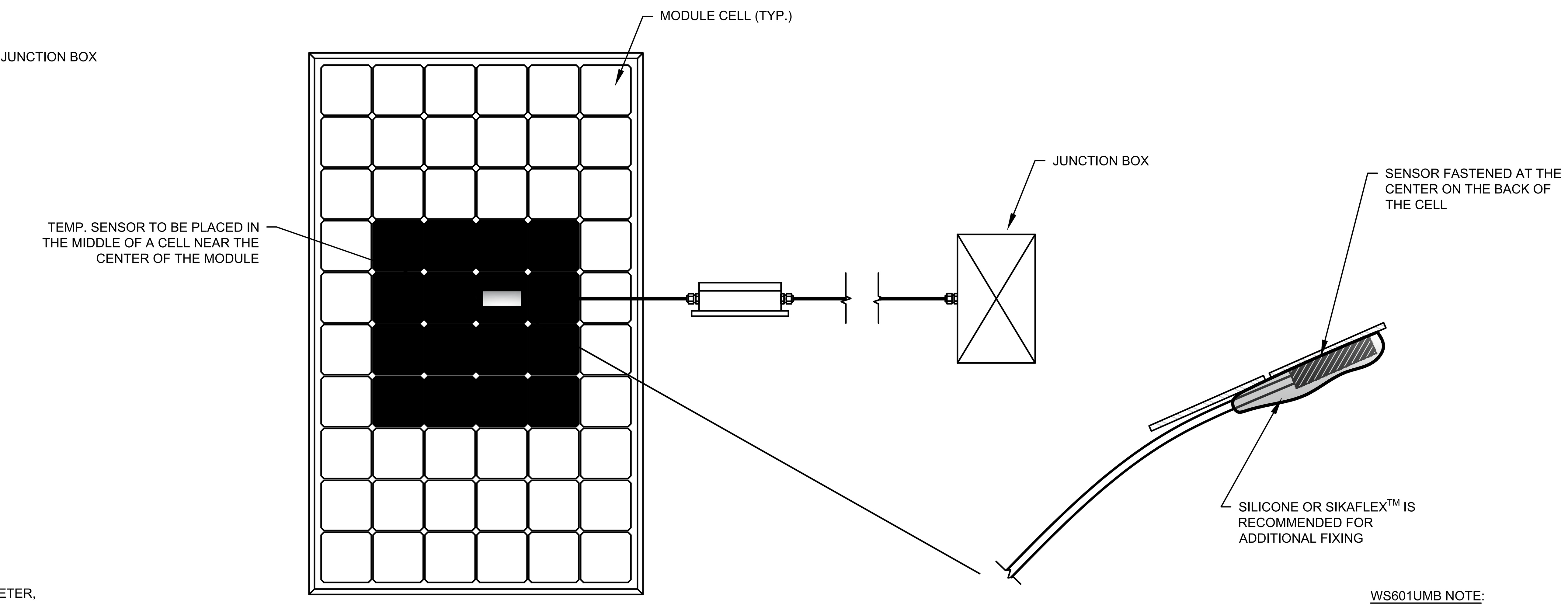


PYRANOMETER NOTE:

1. FOR POA PYRANOMETERS, ROTATE ASSEMBLY SO THAT THE BASEPLATE IS PARALLEL TO THE PV ARRAY AND FASTEN SNUGLY. FOR GHI PYRANOMETER, ROTATE ASSEMBLY SO THAT THE BASEPLATE IS PARALLEL TO THE GROUND.
2. PLACE PYRANOMETER ONTO THE MOUNTING BRACKET BASEPLATE AND ENSURE THEY ARE PARALLEL TO EACH OTHER USING THE LEVELING METER.
3. ELECTRICAL DETAILS REFERS TO DAS INFORMATION. IF THE SENSOR IS THE LAST DEVICE IN A MODBUS CHAIN WHICH CONSISTS OF 3 OR MORE DEVICES, THEN ADD A 120Ω RESISTOR BETWEEN THE DATA+ AND DATA- WIRES

A E-503 PYRANOMETER (POA) INSTALLATION

SCALE: N.T.S.

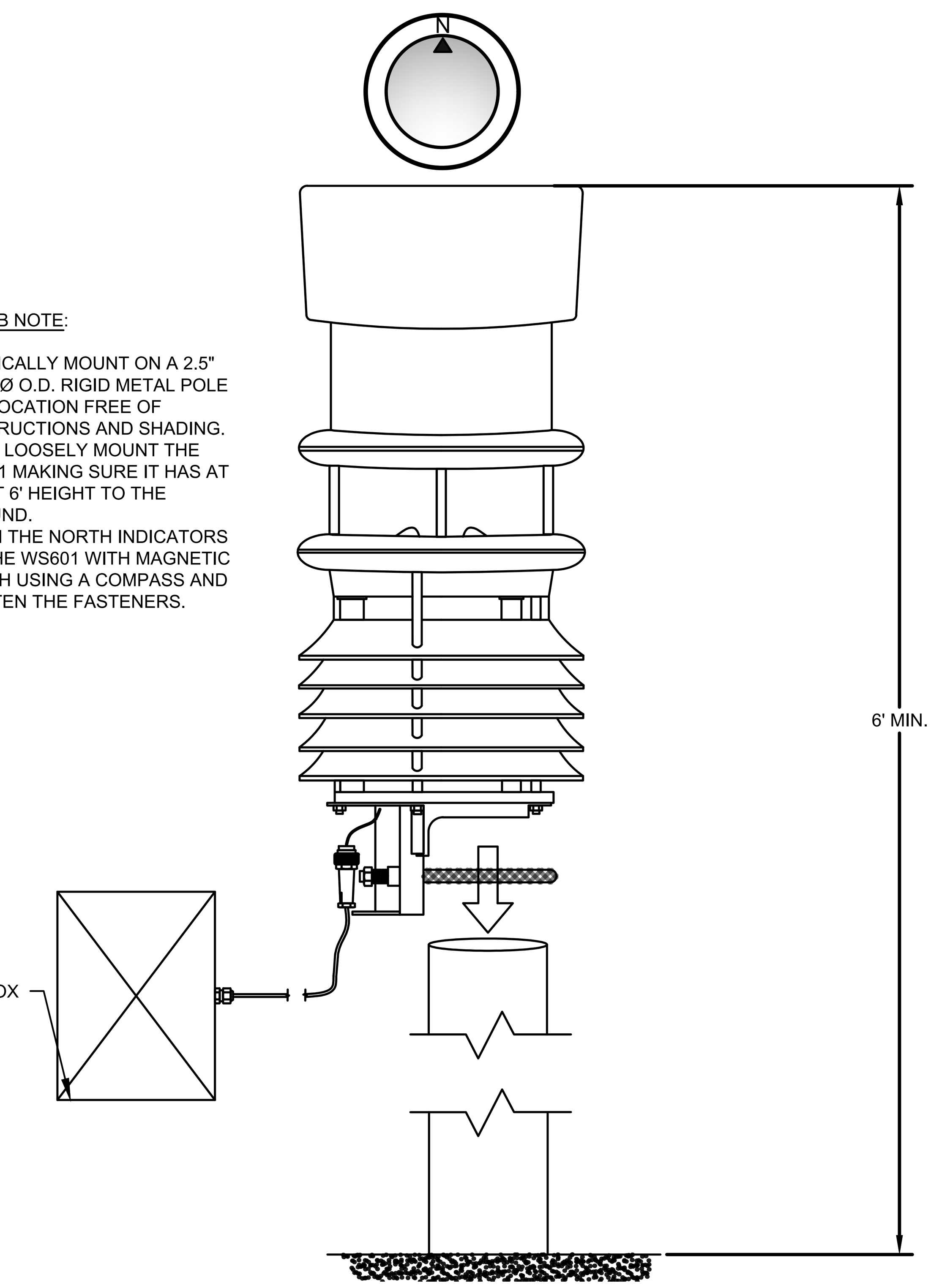


TEMPERATURE SENSOR NOTE:

1. THE SENSOR SHALL BE PLACED ON A MODULE THAT IS AT LEAST 1 MODULE FROM THE EDGE OF THE ARRAY ON ALL SIDES WHEN POSSIBLE.
2. CLEAN THE CELL BEFORE ATTACHING A SENSOR ONTO IT.

C E-503 MODULE TEMPERATURE SENSOR INSTALLATION

SCALE: N.T.S.



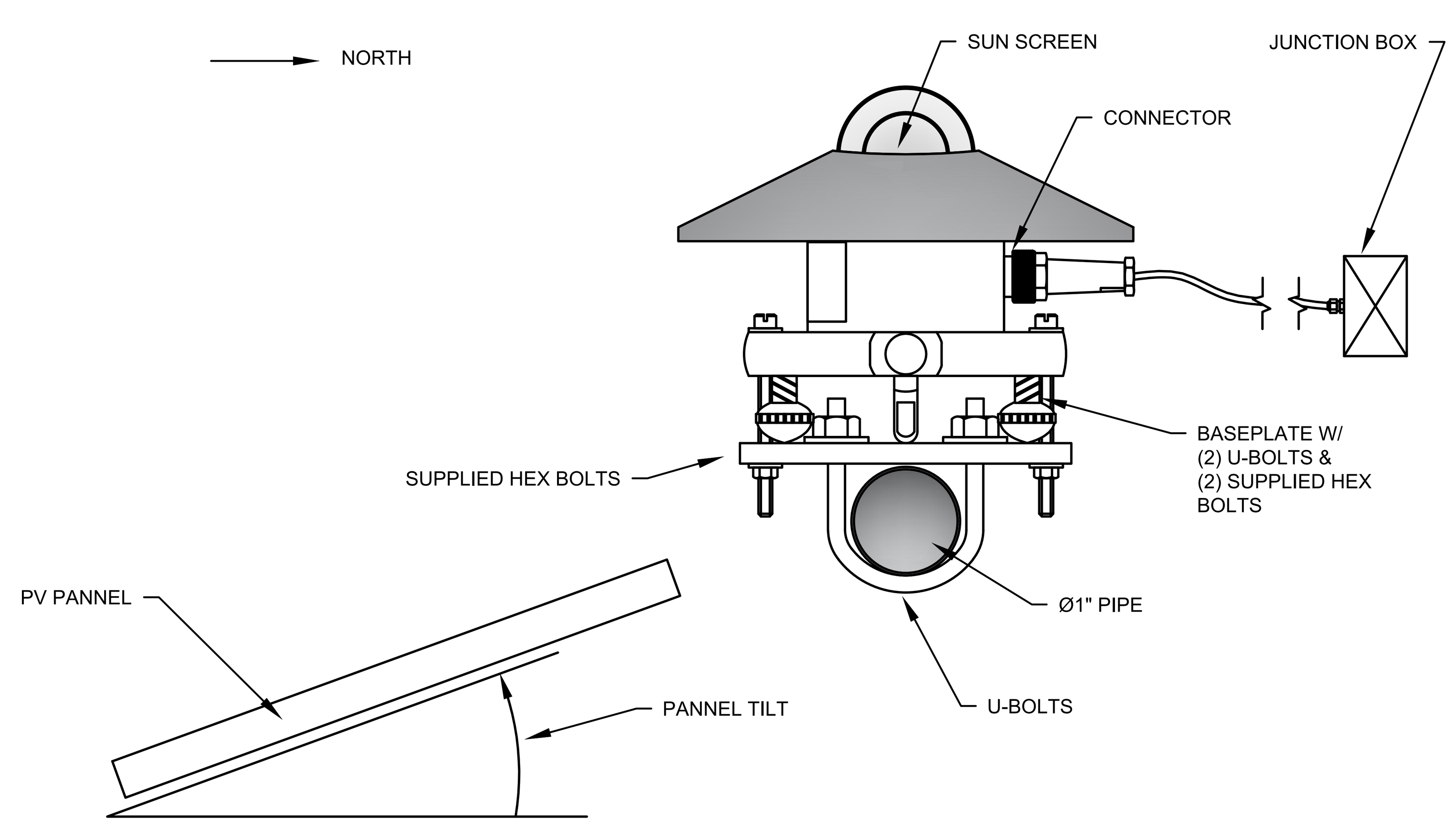
JUNCTION BOX

WS601UMB NOTE:

1. VERTICALLY MOUNT ON A 2.5" TO 3" Ø O.D. RIGID METAL POLE IN A LOCATION FREE OF OBSTRUCTIONS AND SHADING.
2. FIRST LOOSELY MOUNT THE WS601 MAKING SURE IT HAS AT LEAST 6' HEIGHT TO THE GROUND.
3. ALIGN THE NORTH INDICATORS ON THE WS601 WITH MAGNETIC NORTH USING A COMPASS AND TIGHTEN THE FASTENERS.

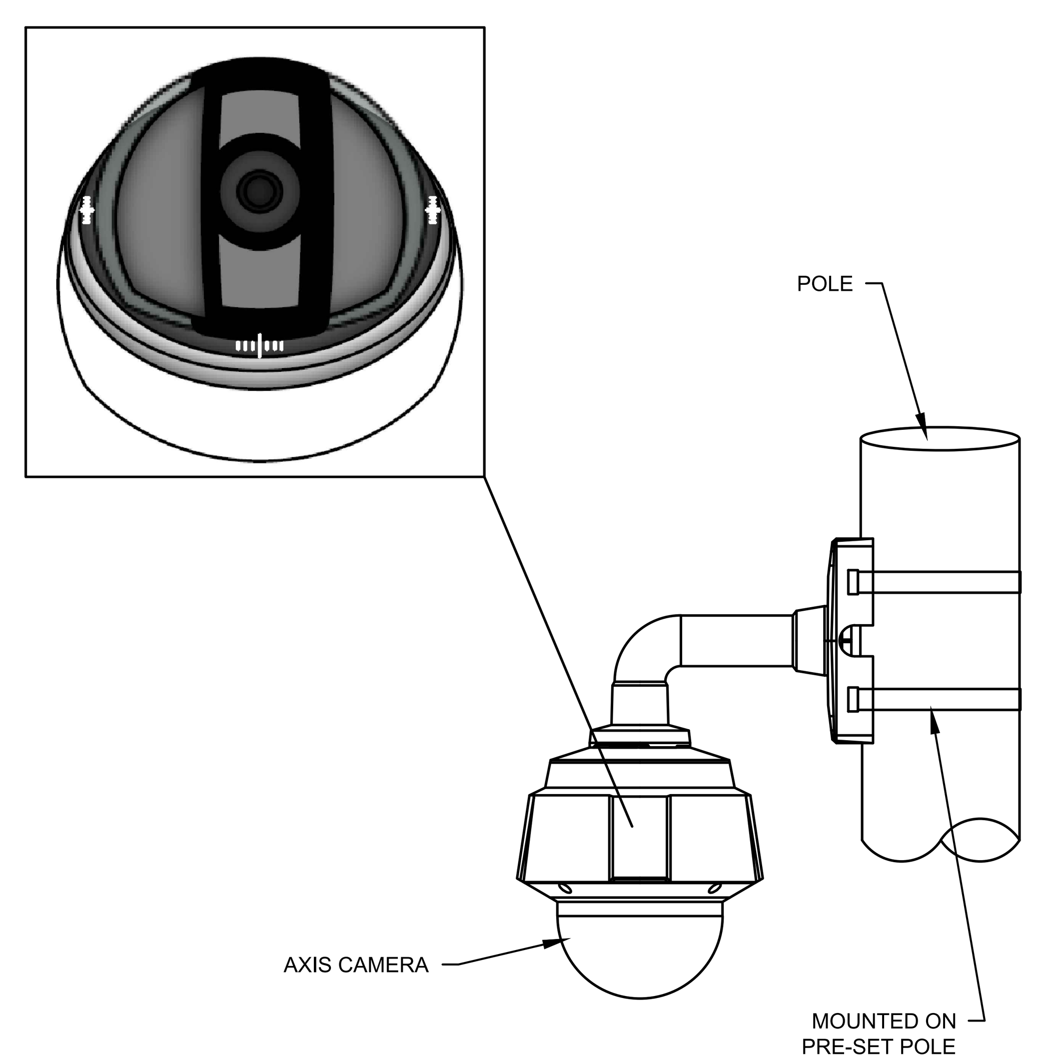
E E-503 LUFFT WS601USM INSTALLATION

SCALE: N.T.S.



B E-503 PYRANOMETER (GHI) INSTALLATION

SCALE: N.T.S.



D E-503 AXIS CAMERA INSTALLATION

SCALE: N.T.S.

ELECTRICAL DETAIL NOTES:

1. ALL ELECTRICAL DETAILS SHOWN HAVE BEEN INCLUDED FOR GENERAL REFERENCE AND DOES NOT REPRESENT THE SPECIFIC DESIGN OF ALL ELECTRICAL AND/OR RACKING COMPONENTS. THE ELECTRICAL DESIGN AND CONSTRUCTION DRAWINGS SHALL BE REFERENCED FOR ALL ELECTRICAL COMPONENTS DURING CONSTRUCTION OF THIS PROJECT.

REV #	DESCRIPTION	DATE	BY
4	REVISED PER PB COMMENT – SCREENING & HYDRANT	11/22/24	ETY

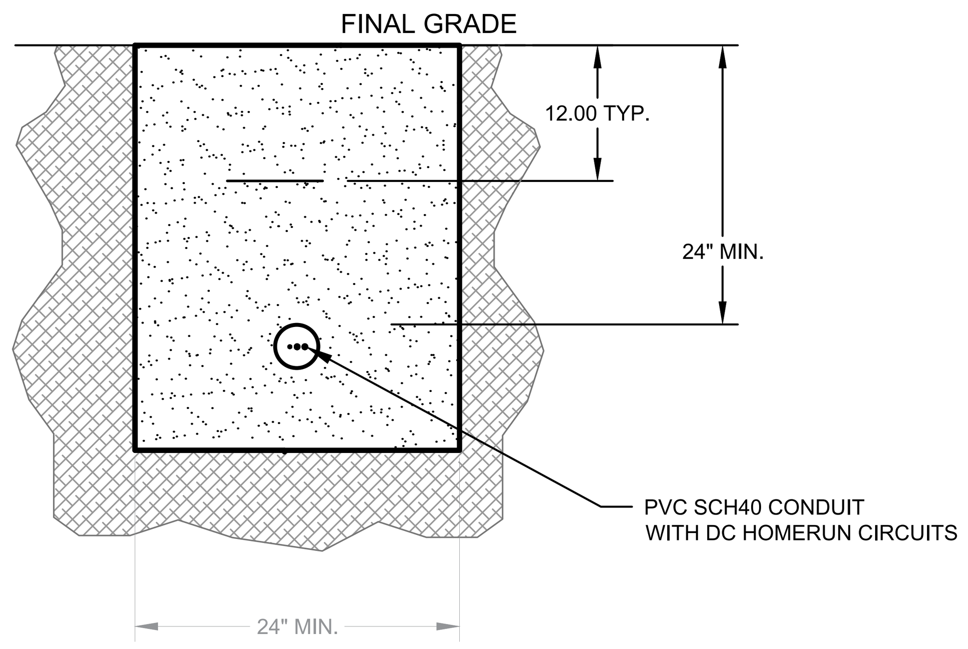
ELP MARLBOROUGH SOLAR
335 BINGHAM ROAD

TOWN OF MARLBOROUGH — ULSTER COUNTY, NY

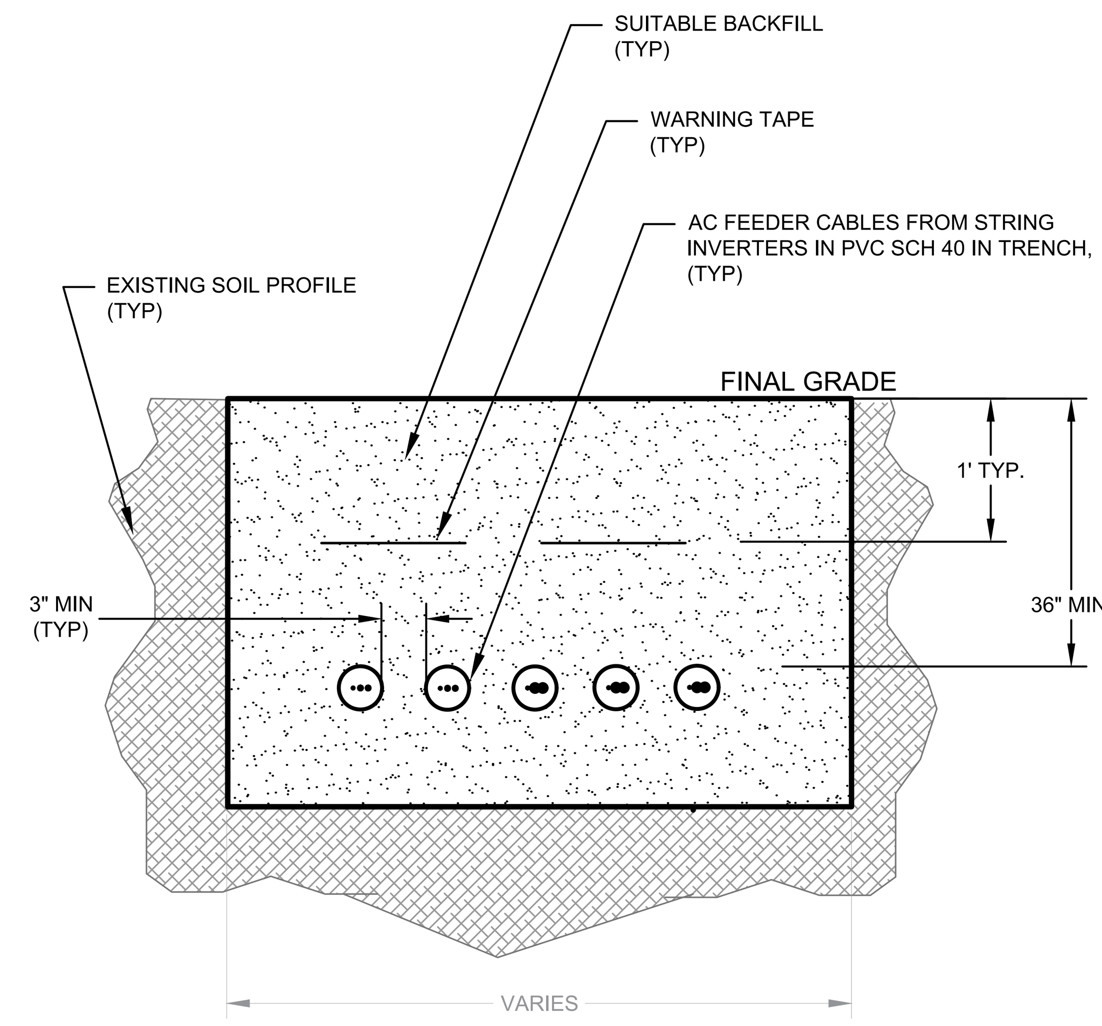
ELECTRICAL DETAILS - SHEET 3

CRAWFORD & ASSOCIATES
ENGINEERING & LAND SURVEYING, PC
4411 Route 9, Suite 200, Hudson New York 12534 tel: (518) 828-2700
www.crawfordandassociates.com fax: (518) 828-2723

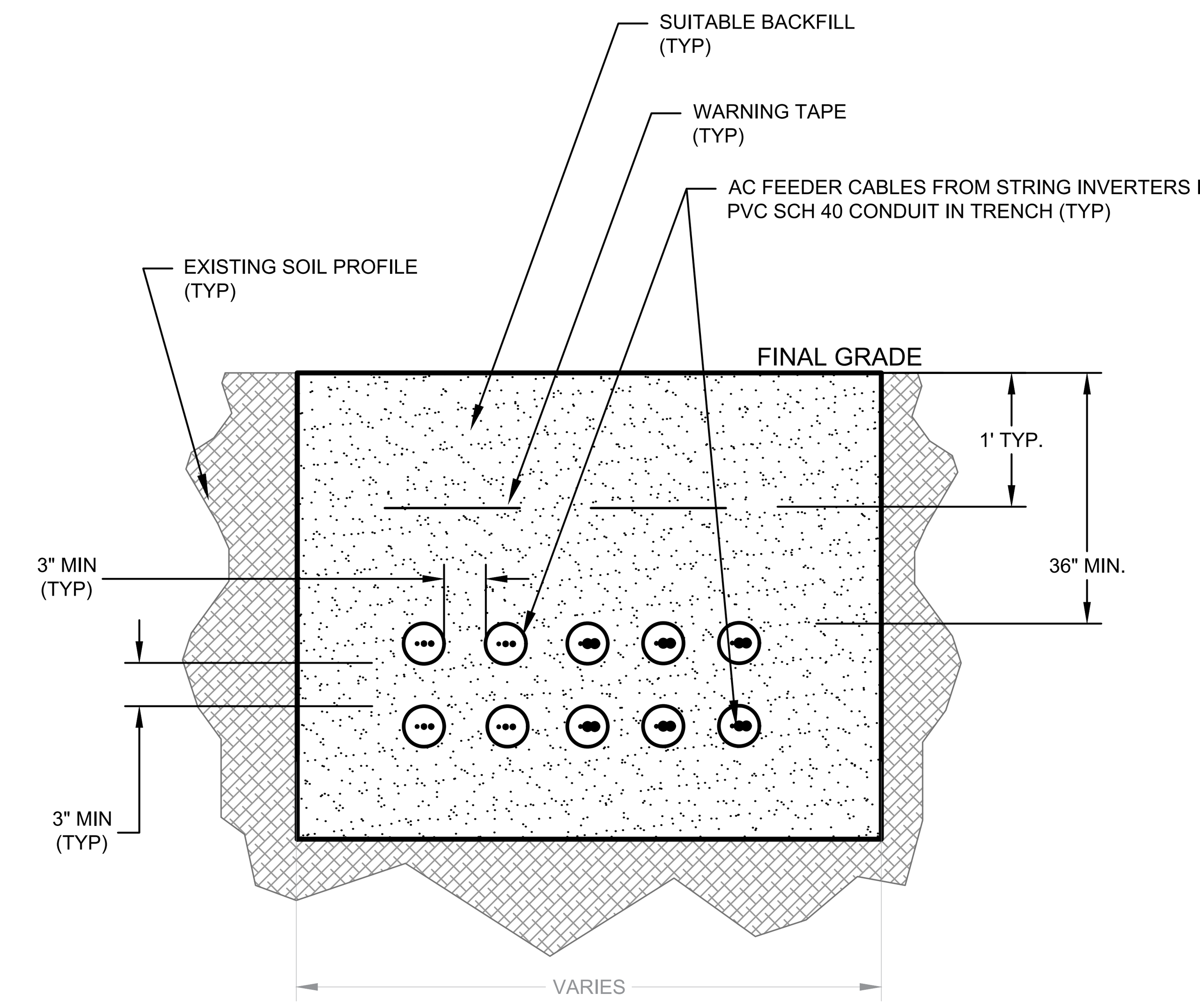
DATE 4/5/2024	DRAWN BY: TSB/DPB	H:\WORK\4996.26 Marlborough\DWG\4996.26 DETAILS-E.dwg	
	DESIGNED BY: TSB/DPB	C&A JOB# 4996.26	DRAWING: E-503
SCALE AS SHOWN	CHECKED BY: CJK		
	APPROVED BY: CJK		



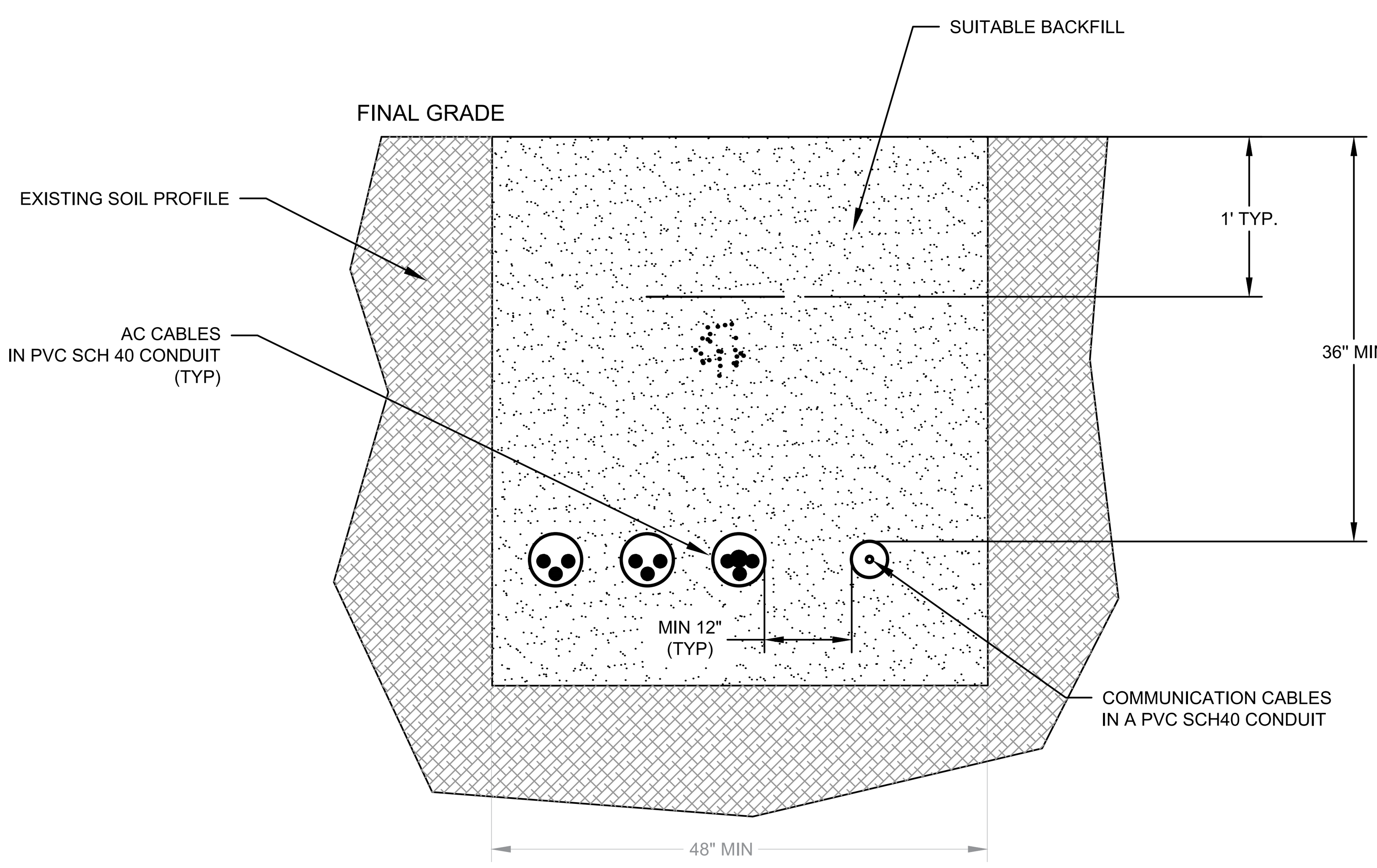
A
E-504
DC HOMERUNS ROW TO ROW JUMPER TRENCH DETAIL
SCALE: N.T.S.



B
E-504
AC FEEDER CIRCUITS TRENCH DETAIL (SINGLE LAYER)
SCALE: N.T.S.



C
E-504
AC FEEDER CIRCUITS TRENCH DETAIL (TWO LAYERS)
SCALE: N.T.S.



D
E-504
MEDIUM VOLTAGE CONDUCTORS WITH COMMUNICATIONS CABLES TRENCH DETAIL
SCALE: N.T.S.

NOTES:

1. ALL AC CONDUITS TO BE BURIED AT A MINIMUM OF 3'. ALL DC CONDUITS TO BE BURIED AT A MINIMUM OF 2'.
2. COMMUNICATION CABLES TO BE A MINIMUM OF 12" AWAY FROM DC AND AC CABLES.
3. WARNING TAPE TO BE METALLIC WITH THE PHRASE "CAUTION: BURIED ELECTRICAL LINES"
4. BACKFILL TO BE FREE FROM ANY ROCKS OR OTHER DELETERIOUS OBJECTS THAT ARE 3/4" IN DIAMETER OR GREATER.
5. ELECTRICIANS TO PROVIDE MATCHING FITTINGS AND EXPANSION COUPLINGS BY THE SAME MANUFACTURER AS THE CONDUIT

ELECTRICAL DETAIL NOTES:

1. ALL ELECTRICAL DETAILS SHOWN HAVE BEEN INCLUDED FOR GENERAL REFERENCE AND DOES NOT REPRESENT THE SPECIFIC DESIGN OF ALL ELECTRICAL AND/OR RACKING COMPONENTS. THE ELECTRICAL DESIGN AND CONSTRUCTION DRAWINGS SHALL BE REFERENCED FOR ALL ELECTRICAL COMPONENTS DURING CONSTRUCTION OF THIS PROJECT.

REV #	DESCRIPTION	DATE	BY
4	REVISED PER PB COMMENT – SCREENING & HYDRANT	11/22/24	ETY

ELP MARLBOROUGH SOLAR
335 BINGHAM ROAD
TOWN OF MARLBOROUGH — ULSTER COUNTY, NY

ELECTRICAL DETAILS - SHEET 4

CRAWFORD & ASSOCIATES
ENGINEERING & LAND SURVEYING, PC
4411 Route 9, Suite 200, Hudson New York 12534 tel: (518) 828-2700
www.crawfordandassociates.com fax: (518) 828-2723

DATE	DRAWN BY: TSB/DPB	H:\WORK\4996.26 Marlborough\DWG\4996.26 DETAILS-E.dwg	
4/5/2024	DESIGNED BY: TSB/DPB	C&A JOB#	DRAWING:
SCALE	CHECKED BY: CJK	4996.26	E-504
AS SHOWN	APPROVED BY: CJK		

Appendix D: Notice of Intent

NOI for coverage under Stormwater General Permit for Construction Activity

version 1.40

(Submission #: HQ4-PQJ7-90CN4, version 1)

Details

Originally Started By	Jeff Hotaling
Alternate Identifier	ELP Marlborough Solar
Submission ID	HQ4-PQJ7-90CN4
Submission Reason	New
Status	Draft
Active Steps	Form Submitted

Form Input

Owner/Operator Information

Owner/Operator Name (Company/Private Owner/Municipality/Agency/Institution, etc.)
ELP Marlborough Solar, LLC.

Owner/Operator Contact Person Last Name (NOT CONSULTANT)
Velasco

Owner/Operator Contact Person First Name
David

Owner/Operator Mailing Address
14 Arrow Street, Suite 22

City
Cambridge

State
MA

Zip
02139

Phone
(201) 275-4863

Email
dve@vcrenewables.com

Federal Tax ID
TBD

> If the owner/operator is an organization, provide the Federal Tax ID number, or Employer Identification Number (EIN), in the format xx-xxxxxxx. If the owner/operator is an individual and not an organization, enter "Not Applicable" or "N/A" and do not provide the individual's social security number.

Project Location

Project/Site Name
ELP Marlborough Solar

Street Address (Not P.O. Box)
335 Bingham Road

Side of Street
South

City/Town/Village (THAT ISSUES BUILDING PERMIT)
Town of Marlborough

State
NY

Zip
12542

DEC Region
3

> The DEC Region must be provided. Please use the NYSDEC Stormwater Interactive Map (https://gisservices.dec.ny.gov/gis/stormwater/) to confirm which DEC Region this site is located in. To view the DEC Regions, click on "Other Useful Reference Layers" on the left side of the map, then click on "DEC Administrative Boundary." Zoom out as needed to see the Region boundaries.

> For projects that span multiple Regions, please select a primary Region and then provide the additional Regions as a note in Question 39.

County
ULSTER

Name of Nearest Cross Street
Hampton Road

Distance to Nearest Cross Street (Feet)
1480

Project In Relation to Cross Street
West

Tax Map Numbers Section-Block-Parcel
108.3-3-21

Tax Map Numbers
N/A

> If the project does not have tax map numbers (e.g. linear projects), enter “Not Applicable” or "N/A".

1. Coordinates

Provide the Geographic Coordinates for the project site. The two methods are:
- Navigate to the project location on the map (below) and click to place a marker and obtain the XY coordinates.
- The "Find Me" button will provide the lat/long for the person filling out this form. Then pan the map to the correct location and click the map to place a marker and obtain the XY coordinates.

Navigate to your location and click on the map to get the X,Y coordinates
41.58687403096808,-74.01793934025055

Project Details

2. What is the nature of this project?
Redevelopment with no increase in impervious area

> For the purposes of this eNOI, “New Construction” refers to any project that does not involve the disturbance of existing impervious area (i.e. 0 acres). If existing impervious area

> will be disturbed on the project site, it is considered redevelopment with either increase in impervious area or no increase in impervious area.

3. Select the predominant land use for both pre and post development conditions.

Pre-Development Existing Landuse
Other: Orchard

Post-Development Future Land Use
Other: Large Scale Solar Energy System (5MW-AC)

3a. If Single Family Subdivision was selected in question 3, enter the number of subdivision lots.
NONE PROVIDED

---

4. In accordance with the larger common plan of development or sale, enter the total project site acreage, the acreage to be disturbed and the future impervious area (acreage)within the disturbed area.

*** ROUND TO THE NEAREST TENTH OF AN ACRE. ***

Total Site Area (acres)
21.0

Total Area to be Disturbed (acres)
21.9

Existing Impervious Area to be Disturbed (acres)
2.1

Future Impervious Area Within Disturbed Area (acres)
0.5

5. Do you plan to disturb more than 5 acres of soil at any one time?
No

---

6. Indicate the percentage (%) of each Hydrologic Soil Group(HSG) at the site.

A (%)
0

B (%)
0

C (%)
42

D (%)
47

7. Is this a phased project?
Yes

8. Enter the planned start and end dates of the disturbance activities.

Start Date
07/12/2024

End Date
08/31/2024

9. Identify the nearest surface waterbody(ies) to which construction site runoff will discharge.
Unnamed tributary to Hudson River

> Drainage ditches and storm sewer systems are not considered surface waterbodies. Please identify the surface waterbody that they discharge to. If the nearest surface waterbody is unnamed, provide a description of the waterbody, such as, “Unnamed tributary to Niagara River.”

9a. Type of waterbody identified in question 9?
Wetland/Federal Jurisdiction On Site (Answer 9b)

Other Waterbody Type Off Site Description
NONE PROVIDED

9b. If "wetland" was selected in 9A, how was the wetland identified?
Regulatory Map

10. Has the surface waterbody(ies) in question 9 been identified as a 303(d) segment in Appendix E of GP-0-20-001?
No

11. Is this project located in one of the Watersheds identified in Appendix C of GP-0-20-001?
No

12. Is the project located in one of the watershed areas associated with AA and AA-S classified waters?
No

> Please use the DEC Stormwater Interactive Map (https://gisservices.dec.ny.gov/gis/stormwater/) to confirm if this site is located in one of the

> watersheds of an AA or AA-S classified water. To view the watershed areas, click on “Permit Related Layers” on the left side of the map, then click on “Class AA AAS Watersheds.”

If No, skip question 13.

13. Does this construction activity disturb land with no existing impervious cover and where the Soil Slope Phase is identified as D (provided the map unit name is inclusive of slopes greater than 25%), E or F on the USDA Soil Survey?
NONE PROVIDED

If Yes, what is the acreage to be disturbed?
NONE PROVIDED

14. Will the project disturb soils within a State regulated wetland or the protected 100 foot adjacent area?
No

15. Does the site runoff enter a separate storm sewer system (including roadside drains, swales, ditches, culverts, etc)?
No

16. What is the name of the municipality/entity that owns the separate storm sewer system?
NONE PROVIDED

17. Does any runoff from the site enter a sewer classified as a Combined Sewer?
No

18. Will future use of this site be an agricultural property as defined by the NYS Agriculture and Markets Law?
No

19. Is this property owned by a state authority, state agency, federal government or local government?
No

20. Is this a remediation project being done under a Department approved work plan? (i.e. CERCLA, RCRA, Voluntary Cleanup Agreement, etc.)
No

Required SWPPP Components

21. Has the required Erosion and Sediment Control component of the SWPPP been developed in conformance with the current NYS Standards and Specifications for Erosion and Sediment Control (aka Blue Book)?
Yes

22. Does this construction activity require the development of a SWPPP that includes the post-construction stormwater management practice component (i.e. Runoff Reduction, Water Quality and Quantity Control practices/techniques)?
No

If you answered No in question 22, skip question 23 and the Post-construction Criteria and Post-construction SMP Identification sections.

23. Has the post-construction stormwater management practice component of the SWPPP been developed in conformance with the 2015 or 2024 NYS Stormwater Management Design Manual?
NONE PROVIDED

24. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:
Professional Engineer (P.E.)

SWPPP Preparer
Crawford & Associates Engineering & Land Surveying, P.C.

Contact Name (Last, First)
Knox, Christopher

Mailing Address
1 Hudson City Centre, Suite 300

City
Hudson

State
NY

Zip
12534

Phone
5188282700

Email
cknox@crawfordandassociates.com

Download SWPPP Preparer Certification Form

Please take the following steps to prepare and upload your preparer certification form:

1) Click on the link below to download a blank certification form
2) The certified SWPPP preparer should sign this form
3) Scan the signed form
4) Upload the scanned document
Download SWPPP Preparer Certification Form

Please upload the SWPPP Preparer Certification
NONE PROVIDED
Comment
NONE PROVIDED

Erosion & Sediment Control Criteria

25. Has a construction sequence schedule for the planned management practices been prepared?
Yes

26. Select all of the erosion and sediment control practices that will be employed on the project site:

Temporary Structural
Silt Fence
Stabilized Construction Entrance
Dust Control

Biotechnical
None

Vegetative Measures
Seeding
Mulching
Protecting Vegetation
Topsoiling

Permanent Structural
None

Other
Concrete Washout, Stockpiling, Rolled Erosion Control, Filter Sock

Post-Construction Criteria

*** IMPORTANT: Completion of Questions 27-39 is not required if response to Question 22 is No.**

27. Identify all site planning practices that were used to prepare the final site plan/layout for the project.
NONE PROVIDED

27a. Indicate which of the following soil restoration criteria was used to address the requirements in Section 5.1.6("Soil Restoration") of the Design Manual.
NONE PROVIDED

28. Provide the total Water Quality Volume (WQv) required for this project (based on final site plan/layout). (Acre-feet)
NONE PROVIDED

29. Post-construction SMP Identification

Use the Post-construction SMP Identification section to identify the RR techniques (Area Reduction), RR techniques(Volume Reduction) and Standard SMPs with RRv Capacity that were used to reduce the Total WQv Required (#28).

Identify the SMPs to be used by providing the total impervious area that contributes runoff to each technique/practice selected. For the Area Reduction Techniques, provide the total contributing area (includes pervious area) and, if applicable, the total impervious area that contributes runoff to the technique/practice.

Note: Redevelopment projects shall use the Post-Construction SMP Identification section to identify the SMPs used to treat and/or reduce the WQv required. If runoff reduction techniques will not be used to reduce the required WQv, skip to question 33a after identifying the SMPs.

30. Indicate the Total RRv provided by the RR techniques (Area/Volume Reduction) and Standard SMPs with RRv capacity identified in question 29. (acre-feet)
NONE PROVIDED

31. Is the Total RRv provided (#30) greater than or equal to the total WQv required (#28)?
NONE PROVIDED

If Yes, go to question 36. If No, go to question 32.

32. Provide the Minimum RRv required based on HSG. [Minimum RRv Required = (P)(0.95) (Ai) / 12, Ai=(s) (Aic)] (acre-feet)
NONE PROVIDED

32a. Is the Total RRv provided (#30) greater than or equal to the Minimum RRv Required (#32)?
NONE PROVIDED

If Yes, go to question 33.

Note: Use the space provided in question #39 to summarize the specific site limitations and justification for not reducing 100% of WQv required (#28). A detailed evaluation of the specific site limitations and justification for not reducing 100% of the WQv required (#28) must also be included in the SWPPP.

If No, sizing criteria has not been met; therefore, NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

33. SMPs

Use the Post-construction SMP Identification section to identify the Standard SMPs and, if applicable, the Alternative SMPs to be used to treat the remaining total WQv (=Total WQv Required in #28 - Total RRv Provided in #30).

Also, provide the total impervious area that contributes runoff to each practice selected.

NOTE: Use the Post-construction SMP Identification section to identify the SMPs used on Redevelopment projects.

33a. Indicate the Total WQv provided (i.e. WQv treated) by the SMPs identified in question #33 and Standard SMPs with RRv Capacity identified in question #29. (acre-feet)
NONE PROVIDED

Note: For the standard SMPs with RRv capacity, the WQv provided by each practice = the WQv calculated using the contributing drainage area to the practice - provided by the practice. (See Table 3.5 in Design Manual)

34. Provide the sum of the Total RRv provided (#30) and the WQv provided (#33a).
NONE PROVIDED

35. Is the sum of the RRv provided (#30) and the WQv provided (#33a) greater than or equal to the total WQv required (#28)?
NONE PROVIDED

If Yes, go to question 36.

If No, sizing criteria has not been met; therefore, NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

36. Provide the total Channel Protection Storage Volume (CPv required and provided or select waiver (#36a), if applicable.

CPv Required (acre-feet)
NONE PROVIDED

CPv Provided (acre-feet)
NONE PROVIDED

36a. The need to provide channel protection has been waived because:
NONE PROVIDED

37. Provide the Overbank Flood (Qp) and Extreme Flood (Qf) control criteria or select waiver (#37a), if applicable.

Overbank Flood Control Criteria (Qp)

Pre-Development (CFS)
NONE PROVIDED

Post-Development (CFS)
NONE PROVIDED

Total Extreme Flood Control Criteria (Qf)

Pre-Development (CFS)
NONE PROVIDED

Post-Development (CFS)
NONE PROVIDED

37a. The need to meet the Qp and Qf criteria has been waived because:
NONE PROVIDED

38. Has a long term Operation and Maintenance Plan for the post-construction stormwater management practice(s) been developed?
NONE PROVIDED

If Yes, Identify the entity responsible for the long term Operation and Maintenance
NONE PROVIDED

39. Use this space to summarize the specific site limitations and justification for not reducing 100% of WQv required (#28). (See question #32a) This space can also be used for other pertinent project information.
The project includes approximately 1,400 SF (0.03 acres) of impervious area, including equipment pad area for the associated solar facility equipment. The project also includes removal of approximately 2.1 acres of existing impervious area (existing driveways). The project does not include traditional impervious areas such as buildings, substation pads, gravel access roads, or parking areas. According to DEC's SWPPP guidance for Solar Farms, this project follows Scenario 1. In addition, DEC's SWPPP guidance for Solar Farm projects has been included in the SWPPP for this project.

The stormwater runoff from the proposed concrete equipment pads shall be treated by Grass Filter Strips.

Post-Construction SMP Identification

Runoff Reduction (RR) Techniques, Standard Stormwater Management Practices (SMPs) and Alternative SMPs

Identify the Post-construction SMPs to be used by providing the total impervious area that contributes runoff to each technique/practice selected. For the Area Reduction Techniques, provide the total contributing area (includes pervious area) and, if applicable, the total impervious area that contributes runoff to the technique/practice.

RR Techniques (Area Reduction)

Round to the nearest tenth

Total Contributing Acres for Conservation of Natural Area (RR-1)
NONE PROVIDED

Total Contributing Impervious Acres for Conservation of Natural Area (RR-1)
NONE PROVIDED

Total Contributing Acres for Sheetflow to Riparian Buffers/Filter Strips (RR-2)
NONE PROVIDED

Total Contributing Impervious Acres for Sheetflow to Riparian Buffers/Filter Strips (RR-2)
NONE PROVIDED

Total Contributing Acres for Tree Planting/Tree Pit (RR-3)
NONE PROVIDED

Total Contributing Impervious Acres for Tree Planting/Tree Pit (RR-3)
NONE PROVIDED

Total Contributing Acres for Disconnection of Rooftop Runoff (RR-4)
NONE PROVIDED

RR Techniques (Volume Reduction)

Total Contributing Impervious Acres for Disconnection of Rooftop Runoff (RR-4)
NONE PROVIDED

Total Contributing Impervious Acres for Vegetated Swale (RR-5)
NONE PROVIDED

Total Contributing Impervious Acres for Rain Garden (RR-6)
NONE PROVIDED

Total Contributing Impervious Acres for Stormwater Planter (RR-7)
NONE PROVIDED

Total Contributing Impervious Acres for Rain Barrel/Cistern (RR-8)
NONE PROVIDED

Total Contributing Impervious Acres for Porous Pavement (RR-9)
NONE PROVIDED

Total Contributing Impervious Acres for Green Roof (RR-10)
NONE PROVIDED

Standard SMPs with RRv Capacity

Total Contributing Impervious Acres for Infiltration Trench (I-1)
NONE PROVIDED

Total Contributing Impervious Acres for Infiltration Basin (I-2)
NONE PROVIDED

Total Contributing Impervious Acres for Dry Well (I-3)
NONE PROVIDED

Total Contributing Impervious Acres for Underground Infiltration System (I-4)
NONE PROVIDED

Total Contributing Impervious Acres for Bioretention (F-5)
NONE PROVIDED

Total Contributing Impervious Acres for Dry Swale (O-1)
NONE PROVIDED

Standard SMPs

Total Contributing Impervious Acres for Micropool Extended Detention (P-1)
NONE PROVIDED

Total Contributing Impervious Acres for Wet Pond (P-2)
NONE PROVIDED

Total Contributing Impervious Acres for Wet Extended Detention (P-3)
NONE PROVIDED

Total Contributing Impervious Acres for Multiple Pond System (P-4)
NONE PROVIDED

Total Contributing Impervious Acres for Pocket Pond (P-5)
NONE PROVIDED

Total Contributing Impervious Acres for Surface Sand Filter (F-1)
NONE PROVIDED

Total Contributing Impervious Acres for Underground Sand Filter (F-2)
NONE PROVIDED

Total Contributing Impervious Acres for Perimeter Sand Filter (F-3)
NONE PROVIDED

Total Contributing Impervious Acres for Organic Filter (F-4)
NONE PROVIDED

Total Contributing Impervious Acres for Shallow Wetland (W-1)
NONE PROVIDED

Total Contributing Impervious Acres for Extended Detention Wetland (W-2)
NONE PROVIDED

Total Contributing Impervious Acres for Pond/Wetland System (W-3)
NONE PROVIDED

Total Contributing Impervious Acres for Pocket Wetland (W-4)
NONE PROVIDED

Total Contributing Impervious Acres for Wet Swale (O-2)
NONE PROVIDED

Alternative SMPs (DO NOT INCLUDE PRACTICES BEING USED FOR PRETREATMENT ONLY)

Total Contributing Impervious Area for Hydrodynamic
NONE PROVIDED

Total Contributing Impervious Area for Wet Vault
NONE PROVIDED

Total Contributing Impervious Area for Media Filter
NONE PROVIDED

"Other" Alternative SMP?
NONE PROVIDED

Total Contributing Impervious Area for "Other"
NONE PROVIDED

Provide the name and manufaturer of the alternative SMPs (i.e. proprietary practice(s)) being used for WQv treatment.

Note: Redevelopment projects which do not use RR techniques, shall use questions 28, 29, 33 and 33a to provide SMPs used, total WQv required and total WQv provided for the project.

Manufacturer of Alternative SMP
NONE PROVIDED

Name of Alternative SMP
NONE PROVIDED

Other Permits

40. Identify other DEC permits, existing and new, that are required for this project/facility.
None

If SPDES Multi-Sector GP, then give permit ID
NONE PROVIDED

If Other, then identify
NONE PROVIDED

41. Does this project require a US Army Corps of Engineers Wetland Permit?
No

If "Yes," then indicate Size of Impact, in acres, to the nearest tenth
NONE PROVIDED

42. If this NOI is being submitted for the purpose of continuing or transferring coverage under a general permit for stormwater runoff from construction activities, please indicate the former SPDES number assigned.
NONE PROVIDED

MS4 SWPPP Acceptance

43. Is this project subject to the requirements of a regulated, traditional land use control MS4?
No

If No, skip question 44

44. Has the "MS4 SWPPP Acceptance" form been signed by the principal executive officer or ranking elected official and submitted along with this NOI?
NONE PROVIDED

MS4 SWPPP Acceptance Form Download

Download form from the link below. Complete, sign, and upload.
MS4 SWPPP Acceptance Form

MS4 Acceptance Form Upload

> NONE PROVIDED
> **Comment**
> NONE PROVIDED

Owner/Operator Certification

Owner/Operator Certification Form Download

Download the certification form by clicking the link below. Complete, sign, scan, and upload the form.
Owner/Operator Certification Form (PDF, 45KB)

Upload Owner/Operator Certification Form

> NONE PROVIDED
> **Comment**
> NONE PROVIDED

Status History

	User	Processing Status
6/27/2024 11:19:37 AM	Jeff Hotaling	Draft

Processing Steps

Step Name	Assigned To/Completed By	Date Completed
Form Submitted		
Under Review	Daniel von Schilgen	

Appendix E: NYSDEC GP-0-20-001 & NYSDEC SOLAR GUIDANCE

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Water, Bureau of Water Permits
625 Broadway, Albany, New York 12233-3505
P: (518) 402-8111 | F: (518) 402-9029
www.dec.ny.gov

M E M O R A N D U M

TO: Regional Water Engineers

FROM: Robert Wither, Chief, South Permit Section

SUBJECT: Solar Panel Construction Stormwater Permitting/SWPPP Guidance

DATE: April 5, 2018

Issue

The Department is seeing an increase in the number of solar panel construction projects across New York State. This has resulted in an increase in the number of questions on Construction General Permit (CGP) and Stormwater Pollution Prevention Plan (SWPPP) requirements from design professionals because the current CGP (GP-0-15-002) does not include a specific reference to the SWPPP requirements for solar panel projects in Tables 1 and 2 of Appendix B. To address this issue, the Division of Water (DOW) has developed the following guidance on CGP/SWPPP requirements for the different types of solar panel projects.

Scenario 1

The DOW considers solar panel projects designed and constructed in accordance with the following criteria to be a "*Land clearing and grading for the purposes of creating vegetated open space (i.e. recreational parks, lawns, meadows, fields)*" type project as listed in Table 1, Appendix B of the CGP. Therefore, the SWPPP for this type of project will typically just need to address erosion and sediment controls.

1. Solar panels are constructed on post or rack systems and elevated off the ground surface,
2. The panels are spaced apart so that rain water can flow off the down gradient side of the panel and continue as sheet flow across the ground surface*,
3. For solar panels constructed on slopes, the individual rows of solar panels are generally installed along the contour so rain water sheet flows down slope*,
4. The ground surface below the panels consist of a well-established vegetative cover (see "Final Stabilization" definition in Appendix A of the CGP),
5. The project does not include the construction of any traditional impervious areas (i.e. buildings, substation pads, gravel access roads or parking areas, etc.),
6. Construction of the solar panels will not alter the hydrology from pre-to post development conditions (see Appendix A of the CGP, for definition of "Alter the hydrology…"). Note: The design professional shall perform the necessary site assessment/hydrology analysis to make this determination.

*Refer to Maryland's "Stormwater Design Guidance- Solar Panel Installations" attached for guidance on panel installation.
**See notes below for additional criteria.

Scenario 2

If the design and construction of the solar panels meets all the criteria above, except for item 6, the project will fall under the "*All other construction activities that include the construction or reconstruction of impervious area or alter the hydrology from pre-to post development conditions, and are not listed in Table 1*" project type as listed in Table 2, Appendix B of the CGP. Therefore, the SWPPP for this type of project must address post-construction stormwater practices designed in accordance with the sizing criteria in Chapter 4 of the NYS Stormwater Management Design Manual, dated January 2015 (Note: Chapter 10 for projects in NYC EOH Watershed). The Water Quality Volume (WQv)/Runoff Reduction Volume (RRv) sizing criteria can be addressed by designing and constructing the solar panels in accordance with the criteria in items 1 – 4 above, however, the quantity control sizing criteria (Cpv, Qp and Qf) from Chapter 4 (or 10) of the Design Manual must still be addressed, unless one of the waiver criteria from Chapter 4 can be applied. **See notes below for additional criteria.

**** Notes**

- Item 1: For solar panel projects where the panels are mounted directly to the ground (i.e. no space below panel to allow for infiltration of runoff), the SWPPP must address post-construction stormwater management controls designed in accordance with the sizing criteria in Chapter 4 of the NYS Stormwater Management Design Manual, dated January 2015 (Note: Chapter 10 for projects in NYC EOH Watershed).

- Item 5: For solar panel projects that include the construction of traditional impervious areas (i.e. buildings, substation pads, gravel access roads or parking areas, etc.), the SWPPP must address post-construction stormwater management controls for those areas of the project. This applies to both Scenario 1 and 2 above.

cc: Carol Lamb-Lafay, BWP
Dave Gasper, BWP

Stormwater Design Guidance – Solar Panel Installations

Revisions to Maryland's stormwater management regulations in 2010 require that environmental site design (ESD) be used to the maximum extent practicable (MEP) to mimic natural hydrology, reduce runoff to reflect forested wooded conditions, and minimize the impact of land development on water resources. This applies to any residential, commercial, industrial, or institutional development where more than 5,000 square feet of land area is disturbed. Consequently, stormwater management must be addressed even when permeable features like solar panel installations exceed 5,000 square feet of land disturbance.

Depending on local soil conditions and proposed imperviousness, the amount of rainfall that stormwater requirements are based on varies from 1.0 to 2.6 inches. However, addressing stormwater management does not mean that structural or micro-scale practices must be constructed to capture and treat large volumes of runoff. Using nonstructural techniques like disconnecting impervious cover reduces runoff by promoting overland filtering and infiltration. Commonly used with smaller or narrower impervious areas like driveways or open roads, the Disconnection of Non-Rooftop Runoff technique (see pp. 5.61 to 5.65 of the **2000 Maryland Stormwater Design Manual**[1]) is a low cost alternative for treating runoff in situations like rows of solar panels.

When non-rooftop disconnection is used to treat runoff, the following factors should be considered:

- The vegetated area receiving runoff must be equal to or greater in length than the disconnected surface (e.g., width of the row of solar panels)
- Runoff must sheet flow onto and across vegetated areas to maintain the disconnection
- Disconnections should be located on gradual slopes (≤ 5%) to maintain sheetflow. Level spreaders, terraces, or berms may be used to maintain sheetflow conditions if the average slope is steeper than 5%. However, installations on slopes greater than 10% will require an engineered plan that ensures adequate treatment and the safe and non-erosive conveyance of runoff to the property line or downstream stormwater management practice.
- Disconnecting impervious surfaces works best in undisturbed soils. To minimize disturbance and compaction, construction vehicles and equipment should avoid areas used for disconnection during installation of the solar panels.
- Groundcover vegetation must be maintained in good condition in those areas receiving disconnected runoff. Typically this maintenance is no different than other lawn or landscaped areas. However, areas receiving runoff should be protected (e.g., planting shrubs or trees along the perimeter) from future compaction.

Depending on the layout and number of panels installed, the disconnection of non-rooftop runoff technique may address some or all of the stormwater management requirements for an individual project. Where the imperviousness is high or there is other infrastructure (e.g., access roads, transformers), additional runoff may need to be treated. In these situations, other ESD techniques or micro-scale practices may be needed to provide stormwater management for these features.

Example 1 – Using Non-Rooftop Disconnection Where the Average Slope ≤ 5%

Several rows of solar panels will be installed in an existing meadow. The soils within the meadow are hydrologic soil group (HSG) B and the average slope does not exceed 5%. Each row of panels is 10 feet wide and the distance between rows is 20 feet. The rows of solar panels will be installed according to Figure 1 below. In this scenario, the disconnection length is the same as the distance between rows (20 feet) and is greater than the width of each row (10 feet). Therefore, each row of panels is adequately disconnected and the runoff from 1.0 inch of rainfall is treated.

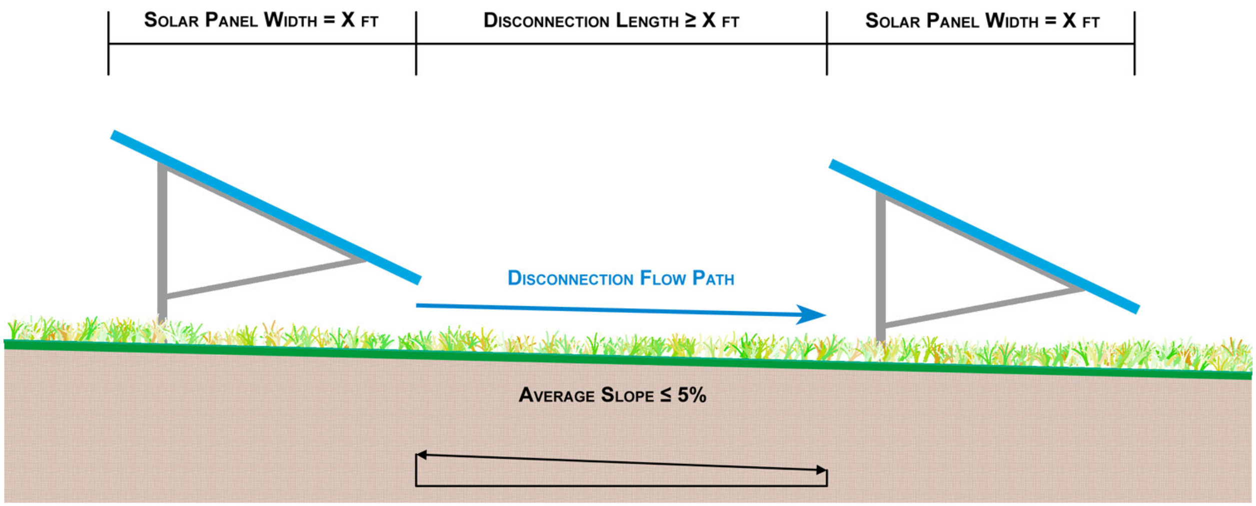


Figure 1. Typical Installation - Slope ≤ 5%

Example 2 – Using Non-Rooftop Disconnection Where the Average Slope ≥ 5% but ≤ 10%

Several rows of solar panels will be installed in an existing meadow. The soils within the meadow are hydrologic soil group (HSG) B and the average slope is greater than 5% but less than 10%. Each row of panels is 10 feet wide and the distance between rows is 20 feet. The rows of solar panels will be installed as shown in Figure 2 below. The disconnection length is the same as the distance between rows (20 feet) and is greater than the width of each row (10 feet). However, in this example, a level spreader (typically 1 to 2-foot wide and 1 foot deep) has been located at the drip edge of each row of panels to dissipate energy and maintain sheetflow.

Discussion

To meet State and local stormwater management requirements, ESD must be used to the MEP to reduce runoff to reflect forested conditions. While all reasonable options for implementing ESD must be investigated, minimally, the runoff from 1 inch of rainfall must be treated. In each of the examples above, there may be additional opportunities to implement ESD techniques or practices and reduce runoff that should be explored. However, simply disconnecting the runoff from the solar panel arrays captures and treats the runoff from 1.0 inch of rainfall. Where imperviousness is low and soil conditions less optimal (e.g., HSG C or D), this may be sufficient to completely address stormwater management requirements. In more dense applications or in sandy soils, additional stormwater management may be required.

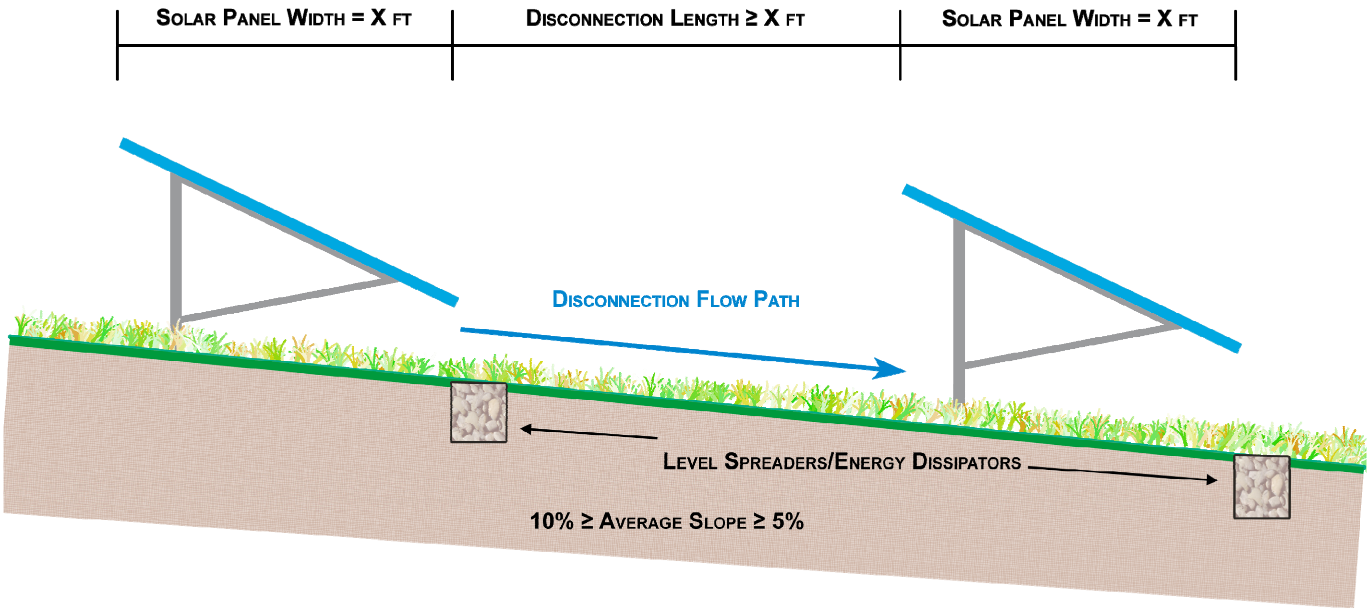


Figure 2. Typical Installation – Slope ≥ 5% but ≤ 10%

Conclusion

The primary purpose of Maryland's stormwater management program is to mimic natural hydrologic runoff characteristics and minimize the impact of land development on water resources. Any land development project that exceeds 5,000 square feet of disturbance, including solar panel projects, must address stormwater management. However, for solar panels, stormwater management may be provided in a cost-effective manner by disconnecting each row of panels and directing runoff over the vegetated areas between the individual rows.

Resources

[1] 2000 Maryland Stormwater Design Manual, Volumes I and II, MDE, October 2000 (http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/MarylandStormwaterDesignManual/Pages/Programs/WaterPrograms/SedimentandStormwater/stormwater_design/index.aspx)

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SPDES GENERAL PERMIT
FOR STORMWATER DISCHARGES

From

CONSTRUCTION ACTIVITY

Permit No. GP- 0-20-001

Issued Pursuant to Article 17, Titles 7, 8 and Article 70

of the Environmental Conservation Law

Effective Date: January 29, 2020

Expiration Date: January 28, 2025

John J. Ferguson

Chief Permit Administrator

1-23-20

Authorized Signature

Date

Address: NYS DEC
Division of Environmental Permits
625 Broadway, 4th Floor
Albany, N.Y. 12233-1750

PREFACE

Pursuant to Section 402 of the Clean Water Act ("CWA"), stormwater *discharges* from certain *construction activities* are unlawful unless they are authorized by a *National Pollutant Discharge Elimination System ("NPDES")* permit or by a state permit program. New York administers the approved State Pollutant Discharge Elimination System (SPDES) program with permits issued in accordance with the New York State Environmental Conservation Law (ECL) Article 17, Titles 7, 8 and Article 70.

An *owner or operator* of a *construction activity* that is eligible for coverage under this permit must obtain coverage prior to the *commencement of construction activity*. Activities that fit the definition of "*construction activity*", as defined under 40 CFR 122.26(b)(14)(x), (15)(i), and (15)(ii), constitute construction of a *point source* and therefore, pursuant to ECL section 17-0505 and 17-0701, the *owner or operator* must have coverage under a SPDES permit prior to *commencing construction activity*. The *owner or operator* cannot wait until there is an actual *discharge* from the *construction site* to obtain permit coverage.

***Note: The italicized words/phrases within this permit are defined in Appendix A.**

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITIES

Table of Contents

Part 1. PERMIT COVERAGE AND LIMITATIONS

A. Permit Application

This permit authorizes stormwater *discharges* to *surface waters of the State* from the following *construction activities* identified within 40 CFR Parts 122.26(b)(14)(x), 122.26(b)(15)(i) and 122.26(b)(15)(ii), provided all of the eligibility provisions of this permit are met:

1. *Construction activities* involving soil disturbances of one (1) or more acres; including disturbances of less than one acre that are part of a *larger common plan of development or sale* that will ultimately disturb one or more acres of land; excluding *routine maintenance activity* that is performed to maintain the original line and grade, hydraulic capacity or original purpose of a facility;

2. *Construction activities* involving soil disturbances of less than one (1) acre where the Department has determined that a *SPDES* permit is required for stormwater *discharges* based on the potential for contribution to a violation of a *water quality standard* or for significant contribution of *pollutants* to *surface waters of the State.*

3. *Construction activities* located in the watershed(s) identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

B. Effluent Limitations Applicable to Discharges from Construction Activities

*Discharge*s authorized by this permit must achieve, at a minimum, the effluent limitations in Part I.B.1. (a) – (f) of this permit. These limitations represent the degree of effluent reduction attainable by the application of best practicable technology currently available.

1. Erosion and Sediment Control Requirements - The *owner or operator* must select, design, install, implement and maintain control measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. The selection, design, installation, implementation, and maintenance of these control measures must meet the non-numeric effluent limitations in Part I.B.1.(a) – (f) of this permit and be in accordance with the New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016, using sound engineering judgment. Where control measures are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must include in the *Stormwater Pollution Prevention Plan* ("SWPPP") the reason(s) for the

deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

a. **Erosion and Sediment Controls.** Design, install and maintain effective erosion and sediment controls to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such controls must be designed, installed and maintained to:

   (i) *Minimize* soil erosion through application of runoff control and soil stabilization control measure to *minimize pollutant discharge*s;

   (ii) Control stormwater *discharge*s, including both peak flowrates and total stormwater volume, to *minimize* channel and *streambank* erosion and scour in the immediate vicinity of the *discharge* points;

   (iii) *Minimize* the amount of soil exposed during *construction activity*;

   (iv) *Minimize* the disturbance of *steep slopes*;

   (v) *Minimize* sediment *discharge*s from the site;

   (vi) Provide and maintain *natural buffer*s around surface waters, direct stormwater to vegetated areas and maximize stormwater infiltration to reduce *pollutant discharge*s, unless *infeasible*;

   (vii) *Minimize* soil compaction. Minimizing soil compaction is not required where the intended function of a specific area of the site dictates that it be compacted;

   (viii) Unless *infeasible*, preserve a sufficient amount of topsoil to complete soil restoration and establish a uniform, dense vegetative cover; and

   (ix) *Minimize* dust. On areas of exposed soil, *minimize* dust through the appropriate application of water or other dust suppression techniques to control the generation of pollutants that could be discharged from the site.

b. **Soil Stabilization**. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within fourteen (14) days from the date the current soil disturbance activity ceased. For construction sites that *directly discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. See Appendix A for definition of *Temporarily Ceased*.

c. **Dewatering**. *Discharge*s from *dewatering* activities, including *discharge*s from *dewatering* of trenches and excavations, must be managed by appropriate control measures.

d. **Pollution Prevention Measures**. Design, install, implement, and maintain effective pollution prevention measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such measures must be designed, installed, implemented and maintained to:

(i) *Minimize* the *discharge* of *pollutants* from equipment and vehicle washing, wheel wash water, and other wash waters. This applies to washing operations that use clean water only. Soaps, detergents and solvents cannot be used;

(ii) *Minimize* the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, hazardous and toxic waste, and other materials present on the site to precipitation and to stormwater. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a *discharge* of *pollutants*, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use) ; and

(iii) Prevent the *discharge* of *pollutants* from spills and leaks and implement chemical spill and leak prevention and response procedures.

e. **Prohibited *Discharge*s.** The following *discharge*s are prohibited:

(i) Wastewater from washout of concrete;

(ii) Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;

(iii) Fuels, oils, or other *pollutants* used in vehicle and equipment operation and maintenance;

(iv) Soaps or solvents used in vehicle and equipment washing; and

(v) Toxic or hazardous substances from a spill or other release.

f. Surface Outlets. When discharging from basins and impoundments, the outlets shall be designed, constructed and maintained in such a manner that sediment does not leave the basin or impoundment and that erosion at or below the outlet does not occur.

C. Post-construction Stormwater Management Practice Requirements

1. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must select, design, install, and maintain the practices to meet the *performance criteria* in the New York State Stormwater Management Design Manual (“Design Manual”), dated January 2015, using sound engineering judgment. Where post-construction stormwater management practices (“SMPs”) are not designed in conformance with the *performance criteria* in the Design Manual, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must design the practices to meet the applicable *sizing criteria* in Part I.C.2.a., b., c. or d. of this permit.

a. Sizing Criteria for New Development

(i) Runoff Reduction Volume (“RRv”): Reduce the total Water Quality Volume (“WQv”) by application of RR techniques and standard SMPs with RRv capacity. The total WQv shall be calculated in accordance with the criteria in Section 4.2 of the Design Manual.

(ii) Minimum RRv and Treatment of Remaining Total WQv: Construction activities that cannot meet the criteria in Part I.C.2.a.(i) of this permit due to site limitations shall direct runoff from all newly constructed impervious areas to a RR technique or standard SMP with RRv capacity unless infeasible. The specific site limitations that prevent the reduction of 100% of the WQv shall be documented in the SWPPP.

For each impervious area that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered infeasible.

In no case shall the runoff reduction achieved from the newly constructed impervious areas be less than the Minimum RRv as calculated using the criteria in Section 4.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume (“Cpv”): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
(1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or
(2) The site discharges directly to tidal waters, or fifth order or larger streams.

(iv) *Overbank* Flood Control Criteria (“Qp”): Requires storage to attenuate the post-development 10-year, 24-hour peak discharge rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
(1) the site discharges directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

(v) Extreme Flood Control Criteria (“Qf”): Requires storage to attenuate the post-development 100-year, 24-hour peak discharge rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
(1) the site discharges directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

b. *Sizing Criteria* for *New Development* in Enhanced Phosphorus Removal Watershed

(i) Runoff Reduction Volume (RRv): Reduce the total Water Quality Volume (WQv) by application of RR techniques and standard SMPs with RRv capacity. The total WQv is the runoff volume from the 1-year, 24 hour design storm over the post-developed watershed and shall be calculated in accordance with the criteria in Section 10.3 of the Design Manual.

(ii) Minimum RRv and Treatment of Remaining Total WQv: *Construction activities* that cannot meet the criteria in Part I.C.2.b.(i) of this permit due to *site limitations* shall direct runoff from all newly constructed *impervious areas* to a RR technique or standard SMP with RRv capacity unless *infeasible*. The specific *site limitations* that prevent the reduction of 100% of the WQv shall be documented in the SWPPP. For each *impervious area* that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered *infeasible.*

In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 10.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume (Cpv): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
(1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or
(2) The site *discharge*s directly to tidal waters, or fifth order or larger streams.

(iv) *Overbank* Flood Control Criteria (Qp): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

(v) Extreme Flood Control Criteria (Qf): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

c. Sizing Criteria for Redevelopment Activity

(i) Water Quality Volume (WQv): The WQv treatment objective for *redevelopment activity* shall be addressed by one of the following options. *Redevelopment activities* located in an Enhanced Phosphorus Removal Watershed (see Part III.B.3. and Appendix C of this permit) shall calculate the WQv in accordance with Section 10.3 of the Design Manual. All other *redevelopment activities* shall calculate the WQv in accordance with Section 4.2 of the Design Manual.

(1) Reduce the existing *impervious cover* by a minimum of 25% of the total disturbed, *impervious area*. The Soil Restoration criteria in Section 5.1.6 of the Design Manual must be applied to all newly created pervious areas, or

(2) Capture and treat a minimum of 25% of the WQv from the disturbed, *impervious area* by the application of standard SMPs; or reduce 25% of the WQv from the disturbed, *impervious area* by the application of RR techniques or standard SMPs with RRv capacity., or

(3) Capture and treat a minimum of 75% of the WQv from the disturbed, *impervious area* as well as any additional runoff from tributary areas by application of the alternative practices discussed in Sections 9.3 and 9.4 of the Design Manual., or

(4) Application of a combination of 1, 2 and 3 above that provide a weighted average of at least two of the above methods. Application of this method shall be in accordance with the criteria in Section 9.2.1(B) (IV) of the Design Manual.

If there is an existing post-construction stormwater management practice located on the site that captures and treats runoff from the *impervious area* that is being disturbed, the WQv treatment option selected must, at a minimum, provide treatment equal to the treatment that was being provided by the existing practice(s) if that treatment is greater than the treatment required by options 1 – 4 above.

(ii) Channel Protection Volume (Cpv): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iii) *Overbank* Flood Control Criteria (Qp): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iv) Extreme Flood Control Criteria (Qf): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site

d. Sizing Criteria for Combination of Redevelopment Activity and New Development

Construction projects that include both New Development and Redevelopment Activity shall provide post-construction stormwater management controls that meet the sizing criteria calculated as an aggregate of the Sizing Criteria in Part I.C.2.a. or b. of this permit for the New Development portion of the project and Part I.C.2.c of this permit for Redevelopment Activity portion of the project.

D. Maintaining Water Quality

The Department expects that compliance with the conditions of this permit will control *discharge*s necessary to meet applicable *water quality standards*. It shall be a violation of the *ECL* for any discharge to either cause or contribute to a violation of *water quality standards* as contained in Parts 700 through 705 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York, such as:

1. There shall be no increase in turbidity that will cause a substantial visible contrast to natural conditions;

2. There shall be no increase in suspended, colloidal or settleable solids that will cause deposition or impair the waters for their best usages; and

3. There shall be no residue from oil and floating substances, nor visible oil film, nor globules of grease.

If there is evidence indicating that the stormwater *discharge*s authorized by this permit are causing, have the reasonable potential to cause, or are contributing to a violation of the *water quality standards*; the *owner or operator* must take appropriate corrective action in accordance with Part IV.C.5. of this general permit and document in accordance with Part IV.C.4. of this general permit. To address the *water quality standard* violation the *owner or operator* may need to provide additional information, include and implement appropriate controls in the SWPPP to correct the problem, or obtain an individual SPDES permit.

If there is evidence indicating that despite compliance with the terms and conditions of this general permit it is demonstrated that the stormwater *discharge*s authorized by this permit are causing or contributing to a violation of *water quality standards*, or if the Department determines that a modification of the permit is necessary to prevent a violation of *water quality standards*, the authorized *discharge*s will no longer be eligible for coverage under this permit. The Department may require the *owner or operator* to obtain an individual SPDES permit to continue discharging.

E. Eligibility Under This General Permit

1. This permit may authorize all *discharges* of stormwater from *construction activity* to *surface waters of the State* and *groundwaters* except for ineligible *discharges* identified under subparagraph F. of this Part.

2. Except for non-stormwater *discharges* explicitly listed in the next paragraph, this permit only authorizes stormwater *discharge*s; including stormwater runoff, snowmelt runoff, and surface runoff and drainage, from *construction activities*.

3. Notwithstanding paragraphs E.1 and E.2 above, the following non-stormwater discharges are authorized by this permit: those listed in 6 NYCRR 750-1.2(a)(29)(vi), with the following exception: "Discharges from firefighting activities are authorized only when the firefighting activities are emergencies/unplanned"; waters to which other components have not been added that are used to control dust in accordance with the SWPPP; and uncontaminated *discharge*s from *construction site* de-watering operations. All non-stormwater discharges must be identified in the SWPPP. Under all circumstances, the *owner or operator* must still comply with *water quality standards* in Part I.D of this permit.

4. The *owner or operator* must maintain permit eligibility to *discharge* under this permit. Any *discharges* that are not compliant with the eligibility conditions of this permit are not authorized by the permit and the *owner or operator* must either apply for a separate permit to cover those ineligible *discharges* or take steps necessary to make the *discharge* eligible for coverage.

F. Activities Which Are Ineligible for Coverage Under This General Permit

All of the following are **<u>not</u>** authorized by this permit:

1. *Discharge*s after *construction activities* have been completed and the site has undergone *final stabilization*;

2. *Discharge*s that are mixed with sources of non-stormwater other than those expressly authorized under subsection E.3. of this Part and identified in the SWPPP required by this permit;

3. *Discharges* that are required to obtain an individual SPDES permit or another SPDES general permit pursuant to Part VII.K. of this permit;

4. *Construction activities* or *discharges* from *construction activities* that may adversely affect an *endangered or threatened species* unless the *owner or*

operator has obtained a permit issued pursuant to 6 NYCRR Part 182 for the project or the Department has issued a letter of non-jurisdiction for the project. All documentation necessary to demonstrate eligibility shall be maintained on site in accordance with Part II.D.2 of this permit;

5. *Discharges* which either cause or contribute to a violation of *water quality standards* adopted pursuant to the *ECL* and its accompanying regulations;

6. *Construction activities* for residential, commercial and institutional projects:

   a. Where the *discharge*s from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

   b. Which are undertaken on land with no existing *impervious cover*; and

   c. Which disturb one (1) or more acres of land designated on the current United States Department of Agriculture ("USDA") Soil Survey as Soil Slope Phase "D", (provided the map unit name is inclusive of slopes greater than 25%), or Soil Slope Phase "E" or "F" (regardless of the map unit name), or a combination of the three designations.

7. *Construction activities* for linear transportation projects and linear utility projects:

   a. Where the *discharge*s from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

   b. Which are undertaken on land with no existing *impervious cover*; and

   c. Which disturb two (2) or more acres of land designated on the current USDA Soil Survey as Soil Slope Phase "D" (provided the map unit name is inclusive of slopes greater than 25%), or Soil Slope Phase "E" or "F" (regardless of the map unit name), or a combination of the three designations.

8. *Construction activities* that have the potential to affect an *historic property*, unless there is documentation that such impacts have been resolved. The following documentation necessary to demonstrate eligibility with this requirement shall be maintained on site in accordance with Part II.D.2 of this permit and made available to the Department in accordance with Part VII.F of this permit:

   a. Documentation that the *construction activity* is not within an archeologically sensitive area indicated on the sensitivity map, and that the *construction activity* is not located on or immediately adjacent to a property listed or determined to be eligible for listing on the National or State Registers of Historic Places, and that there is no new permanent building on the *construction site* within the following distances from a building, structure, or object that is more than 50 years old, or if there is such a new permanent building on the *construction site* within those parameters that NYS Office of Parks, Recreation and Historic Preservation (OPRHP), a Historic Preservation Commission of a Certified Local Government, or a qualified preservation professional has determined that the building, structure, or object more than 50 years old is not historically/archeologically significant.

      - 1-5 acres of disturbance - 20 feet
      - 5-20 acres of disturbance - 50 feet
      - 20+ acres of disturbance - 100 feet, or

   b. DEC consultation form sent to OPRHP, and copied to the NYS DEC Agency Historic Preservation Officer (APO), and
      (i) the State Environmental Quality Review (SEQR) Environmental Assessment Form (EAF) with a negative declaration or the Findings Statement, with documentation of OPRHP’s agreement with the resolution; or
      (ii) documentation from OPRHP that the *construction activity* will result in No Impact; or
      (iii) documentation from OPRHP providing a determination of No Adverse Impact; or
      (iv) a Letter of Resolution signed by the owner/operator, OPRHP and the DEC APO which allows for this *construction activity* to be eligible for coverage under the general permit in terms of the State Historic Preservation Act (SHPA); or

   c. Documentation of satisfactory compliance with Section 106 of the National Historic Preservation Act for a coterminous project area:

(i) No Affect
(ii) No Adverse Affect
(iii) Executed Memorandum of Agreement, or

d. Documentation that:

(i) SHPA Section 14.09 has been completed by NYS DEC or another state agency.

9. *Discharge*s from *construction activities* that are subject to an existing SPDES individual or general permit where a SPDES permit for *construction activity* has been terminated or denied; or where the *owner or operator* has failed to renew an expired individual permit.

Part II. PERMIT COVERAGE

A. How to Obtain Coverage

1. An *owner or operator* of a *construction activity* that is not subject to the requirements of a regulated, traditional land use control MS4 must first prepare a SWPPP in accordance with all applicable requirements of this permit and then submit a completed Notice of Intent (NOI) to the Department to be authorized to discharge under this permit.

2. An *owner or operator* of a *construction activity* that is subject to the requirements of a *regulated, traditional land use control MS4* must first prepare a SWPPP in accordance with all applicable requirements of this permit and then have the SWPPP reviewed and accepted by the *regulated, traditional land use control MS4* prior to submitting the NOI to the Department. The *owner or operator* shall have the “MS4 SWPPP Acceptance” form signed in accordance with Part VII.H., and then submit that form along with a completed NOI to the Department.

3. The requirement for an *owner or operator* to have its SWPPP reviewed and accepted by the *regulated, traditional land use control MS4* prior to submitting the NOI to the Department does not apply to an *owner or operator* that is obtaining permit coverage in accordance with the requirements in Part II.F. (Change of *Owner or Operator*) or where the *owner or operator* of the *construction activity* is the *regulated, traditional land use control MS4* . This exemption does not apply to *construction activities* subject to the New York City Administrative Code.

B. Notice of Intent (NOI) Submittal

1. Prior to December 21, 2020, an owner or operator shall use either the electronic (eNOI) or paper version of the NOI that the Department prepared. Both versions of the NOI are located on the Department's website (http://www.dec.ny.gov/). The paper version of the NOI shall be signed in accordance with Part VII.H. of this permit and submitted to the following address:

   NOTICE OF INTENT
   NYS DEC, Bureau of Water Permits
   625 Broadway, 4th Floor
   Albany, New York 12233-3505

2. Beginning December 21, 2020 and in accordance with EPA's 2015 NPDES Electronic Reporting Rule (40 CFR Part 127), the *owner or operator* must submit the NOI electronically using the *Department's* online NOI.

3. The *owner or operator* shall have the SWPPP preparer sign the "SWPPP Preparer Certification" statement on the NOI prior to submitting the form to the Department.

4. As of the date the NOI is submitted to the Department, the *owner or operator* shall make the NOI and SWPPP available for review and copying in accordance with the requirements in Part VII.F. of this permit.

C. Permit Authorization

1. An *owner or operator* shall not *commence construction activity* until their authorization to *discharge* under this permit goes into effect.

2. Authorization to *discharge* under this permit will be effective when the *owner or operator* has satisfied all of the following criteria:

   a. project review pursuant to the State Environmental Quality Review Act ("SEQRA") have been satisfied, when SEQRA is applicable. See the Department's website (http://www.dec.ny.gov/) for more information,

   b. where required, all necessary Department permits subject to the *Uniform Procedures Act ("UPA")* (see 6 NYCRR Part 621), or the equivalent from another New York State agency, have been obtained, unless otherwise notified by the Department pursuant to 6 NYCRR 621.3(a)(4). *Owners or operators* of *construction activities* that are required to obtain *UPA* permits must submit a preliminary SWPPP to the appropriate DEC Permit Administrator at the Regional Office listed in Appendix F at the time all other necessary *UPA* permit applications are submitted. The preliminary SWPPP must include sufficient information to demonstrate that the *construction activity* qualifies for authorization under this permit,

c. the final SWPPP has been prepared, and

d. a complete NOI has been submitted to the Department in accordance with the requirements of this permit.

3. An *owner or operator* that has satisfied the requirements of Part II.C.2 above will be authorized to *discharge* stormwater from their *construction activity* in accordance with the following schedule:

a. For *construction activities* that are <u>not</u> subject to the requirements of a *regulated, traditional land use control MS4*:

(i) Five (5) business days from the date the Department receives a complete electronic version of the NOI (eNOI) for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.; or

(ii) Sixty (60) business days from the date the Department receives a complete NOI (electronic or paper version) for *construction activities* with a SWPPP that has <u>not</u> been prepared in conformance with the design criteria in technical standard referenced in Part III.B.1. or, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C., the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, or;

(iii) Ten (10) business days from the date the Department receives a complete paper version of the NOI for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.

b. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*:

(i) Five (5) business days from the date the Department receives both a complete electronic version of the NOI (eNOI) and signed "*MS4* SWPPP Acceptance" form, or

(ii) Ten (10) business days from the date the Department receives both a complete paper version of the NOI and signed "MS4 SWPPP Acceptance" form.

4. Coverage under this permit authorizes stormwater *discharges* from only those areas of disturbance that are identified in the NOI. If an *owner or operator* wishes to have stormwater *discharges* from future or additional areas of disturbance authorized, they must submit a new NOI that addresses that phase of the development, unless otherwise notified by the Department. The *owner or operator* shall not *commence construction activity* on the future or additional areas until their authorization to *discharge* under this permit goes into effect in accordance with Part II.C. of this permit.

D. General Requirements For Owners or Operators With Permit Coverage

1. The *owner or operator* shall ensure that the provisions of the SWPPP are implemented from the *commencement of construction activity* until all areas of disturbance have achieved *final stabilization* and the Notice of Termination ("NOT") has been submitted to the Department in accordance with Part V. of this permit. This includes any changes made to the SWPPP pursuant to Part III.A.4. of this permit.

2. The *owner or operator* shall maintain a copy of the General Permit (GP-0-20-001), NOI, *NOI Acknowledgment Letter*, SWPPP, MS4 SWPPP Acceptance form, inspection reports, responsible contractor's or subcontractor's certification statement (see Part III.A.6.), and all documentation necessary to demonstrate eligibility with this permit at the *construction site* until all disturbed areas have achieved *final stabilization* and the NOT has been submitted to the Department. The documents must be maintained in a secure location, such as a job trailer, on-site construction office, or mailbox with lock. The secure location must be accessible during normal business hours to an individual performing a compliance inspection.

3. The *owner or operator* of a *construction activity* shall not disturb greater than five (5) acres of soil at any one time without prior written authorization from the Department or, in areas under the jurisdiction of a *regulated, traditional land* *use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*). At a minimum, the *owner or operator* must comply with the following requirements in order to be authorized to disturb greater than five (5) acres of soil at any one time:

a. The *owner or operator* shall have a *qualified inspector* conduct **at least** two (2) site inspections in accordance with Part IV.C. of this permit every seven (7) calendar days, for as long as greater than five (5) acres of soil remain disturbed. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

b. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016.

c. The *owner or operator* shall prepare a phasing plan that defines maximum disturbed area per phase and shows required cuts and fills.

d. The *owner or operator* shall install any additional site-specific practices needed to protect water quality.

e. The *owner or operator* shall include the requirements above in their SWPPP.

4. In accordance with statute, regulations, and the terms and conditions of this permit, the Department may suspend or revoke an *owner's or operator's* coverage under this permit at any time if the Department determines that the SWPPP does not meet the permit requirements or consistent with Part VII.K..

5. Upon a finding of significant non-compliance with the practices described in the SWPPP or violation of this permit, the Department may order an immediate stop to all activity at the site until the non-compliance is remedied. The stop work order shall be in writing, describe the non-compliance in detail, and be sent to the *owner or operator*.

6. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*, the *owner or operator* shall notify the

regulated, traditional land use control MS4 in writing of any planned amendments or modifications to the post-construction stormwater management practice component of the SWPPP required by Part III.A. 4. and 5. of this permit. Unless otherwise notified by the *regulated, traditional land use control MS4*, the *owner or operator* shall have the SWPPP amendments or modifications reviewed and accepted by the *regulated, traditional land use control MS4* prior to commencing construction of the post-construction stormwater management practice.

E. Permit Coverage for Discharges Authorized Under GP-0-15-002

1. Upon renewal of SPDES General Permit for Stormwater Discharges from *Construction Activity* (Permit No. GP-0-15-002), an *owner or operator* of *a construction activity* with coverage under GP-0-15-002, as of the effective date of GP- 0-20-001, shall be authorized to *discharge* in accordance with GP- 0-20-001, unless otherwise notified by the Department.

   An *owner or operator* may continue to implement the technical/design components of the post-construction stormwater management controls provided that such design was done in conformance with the technical standards in place at the time of initial project authorization. However, they must comply with the other, non-design provisions of GP-0-20-001.

F. Change of Owner or Operator

1. When property ownership changes or when there is a change in operational control over the construction plans and specifications, the original *owner or operator* must notify the new *owner or operator*, in writing, of the requirement to obtain permit coverage by submitting a NOI with the Department. For *construction activities* subject to the requirements of a *regulated, traditional land use control MS4,* the original *owner or operator* must also notify the MS4, in writing, of the change in ownership at least 30 calendar days prior to the change in ownership.

2. Once the new *owner or operator* obtains permit coverage, the original *owner or operator* shall then submit a completed NOT with the name and permit identification number of the new *owner or operator* to the Department at the address in Part II.B.1. of this permit. If the original *owner or operator* maintains ownership of a portion of the *construction activity* and will disturb soil, they must maintain their coverage under the permit.

3. Permit coverage for the new *owner or operator* will be effective as of the date the Department receives a complete NOI, provided the original *owner or*

operator was not subject to a sixty (60) business day authorization period that has not expired as of the date the Department receives the NOI from the new *owner or operator*.

Part III. STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A. General SWPPP Requirements

1. A SWPPP shall be prepared and implemented by the *owner or operator* of each *construction activity* covered by this permit. The SWPPP must document the selection, design, installation, implementation and maintenance of the control measures and practices that will be used to meet the effluent limitations in Part I.B. of this permit and where applicable, the post-construction stormwater management practice requirements in Part I.C. of this permit. The SWPPP shall be prepared prior to the submittal of the NOI. The NOI shall be submitted to the Department prior to the *commencement of construction activity*. A copy of the completed, final NOI shall be included in the SWPPP.

2. The SWPPP shall describe the erosion and sediment control practices and where required, post-construction stormwater management practices that will be used and/or constructed to reduce the *pollutants* in stormwater *discharges* and to assure compliance with the terms and conditions of this permit. In addition, the SWPPP shall identify potential sources of pollution which may reasonably be expected to affect the quality of stormwater *discharges*.

3. All SWPPPs that require the post-construction stormwater management practice component shall be prepared by a *qualified professional* that is knowledgeable in the principles and practices of stormwater management and treatment.

4. The *owner or operator* must keep the SWPPP current so that it at all times accurately documents the erosion and sediment controls practices that are being used or will be used during construction, and all post-construction stormwater management practices that will be constructed on the site. At a minimum, the *owner or operator* shall amend the SWPPP, including construction drawings:

    a. whenever the current provisions prove to be ineffective in minimizing *pollutants* in stormwater *discharges* from the site;

b. whenever there is a change in design, construction, or operation at the *construction site* that has or could have an effect on the *discharge* of *pollutants*;

c. to address issues or deficiencies identified during an inspection by the *qualified inspector,* the Department or other regulatory authority; and

d. to document the final construction conditions.

5. The Department may notify the *owner or operator* at any time that the SWPPP does not meet one or more of the minimum requirements of this permit. The notification shall be in writing and identify the provisions of the SWPPP that require modification. Within fourteen (14) calendar days of such notification, or as otherwise indicated by the Department, the *owner or operator* shall make the required changes to the SWPPP and submit written notification to the Department that the changes have been made. If the *owner or operator* does not respond to the Department's comments in the specified time frame, the Department may suspend the *owner's or operator's* coverage under this permit or require the *owner or operator* to obtain coverage under an individual SPDES permit in accordance with Part II.D.4. of this permit.

6. Prior to the *commencement of construction activity*, the *owner or operator* must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting and maintaining the erosion and sediment control practices included in the SWPPP; and the contractor(s) and subcontractor(s) that will be responsible for constructing the post-construction stormwater management practices included in the SWPPP. The *owner or operator* shall have each of the contractors and subcontractors identify at least one person from their company that will be responsible for implementation of the SWPPP. This person shall be known as the *trained contractor.* The *owner or operator* shall ensure that at least one *trained contractor* is on site on a daily basis when soil disturbance activities are being performed.

   The *owner or operator* shall have each of the contractors and subcontractors identified above sign a copy of the following certification statement below before they commence any *construction activity*:

   "I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and 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 most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater *discharge*s from *construction activities* and that it is unlawful for any person to cause or contribute to a violation of *water quality standards*. Furthermore, I am aware that there are significant penalties for submitting false information, that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations"

In addition to providing the certification statement above, the certification page must also identify the specific elements of the SWPPP that each contractor and subcontractor will be responsible for and include the name and title of the person providing the signature; the name and title of the *trained contractor* responsible for SWPPP implementation; the name, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification statement is signed. The *owner or operator* shall attach the certification statement(s) to the copy of the SWPPP that is maintained at the *construction site*. If new or additional contractors are hired to implement measures identified in the SWPPP after construction has commenced, they must also sign the certification statement and provide the information listed above.

7. For projects where the Department requests a copy of the SWPPP or inspection reports, the *owner or operator* shall submit the documents in both electronic (PDF only) and paper format within five (5) business days, unless otherwise notified by the Department.

B. Required SWPPP Contents

1. Erosion and sediment control component - All SWPPPs prepared pursuant to this permit shall include erosion and sediment control practices designed in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. Where erosion and sediment control practices are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must demonstrate *equivalence* to the technical standard. At a minimum, the erosion and sediment control component of the SWPPP shall include the following:

   a. Background information about the scope of the project, including the location, type and size of project

b. A site map/construction drawing(s) for the project, including a general location map. At a minimum, the site map shall show the total site area; all improvements; areas of disturbance; areas that will not be disturbed; existing vegetation; on-site and adjacent off-site surface water(s); floodplain/floodway boundaries; wetlands and drainage patterns that could be affected by the *construction activity*; existing and final contours ; locations of different soil types with boundaries; material, waste, borrow or equipment storage areas located on adjacent properties; and location(s) of the stormwater *discharge*(s);

c. A description of the soil(s) present at the site, including an identification of the Hydrologic Soil Group (HSG);

d. A construction phasing plan and sequence of operations describing the intended order of *construction activities*, including clearing and grubbing, excavation and grading, utility and infrastructure installation and any other activity at the site that results in soil disturbance;

e. A description of the minimum erosion and sediment control practices to be installed or implemented for each *construction activity* that will result in soil disturbance. Include a schedule that identifies the timing of initial placement or implementation of each erosion and sediment control practice and the minimum time frames that each practice should remain in place or be implemented;

f. A temporary and permanent soil stabilization plan that meets the requirements of this general permit and the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016, for each stage of the project, including initial land clearing and grubbing to project completion and achievement of *final stabilization*;

g. A site map/construction drawing(s) showing the specific location(s), size(s), and length(s) of each erosion and sediment control practice;

h. The dimensions, material specifications, installation details, and operation and maintenance requirements for all erosion and sediment control practices. Include the location and sizing of any temporary sediment basins and structural practices that will be used to divert flows from exposed soils;

i. A maintenance inspection schedule for the contractor(s) identified in Part III.A.6. of this permit, to ensure continuous and effective operation of the erosion and sediment control practices. The maintenance inspection schedule shall be in accordance with the requirements in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016;

j. A description of the pollution prevention measures that will be used to control litter, construction chemicals and construction debris from becoming a *pollutant* source in the stormwater *discharges*;

k. A description and location of any stormwater *discharges* associated with industrial activity other than construction at the site, including, but not limited to, stormwater *discharges* from asphalt plants and concrete plants located on the *construction site*; and

l. Identification of any elements of the design that are not in conformance with the design criteria in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. Include the reason for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. Post-construction stormwater management practice component – The *owner or operator* of any construction project identified in Table 2 of Appendix B as needing post-construction stormwater management practices shall prepare a SWPPP that includes practices designed in conformance with the applicable *sizing criteria* in Part I.C.2.a., c. or d. of this permit and the *performance criteria* in the technical standard, New York State Stormwater Management Design Manual dated January 2015

   Where post-construction stormwater management practices are not designed in conformance with the *performance criteria* in the technical standard, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

   The post-construction stormwater management practice component of the SWPPP shall include the following:

   a. Identification of all post-construction stormwater management practices to be constructed as part of the project. Include the dimensions, material specifications and installation details for each post-construction stormwater management practice;

b. A site map/construction drawing(s) showing the specific location and size of each post-construction stormwater management practice;

c. A Stormwater Modeling and Analysis Report that includes:
   (i) Map(s) showing pre-development conditions, including watershed/subcatchments boundaries, flow paths/routing, and design points;

   (ii) Map(s) showing post-development conditions, including watershed/subcatchments boundaries, flow paths/routing, design points and post-construction stormwater management practices;

   (iii) Results of stormwater modeling (i.e. hydrology and hydraulic analysis) for the required storm events. Include supporting calculations (model runs), methodology, and a summary table that compares pre and post-development runoff rates and volumes for the different storm events;

   (iv) Summary table, with supporting calculations, which demonstrates that each post-construction stormwater management practice has been designed in conformance with the *sizing criteria* included in the Design Manual;

   (v) Identification of any *sizing criteria* that is not required based on the requirements included in Part I.C. of this permit; and

   (vi) Identification of any elements of the design that are not in conformance with the *performance criteria* in the Design Manual. Include the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the Design Manual;

d. Soil testing results and locations (test pits, borings);

e. Infiltration test results, when required; and

f. An operations and maintenance plan that includes inspection and maintenance schedules and actions to ensure continuous and effective operation of each post-construction stormwater management practice. The plan shall identify the entity that will be responsible for the long term operation and maintenance of each practice.

3. Enhanced Phosphorus Removal Standards - All construction projects identified in Table 2 of Appendix B that are located in the watersheds identified in Appendix C shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the applicable *sizing criteria* in Part I.C.2. b., c. or d. of this permit and the *performance criteria,* Enhanced Phosphorus Removal Standards included in the Design Manual. At a minimum, the post-construction stormwater management practice component of the SWPPP shall include items 2.a - 2.f. above.

C. Required SWPPP Components by Project Type

Unless otherwise notified by the Department, *owners or operators* of *construction activities* identified in Table 1 of Appendix B are required to prepare a SWPPP that only includes erosion and sediment control practices designed in conformance with Part III.B.1 of this permit. *Owners or operators* of the *construction activities* identified in Table 2 of Appendix B shall prepare a SWPPP that also includes post-construction stormwater management practices designed in conformance with Part III.B.2 or 3 of this permit.

Part IV. INSPECTION AND MAINTENANCE REQUIREMENTS

A. General Construction Site Inspection and Maintenance Requirements

1. The *owner or operator* must ensure that all erosion and sediment control practices (including pollution prevention measures) and all post-construction stormwater management practices identified in the SWPPP are inspected and maintained in accordance with Part IV.B. and C. of this permit.

2. The terms of this permit shall not be construed to prohibit the State of New York from exercising any authority pursuant to the ECL, common law or federal law, or prohibit New York State from taking any measures, whether civil or criminal, to prevent violations of the laws of the State of New York or protect the public health and safety and/or the environment.

B. Contractor Maintenance Inspection Requirements

1. The *owner or operator* of each *construction activity* identified in Tables 1 and 2 of Appendix B shall have a *trained contractor* inspect the erosion and sediment control practices and pollution prevention measures being implemented within the active work area daily to ensure that they are being maintained in effective operating condition at all times. If deficiencies are identified, the contractor shall

begin implementing corrective actions within one business day and shall complete the corrective actions in a reasonable time frame.

2. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *trained contractor* can stop conducting the maintenance inspections. The *trained contractor* shall begin conducting the maintenance inspections in accordance with Part IV.B.1. of this permit as soon as soil disturbance activities resume.

3. For construction sites where soil disturbance activities have been shut down with partial project completion, the *trained contractor* can stop conducting the maintenance inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* <u>and</u> all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational.

C. Qualified Inspector Inspection Requirements

The *owner or operator* shall have a *qualified inspector* conduct site inspections in conformance with the following requirements:

[Note: The *trained contractor* identified in Part III.A.6. and IV.B. of this permit **cannot** conduct the *qualified inspector* site inspections unless they meet the *qualified inspector* qualifications included in Appendix A. In order to perform these inspections, the *trained contractor* would have to be a:

- licensed Professional Engineer,
- Certified Professional in Erosion and Sediment Control (CPESC),
- New York State Erosion and Sediment Control Certificate Program holder
- Registered Landscape Architect, or
- someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity].

1. A *qualified inspector* shall conduct site inspections for all *construction activities* identified in Tables 1 and 2 of Appendix B, <u>with the exception of</u>:

   a. the construction of a single family residential subdivision with 25% or less *impervious cover* at total site build-out that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is <u>not</u> located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E;

b. the construction of a single family home that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E;

c. construction on agricultural property that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres; and

d. *construction activities* located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

2. Unless otherwise notified by the Department, the *qualified inspector* shall conduct site inspections in accordance with the following timetable:

   a. For construction sites where soil disturbance activities are on-going, the *qualified inspector* shall conduct a site inspection at least once every seven (7) calendar days.

   b. For construction sites where soil disturbance activities are on-going and the *owner or operator* has received authorization in accordance with Part II.D.3 to disturb greater than five (5) acres of soil at any one time, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

   c. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *qualified inspector* shall conduct a site inspection at least once every thirty (30) calendar days. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to reducing the frequency of inspections.

d. For construction sites where soil disturbance activities have been shut down with partial project completion, the *qualified inspector* can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to the shutdown. If soil disturbance activities are not resumed within 2 years from the date of shutdown, the *owner or operator* shall have the *qualified inspector* perform a final inspection and certify that all disturbed areas have achieved *final stabilization,* and all temporary, structural erosion and sediment control measures have been removed*;* and that all post-construction stormwater management practices have been constructed in conformance with the SWPPP by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice" certification statements on the NOT. The *owner or operator* shall then submit the completed NOT form to the address in Part II.B.1 of this permit.

e. For construction sites that directly *discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

3. At a minimum, the *qualified inspector* shall inspect all erosion and sediment control practices and pollution prevention measures to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the SWPPP, all areas of disturbance that have not achieved *final stabilization,* all points of *discharge* to natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the *construction site*, and all points of *discharge* from the *construction site*.

4. The *qualified inspector* shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:

a. Date and time of inspection;

b. Name and title of person(s) performing inspection;

c. A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection;

d. A description of the condition of the runoff at all points of *discharge* from the *construction site*. This shall include identification of any *discharges* of sediment from the *construction site*. Include *discharges* from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;

e. A description of the condition of all natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the *construction site* which receive runoff from disturbed areas. This shall include identification of any *discharges* of sediment to the surface waterbody;

f. Identification of all erosion and sediment control practices and pollution prevention measures that need repair or maintenance;

g. Identification of all erosion and sediment control practices and pollution prevention measures that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;

h. Description and sketch of areas with active soil disturbance activity, areas that have been disturbed but are inactive at the time of the inspection, and areas that have been stabilized (temporary and/or final) since the last inspection;

i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;

j. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices and pollution prevention measures; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s);

k. Identification and status of all corrective actions that were required by previous inspection; and

l. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The *qualified inspector* shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

5. Within one business day of the completion of an inspection, the *qualified inspector* shall notify the *owner or operator* and appropriate contractor or subcontractor identified in Part III.A.6. of this permit of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.

6. All inspection reports shall be signed by the *qualified inspector.* Pursuant to Part II.D.2. of this permit, the inspection reports shall be maintained on site with the SWPPP.

Part V. TERMINATION OF PERMIT COVERAGE

A. Termination of Permit Coverage

1. An *owner or operator* that is eligible to terminate coverage under this permit must submit a completed NOT form to the address in Part II.B.1 of this permit. The NOT form shall be one which is associated with this permit, signed in accordance with Part VII.H of this permit.

2. An *owner or operator* may terminate coverage when one or more the following conditions have been met:

   a. Total project completion - All *construction activity* identified in the SWPPP has been completed; and all areas of disturbance have achieved *final stabilization*; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices have been constructed in conformance with the SWPPP and are operational;

b. Planned shutdown with partial project completion - All soil disturbance activities have ceased; and all areas disturbed as of the project shutdown date have achieved *final stabilization*; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational;

c. A new *owner or operator* has obtained coverage under this permit in accordance with Part II.F. of this permit.

d. The *owner or operator* obtains coverage under an alternative SPDES general permit or an individual SPDES permit.

3. For *construction activities* meeting subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *qualified inspector* perform a final site inspection prior to submitting the NOT. The *qualified inspector* shall, by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice certification statements on the NOT, certify that all the requirements in Part V.A.2.a. or b. of this permit have been achieved.

4. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4* and meet subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *regulated, traditional land use control MS4* sign the "MS4 Acceptance" statement on the NOT in accordance with the requirements in Part VII.H. of this permit. The *regulated, traditional land use control MS4* official, by signing this statement, has determined that it is acceptable for the *owner or operator* to submit the NOT in accordance with the requirements of this Part. The *regulated, traditional land use control MS4* can make this determination by performing a final site inspection themselves or by accepting the *qualified inspector*'s final site inspection certification(s) required in Part V.A.3. of this permit.

5. For *construction activities* that require post-construction stormwater management practices and meet subdivision 2a. of this Part, the *owner or operator* must, prior to submitting the NOT, ensure one of the following:

a. the post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain such practice(s) have been deeded to the municipality in which the practice(s) is located,

b. an executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s),

c. for post-construction stormwater management practices that are privately owned, the *owner or operator* has a mechanism in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the *owner or operator's* deed of record,

d. for post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university, hospital), government agency or authority, or public utility; the *owner or operator* has policy and procedures in place that ensures operation and maintenance of the practices in accordance with the operation and maintenance plan.

Part VI. REPORTING AND RETENTION RECORDS

A. Record Retention

The *owner or operator* shall retain a copy of the NOI, NOI Acknowledgment Letter, SWPPP, MS4 SWPPP Acceptance form and any inspection reports that were prepared in conjunction with this permit for a period of at least five (5) years from the date that the Department receives a complete NOT submitted in accordance with Part V. of this general permit.

B. Addresses

With the exception of the NOI, NOT, and MS4 SWPPP Acceptance form (which must be submitted to the address referenced in Part II.B.1 of this permit), all written correspondence requested by the Department, including individual permit applications, shall be sent to the address of the appropriate DOW Water (SPDES) Program contact at the Regional Office listed in Appendix F.

Part VII. STANDARD PERMIT CONDITIONS

A. Duty to Comply

The *owner or operator* must comply with all conditions of this permit. All contractors and subcontractors associated with the project must comply with the terms of the SWPPP. Any non-compliance with this permit constitutes a violation of the Clean Water

Act (CWA) and the ECL and is grounds for an enforcement action against the *owner or operator* and/or the contractor/subcontractor; permit revocation, suspension or modification; or denial of a permit renewal application. Upon a finding of significant non-compliance with this permit or the applicable SWPPP, the Department may order an immediate stop to all *construction activity* at the site until the non-compliance is remedied. The stop work order shall be in writing, shall describe the non-compliance in detail, and shall be sent to the *owner or operator*.

If any human remains or archaeological remains are encountered during excavation, the *owner or operator* must immediately cease, or cause to cease, all *construction activity* in the area of the remains and notify the appropriate Regional Water Engineer (RWE). *Construction activity* shall not resume until written permission to do so has been received from the RWE.

B. Continuation of the Expired General Permit

This permit expires five (5) years from the effective date. If a new general permit is not issued prior to the expiration of this general permit, an *owner or operator* with coverage under this permit may continue to operate and *discharge* in accordance with the terms and conditions of this general permit, if it is extended pursuant to the State Administrative Procedure Act and 6 NYCRR Part 621, until a new general permit is issued.

C. Enforcement

Failure of the *owner or operator,* its contractors, subcontractors, agents and/or assigns to strictly adhere to any of the permit requirements contained herein shall constitute a violation of this permit. There are substantial criminal, civil, and administrative penalties associated with violating the provisions of this permit. Fines of up to $37,500 per day for each violation and imprisonment for up to fifteen (15) years may be assessed depending upon the nature and degree of the offense.

D. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for an *owner or operator* in an enforcement action that it would have been necessary to halt or reduce the *construction activity* in order to maintain compliance with the conditions of this permit.

E. Duty to Mitigate

The *owner or operator* and its contractors and subcontractors shall take all reasonable steps to *minimize* or prevent any *discharge* in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

F. Duty to Provide Information

The *owner or operator* shall furnish to the Department, within a reasonable specified time period of a written request, all documentation necessary to demonstrate eligibility and any information to determine compliance with this permit or to determine whether cause exists for modifying or revoking this permit, or suspending or denying coverage under this permit, in accordance with the terms and conditions of this permit. The NOI, SWPPP and inspection reports required by this permit are public documents that the *owner or operator* must make available for review and copying by any person within five (5) business days of the *owner or operator* receiving a written request by any such person to review these documents. Copying of documents will be done at the requester's expense.

G. Other Information

When the *owner or operator* becomes aware that they failed to submit any relevant facts, or submitted incorrect information in the NOI or in any of the documents required by this permit , or have made substantive revisions to the SWPPP (e.g. the scope of the project changes significantly, the type of post-construction stormwater management practice(s) changes, there is a reduction in the sizing of the post-construction stormwater management practice, or there is an increase in the disturbance area or *impervious area*), which were not reflected in the original NOI submitted to the Department, they shall promptly submit such facts or information to the Department using the contact information in Part II.A. of this permit. Failure of the *owner or operator* to correct or supplement any relevant facts within five (5) business days of becoming aware of the deficiency shall constitute a violation of this permit.

H. Signatory Requirements

1. All NOIs and NOTs shall be signed as follows:

    a. For a corporation these forms shall be signed by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

(i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or

(ii) the manager of one or more manufacturing, production or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

b. For a partnership or sole proprietorship these forms shall be signed by a general partner or the proprietor, respectively; or

c. For a municipality, State, Federal, or other public agency these forms shall be signed by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

(i) the chief executive officer of the agency, or

(ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

2. The SWPPP and other information requested by the Department shall be signed by a person described in Part VII.H.1. of this permit or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in Part VII.H.1. of this permit;

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of *equivalent* responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position) and,

c. The written authorization shall include the name, title and signature of the authorized representative and be attached to the SWPPP.

3. All inspection reports shall be signed by the *qualified inspector* that performs the inspection.

4. The MS4 SWPPP Acceptance form shall be signed by the principal executive officer or ranking elected official from the *regulated, traditional land use control MS4,* or by a duly authorized representative of that person.

   It shall constitute a permit violation if an incorrect and/or improper signatory authorizes any required forms, SWPPP and/or inspection reports.

I. Property Rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations. *Owners or operators* must obtain any applicable conveyances, easements, licenses and/or access to real property prior to *commencing construction activity*.

J. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

K. Requirement to Obtain Coverage Under an Alternative Permit

1. The Department may require any owner or operator authorized by this permit to apply for and/or obtain either an individual SPDES permit or another SPDES general permit. When the Department requires any discharger authorized by a general permit to apply for an individual SPDES permit, it shall notify the discharger in writing that a permit application is required. This notice shall

include a brief statement of the reasons for this decision, an application form, a statement setting a time frame for the owner or operator to file the application for an individual SPDES permit, and a deadline, not sooner than 180 days from owner or operator receipt of the notification letter, whereby the authorization to discharge under this general permit shall be terminated. Applications must be submitted to the appropriate Permit Administrator at the Regional Office. The Department may grant additional time upon demonstration, to the satisfaction of the Department, that additional time to apply for an alternative authorization is necessary or where the Department has not provided a permit determination in accordance with Part 621 of this Title.

2. When an individual SPDES permit is issued to a discharger authorized to *discharge* under a general SPDES permit for the same *discharge*(s), the general permit authorization for outfalls authorized under the individual SPDES permit is automatically terminated on the effective date of the individual permit unless termination is earlier in accordance with 6 NYCRR Part 750.

L. Proper Operation and Maintenance

The *owner or operator* shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the *owner or operator* to achieve compliance with the conditions of this permit and with the requirements of the SWPPP.

M. Inspection and Entry

The *owner or operator* shall allow an authorized representative of the Department, EPA, applicable county health department, or, in the case of a *construction site* which *discharges* through an *MS4*, an authorized representative of the *MS4* receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the owner’s or operator's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;

2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and

3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment), practices or operations regulated or required by this permit.

4. Sample or monitor at reasonable times, for purposes of assuring permit compliance or as otherwise authorized by the Act or ECL, any substances or parameters at any location.

N. Permit Actions

This permit may, at any time, be modified, suspended, revoked, or renewed by the Department in accordance with 6 NYCRR Part 621. The filing of a request by the *owner or operator* for a permit modification, revocation and reissuance, termination, a notification of planned changes or anticipated noncompliance does not limit, diminish and/or stay compliance with any terms of this permit.

O. Definitions

Definitions of key terms are included in Appendix A of this permit.

P. Re-Opener Clause

1. If there is evidence indicating potential or realized impacts on water quality due to any stormwater discharge associated with construction activity covered by this permit, the owner or operator of such discharge may be required to obtain an individual permit or alternative general permit in accordance with Part VII.K. of this permit or the permit may be modified to include different limitations and/or requirements.

2. Any Department initiated permit modification, suspension or revocation will be conducted in accordance with 6 NYCRR Part 621, 6 NYCRR 750-1.18, and 6 NYCRR 750-1.20.

Q. Penalties for Falsification of Forms and Reports

In accordance with 6NYCRR Part 750-2.4 and 750-2.5, any person who knowingly makes any false material statement, representation, or certification in any application, record, report or other document filed or required to be maintained under this permit, including reports of compliance or noncompliance shall, upon conviction, be punished in accordance with ECL §71-1933 and or Articles 175 and 210 of the New York State Penal Law.

R. Other Permits

Nothing in this permit relieves the *owner or operator* from a requirement to obtain any other permits required by law.

APPENDIX A – Acronyms and Definitions

Acronyms

APO – Agency Preservation Officer
BMP – Best Management Practice
CPESC – Certified Professional in Erosion and Sediment Control
Cpv – Channel Protection Volume
CWA – Clean Water Act (or the Federal Water Pollution Control Act, 33 U.S.C. §1251 et seq)
DOW – Division of Water
EAF – Environmental Assessment Form
ECL - Environmental Conservation Law
EPA – U. S. Environmental Protection Agency
HSG – Hydrologic Soil Group
MS4 – Municipal Separate Storm Sewer System
NOI – Notice of Intent
NOT – Notice of Termination
NPDES – National Pollutant Discharge Elimination System
OPRHP – Office of Parks, Recreation and Historic Places
Qf – Extreme Flood
Qp – Overbank Flood
RRv – Runoff Reduction Volume
RWE – Regional Water Engineer
SEQR – State Environmental Quality Review
SEQRA - State Environmental Quality Review Act
SHPA – State Historic Preservation Act
SPDES – State Pollutant Discharge Elimination System
SWPPP – Stormwater Pollution Prevention Plan
TMDL – Total Maximum Daily Load
UPA – Uniform Procedures Act
USDA – United States Department of Agriculture
WQv – Water Quality Volume

Definitions

All definitions in this section are solely for the purposes of this permit.

Agricultural Building – a structure designed and constructed to house farm implements, hay, grain, poultry, livestock or other horticultural products; excluding any structure designed, constructed or used, in whole or in part, for human habitation, as a place of employment where agricultural products are processed, treated or packaged, or as a place used by the public.

Agricultural Property –means the land for construction of a barn, *agricultural building*, silo, stockyard, pen or other structural practices identified in Table II in the “Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State” prepared by the Department in cooperation with agencies of New York Nonpoint Source Coordinating Committee (dated June 2007).

Alter Hydrology from Pre to Post-Development Conditions - means the post-development peak flow rate(s) has increased by more than 5% of the pre-developed condition for the design storm of interest (e.g. 10 yr and 100 yr).

Combined Sewer - means a sewer that is designed to collect and convey both “sewage” and “stormwater”.

Commence (Commencement of) Construction Activities - means the initial disturbance of soils associated with clearing, grading or excavation activities; or other construction related activities that disturb or expose soils such as demolition, stockpiling of fill material, and the initial installation of erosion and sediment control practices required in the SWPPP. See definition for “*Construction Activity(ies)*” also.

Construction Activity(ies) - means any clearing, grading, excavation, filling, demolition or stockpiling activities that result in soil disturbance. Clearing activities can include, but are not limited to, logging equipment operation, the cutting and skidding of trees, stump removal and/or brush root removal. Construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

Construction Site – means the land area where *construction activity(ies)* will occur. See definition for “*Commence (Commencement of) Construction Activities”* and “*Larger Common Plan of Development or Sale” also.*

Dewatering – means the act of draining rainwater and/or groundwater from building foundations, vaults or excavations/trenches.

Direct Discharge (to a specific surface waterbody) - means that runoff flows from a *construction site* by overland flow and the first point of discharge is the specific surface waterbody, or runoff flows from a *construction site* to a separate storm sewer system and the first point of discharge from the separate storm sewer system is the specific surface waterbody.

Discharge(s) - means any addition of any pollutant to waters of the State through an outlet or *point source*.

Embankment –means an earthen or rock slope that supports a road/highway.

Endangered or Threatened Species – see 6 NYCRR Part 182 of the Department's rules and regulations for definition of terms and requirements.

Environmental Conservation Law (ECL) - means chapter 43-B of the Consolidated Laws of the State of New York, entitled the Environmental Conservation Law.

Equivalent (Equivalence) – means that the practice or measure meets all the performance, longevity, maintenance, and safety objectives of the technical standard and will provide an equal or greater degree of water quality protection.

Final Stabilization - means that all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other equivalent stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied on all disturbed areas that are not covered by permanent structures, concrete or pavement.

General SPDES permit - means a SPDES permit issued pursuant to 6 NYCRR Part 750-1.21 and Section 70-0117 of the ECL authorizing a category of discharges.

Groundwater(s) - means waters in the saturated zone. The saturated zone is a subsurface zone in which all the interstices are filled with water under pressure greater than that of the atmosphere. Although the zone may contain gas-filled interstices or interstices filled with fluids other than water, it is still considered saturated.

Historic Property – means any building, structure, site, object or district that is listed on the State or National Registers of Historic Places or is determined to be eligible for listing on the State or National Registers of Historic Places.

Impervious Area (Cover) - means all impermeable surfaces that cannot effectively infiltrate rainfall. This includes paved, concrete and gravel surfaces (i.e. parking lots, driveways, roads, runways and sidewalks); building rooftops and miscellaneous impermeable structures such as patios, pools, and sheds.

Infeasible – means not technologically possible, or not economically practicable and achievable in light of best industry practices.

Larger Common Plan of Development or Sale - means a contiguous area where multiple separate and distinct *construction activities* are occurring, or will occur, under one plan. The term "plan" in "larger common plan of development or sale" is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, marketing plan, advertisement, drawing, permit application, State Environmental Quality Review Act (SEQRA) environmental assessment form or other documents, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating that *construction activities* may occur on a specific plot.

For discrete construction projects that are located within a larger common plan of development or sale that are at least 1/4 mile apart, each project can be treated as a separate plan of development or sale provided any interconnecting road, pipeline or utility project that is part of the same "common plan" is not concurrently being disturbed.

Minimize – means reduce and/or eliminate to the extent achievable using control measures (including best management practices) that are technologically available and economically practicable and achievable in light of best industry practices.

Municipal Separate Storm Sewer (MS4) - a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to surface waters of the State*;*
(ii) Designed or used for collecting or conveying stormwater;
(iii) Which is not a *combined sewer*; and
(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

National Pollutant Discharge Elimination System (NPDES) - means the national system for the issuance of wastewater and stormwater permits under the Federal Water Pollution Control Act (Clean Water Act).

Natural Buffer –means an undisturbed area with natural cover running along a surface water (e.g. wetland, stream, river, lake, etc.).

New Development – means any land disturbance that does not meet the definition of Redevelopment Activity included in this appendix.

New York State Erosion and Sediment Control Certificate Program – a certificate program that establishes and maintains a process to identify and recognize individuals who are capable of developing, designing, inspecting and maintaining erosion and sediment control plans on projects that disturb soils in New York State. The certificate program is administered by the New York State Conservation District Employees Association.

NOI Acknowledgment Letter - means the letter that the Department sends to an owner or operator to acknowledge the Department's receipt and acceptance of a complete Notice of Intent. This letter documents the owner's or operator's authorization to discharge in accordance with the general permit for stormwater discharges from *construction activity*.

Nonpoint Source - means any source of water pollution or pollutants which is not a discrete conveyance or *point source* permitted pursuant to Title 7 or 8 of Article 17 of the Environmental Conservation Law (see ECL Section 17-1403).

Overbank –means flow events that exceed the capacity of the stream channel and spill out into the adjacent floodplain.

Owner or Operator - means the person, persons or legal entity which owns or leases the property on which the *construction activity* is occurring; an entity that has operational control over the construction plans and specifications, including the ability to make modifications to the plans and specifications; and/or an entity that has day-to-day operational control of those activities at a project that are necessary to ensure compliance with the permit conditions.

Performance Criteria – means the design criteria listed under the "Required Elements" sections in Chapters 5, 6 and 10 of the technical standard, New York State Stormwater Management Design Manual, dated January 2015. It does not include the Sizing Criteria (i.e. WQv, RRv, Cpv, Qp and Qf) in Part I.C.2. of the permit.

Point Source - means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel or other floating craft, or landfill leachate collection system from which *pollutants* are or may be discharged.

Pollutant - means dredged spoil, filter backwash, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand and industrial, municipal, agricultural waste and ballast discharged into water; which may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards or guidance values adopted as provided in 6 NYCRR Parts 700 et seq .

Qualified Inspector - means a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, New York State Erosion and Sediment Control Certificate Program holder or other Department endorsed individual(s).

It can also mean someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect shall receive four (4) hours of training every three (3) years.

It can also mean a person that meets the *Qualified Professional* qualifications in addition to the *Qualified Inspector* qualifications.

Note: Inspections of any post-construction stormwater management practices that include structural components, such as a dam for an impoundment, shall be performed by a licensed Professional Engineer.

Qualified Professional - means a person that is knowledgeable in the principles and practices of stormwater management and treatment, such as a licensed Professional Engineer, Registered Landscape Architect or other Department endorsed individual(s). Individuals preparing SWPPPs that require the post-construction stormwater management practice component must have an understanding of the principles of hydrology, water quality management practice design, water quantity control design, and, in many cases, the principles of hydraulics. All components of the SWPPP that involve the practice of engineering, as defined by the NYS Education Law (see Article 145), shall be prepared by, or under the direct supervision of, a professional engineer licensed to practice in the State of New York.

Redevelopment Activity(ies) – means the disturbance and reconstruction of existing impervious area, including impervious areas that were removed from a project site within five (5) years of preliminary project plan submission to the local government (i.e. site plan, subdivision, etc.).

Regulated, Traditional Land Use Control MS4 - means a city, town or village with land use control authority that is authorized to discharge under New York State DEC's

SPDES General Permit For Stormwater Discharges from Municipal Separate Stormwater Sewer Systems (MS4s) or the City of New York's Individual SPDES Permit for their Municipal Separate Storm Sewer Systems (NY-0287890).

Routine Maintenance Activity - means *construction activity* that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility, including, but not limited to:

- Re-grading of gravel roads or parking lots,
- Cleaning and shaping of existing roadside ditches and culverts that maintains the approximate original line and grade, and hydraulic capacity of the ditch,
- Cleaning and shaping of existing roadside ditches that does not maintain the approximate original grade, hydraulic capacity and purpose of the ditch if the changes to the line and grade, hydraulic capacity or purpose of the ditch are installed to improve water quality and quantity controls (e.g. installing grass lined ditch),
- Placement of aggregate shoulder backing that stabilizes the transition between the road shoulder and the ditch or *embankment*,
- Full depth milling and filling of existing asphalt pavements, replacement of concrete pavement slabs, and similar work that does not expose soil or disturb the bottom six (6) inches of subbase material,
- Long-term use of equipment storage areas at or near highway maintenance facilities,
- Removal of sediment from the edge of the highway to restore a previously existing sheet-flow drainage connection from the highway surface to the highway ditch or *embankment*,
- Existing use of Canal Corp owned upland disposal sites for the canal, and
- Replacement of curbs, gutters, sidewalks and guide rail posts.

Site limitations – means site conditions that prevent the use of an infiltration technique and or infiltration of the total WQv. Typical site limitations include: seasonal high groundwater, shallow depth to bedrock, and soils with an infiltration rate less than 0.5 inches/hour. The existence of site limitations shall be confirmed and documented using actual field testing (i.e. test pits, soil borings, and infiltration test) or using information from the most current United States Department of Agriculture (USDA) Soil Survey for the County where the project is located.

Sizing Criteria – means the criteria included in Part I.C.2 of the permit that are used to size post-construction stormwater management control practices. The criteria include; Water Quality Volume (WQv), Runoff Reduction Volume (RRv), Channel Protection Volume (Cpv), *Overbank* Flood (Qp), and Extreme Flood (Qf).

State Pollutant Discharge Elimination System (SPDES) - means the system established pursuant to Article 17 of the ECL and 6 NYCRR Part 750 for issuance of permits authorizing discharges to the waters of the state.

Steep Slope – means land area designated on the current United States Department of Agriculture ("USDA") Soil Survey as Soil Slope Phase "D", (provided the map unit name is inclusive of slopes greater than 25%) , or Soil Slope Phase E or F, (regardless of the map unit name), or a combination of the three designations.

Streambank – as used in this permit, means the terrain alongside the bed of a creek or stream. The bank consists of the sides of the channel, between which the flow is confined.

Stormwater Pollution Prevention Plan (SWPPP) – means a project specific report, including construction drawings, that among other things: describes the construction activity(ies), identifies the potential sources of pollution at the *construction site*; describes and shows the stormwater controls that will be used to control the pollutants (i.e. erosion and sediment controls; for many projects, includes post-construction stormwater management controls); and identifies procedures the *owner or operator* will implement to comply with the terms and conditions of the permit. See Part III of the permit for a complete description of the information that must be included in the SWPPP.

Surface Waters of the State - shall be construed to include lakes, bays, sounds, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic ocean within the territorial seas of the state of New York and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters that do not combine or effect a junction with natural surface waters), which are wholly or partially within or bordering the state or within its jurisdiction. Waters of the state are further defined in 6 NYCRR Parts 800 to 941.

Temporarily Ceased – means that an existing disturbed area will not be disturbed again within 14 calendar days of the previous soil disturbance.

Temporary Stabilization - means that exposed soil has been covered with material(s) as set forth in the technical standard, New York Standards and Specifications for Erosion and Sediment Control, to prevent the exposed soil from eroding. The materials can include, but are not limited to, mulch, seed and mulch, and erosion control mats (e.g. jute twisted yarn, excelsior wood fiber mats).

Total Maximum Daily Loads (TMDLs) - A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and *nonpoint source*s. It is a calculation of the maximum amount of a pollutant that a waterbody can receive on a daily basis and still meet *water quality standards*, and an allocation of that amount to the pollutant's sources. A TMDL stipulates wasteload allocations (WLAs) for *point source* discharges, load allocations (LAs) for *nonpoint source*s, and a margin of safety (MOS).

Trained Contractor - means an employee from the contracting (construction) company, identified in Part III.A.6., that has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the *trained contractor* shall receive four (4) hours of training every three (3) years.

It can also mean an employee from the contracting (construction) company, identified in Part III.A.6., that meets the *qualified inspector* qualifications (e.g. licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, New York State Erosion and Sediment Control Certificate Program holder, or someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity).

The *trained contractor* is responsible for the day to day implementation of the SWPPP.

Uniform Procedures Act (UPA) Permit - means a permit required under 6 NYCRR Part 621 of the Environmental Conservation Law (ECL), Article 70.

Water Quality Standard - means such measures of purity or quality for any waters in relation to their reasonable and necessary use as promulgated in 6 NYCRR Part 700 et seq.

APPENDIX B – Required SWPPP Components by Project Type

Table 1
Construction Activities that Require the Preparation of a SWPPP That Only Includes Erosion and Sediment Controls

The following construction activities that involve soil disturbances of one (1) or more acres of land, but less than five (5) acres:

- Single family home not located in one of the watersheds listed in Appendix C or not *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions with 25% or less impervious cover at total site build-out and not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E
- Construction of a barn or other *agricultural building*, silo, stock yard or pen.

The following construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land:

All construction activities located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Installation of underground, linear utilities; such as gas lines, fiber-optic cable, cable TV, electric, telephone, sewer mains, and water mains
- Environmental enhancement projects, such as wetland mitigation projects, stormwater retrofits and stream restoration projects
- Pond construction
- Linear bike paths running through areas with vegetative cover, including bike paths surfaced with an impervious cover
- Cross-country ski trails and walking/hiking trails
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are not part of residential, commercial or institutional development;
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that include incidental shoulder or curb work along an existing highway to support construction of the sidewalk, bike path or walking path.
- Slope stabilization projects
- Slope flattening that changes the grade of the site, but does not significantly change the runoff characteristics

Table 1 (Continued) CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT ONLY INCLUDES EROSION AND SEDIMENT CONTROLS

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Spoil areas that will be covered with vegetation
- Vegetated open space projects (i.e. recreational parks, lawns, meadows, fields, downhill ski trails) excluding projects that *alter hydrology from pre to post development* conditions,
- Athletic fields (natural grass) that do not include the construction or reconstruction of *impervious area* and do not *alter hydrology from pre to post development* conditions
- Demolition project where vegetation will be established, and no redevelopment is planned
- Overhead electric transmission line project that does not include the construction of permanent access roads or parking areas surfaced with *impervious cover*
- Structural practices as identified in Table II in the “Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State”, excluding projects that involve soil disturbances of greater than five acres and construction activities that include the construction or reconstruction of impervious area
- Temporary access roads, median crossovers, detour roads, lanes, or other temporary impervious areas that will be restored to pre-construction conditions once the construction activity is complete

Table 2

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Single family home located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family home that disturbs five (5) or more acres of land
- Single family residential subdivisions located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions that involve soil disturbances of between one (1) and five (5) acres of land with greater than 25% impervious cover at total site build-out
- Single family residential subdivisions that involve soil disturbances of five (5) or more acres of land, and single family residential subdivisions that involve soil disturbances of less than five (5) acres that are part of a larger common plan of development or sale that will ultimately disturb five or more acres of land
- Multi-family residential developments; includes duplexes, townhomes, condominiums, senior housing complexes, apartment complexes, and mobile home parks
- Airports
- Amusement parks
- Breweries, cideries, and wineries, including establishments constructed on agricultural land
- Campgrounds
- Cemeteries that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Commercial developments
- Churches and other places of worship
- Construction of a barn or other *agricultural building* (e.g. silo) and structural practices as identified in Table II in the “Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State” that include the construction or reconstruction of *impervious area*, excluding projects that involve soil disturbances of less than five acres.
- Golf courses
- Institutional development; includes hospitals, prisons, schools and colleges
- Industrial facilities; includes industrial parks
- Landfills
- Municipal facilities; includes highway garages, transfer stations, office buildings, POTW’s, water treatment plants, and water storage tanks
- Office complexes
- Playgrounds that include the construction or reconstruction of impervious area
- Sports complexes
- Racetracks; includes racetracks with earthen (dirt) surface
- Road construction or reconstruction, including roads constructed as part of the construction activities listed in Table 1

Table 2 (Continued)

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Parking lot construction or reconstruction, including parking lots constructed as part of the construction activities listed in Table 1
- Athletic fields (natural grass) that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Athletic fields with artificial turf
- Permanent access roads, parking areas, substations, compressor stations and well drilling pads, surfaced with *impervious cover,* and constructed as part of an over-head electric transmission line project, wind-power project, cell tower project, oil or gas well drilling project, sewer or water main project or other linear utility project
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are part of a residential, commercial or institutional development
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are part of a highway construction or reconstruction project
- All other construction activities that include the construction or reconstruction of *impervious area* or *alter the hydrology from pre to post development* conditions, and are not listed in Table 1

APPENDIX C – Watersheds Requiring Enhanced Phosphorus Removal

Watersheds where *owners or operators* of construction activities identified in Table 2 of Appendix B must prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the Enhanced Phosphorus Removal Standards included in the technical standard, New York State Stormwater Management Design Manual ("Design Manual").

- Entire New York City Watershed located east of the Hudson River **-** Figure 1
- Onondaga Lake Watershed **-** Figure 2
- Greenwood Lake Watershed **-**Figure 3
- Oscawana Lake Watershed – Figure 4
- Kinderhook Lake Watershed – Figure 5

Figure 1 - New York City Watershed East of the Hudson

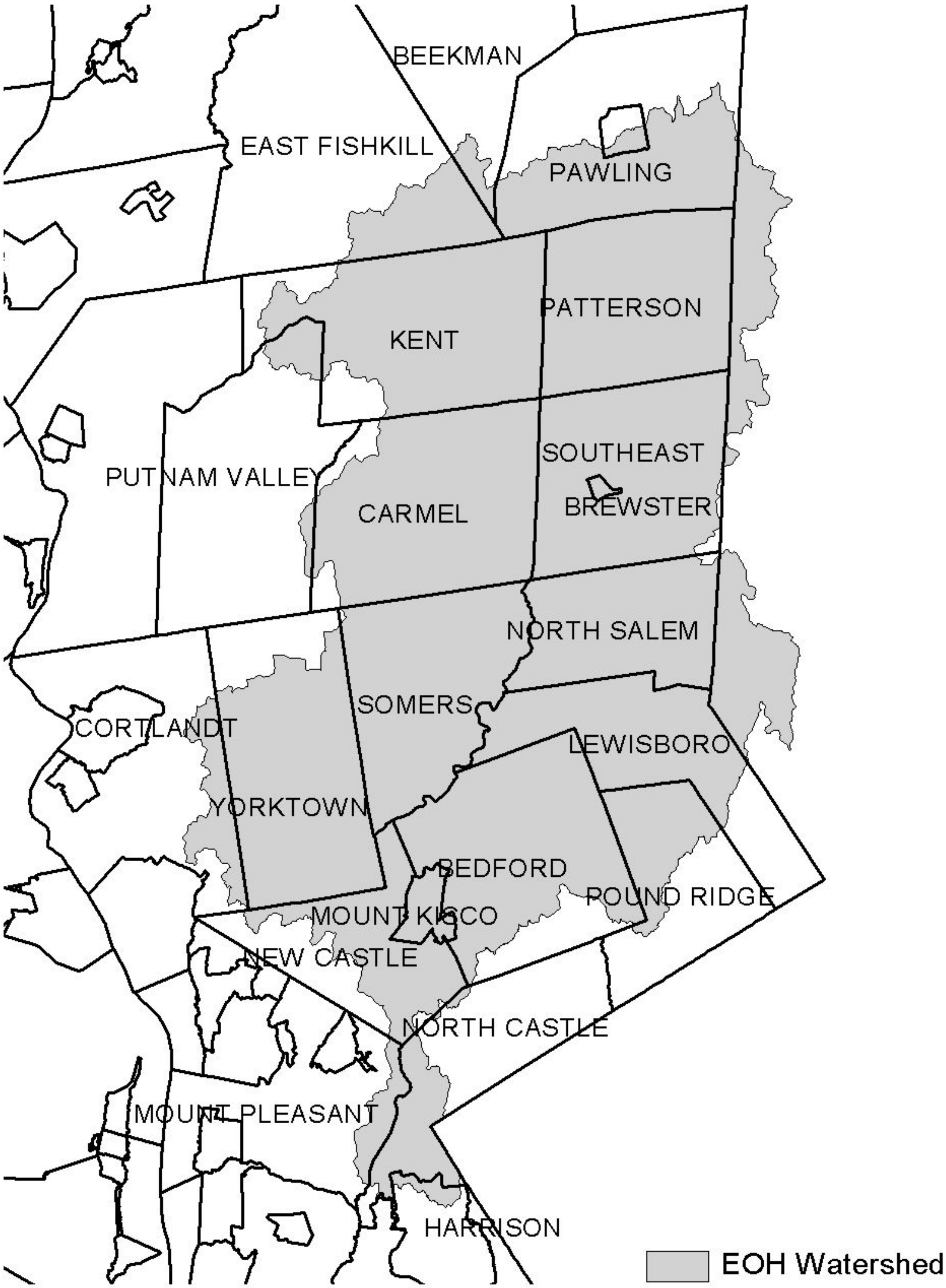


Figure 2 - Onondaga Lake Watershed

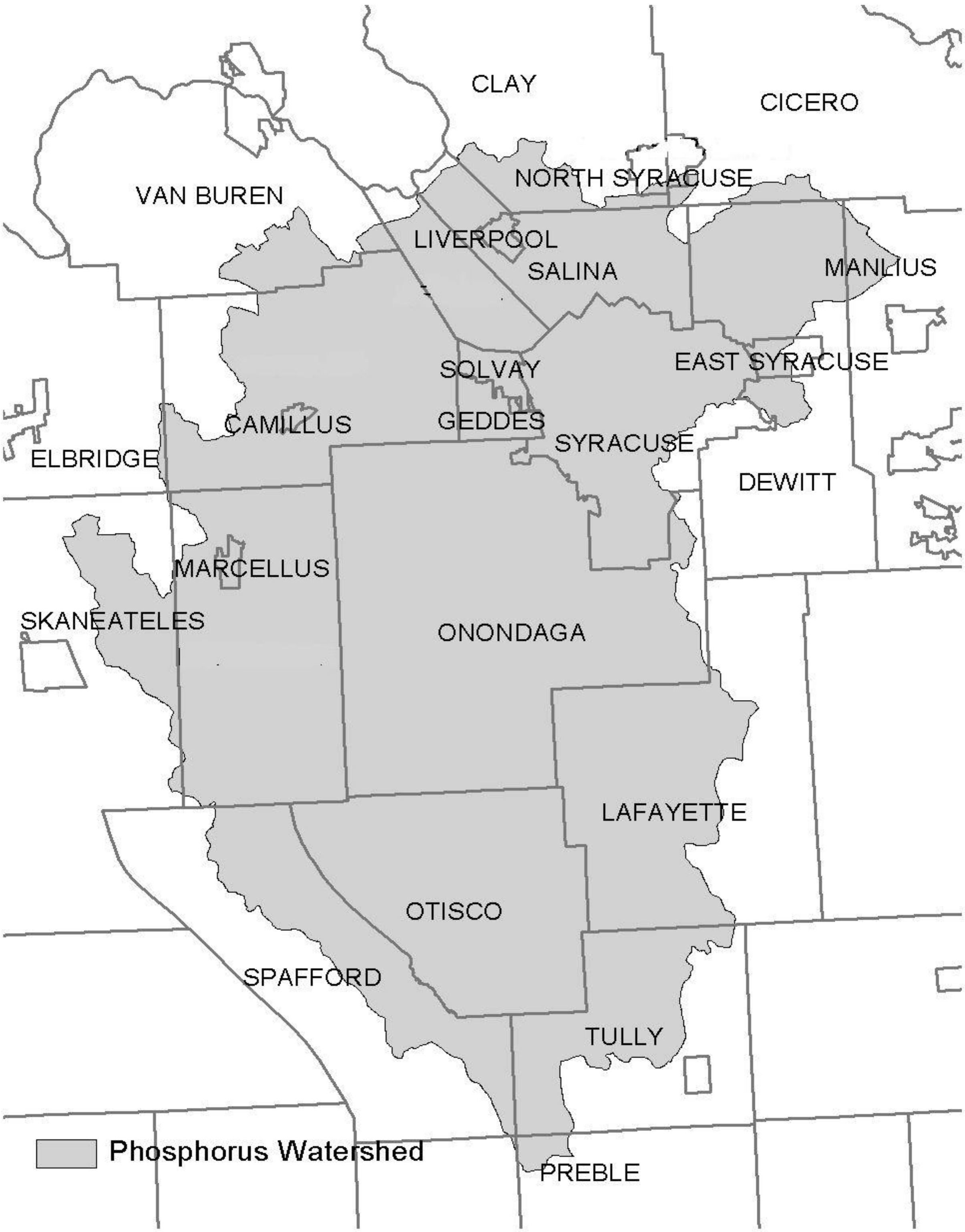


Figure 3 - Greenwood Lake Watershed

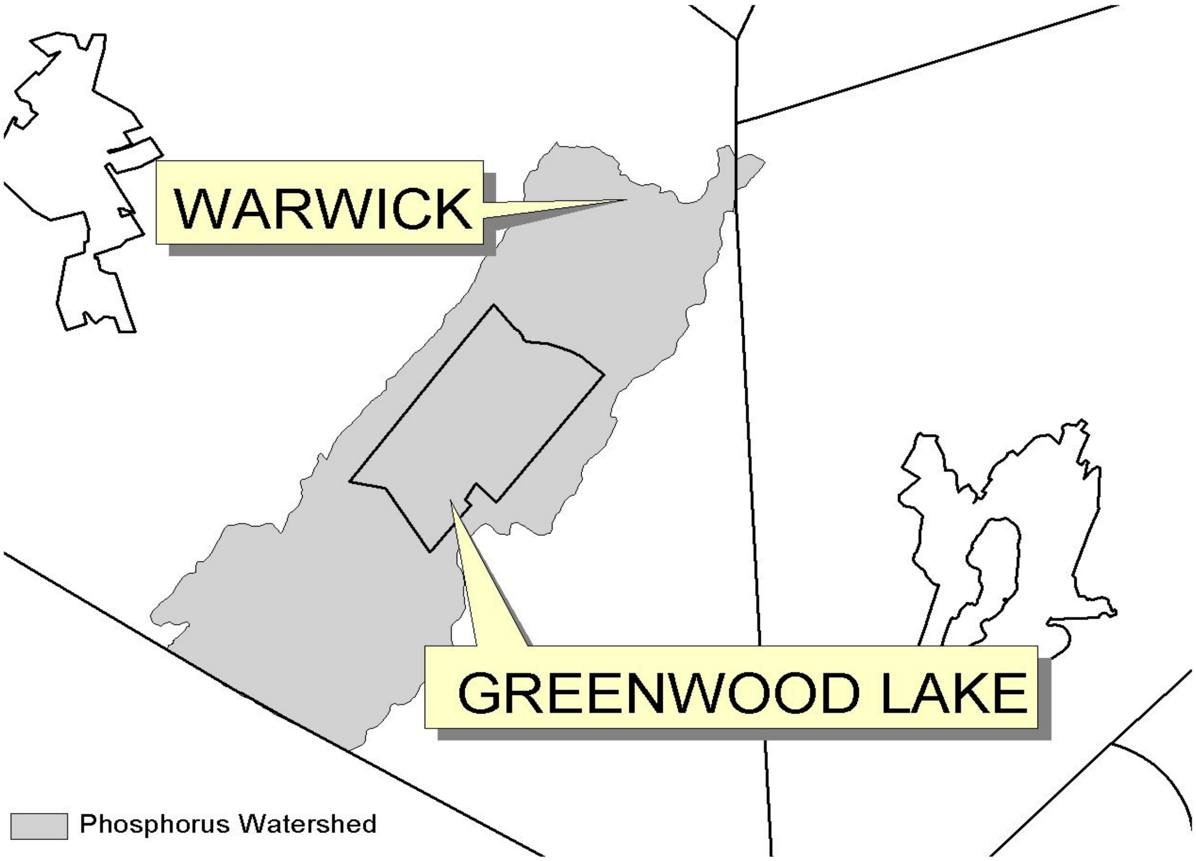


Figure 4 - Oscawana Lake Watershed

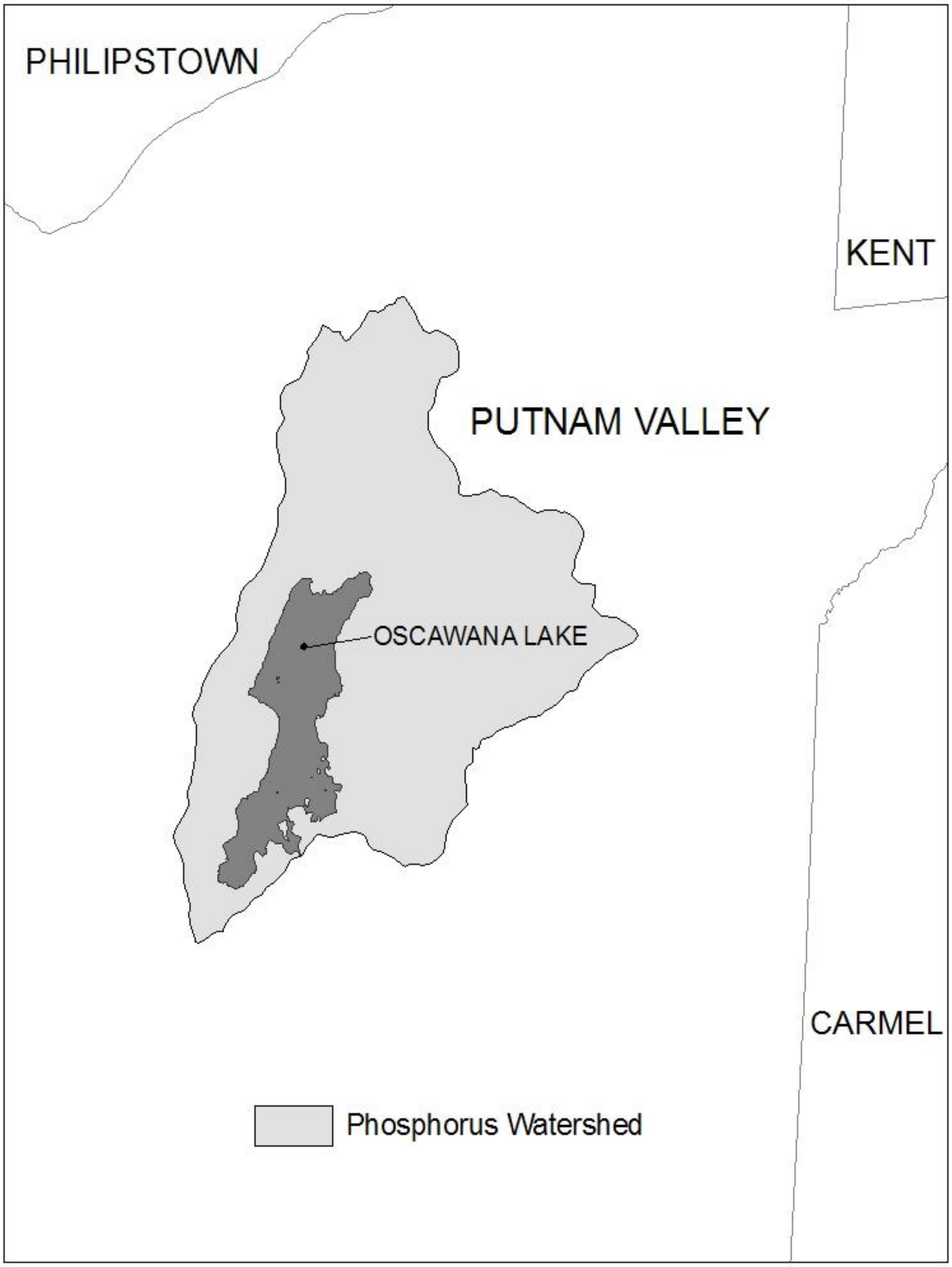
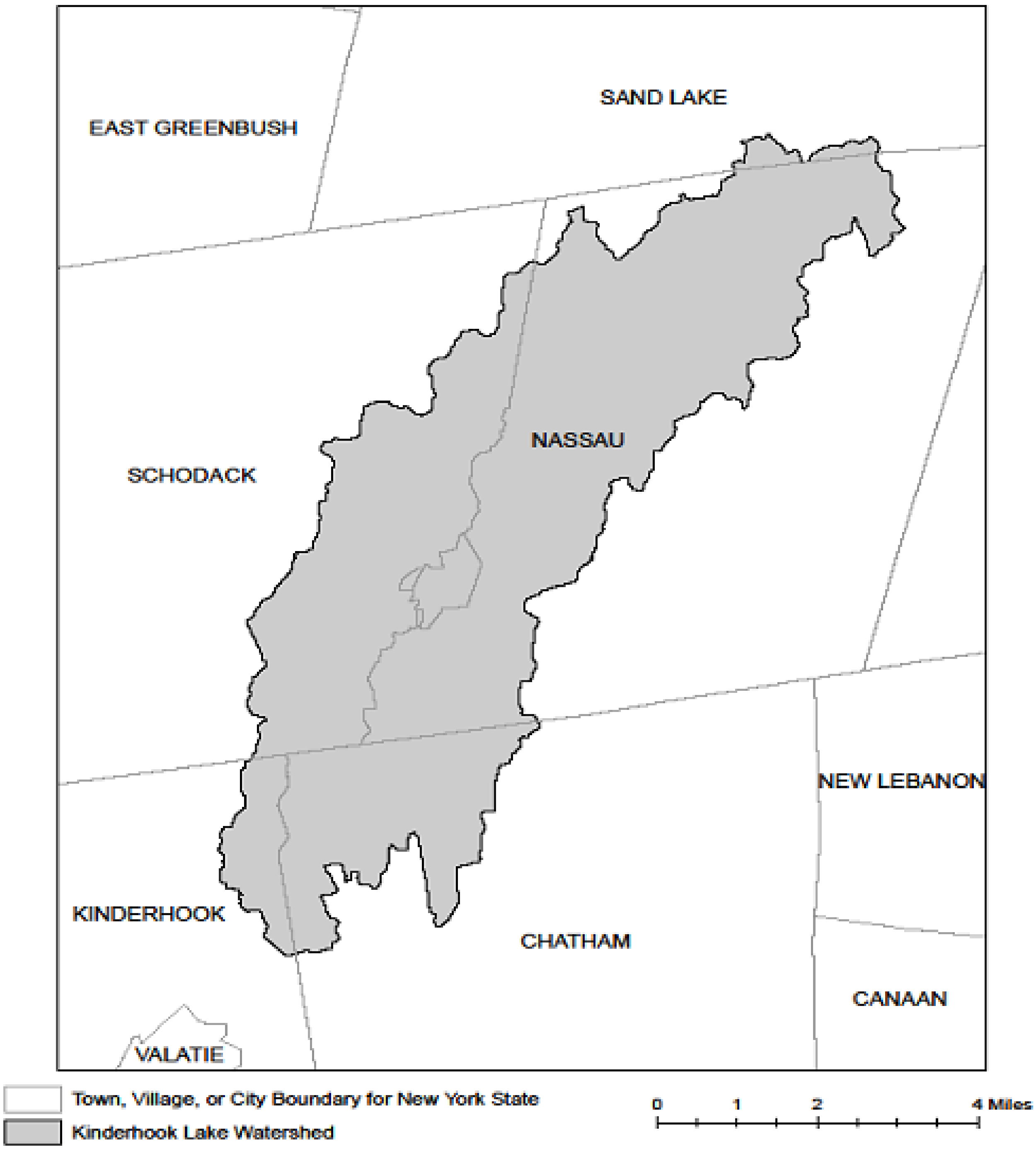


Figure 5 - Kinderhook Lake Watershed



APPENDIX D – Watersheds with Lower Disturbance Threshold

Watersheds where *owners or operators* of construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land must obtain coverage under this permit.

Entire New York City Watershed that is located east of the Hudson River **-** See Figure 1 in Appendix C

APPENDIX E – 303(d) Segments Impaired by Construction Related Pollutant(s)

List of 303(d) segments impaired by pollutants related to *construction activity* (e.g. silt, sediment or nutrients). The list was developed using "The Final New York State 2016 Section 303(d) List of Impaired Waters Requiring a TMDL/Other Strategy" dated November 2016. *Owners or operators* of single family home and single family residential subdivisions with 25% or less total impervious cover at total site build-out that involve soil disturbances of one or more acres of land, but less than 5 acres, and *directly discharge* to one of the listed segments below shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the New York State Stormwater Management Design Manual ("Design Manual"), dated January 2015.

COUNTY	WATERBODY	POLLUTANT
Albany	Ann Lee (Shakers) Pond, Stump Pond	Nutrients
Albany	Basic Creek Reservoir	Nutrients
Allegany	Amity Lake, Saunders Pond	Nutrients
Bronx	Long Island Sound, Bronx	Nutrients
Bronx	Van Cortlandt Lake	Nutrients
Broome	Fly Pond, Deer Lake, Sky Lake	Nutrients
Broome	Minor Tribs to Lower Susquehanna (north)	Nutrients
Broome	Whitney Point Lake/Reservoir	Nutrients
Cattaraugus	Allegheny River/Reservoir	Nutrients
Cattaraugus	Beaver (Alma) Lake	Nutrients
Cattaraugus	Case Lake	Nutrients
Cattaraugus	Linlyco/Club Pond	Nutrients
Cayuga	Duck Lake	Nutrients
Cayuga	Little Sodus Bay	Nutrients
Chautauqua	Bear Lake	Nutrients
Chautauqua	Chadakoin River and tribs	Nutrients
Chautauqua	Chautauqua Lake, North	Nutrients
Chautauqua	Chautauqua Lake, South	Nutrients
Chautauqua	Findley Lake	Nutrients
Chautauqua	Hulburt/Clymer Pond	Nutrients
Clinton	Great Chazy River, Lower, Main Stem	Silt/Sediment
Clinton	Lake Champlain, Main Lake, Middle	Nutrients
Clinton	Lake Champlain, Main Lake, North	Nutrients
Columbia	Kinderhook Lake	Nutrients
Columbia	Robinson Pond	Nutrients
Cortland	Dean Pond	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Dutchess	Fall Kill and tribs	Nutrients
Dutchess	Hillside Lake	Nutrients
Dutchess	Wappingers Lake	Nutrients
Dutchess	Wappingers Lake	Silt/Sediment
Erie	Beeman Creek and tribs	Nutrients
Erie	Ellicott Creek, Lower, and tribs	Silt/Sediment
Erie	Ellicott Creek, Lower, and tribs	Nutrients
Erie	Green Lake	Nutrients
Erie	Little Sister Creek, Lower, and tribs	Nutrients
Erie	Murder Creek, Lower, and tribs	Nutrients
Erie	Rush Creek and tribs	Nutrients
Erie	Scajaquada Creek, Lower, and tribs	Nutrients
Erie	Scajaquada Creek, Middle, and tribs	Nutrients
Erie	Scajaquada Creek, Upper, and tribs	Nutrients
Erie	South Branch Smoke Cr, Lower, and tribs	Silt/Sediment
Erie	South Branch Smoke Cr, Lower, and tribs	Nutrients
Essex	Lake Champlain, Main Lake, South	Nutrients
Essex	Lake Champlain, South Lake	Nutrients
Essex	Willsboro Bay	Nutrients
Genesee	Bigelow Creek and tribs	Nutrients
Genesee	Black Creek, Middle, and minor tribs	Nutrients
Genesee	Black Creek, Upper, and minor tribs	Nutrients
Genesee	Bowen Brook and tribs	Nutrients
Genesee	LeRoy Reservoir	Nutrients
Genesee	Oak Orchard Cr, Upper, and tribs	Nutrients
Genesee	Tonawanda Creek, Middle, Main Stem	Nutrients
Greene	Schoharie Reservoir	Silt/Sediment
Greene	Sleepy Hollow Lake	Silt/Sediment
Herkimer	Steele Creek tribs	Silt/Sediment
Herkimer	Steele Creek tribs	Nutrients
Jefferson	Moon Lake	Nutrients
Kings	Hendrix Creek	Nutrients
Kings	Prospect Park Lake	Nutrients
Lewis	Mill Creek/South Branch, and tribs	Nutrients
Livingston	Christie Creek and tribs	Nutrients
Livingston	Conesus Lake	Nutrients
Livingston	Mill Creek and minor tribs	Silt/Sediment
Monroe	Black Creek, Lower, and minor tribs	Nutrients
Monroe	Buck Pond	Nutrients
Monroe	Cranberry Pond	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Monroe	Lake Ontario Shoreline, Western	Nutrients
Monroe	Long Pond	Nutrients
Monroe	Mill Creek and tribs	Nutrients
Monroe	Mill Creek/Blue Pond Outlet and tribs	Nutrients
Monroe	Minor Tribs to Irondequoit Bay	Nutrients
Monroe	Rochester Embayment - East	Nutrients
Monroe	Rochester Embayment - West	Nutrients
Monroe	Shipbuilders Creek and tribs	Nutrients
Monroe	Thomas Creek/White Brook and tribs	Nutrients
Nassau	Beaver Lake	Nutrients
Nassau	Camaans Pond	Nutrients
Nassau	East Meadow Brook, Upper, and tribs	Silt/Sediment
Nassau	East Rockaway Channel	Nutrients
Nassau	Grant Park Pond	Nutrients
Nassau	Hempstead Bay	Nutrients
Nassau	Hempstead Lake	Nutrients
Nassau	Hewlett Bay	Nutrients
Nassau	Hog Island Channel	Nutrients
Nassau	Long Island Sound, Nassau County Waters	Nutrients
Nassau	Massapequa Creek and tribs	Nutrients
Nassau	Milburn/Parsonage Creeks, Upp, and tribs	Nutrients
Nassau	Reynolds Channel, west	Nutrients
Nassau	Tidal Tribs to Hempstead Bay	Nutrients
Nassau	Tribs (fresh) to East Bay	Nutrients
Nassau	Tribs (fresh) to East Bay	Silt/Sediment
Nassau	Tribs to Smith/Halls Ponds	Nutrients
Nassau	Woodmere Channel	Nutrients
New York	Harlem Meer	Nutrients
New York	The Lake in Central Park	Nutrients
Niagara	Bergholtz Creek and tribs	Nutrients
Niagara	Hyde Park Lake	Nutrients
Niagara	Lake Ontario Shoreline, Western	Nutrients
Niagara	Lake Ontario Shoreline, Western	Nutrients
Oneida	Ballou, Nail Creeks and tribs	Nutrients
Onondaga	Harbor Brook, Lower, and tribs	Nutrients
Onondaga	Ley Creek and tribs	Nutrients
Onondaga	Minor Tribs to Onondaga Lake	Nutrients
Onondaga	Ninemile Creek, Lower, and tribs	Nutrients
Onondaga	Onondaga Creek, Lower, and tribs	Nutrients
Onondaga	Onondaga Creek, Middle, and tribs	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Onondaga	Onondaga Lake, northern end	Nutrients
Onondaga	Onondaga Lake, southern end	Nutrients
Ontario	Great Brook and minor tribs	Silt/Sediment
Ontario	Great Brook and minor tribs	Nutrients
Ontario	Hemlock Lake Outlet and minor tribs	Nutrients
Ontario	Honeoye Lake	Nutrients
Orange	Greenwood Lake	Nutrients
Orange	Monhagen Brook and tribs	Nutrients
Orange	Orange Lake	Nutrients
Orleans	Lake Ontario Shoreline, Western	Nutrients
Orleans	Lake Ontario Shoreline, Western	Nutrients
Oswego	Lake Neatahwanta	Nutrients
Oswego	Pleasant Lake	Nutrients
Putnam	Bog Brook Reservoir	Nutrients
Putnam	Boyd Corners Reservoir	Nutrients
Putnam	Croton Falls Reservoir	Nutrients
Putnam	Diverting Reservoir	Nutrients
Putnam	East Branch Reservoir	Nutrients
Putnam	Lake Carmel	Nutrients
Putnam	Middle Branch Reservoir	Nutrients
Putnam	Oscawana Lake	Nutrients
Putnam	Palmer Lake	Nutrients
Putnam	West Branch Reservoir	Nutrients
Queens	Bergen Basin	Nutrients
Queens	Flushing Creek/Bay	Nutrients
Queens	Jamaica Bay, Eastern, and tribs (Queens)	Nutrients
Queens	Kissena Lake	Nutrients
Queens	Meadow Lake	Nutrients
Queens	Willow Lake	Nutrients
Rensselaer	Nassau Lake	Nutrients
Rensselaer	Snyders Lake	Nutrients
Richmond	Grasmere Lake/Bradys Pond	Nutrients
Rockland	Congers Lake, Swartout Lake	Nutrients
Rockland	Rockland Lake	Nutrients
Saratoga	Ballston Lake	Nutrients
Saratoga	Dwaas Kill and tribs	Silt/Sediment
Saratoga	Dwaas Kill and tribs	Nutrients
Saratoga	Lake Lonely	Nutrients
Saratoga	Round Lake	Nutrients
Saratoga	Tribs to Lake Lonely	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Schenectady	Collins Lake	Nutrients
Schenectady	Duane Lake	Nutrients
Schenectady	Mariaville Lake	Nutrients
Schoharie	Engleville Pond	Nutrients
Schoharie	Summit Lake	Nutrients
Seneca	Reeder Creek and tribs	Nutrients
St.Lawrence	Black Lake Outlet/Black Lake	Nutrients
St.Lawrence	Fish Creek and minor tribs	Nutrients
Steuben	Smith Pond	Nutrients
Suffolk	Agawam Lake	Nutrients
Suffolk	Big/Little Fresh Ponds	Nutrients
Suffolk	Canaan Lake	Silt/Sediment
Suffolk	Canaan Lake	Nutrients
Suffolk	Flanders Bay, West/Lower Sawmill Creek	Nutrients
Suffolk	Fresh Pond	Nutrients
Suffolk	Great South Bay, East	Nutrients
Suffolk	Great South Bay, Middle	Nutrients
Suffolk	Great South Bay, West	Nutrients
Suffolk	Lake Ronkonkoma	Nutrients
Suffolk	Long Island Sound, Suffolk County, West	Nutrients
Suffolk	Mattituck (Marratooka) Pond	Nutrients
Suffolk	Meetinghouse/Terrys Creeks and tribs	Nutrients
Suffolk	Mill and Seven Ponds	Nutrients
Suffolk	Millers Pond	Nutrients
Suffolk	Moriches Bay, East	Nutrients
Suffolk	Moriches Bay, West	Nutrients
Suffolk	Peconic River, Lower, and tidal tribs	Nutrients
Suffolk	Quantuck Bay	Nutrients
Suffolk	Shinnecock Bay and Inlet	Nutrients
Suffolk	Tidal tribs to West Moriches Bay	Nutrients
Sullivan	Bodine, Montgomery Lakes	Nutrients
Sullivan	Davies Lake	Nutrients
Sullivan	Evens Lake	Nutrients
Sullivan	Pleasure Lake	Nutrients
Tompkins	Cayuga Lake, Southern End	Nutrients
Tompkins	Cayuga Lake, Southern End	Silt/Sediment
Tompkins	Owasco Inlet, Upper, and tribs	Nutrients
Ulster	Ashokan Reservoir	Silt/Sediment
Ulster	Esopus Creek, Upper, and minor tribs	Silt/Sediment
Warren	Hague Brook and tribs	Silt/Sediment

303(d) Segments Impaired by Construction Related Pollutant(s)

Warren	Huddle/Finkle Brooks and tribs	Silt/Sediment
Warren	Indian Brook and tribs	Silt/Sediment
Warren	Lake George	Silt/Sediment
Warren	Tribs to L.George, Village of L George	Silt/Sediment
Washington	Cossayuna Lake	Nutrients
Washington	Lake Champlain, South Bay	Nutrients
Washington	Tribs to L.George, East Shore	Silt/Sediment
Washington	Wood Cr/Champlain Canal and minor tribs	Nutrients
Wayne	Port Bay	Nutrients
Westchester	Amawalk Reservoir	Nutrients
Westchester	Blind Brook, Upper, and tribs	Silt/Sediment
Westchester	Cross River Reservoir	Nutrients
Westchester	Lake Katonah	Nutrients
Westchester	Lake Lincolndale	Nutrients
Westchester	Lake Meahagh	Nutrients
Westchester	Lake Mohegan	Nutrients
Westchester	Lake Shenorock	Nutrients
Westchester	Long Island Sound, Westchester (East)	Nutrients
Westchester	Mamaroneck River, Lower	Silt/Sediment
Westchester	Mamaroneck River, Upper, and minor tribs	Silt/Sediment
Westchester	Muscoot/Upper New Croton Reservoir	Nutrients
Westchester	New Croton Reservoir	Nutrients
Westchester	Peach Lake	Nutrients
Westchester	Reservoir No.1 (Lake Isle)	Nutrients
Westchester	Saw Mill River, Lower, and tribs	Nutrients
Westchester	Saw Mill River, Middle, and tribs	Nutrients
Westchester	Sheldrake River and tribs	Silt/Sediment
Westchester	Sheldrake River and tribs	Nutrients
Westchester	Silver Lake	Nutrients
Westchester	Teatown Lake	Nutrients
Westchester	Titicus Reservoir	Nutrients
Westchester	Truesdale Lake	Nutrients
Westchester	Wallace Pond	Nutrients
Wyoming	Java Lake	Nutrients
Wyoming	Silver Lake	Nutrients

APPENDIX F – List of NYS DEC Regional Offices

Region	Covering the following counties:	Division of Environmental Permits (DEP) Permit Administrators	Division of Water (DOW) Water (SPDES) Program
1	Nassau and Suffolk	50 Circle Road Stony Brook, Ny 11790 Tel. (631) 444-0365	50 Circle Road Stony Brook, Ny 11790-3409 Tel. (631) 444-0405
2	Bronx, Kings, New York, Queens and Richmond	1 Hunters Point Plaza, 47-40 21st St. Long Island City, Ny 11101-5407 Tel. (718) 482-4997	1 Hunters Point Plaza, 47-40 21st St. Long Island City, Ny 11101-5407 Tel. (718) 482-4933
3	Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster and Westchester	21 South Putt Corners Road New Paltz, Ny 12561-1696 Tel. (845) 256-3059	100 Hillside Avenue, Suite 1w White Plains, Ny 10603 Tel. (914) 428 - 2505
4	Albany, Columbia, Delaware, Greene, Montgomery, Otsego, Rensselaer, Schenectady and Schoharie	1150 North Westcott Road Schenectady, Ny 12306-2014 Tel. (518) 357-2069	1130 North Westcott Road Schenectady, Ny 12306-2014 Tel. (518) 357-2045
5	Clinton, Essex, Franklin, Fulton, Hamilton, Saratoga, Warren and Washington	1115 State Route 86, Po Box 296 Ray Brook, Ny 12977-0296 Tel. (518) 897-1234	232 Golf Course Road Warrensburg, Ny 12885-1172 Tel. (518) 623-1200
6	HERKIMER, JEFFERSON, LEWIS, ONEIDA AND ST. LAWRENCE	STATE OFFICE BUILDING 317 WASHINGTON STREET WATERTOWN, NY 13601-3787 TEL. (315) 785-2245	STATE OFFICE BUILDING 207 GENESEE STREET UTICA, NY 13501-2885 TEL. (315) 793-2554
7	BROOME, CAYUGA, CHENANGO, CORTLAND, MADISON, ONONDAGA, OSWEGO, TIOGA AND TOMPKINS	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7438	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7500
8	CHEMUNG, GENESEE, LIVINGSTON, MONROE, ONTARIO, ORLEANS, SCHUYLER, SENECA, STEUBEN, WAYNE AND YATES	6274 EAST AVON-LIMA ROADAVON, NY 14414-9519 TEL. (585) 226-2466	6274 EAST AVON-LIMA RD. AVON, NY 14414-9519 TEL. (585) 226-2466
9	ALLEGANY, CATTARAUGUS, CHAUTAUQUA, ERIE, NIAGARA AND WYOMING	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7165	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7070

Appendix F: Construction Forms

STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM
FOR CONSTRUCTION ACTIVITIES

CONSTRUCTION SITE LOG BOOK

Table of Contents

Properly completing forms such as those contained in this document meet the inspection requirement of NYSDEC SPDES GP for Construction Activities. Completed forms shall be kept on site at all times and made available to authorities upon request.

I. PRE-CONTRESTRUCTION 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 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. The Operator shall post at the site, in a publicly accessible location, a summary of the site inspection activities on a monthly basis (Monthly Summary Report).

The operator shall also prepare a written summary of compliance with this general permit at a minimum frequency of every three months (Operator's Compliance Response Form), while coverage exists. The summary should address the status of achieving each component of the SWPPP.

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[3] 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 "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. Operators Certification

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. Further, I hereby certify that the SWPPP meets all Federal, State, and local erosion and sediment control requirements. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to Section 210.45 of the Penal Law. "

Name (please print):____

Title ____________________________________ **Date:**____________

Address: ____

Phone: __________ **Email:**_________________________________

Signature:____

c. 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:____

d. 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?

Pre-construction Site Assessment Checklist (continued)

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 fence material and installation comply with the standard drawing and specifications.

[ ] [ ] [ ] Silt fences 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 plan is contained in the SWPPP on page ______

[ ] [ ] [ ] Appropriate materials to control spills are onsite. Where? ___________________

II. CONSTRUCTION DURATION INSPECTIONS

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;

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.

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.

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
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
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 Fence
Yes No NA
[ ] [ ] [ ] Installed on Contour, 10 feet from toe of slope (not across conveyance channels).
[ ] [ ] [ ] Joints constructed by wrapping the two ends together for continuous support.
[ ] [ ] [ ] Fabric buried 6 inches minimum.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
Sediment accumulation is ___% of design capacity.

Sediment Control (continued)

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

Yes No NA

[ ] [ ] [ ] Installed concrete blocks lengthwise so open ends face outward, not upward.
[ ] [ ] [ ] Placed wire screen between No. 3 crushed stone and concrete blocks.
[ ] [ ] [ ] Drainage area is 1acre or less.
[ ] [ ] [ ] Excavated area is 900 cubic feet.
[ ] [ ] [ ] Excavated side slopes should be 2:1.
[ ] [ ] [ ] 2" x 4" frame is constructed and structurally sound.
[ ] [ ] [ ] Posts 3-foot maximum spacing between posts.
[ ] [ ] [ ] Fabric is embedded 1 to 1.5 feet below ground and secured to frame/posts with staples at max 8-inch spacing.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
Sediment accumulation ___% of design capacity.

4. Temporary Sediment Trap

Yes No NA

[ ] [ ] [ ] Outlet structure is constructed per the approved plan or drawing.
[ ] [ ] [ ] Geotextile fabric has been placed beneath rock fill.
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.

Note: Not all erosion and sediment control practices are included in this listing. Add additional pages to this list as required by site specific design.
Construction inspection checklists for post-development stormwater management practices can be found in Appendix F of the New York Stormwater Management Design Manual.

CONSTRUCTION DURATION INSPECTIONS
b. Modifications to the SWPPP (To be completed as described below)

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. Monthly Summary of Site Inspection Activities

Name of Permitted Facility:	Today's Date:	Reporting Month:
Location:	Permit Identification #:	
Name and Telephone Number of Site Inspector:		

Date of Inspection	Regular / Rainfall based Inspection	Name of Inspector	Items of Concern

Owner/Operator Certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to Section 210.45 of the Penal Law."

Signature of Permittee or Duly Authorized Representative

Name of Permittee or Duly Authorized Representative date

Duly authorized representatives must have written authorization, submitted to DEC, to sign any permit documents.

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505
(NOTE: Submit completed form to address above)

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity

Please indicate your permit identification number: NYR ___ ___ ___ ___ ___ ___

I. Owner or Operator Information

1. Owner/Operator Name:

2. Street Address:

3. City/State/Zip:

4. Contact Person: | 4a.Telephone:

4b. Contact Person E-Mail:

II. Project Site Information

5. Project/Site Name:

6. Street Address:

7. City/Zip:

8. County:

III. Reason for Termination

9a. □ All disturbed areas have achieved final stabilization in accordance with the general permit and SWPPP. ***Date final stabilization completed** (month/year): ______________________

9b. □ Permit coverage has been transferred to new owner/operator. Indicate new owner/operator's permit identification number: NYR ____ ____ ____ ____ ____ ____
(Note: Permit coverage can not be terminated by owner identified in I.1. above until new owner/operator obtains coverage under the general permit)

9c. □ Other (Explain on Page 2)

IV. Final Site Information:

10a. Did this construction activity require the development of a SWPPP that includes post-construction stormwater management practices? □ yes □ no (If no, go to question 10f.)

10b. Have all post-construction stormwater management practices included in the final SWPPP been constructed? □ yes □ no (If no, explain on Page 2)

10c. Identify the entity responsible for long-term operation and maintenance of practice(s)?

____

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

10d. Has the entity responsible for long-term operation and maintenance been given a copy of the operation and maintenance plan required by the general permit? □ yes □ no

10e. Indicate the method used to ensure long-term operation and maintenance of the post-construction stormwater management practice(s):

□ Post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain practice(s) have been deeded to the municipality.

□ Executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s).

□ For post-construction stormwater management practices that are privately owned, a mechanism is in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the owner or operator's deed of record.

□ For post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university or hospital), government agency or authority, or public utility; policy and procedures are in place that ensures operation and maintenance of the practice(s) in accordance with the operation and maintenance plan.

10f. Provide the total area of impervious surface (i.e. roof, pavement, concrete, gravel, etc.) constructed within the disturbance area? ______________________________ (acres)

11. Is this project subject to the requirements of a regulated, traditional land use control MS4? □ yes □ no

(If Yes, complete section VI - "MS4 Acceptance" statement

V. Additional Information/Explanation:

(Use this section to answer questions 9c. and 10b., if applicable)

VI. MS4 Acceptance - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative (Note: Not required when 9b. is checked -transfer of coverage)

I have determined that it is acceptable for the owner or operator of the construction project identified in question 5 to submit the Notice of Termination at this time.

Printed Name:

Title/Position:

Signature:	Date:

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

VII. Qualified Inspector Certification - Final Stabilization:	
I hereby certify that all disturbed areas have achieved final stabilization as defined in the current version of the general permit, and that all temporary, structural erosion and sediment control measures have been removed. 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.	
Printed Name:	
Title/Position:	
Signature:	Date:
VIII. Qualified Inspector Certification - Post-construction Stormwater Management Practice(s):	
I hereby certify that all post-construction stormwater management practices have been constructed in conformance with the SWPPP. 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.	
Printed Name:	
Title/Position:	
Signature:	Date:
IX. Owner or Operator Certification	
I hereby certify that this document was prepared by me or under my direction or supervision. My determination, based upon my inquiry of the person(s) who managed the construction activity, or those persons directly responsible for gathering the information, is that the information provided in this document is true, accurate and complete. 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.	
Printed Name:	
Title/Position:	
Signature:	Date:

NYS Department of Conservation
SPDES General Permit Phase II for
Storm Water Discharges from
CONSTRUCTION ACTIVITY
Permit No. GP-0-20-001

CONTRACTOR CERTIFICATION STATEMENT

Project Name: Jaycox Creek Solar

Project Address: Lakeville Road, Geneseo, NY

Date: ________________

Certification Statement:

> "I hereby certify that I understand and agree to comply with the terms and conditions of the SWPPP and 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 most current version 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 aware that there are significant penalties for submitting false information, that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations."

Contractor:

Signature:_________________________

Name (Print):______________________

Title:________________________

SWT# (Stormwater Training Number- NYSDEC Card):____________________

Contracting Firm:____

Address:____

Telephone: ____________________________

Is this contractor the sole provider for stormwater implementation? (Circle one) Yes No

(If no, specify the elements within the SWPPP this contractor is responsible for)

____
____
____
____
____

<u>Contractors Trained Individual</u> (if other than contractor him/herself)

Signature:_________________________ SWT#:___________________

Name (Print):______________________

Title:________________________

<u>Subcontractor:</u>

Signature:_________________________

Name (Print):______________________

Title:________________________

SWT# (Stormwater Training Number- NYSDEC Card):______________________

Contracting Firm:____

Address:____

Telephone: ____________________________

Is this subcontractor the sole provider for stormwater implementation? Yes No
(If no, specify the elements within the SWPPP this contractor is responsible for)

____
____
____
____
____

<u>Subcontractors Trained Individual</u> (if other than subcontractor him/herself)

Signature:_________________________ SWT#:__________________

Name (Print):______________________

Title:________________________

Appendix G: Deep Ripping & Decompaction, NYSDEC 2008

New York State
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Water

Deep-Ripping and Decompaction

April 2008

New York State
Department of Environmental Conservation

Document Prepared by:

John E. Lacey,
Land Resource Consultant and Environmental Compliance Monitor
(Formerly with the Division of Agricultural Protection and Development Services,
NYS Dept. of Agriculture & Markets)

Alternative Stormwater Management
Deep-Ripping and Decompaction

Description

The two-phase practice of 1) “Deep Ripping;” and 2) “Decompaction” (deep subsoiling), of the soil material as a step in the cleanup and restoration/landscaping of a construction site, helps mitigate the physically induced impacts of soil compression; i.e.: soil compaction or the substantial increase in the bulk density of the soil material.

Deep Ripping and Decompaction are key factors which help in restoring soil pore space and permeability for water infiltration. Conversely, the physical actions of cut-and-fill work, land grading, the ongoing movement of construction equipment and the transport of building materials throughout a site alter the architecture and structure of the soil, resulting in: the mixing of layers (horizons) of soil materials, compression of those materials and diminished soil porosity which, if left unchecked, severely impairs the soil’s water holding capacity and vertical drainage (rainfall infiltration), from the surface downward.

In a humid climate region, compaction damage on a site is virtually guaranteed over the duration of a project. Soil in very moist to wet condition when compacted, will have severely reduced permeability. Figure 1 displays the early stage of the deep-ripping phase (Note that all topsoil was stripped prior to construction access, and it remains stockpiled until the next phase – decompaction – is complete). A heavy-duty tractor is pulling a three-shank ripper on the first of several series of incrementally deepening passes through the construction access corridor's densely compressed subsoil material. Figure 2 illustrates the approximate volumetric composition of a loam surface soil when conditions are good for plant growth, with adequate natural pore space for fluctuating moisture conditions.

Fig. 1. A typical deep ripping phase of this practice, during the first in a series of progressively deeper “rips” through severely compressed subsoil.

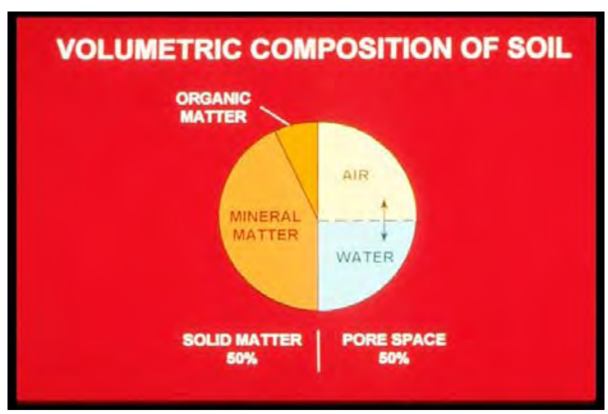


Fig. 2. About 50% of the volume of undisturbed loam surface soil is pore space, when soil is in good condition for plant growth. Brady, 2002.

Recommended Application of Practice

The objective of Deep Ripping and Decompaction is to effectively fracture (vertically and laterallly) through the thickness of the physically compressed subsoil material (see Figure 3), restoring soil porosity and permeability and aiding infiltration to help reduce runoff. Together with topsoil stripping, the “two-phase” practice of Deep Ripping and Decompaction first became established as a “best management practice” through ongoing success on commercial farmlands affected by heavy utility construction right-of-way projects (transmission pipelines and large power lines).

Fig. 3. Construction site with significant compaction of the deep basal till subsoil extends 24 inches below this exposed cut-and-fill work surface.

Soil permeability, soil drainage and cropland productivity were restored. For broader construction application, the two-phase practice of Deep Ripping and Decompaction is best adapted to areas impacted with significant soil compaction, on contiguous open portions of large construction sites and inside long, open construction corridors used as temporary access over the duration of construction. Each mitigation area should have minimal above-and-below-ground obstructions for the easy avoidance and maneuvering of a large tractor and ripping/decompacting implements. Conversely, the complete two-phase practice is not recommended in congested or obstructed areas due to the limitations on tractor and implement movement.

Benefits

Aggressive “deep ripping” through the compressed thickness of exposed subsoil before the replacement/respreading of the topsoil layer, followed by “decompaction,” i.e.: “sub-soiling,” through the restored topsoil layer down into the subsoil, offers the following benefits:

- Increases the project (larger size) area’s direct surface infiltration of rainfall by providing the open site’s mitigated soil condition and lowers the demand on concentrated runoff control structures

- Enhances direct groundwater recharge through greater dispersion across and through a broader surface than afforded by some runoff-control structural measures

- Decreases runoff volume generated and provides hydrologic source control

- May be planned for application in feasible open locations either alone or in conjunction with plans for structural practices (e.g., subsurface drain line or infiltration basin) serving the same or contiguous areas

- Promotes successful long-term revegetation by restoring soil permeability, drainage and water holding capacity for healthy (rather than restricted) root-system development of trees, shrubs and deep rooted ground cover, minimizing plant drowning during wet periods and burnout during dry periods.

Feasibility / Limitations

The effectiveness of Deep Ripping and Decompaction is governed mostly by site factors such as: the original (undisturbed) soil's hydrologic characteristics; the general slope; local weather/timing (soil moisture) for implementation; the space-related freedom of equipment/implement maneuverability (noted above in **Recommended Application of Practice**), and by the proper selection and operation of tractor and implements (explained below in **Design Guidance**). The more notable site-related factors include:

Soil

In the undisturbed condition, each identified soil type comprising a site is grouped into one of four categories of soil hydrology, Hydrologic Soil Group A, B, C or D, determined primarily by a range of characteristics including soil texture, drainage capability when thoroughly wet, and depth to water table. The natural rates of infiltration and transmission of soil-water through the undisturbed soil layers for Group A is "high" with a low runoff potential while soils in Group B are moderate in infiltration and the transmission of soil-water with a moderate runoff potential, depending somewhat on slope. Soils in Group C have slow rates of infiltration and transmission of soil-water and a moderately high runoff potential influenced by soil texture and slope; while soils in Group D have exceptionally slow rates of infiltration and transmission of soil-water, and high runoff potential.

In Figure 4, the profile displays the undisturbed horizons of a soil in Hydrologic Soil Group C and the naturally slow rate of infiltration through the subsoil. The slow rate of infiltration begins immediately below the topsoil horizon (30 cm), due to the limited amount of macro pores, e.g.: natural subsoil fractures, worm holes and root channels. Infiltration after the construction-induced mixing and compression of such subsoil material is virtually absent; but can be restored back to this natural level with the two-phase practice of deep ripping and decompaction, followed by the permanent establishment of an appropriate, deep taproot

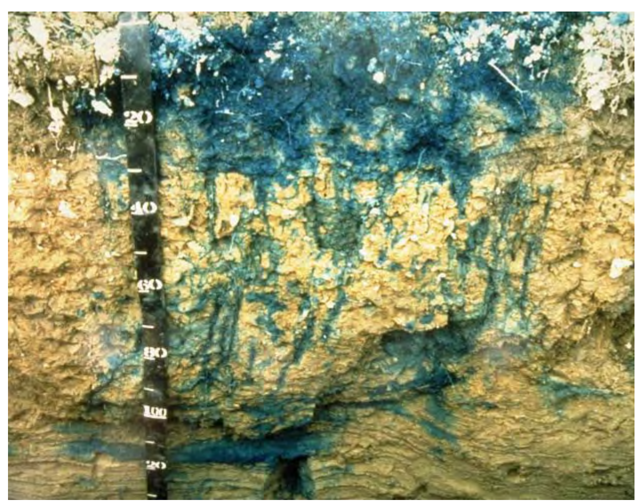


Fig. 4. Profile (in centimeters) displaying the infiltration test result of the natural undisturbed horizons of a soil in Hydrologic Soil Group C.

lawn/ground cover to help maintain the restored subsoil structure. Infiltration after construction-induced mixing and compression of such subsoil material can be notably rehabilitated with the Deep Ripping and Decompaction practice, which prepares the site for the appropriate long-term lawn/ground cover mix including deep taproot plants such as clover, fescue or trefoil, etc. needed for all rehabilitated soils.

Generally, soils in Hydrologic Soil Groups A and B, which respectively may include deep, well-drained, sandy-gravelly materials or deep, moderately well-drained basal till materials, are among the easier ones to restore permeability and infiltration, by deep ripping and decompaction. Among the many different soils in Hydrologic Soil Group C are those unique glacial tills having a natural fragipan zone, beginning about 12 to 18 inches (30 – 45cm), below surface. Although soils in Hydrologic Soil Group C do require a somewhat more carefully applied level of the Deep Ripping and Decompaction practice, it can greatly benefit such affected areas by reducing the runoff and fostering infiltration to a level equal to that of pre-disturbance.

Soils in Hydrologic Soil Group D typically have a permanent high water table close to the surface, influenced by a clay or other highly impervious layer of material. In many locations with clay subsoil material, the bulk density is so naturally high that heavy trafficking has little or no added impact on infiltration; and structural runoff control practices rather than Deep Ripping and Decompaction should be considered.

The information about Hydrologic Soil Groups is merely a general guideline. Site-specific data such as limited depths of cut-and-fill grading with minimal removal or translocation of the inherent subsoil materials (as analyzed in the county soil survey) or, conversely, the excavation and translocation of deeper, unconsolidated substratum or consolidated bedrock materials (unlike the analyzed subsoil horizons' materials referred to in the county soil survey) should always be taken into account.

Sites made up with significant quantities of large rocks, or having a very shallow depth to bedrock, are not conducive to deep ripping and decompation (subsoiling); and other measures may be more practical.

Slope

The two-phase application of 1) deep ripping and 2) decompaction (deep subsoiling), is most practical on flat, gentle and moderate slopes. In some situations, such as but not limited to temporary construction access corridors, inclusion areas that are moderately steep along a project's otherwise gentle or moderate slope may also be deep ripped and decompacted. For limited instances of moderate steepness on other projects, however, the post-construction land use and the relative alignment of the potential ripping and decompaction work in relation to the lay of the slope should be reviewed for safety and practicality. In broad construction areas predominated by moderately steep or steep slopes, the practice is generally not used.

Local Weather/Timing/Soil Moisture

Effective fracturing of compressed subsoil material from the exposed work surface, laterally and vertically down through the affected zone is achieved only when the soil material is moderately dry to moderately moist. Neither one of the two-phases, deep ripping nor decompaction (deep subsoiling), can be effectively conducted when the soil material (subsoil or replaced topsoil) is in either a "plastic" or "liquid" state of soil consistency. Pulling the respective implements legs through the soil when it is overly moist only results in the "slicing and smearing" of the material or added "squeezing and compression" instead of the necessary fracturing. Ample drying time is needed for a "rippable" soil condition not merely in the material close to the surface, but throughout the material located down to the bottom of the physically compressed zone of the subsoil.

The "poor man's Atterberg field test" for soil plasticity is a simple "hand-roll" method used for quick, on-site determination of whether or not the moisture level of the affected soil material is low enough for: effective deep ripping of subsoil; respreading of topsoil in a friable state; and final decompaction (deep subsoiling). Using a sample of soil material obtained from the planned bottom depth of ripping, e.g.: 20 - 24 inches below exposed subsoil surface, the sample is hand rolled between the palms down to a 1/8-inch diameter thread. (Use the same test for stored topsoil material before respreading on the site.) If the respective soil sample crumbles apart in segments no greater than 3/8 of an inch long, by the time it is rolled down to 1/8 inch diameter, it is low enough in moisture for deep ripping (or topsoil replacement), and decompaction. Conversely, as shown in Figure 5, if the rolled sample stretches out in increments greater than 3/8 of an inch long before crumbling, it is in a "plastic" state of soil consistency and is too wet for subsoil ripping (as well as topsoil replacement) and final decompaction.

Fig. 5. Augered from a depth of 19 inches below the surface of the replaced topsoil, this subsoil sample was hand rolled to a 1/8-inch diameter. The test shows the soil at this site stretches out too far without crumbling; it indicates the material is in a plastic state of consistence, too wet for final decompaction (deep subsoiling) at this time.

Design Guidance

Beyond the above-noted site factors, a vital requirement for the effective Deep Ripping and Decompaction (deep subsoiling), is implementing the practice in its distinct, two-phase process:

1) Deep rip the affected thickness of exposed subsoil material (see Figure 10 and 11), aggressively fracturing it before the protected topsoil is reapplied on the site (see Figure 12); and

2) Decompact (deep subsoil), simultaneously through the restored topsoil layer and the upper half of the affected subsoil (Figure 13). The second phase, "decompaction," mitigates the partial recompaction which occurs during the heavy process of topsoil spreading/grading. Prior to deep ripping and decompacting the site, all construction activity, including construction equipment and material storage, site cleanup and trafficking (Figure 14), should be finished; and the site closed off to further disturbance. Likewise, once the practice is underway and the area's soil permeability and

rainfall infiltration are being restored, a policy limiting all further traffic to permanent travel lanes is maintained.

The other critical elements, outlined below, are: using the proper implements (deep, heavy-duty rippers and subsoilers), and ample pulling-power equipment (tractors); and conducting the practice at the appropriate speed, depth and pattern(s) of movement.

Note that an appropriate plan for the separate practice of establishing a healthy perennial ground cover, with deep rooting to help maintain the restored soil structure, should be developed in advance. This may require the assistance of an agronomist or landscape horticulturist.

Implements

Avoid the use of all undersize implements. The small-to-medium, light-duty tool will, at best, only "scarify" the uppermost surface portion of the mass of compacted subsoil material. The term "chisel plow" is commonly but incorrectly applied to a broad range of implements. While a few may be adapted for the moderate subsoiling of non-impacted soils, the majority are less durable and used for only lighter land-fitting (see Figure 6).

Fig. 6. A light duty chisel implement, not adequate for either the deep ripping or decompaction (deep subsoiling) phase.

Fig. 7. One of several variations of an agricultural ripper. This unit has long, rugged shanks mounted on a steel V-frame for deep, aggressive fracturing through Phase 1.

Use a "heavy duty" agricultural-grade, deep ripper (see Figures 7,9,10 and 11) for the first phase: the lateral and vertical fracturing of the mass of exposed and compressed subsoil, down and through, to the bottom of impact, prior to the replacement of the topsoil layer. (Any oversize rocks which are uplifted to the subsoil surface during the deep ripping phase are picked and removed.) Like the heavy-duty class of implement for the first phase, the decompaction (deep subsoiling) of Phase 2 is conducted with the heavy-duty version of the deep subsoiler. More preferable is the angled-leg variety of deep subsoiler (shown in Figures 8 and 13). It minimizes the inversion of the subsoil and topsoil layers while laterally and vertically fracturing the upper half of the previously ripped subsoil layer and all of the topsoil layer by delivering a momentary, wave-like "lifting and shattering" action up through the soil layers as it is pulled.

Pulling-Power of Equipment

Use the following rule of thumb for tractor horsepower (hp) whenever deep ripping and decompacting a significantly impacted site: For both types of implement, have at least 40 hp of tractor pull available for each mounted shank/ leg.

Using the examples of a 3-shank and a 5-shank implement, the respective tractors should have 120 and 200 hp available for fracturing down to the final depth of 20-to-24 inches per phase. Final depth for the deep ripping in Phase 1 is achieved incrementally by a progressive series of passes (see Depth and Patterns of Movement, below); while for Phase 2, the full operating depth of the deep subsoiler is applied from the beginning.

The operating speed for pulling both types of implement should not exceed 2 to 3 mph. At this slow and managed rate of operating speed, maximum functional performance is sustained by the tractor and the implement performing the soil fracturing. Referring to Figure 8, the implement is the 6-leg version of the deep angled-leg subsoiler. Its two outside legs are "chained up" so that only four legs will be engaged (at the maximum depth), requiring no less than 160 hp, (rather than 240 hp) of pull. The 4-wheel drive, articulated-frame tractor in Figure 8 is 174 hp. It will be decompacting this unobstructed, former construction access area simultaneously through 11 inches of replaced topsoil and the upper 12 inches of the previously deep-ripped subsoil. In constricted areas of Phase 1) Deep Ripping, a medium-size tractor with adequate hp, such as the one in Figure 9 pulling a 3-shank deep ripper, may be more maneuverable.

Fig. 8. A deep, angled-leg subsoiler, ideal for Phase 2 decompaction of after the topsoil layer is graded on top of the ripped subsoil.

Fig. 9. This medium tractor is pulling a 3-shank deep ripper. The severely compacted construction access corridor is narrow, and the 120 hp tractor is more maneuverable for Phase 1 deep ripping (subsoil fracturing), here.

Some industrial-grade variations of ripping implements are attached to power graders and bulldozers. Although highly durable, they are generally not recommended. Typically, the shanks or "teeth" of these rippers are too short and stout; and they are mounted too far apart to achieve the well-distributed type of lateral and vertical fracturing of the soil materials necessary to restore soil permeability and infiltration. In addition, the power graders and bulldozers, as pullers, are far less maneuverable for turns and patterns than the tractor.

Depth and Patterns of Movement
As previously noted both Phase 1 Deep Ripping through significantly compressed, exposed subsoil and Phase 2 Decompaction (deep subsoiling) through the replaced topsoil and upper subsoil need to be performed at maximum capable depth of each implement. With an implement's guide wheels attached, some have a "normal" maximum operating depth of 18 inches, while others may go deeper. In many situations, however, the tractor/implement operator must first remove the guide wheels and other non essential elements from the implement. This adapts the ripper or the deep subsoiler for skillful pulling with its frame only a few inches above surface, while the shanks or legs, fracture the soil material 20-to-24 inches deep.

There may be construction sites where the depth of the exposed subsoil's compression is moderate, e.g.: 12 inches, rather than deep. This can be verified by using a ¾ inch cone penetrometer and a shovel to test the subsoil for its level of compaction, incrementally, every three inches of increasing depth. Once the full thickness of the subsoil's compacted zone is finally "pieced" and there is a significant drop in the psi measurements of the soil penetrometer, the depth/thickness of compaction is determined. This is repeated at several representative locations of the construction site. If the thickness of the site's subsoil compaction is verified as, for example, ten inches, then the Phase 1 Deep Ripping can be correspondingly reduced to the implement's minimum operable depth of 12 inches. However, the Phase 2 simultaneous Decompation (subsoiling) of an 11 inch thick layer of replaced topsoil and the upper subsoil should run at the subsoiling implements full operating depth.


Fig. 10. An early pass with a 3-shank deep ripper penetrating only 8 inches into this worksite's severely compressed subsoil.


Fig. 11. A repeat run of the 3-shank ripper along the same patterned pass area as Fig. 9; here, incrementally reaching 18 of the needed 22 inches of subsoil fracture.

Typically, three separate series (patterns) are used for both the Phase 1 Deep Ripping and the Phase 2 Decompaction on significantly compacted sites. For Phase 1, each series begins with a moderate depth of rip and, by repeat-pass, continues until full depth is reached. Phase 2 applies the full depth of Decompation (subsoiling), from the beginning.

Every separate series (pattern) consists of parallel, forward-and-return runs, with each progressive pass of the implement's legs or shanks evenly staggered between those from the previous pass. This compensates for the shank or leg-spacing on the implement, e.g., with 24-to-30 inches between each shank or leg. The staggered return pass ensures lateral and vertical fracturing actuated every 12 to 15 inches across the densely compressed soil mass.

Large, Unobstructed Areas

For larger easy areas, use the standard patterns of movement:

- The first series (pattern) of passes is applied lengthwise, parallel with the longest spread of the site; gradually progressing across the site's width, with each successive pass.

- The second series runs obliquely, crossing the first series at an angle of about 45 degrees.

- The third series runs at right angle (or 90 degrees), to the first series to complete the fracturing and shattering on severely compacted sites, and avoid leaving large unbroken blocks of compressed soil material. (In certain instances, the third series may be optional, depending on how thoroughly the first two series loosen the material and eliminate large chunks/blocks of material as verified by tests with a ¾-inch cone penetrometer.)

Fig. 12. Moderately dry topsoil is being replaced on the affected site now that Phase 1 deep ripping of the compressed subsoil is complete.

Fig. 13. The same deep, angled-leg subsoiler shown in Fig. 7 is engaged at maximum depth for Phase 2, decompaction (deep soiling), of the replaced topsoil and the upper subsoil materials.

Corridors

In long corridors of limited width and less maneuverability than larger sites, e.g.: along compacted areas used as temporary construction access, a modified series of pattern passes are used.

- First, apply the same initial lengthwise, parallel series of passes described above.

● A second series of passes makes a broad "S" shaped pattern of rips, continually and gradually alternating the "S" curves between opposite edges inside the compacted corridor.

● The third and final series again uses the broad, alternating S pattern, but it is "flip-flopped" to continually cross the previous S pattern along the corridor's centerline. This final series of the S pattern curves back along the edge areas skipped by the second series.

Maintenance and Cost

Once the two-phase practice of Deep Ripping and Decompation is completed, two items are essential for maintaining a site's soil porosity and permeability for infiltration. They are: planting and maintaining the appropriate ground cover with deep roots to maintain the soil structure (see Figure 15); and keeping the site free of traffic or other weight loads.

Note that site-specific choice of an appropriate vegetative ground-cover seed mix, including the proper seeding ratio of one or more perennial species with a deep taproot system and the proper amount of lime and soil nutrients (fertilizer mix) adapted to the soil-needs, are basic to the final practice of landscaping, i.e: surface tillage, seeding/planting/fertilizing and culti-packing or mulching is applied. The "maintenance" of an effectively deep-ripped and decompacted area is generally limited to the successful perennial (long-term) landscape ground cover; as long as no weight-bearing force of soil compaction is applied.

Fig. 14. The severely compacted soil of a temporary construction yard used daily by heavy equipment for four months; shown before deep ripping, topsoil replacement, and decompaction.

Fig. 15. The same site as Fig. 14 after deep ripping of the exposed subsoil, topsoil replacement, decompaction through the topsoil and upper subsoil and final surface tillage and revegetation to maintain soil permeability and infiltration.

The Deep Ripping and Decompaction practice is, by necessity, more extensive than periodic subsoiling of farmland.The cost of deep ripping and decompacting (deep subsoiling), will vary according to the depth and severity of soil-material compression and the relative amount of tractor and implement time that is required. In some instances, depending on open maneuverability, two-to-three acres of compacted project area may be deep-ripped in one day. In other situations of more severe compaction and - or less maneuverability, as little as one acre may be fully ripped in a day. Generally, if the Phase 1) Deep Ripping is fully effective, the Phase 2) Decompaction should be completed in 2/3 to 3/4 of the time required for Phase 1.

Using the example of two acres of Phase 1) Deep Ripping in one day, at $1800 per day, the net cost is $900 per acre. If the Phase 2) Decompacting or deep subsoiling takes 3/4 the time as Phase 1, it costs $675 per acre for a combined total of $1575 per acre to complete the practice (these figures do not include the cost of the separate practice of topsoil stripping and replacement). Due to the many variables, it must be recognized that cost will be determined by the specific conditions or constraints of the site and the availability of proper equipment.

Resources

Publications:

- American Society of Agricultural Engineers. 1971. *Compaction of Agricultural Soils.* ASAE.

- Brady, N.C., and R.R. Weil. 2002. *The Nature and Properties of Soils. 13th ed.* Pearson Education, Inc.

- Baver, L.D. 1948. *Soil Physics.* John Wiley & Sons.

- Carpachi, N. 1987 (1995 fifth printing). *Excavation and Grading Handbook, Revised. 2nd ed.* Craftsman Book Company
- Ellis, B. (Editor). 1997. Safe & Easy Lawn Care: The Complete Guide to Organic Low Maintenance Lawn. Houghton Mifflin.

- Harpstead, M.I., T.J. Sauer, and W.F. Bennett. 2001. *Soil Science Simplified. 4th ed.* Iowa State University Press.

- Magdoff, F., and H. van Es. 2000. *Building Soils for Better Crops. 2nd ed.* Sustainable Agricultural Networks

- McCarthy, D.F. 1993. *Essentials of Soil Mechanics and Foundations, Basic Geotechnics 4th ed.* Regents/Prentice Hall.

- Plaster, E.J. 1992. *Soil Science & Management. 3rd ed.* Delmar Publishers.

- Union Gas Limited, Ontario, Canada. 1984. *Rehabilitation of Agricultural Lands, Dawn-Kerwood Loop Pipeline; Technical Report*. Ecological Services for Planning, Ltd.; Robinson, Merritt & Devries, Ltd. and Smith, Hoffman Associates, Ltd.

- US Department of Agriculture in cooperation with Cornell University Agricultural Experiment Station. Various years. *Soil Survey of (various names) County, New York.* USDA.

Internet Access:

- Examples of implements:

V-Rippers. Access by internet search of *John Deere Ag -New Equipment for 915* (larger-frame model) *V-Rippe*; and, *for 913* (smaller-frame model) *V-Ripper*. Deep, angled-leg subsoiler. Access by internet search of: B*igham Brothers Shear Bolt Paratill-Subsoiler*. http://salesmanual.deere.com/sales/salesmanual/en_NA/primary_tillage/2008/feature/rippers/915v_pattern_frame.html?sbu=ag&link=prodcat Last visited March 08.

- Soils data of USDA Natural Resources Conservation Service. *NRCS Web Soil Survey.* http://websoilsurvey.nrcs.usda.gov/app/ and *USDA-NRCS Official Soil Series Descriptions; View by Name.* http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdname.cgi . *Last visited Jan. 08.*

- Soil penetrometer information. Access by internet searches of: *Diagnosing Soil Compaction using a Penetrometer (soil compaction tester), PSU Extension;* as well as *Dickey-john Soil Compaction Tester.* http://www.dickey-johnproducts.com/pdf/SoilCompactionTest.pdf and http://cropsoil.psu.edu/Extension/Facts/uc178pdf Last visited Sept. 07

Appendix H: Stormwater Management System Maintenance/Inspection Summary List

NEW YORK STATE OF OPPORTUNITY.

Department of Environmental Conservation

MAINTENANCE GUIDANCE

Stormwater Management Practices

March 31, 2017

FINAL

Table of Contents

Section 1. Introduction

1.1. Stormwater Management Practice (SMP) Groups

Stormwater management has become an important function for municipalities to address the quality of local water resources and to adhere to state standards. Increasingly, stormwater management practices (SMPs) are constructed as part of new development or redevelopment projects as retrofits to existing infrastructure and/or as part of local watershed restoration plan efforts.

While SMPs are proliferating, municipalities are charged with a certain level of implementation and oversight. Whether this is a new function for a municipality or an expansion of existing programs, it is important for these local programs to have some degree of guidance to successfully meet the challenge. One important area where guidance has been lacking is how to properly operate and maintain the wide range of SMPs that are constructed. This chapter was developed to address this need. It is widely understood that SMPs will not function properly to protect water resources without attention to operation and maintenance (O&M), and that O&M tasks and responsibilities must be identified and assumed by various stakeholders.

The chapter is structured around a hierarchy concept where O&M responsibilities are addressed by SMP owners/property managers, municipal staff, landscape contractors and professionals with knowledge in stormwater management (Qualified Professional). The hierarchy approach, explained in more detail below in Section 1.2, strives for a cost-efficient way to ensure long-term performance of SMPs.

The maintenance procedures described in this chapter are applied to ten separate SMP groups (**Table 1.1**). These same ten groups are used to separate maintenance inspection guidance, costs, and other guidance in the chapter.

Table 1.1 Practices Discussed in this Chapter, by Group

SMP Group	Practices Included
Rainwater Harvesting	• Rain Barrel • Cistern
Disconnection and Sheetflow	• Rooftop Disconnection • Sheetflow to Filter Strip • Sheetflow to Riparian Buffers
Swales	• Vegetated Swale • Wet Swale
Tree Planting	• Tree Planting
Bioretention	• Bioretention Cell • Dry Swale • Rain Garden • Stormwater Planters • Tree Pits
Green Roofs	• Green Roofs
Permeable Pavements	• Permeable Pavers • Porous Asphalt/Concrete
Ponds and Wetlands	• Wet Pond Design Options • Stormwater Wetland Design Options
Infiltration	• Infiltration Trench • Infiltration Basin • Dry Well
Sand and Organic Filters	• Surface Sand Filters • Underground Sand Filters • Underground Organic Filters

1.2. Maintenance Hierarchy

SMPs require inspections and maintenance to identify small problems before they become more serious and expensive to repair. For example, removing a small amount of sediment from a filtering medium or permeable pavement surface is much less expensive than replacing a surface that has already become clogged. However, it can be cost prohibitive for most communities or SMP owners to hire highly trained staff or contractors to inspect these practices or to carry out the actual maintenance tasks. This can be especially true with the advent of "micro-scale" Green Infrastructure practices, which may be distributed across many individual public and private properties, and where the absolute number of SMPs within a municipality may exceed local government inspection and maintenance capabilities.

Many SMP maintenance problems start out as fairly small, easily rectified issues as long as they are detected early enough through an inspection. For these issues, property owners or managers can likely take care of the issue in an expedient and cost-effective manner.

However, at some point, property owners or managers will encounter an issue where diagnosing the problem and knowing the appropriate remedy will exceed their technical capabilities. At this point, an individual with training in SMP inspection, operation and maintenance, such as a municipal inspector or landscape contractor, may have to be called in for assistance.

Similarly, some problems escalate to the point where a Qualified Professional (i.e. professional engineer or landscape architect) is needed to bring the SMP back to a good functioning condition. The Qualified Professional may need to bring in other experts to assess problems with the SMP. For instance, they may call in a horticulturalist to assess problems with the planting plan.

Figure 1.1 The SMP Maintenance Hierarchy Pyramid

Acknowledging this step-wise approach to SMP inspection and maintenance, the SMP Maintenance Hierarchy concept was developed. The concept uses a combination of skill levels (**Figure 1.1**) as explained in more detail below.

Level 1: Property Owners and Managers, Interns, etc.

This category includes property owners, property managers, or HOA representatives, for privately owned SMPs. For municipally owned SMPS, this could include municipal maintenance staff or interns, and volunteers. These individuals would typically have no or only very limited training in stormwater maintenance and inspection but can use available guidance to quickly identify and rectify common and simple issues with SMP performance. This level completes routine inspections and maintenance activities. For most SMPs, the majority of inspection and maintenance activities can be conducted at this skill level, thus Level 1 forms the base of the Maintenance Hierarchy pyramid. Many well-functioning SMPs can be adequately maintained for long periods of time using Level 1 capabilities.

Although many issues can be addressed at Level 1, these inspectors and maintainers need a relief valve when the SMP problems become harder to diagnose and/or the remedies require a higher level of resources and expertise. Such issues are referred to in this chapter as "kick-outs to Level 2." For instance, an SMP may have a minor amount of sediment that has accumulated at inlets or on the practice bottom. A Level 1 person may be able to take care of this with a flat shovel and wheel barrow. However, a Level 2 inspection would be triggered if the sediment is deep, widespread, keeps recurring, and/or requires more sophisticated equipment to remove.

Level 2: Trained Municipal Staff

This level of inspection and maintenance is conducted primarily by municipal employees or landscape contractors who have completed training on SMP, inspection, operation and maintenance. Level 2 inspections can take place in response to two circumstances:

1. As part of an ongoing, routine municipal inspection program whereby SMPs are visited on a rotating basis at a frequency established by the local program, or

2. In response to a “kick-out” from a Level 1 inspector based on a specific problem or problems.

Circumstance #2 obviously will require coordination and communication between the Level 1 and Level 2 inspectors, with documentation and background provided by the Level 1 inspector. This is an essential part of making the hierarchy approach successful. In the example above, the Level 2 inspector can better diagnose the sources of the sediment, whether the sediment is affecting performance of the SMP, and the specific tasks needed to remove the sediment and abate the source.

As with kick-outs from Level 1 to Level 2, the same can exist from Level 2 to Level 3. It may be that the Level 2 inspector encounters a problem where a Qualified Professional is needed to re-design certain components of the SMP, and a qualified contractor is needed to undertake a more serious repair. This is when Level 3 is activated.

Level 3: Qualified Professionals

Qualified professionals include professional engineers and landscape architects, who can revisit design issues associated with chronic or serious problems. For repair and maintenance of the SMPs at this level, individuals with specific skills and certifications, such as a certified plumber who has experience working with rainwater harvesting practices or a horticulturalist with knowledge on proper plantings may need to be called in by the Qualified Professional. Level 3 inspection or maintenance is triggered in response to specific problems identified during a Level 2 inspection.

Continuing with the example above, the Level 2 inspector identifies that the sediment is accumulating in the SMP because of the lack of pre-treatment or that the practice is not sized properly for its drainage area. The Level 2 inspector at this point should consult a Qualified Professional (Level 3) who can go back to the original or as-built plan and develop workable solutions.

Table 1.2 further describes how maintenance and inspection activities differ among the three levels of the SMP Maintenance Hierarchy.

Table 1.2 Maintenance/Inspection Hierarchy Levels

	Level 1: Owners and Untrained Staff	**Level 2: Trained Municipal Staff**	**Level 3: Qualified Professionals**
Qualifications/ Training of Inspectors	No special training, but person is provided educational materials	On-the-job training and/or short workshops Define adequate training or provide examples	Professional License such as a PE or RLA
Frequency of Inspection	At least annually	Routine as determined by the local program OR as kick-out from Level 1 inspection	Only as needed from Level 2 inspection
Inspection Guidance	Checklists are included for each practice group in **Section 2** of this chapter and in **Appendix A**.	Guidance for the inspection is included in **Section 3**, and checklists are included in **Appendix B.**	**Section 4** includes guidance for diagnosing typical problems.
Typical Maintenance Activities	Routine mowing. Trash removal. Plant care and upkeep. Mulching as needed. Removal of small amounts of sediment from pretreatment areas of the practice.	Removal of larger amounts of sediment. Structural damage repair. Minor regrading and scarification of soil surface to restore permeability.	Redesign an improperly functioning practice. Includes re-grading of the contributing drainage area, replacing soil media and plantings (new planting plan), or modifying conveyance structures.
Triggers for Inspection or Maintenance by this Level	Regular inspection (no trigger)	Level 1 Inspection Sheets (**Section 2**) describe triggers that warrant a Level 2 Inspection.	Level 2 Inspection Guidance (**Section 3**) describes triggers that warrant a Level 3 Inspection.

1.3. Using the Remainder of this Chapter

This chapter provides guidance for maintaining SMPs, including inspection, maintenance activities, and maintenance planning. The chapter includes four sections as follows:

- **Section 2** outlines Level 1 inspection and maintenance procedures in the form of visual checklists. This includes guidance for inspection of each of the 10 SMP groups/categories included in this chapter, as well as specific kick-outs for Level 2.
- **Section 3** provides guidance for Level 2 inspections as to observed conditions, remedies, and triggers for Level 3.
- **Section 4** is most relevant to Level 3 and includes diagnostic measures for specific problems, as well as guidance for performing repair activities.
- **Section 5** provides an overview of planning for maintenance, including techniques for estimating maintenance costs and elements of a maintenance plan.

Section 2. Level 1 Inspections

2.1. How to Use this Section

Section 2 provides guidance for Level 1 inspections of 10 groups of stormwater management practices (SMPs). See Section 1 of this chapter for an explanation of Level 1 in the Maintenance Hierarchy.

- **Section 2.2** provides general guidance for Level 1 inspections.
- **Sections 2.3 through 2.12** provide detailed Level 1 inspection guidance and inspection forms for each of the 10 practice categories:
    - 2.3 Rainwater Harvesting
    - 2.4 Disconnection and Sheetflow
    - 2.5 Swales
    - 2.6 Tree Planting
    - 2.7 Bioretention
    - 2.8 Green Roofs
    - 2.9 Permeable Pavement
    - 2.10 Ponds and Wetlands
    - 2.11 Infiltration
    - 2.12 Sand and Organic Filters

2.2. General Guidance for Level 1 Inspections

Regardless of which practice you are inspecting, some key procedures and equipment are necessary. Read through this guidance before going on an inspection, and use the specific guidance in **Sections 2.3 through 2.12** for the particular practice type you are inspecting. The Level 1 Inspection can be completed with minimal previous training. Typical Level 1 inspectors may include a property owner or manager (for private SMPs) or perhaps an intern or maintenance or landscape crew members in the case of a publicly owned practice. Level 1 inspections are the most frequent inspections. They are designed to identify key maintenance issues before they become more serious and to help keep up with routine maintenance tasks.

When to Conduct a Level 1 Inspection

The Level 1 Inspection should be conducted at least annually for all practices and is often supplemented with additional visits after large storms, winter salting and sanding, or other seasonal changes. In addition, it is recommended that inspections take place more frequently during the first few years after installation of an SMP. Many issues can be identified and corrected during this early period so that they do not lead to larger problems in subsequent years. Plant establishment and health is one of these key issues. Once the SMP is stable and seems to be functioning properly, the inspections can become less frequent.

What to Take into the Field

The Level 1 Inspection is fairly simple, and it is assumed that very little measurement will be needed. However, the inspector should take pictures to document findings and should also keep a record of the inspections. The list of needs for the Level 1 Inspection includes the following:

1. Safety vest (if SMP is located in an area near traffic)
2. Notes or records from past inspections
3. Digital camera or phone
4. Clipboard and pencils (if using paper forms), or Tablet or smartphone if using digital forms
5. Bug spray (if needed)
6. Sun block (if needed)
7. Tape measure (optional, to measure pipe sizes and SMP dimensions)
8. Letter of permission to access property if the inspector is from an outside agency (e.g., summer intern working for the municipality)
9. Site Plan showing SMPs, Planting Plan (includes planting/seed mixes) and details
10. Engineers scale
11. Flagging/stakes and waterproof marker (to mark problem areas that need to be visited again)

Checklist and Follow-Up Actions

The Level 1 Inspection checklists included in **Sections 2.3 through 2.12** describe follow-up actions for each observed condition (See **Figure 2.2.1** for an example). A Level 1 Inspection Table is available for each component or key area of the particular SMP group. Use as follows:

- Check the box in the LEFT column if the problem is present at the site.
- Check the appropriate follow-up actions in the RIGHT column, or add your own as needed to fix the problem.
- DOCUMENT all your actions. Keep copies of the Level 1 inspection tables, plus notes, photos, or other documentation of corrective measures to fix problems. Record dates of actions and any follow-up inspections. This will be important for communicating with Level 2 inspectors and/or the local stormwater program.
- Activate a Level 2 Inspection (**Section 3**) as guided by the table (shown in blue cells): These blue cells identify conditions when a more detailed inspection will be needed to further diagnose problems. As the problem becomes more severe, it will be necessary to activate a Level 2 inspection. Consult the local stormwater program authority for the most appropriate Level 2 inspection option.

Permeable Pavement 1. Drainage Area	
Problem (Check if Present)	**Follow-Up Actions**
 ☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and mulch areas of bare soil to get vegetation established. ☐ Fill in erosion areas with soil, compact, and seed straw to get vegetation established. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small bern or adding topsoil to area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.

Figure 2.2.1. Example of a Level 1 Inspection Checklist, with Follow-Up Actions. Note “Kick-Out to Level 2” highlighted in gray.

2.3. Rainwater Harvesting – Level 1 Inspections

Components of Rainwater Harvesting

Key components to inspect for Rainwater Harvesting systems include the following:

- RWH 1. Conveyance System (gutters, downspouts, other pipes) and Filter
- RWH 2. Storage Tank
- RWH 3. Outlets

Note: The category of Rainwater Harvesting includes:

- *Rain Barrel* – A small tank, usually between 50 and 100 gallons that can be installed directly next to a downspout. Multiple rain barrels can be connected in order to increase rainwater storage capacity. This is the most common form of rainwater harvesting on residential properties.
- *Cistern* – A larger tank that can be installed above ground or below ground, depending on the structural capacity of the material.

Figure 2.3.1 Key Areas for Level 1 Inspection of Rainwater Harvesting Systems

Rainwater Harvesting Level 1 Inspection

Figure 2.3.2 Inspecting the Conveyance System and a Vortex-style Filter

The Level 1 Inspection focuses on the Conveyance System and Filter (RWH 1), Storage Tank (RWH 2), and Outlet (RWH 3). It is recommended that this inspection be conducted two to four times per year, especially in spring and late fall. If possible, inspect the system during or immediately after a storm in order to better see any active blockages, leaks, or other problems.

RWH 1. Conveyance System and Filter

Description: The conveyance system is all the components that collect and convey runoff from the roof toward the storage tank. This typically consists of gutters and downspouts, and sometimes additional drainage pipes. These components need to be kept clear of debris in order to avoid blockages and spilling of runoff out of the gutters. Every proper rainwater harvesting system also has one or more ways of filtering the water coming into the tanks from the conveyance system. These may include screens, first-flush diverters, and vortex filters.

Instruction: Inspect any gutters, downspouts, drainage pipes, and filters connected to the Rainwater Harvesting System. Consult **Table 2.3.1** below:

Table 2.3.1 RWH Conveyance System and Filter

Problem (Check if Present)	Follow-Up Actions
☐ Leaves, sticks, or other debris in gutters and downspouts	☐ Remove all debris by hand. ☐ Other:
☐ Leaves, sticks, or other debris in filter(s)	☐ Clean out all debris and organic matter buildup by hand or by spraying with a hose. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Filter (first-flush diverter or vortex filter outside the tank) does not seem to be operating, is completely clogged, or does not appear to be trapping any debris.
☐ Loose or disconnected junctions between gutters, pipes, or filters	☐ Secure any loose junctions or parts and make sure they are properly sealed to prevent leaks, ☐ Other:

RWH 2. Storage Tank

Description: Many different types and sizes of tanks can be used for rainwater harvesting. They can be situated underground, above ground, or even partially buried. The tank body has an inlet (and/or cover) and one or more outlet points for water to leave the tank. Advanced rainwater harvesting systems usually also have a pump and a filter inside or outside the tank to further clean the stored water and pump it to the point of use.

Instruction: When the tank is full, carefully inspect for any leaks or blockages. Next, drain the tank to inspect interior. For safety reason, visually inspect the inside of the tank without breaking the plane of the opening with any body parts, as this is a confined space that should only be entered by those with special training. Consult **Table 2.3.2** below.

Figure 2.3.3 Inspecting the Storage Tank

Table 2.3.2 RWH Storage Tank

Problem (Check if Present)	**Follow-Up Actions**
☐ Tank is above ground and not freeze proof.	**Winterize the tank by performing the following steps:** ☐ Drain down water level in the tank before winter to avoid damage from freezing temperatures. ☐ Drain water from pipes and pumps. ☐ Disconnect conveyance pipes from the tank to enable roof runoff to bypass the tank during winter.
☐ Tank is full between rain events (harvested water is not being used).	☐ Drain down any remaining water in the tank before predicted rain events.
☐ Mosquito larvae or other insects present in the water	☐ Add mosquito dunks to water. ☐ Ensure that insect screens are installed on all openings and are properly sealed (inlet and outlets). ☐ Other:
☐ Debris, algae, or organic matter accumulated in tank	☐ Remove as much as possible, by hand. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: For large tanks that cannot easily be accessed for inspection and/or cleaning, defer to Level 2 Inspection.
☐ Tank does not appear to fill fully even during large rains, or water level drops quickly after filling.	☐ Kick-Out to Level 2 Inspection: Water is bypassing the tank and/or there are leaks in the tank wall. This will likely require special expertise to diagnose and fix.
☐ Problems with pumps, filters, or other mechanical components	☐ Kick-Out to Level 2 Inspection: This will likely require special expertise to diagnose and fix.

RWH 3. Outlets

Description: An above-ground rainwater harvesting tank usually has at least two outlets—one at the top of the tank where water overflows when the tank is full, and one near the bottom of the tank for delivering the stored water by gravity feed. Many filters also have an outlet pipe to divert the first flush of roof runoff away from the tank. Any overflow outlet that spills onto the ground should have sufficient erosion control (e.g., rock or stone pad) to prevent erosion of the ground.

Instruction: Examine the outlet pipe(s) and the point at which it overflows onto the ground. Consult **Table 2.3.3** below.

Table 2.3.3 RWH Outlets

Problem (Check if Present)	Follow-Up Actions
☐ Slow flow from outlet caused by faulty or clogged valve	☐ If clogging seems to be the problem, ream out sediment from valve if this can be done from exterior. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Valve needs to be replaced or cannot be cleaned out from outside of tank.
☐ Flow from outlet is backing up toward building foundation.	☐ Add flexible pipe to end of outlet pipe to divert flow further away and downhill from building.
☐ Erosion or drainage issues at outlet	☐ Add a gravel and/or stone pad to reduce the impact from the water flowing out of the outlet pipe during storms. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Rills have formed, erosion or drainage problems are more severe or cannot be resolved, or there is discoloration or other unusual conditions around the outlet.

2.4. Disconnection and Sheetflow

Components of Disconnection and Sheetflow

The intent of disconnection and sheetflow is for runoff from small areas of impervious cover to spread out evenly and dissipate in a grassy or vegetated area. It is a low-technology practice intended to reduce runoff at its source. Key components to inspect for Disconnection and Sheetflow include the following:

- D&S 1. Drainage Area
- D&S 2. Level Spreader/Energy Dissipator
- D&S 3. Treatment Area

Figure 2.4.1 Key Areas for Level 1 Inspection of Disconnection and Sheetflow with filter strip shown.

R. Winston, NCSU

Note: The category of Disconnection and Sheetflow includes:

- Rooftop Disconnection – Runoff from a small rooftop is directed to a relatively flat pervious area.
- Sheetflow to Filter Strip – Runoff from a small parking lot, sidewalk, or other small impervious surface is directed to a relatively flat, uniformly graded grassy area.
- Sheetflow to Riparian Buffers – Runoff from a small parking lot, sidewalk, or other small impervious surface is directed to a relatively flat, well-vegetated riparian area.

Disconnection and Sheetflow Level 1 Inspection

The Level 1 Inspection focuses on the Drainage Area (D&S 1), Level Spreader/Energy Dissipater (D&S 2), and Treatment Area (D&S 3). This inspection should be conducted twice per year, preferably in the spring and fall. If possible, inspect the practice during a storm in order to better see any active blockages, bypassing, or other problems.

D&S 1. Drainage Area

Description: The drainage area consists of rooftops and/or impervious surfaces such as parking lots, driveways, or sidewalks. Pervious areas such as lawns or forests may also be part of the drainage area.

Instruction: Visually inspect any surfaces in the drainage area. Consult **Table 2.4.1** below.

Table 2.4.1 D&S Drainage Area

Problem (Check if Present)		Follow-Up Actions
	☐ Changes in flow; more runoff; runoff bypassing the practice	☐ For rooftop areas, make sure downspouts are still disconnected and conveying water into the treatment area. ☐ Look for and remove any “dams” of sediment and grass clippings that prevent water from entering the treatment area as sheet flow. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Changes to drainage area size or amount of runoff due to construction, tillage, etc.
	☐ For parking lots in the drainage area—sediment, grass clippings, or other debris has accumulated at pavement edge.	☐ For small, isolated amounts of debris, sweep up by hand and dispose properly so that it will not be exposed to runoff. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Sediment is widespread and cannot be removed by manual sweeping.
	☐ For parking lots in the drainage area—dips or damage at pavement edge caused flow to concentrate.	☐ Kick-Out to Level 2 Inspection: This will likely require special expertise to diagnose and fix pavement edge.

D&S 2. Level Spreader/Energy Dissipator

Description: Some disconnection and sheetflow practices have a structure in place to dissipate any concentrated runoff and turn it into sheet flow. This may consist of a stone or gravel spreader a concrete or wood level spreader, or other level and stable surface.

Instruction: Inspect the energy dissipator closely, during a rain event if possible. Consult the **Table 2.4.2** below.

Table 2.4.2 D&S Level Spreader/Energy Dissipator

Problem (Check if Present)		**Follow-Up Actions**
	☐ Debris and/or sediment accumulated behind or around the level spreader.	☐ Remove debris and sediment by hand and ensure that the area behind the level spreader is relatively flat. Too much debris and sediment can cause runoff to bypass the level spreader structure. ☐ Other:
	☐ Sinking, cracking, sloughing, or other structural problem makes the energy dissipator no longer level.	☐ For stone/gravel spreaders, add new material or rake out as needed to make it even. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Structural issues that cannot be easily fixed by hand

D&S 3. Treatment Area

Description: After runoff is dissipated as sheet flow, it enters the treatment area–a relatively flat grassy or vegetated area.

Instruction: Examine where flow enters the treatment area as well as the whole flow path. Look for signs of concentrated flow. Consult the table below.

Table 2.4.3 D&S Treatment Area

Problem (Check if Present)		Follow-Up Actions
☐ Trash and/or debris in the treatment area		☐ Collect trash/debris and dispose of properly.
	☐ Grass filter strip has grown very tall, to the point that runoff cannot easily enter or is getting concentrated.	☐ Mow filter strip twice a year or more frequently in a residential yard.
☐ Sparse vegetation or bare spots		☐ For grassy areas, add topsoil (as needed), grass seed mulch, and water during the growing season to re-establish consistent vegetation cover. ☐ Other:
	☐ Rills or gullies are forming in treatment area where flow has become concentrated	☐ For minor rills, fill in with soil, compact, and add seed and straw to establish vegetation. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Rills are more than 2" to 3" deep and require more than just hand raking and re-seeding.

2.5. Swales

Areas of Swales

- Key areas to inspect for swales include the following:
- SW 1. Drainage Area
- SW 2. Inlets
- SW 3. Swale Surface Area
- SW 4. Vegetation
- SW 5. Outlets

Note: The category of Swales includes:

- Vegetated Swale – shallow channel densely planted with variety of grasses, shrubs, and/or trees (also called bioswale or drainage swale)
- Wet Swale – a cross between a wetland and a swale, this linear system intercepts groundwater to maintain wetland vegetation

For the purposes of this chapter, the term "Swale" will be used to generally describe these practices.

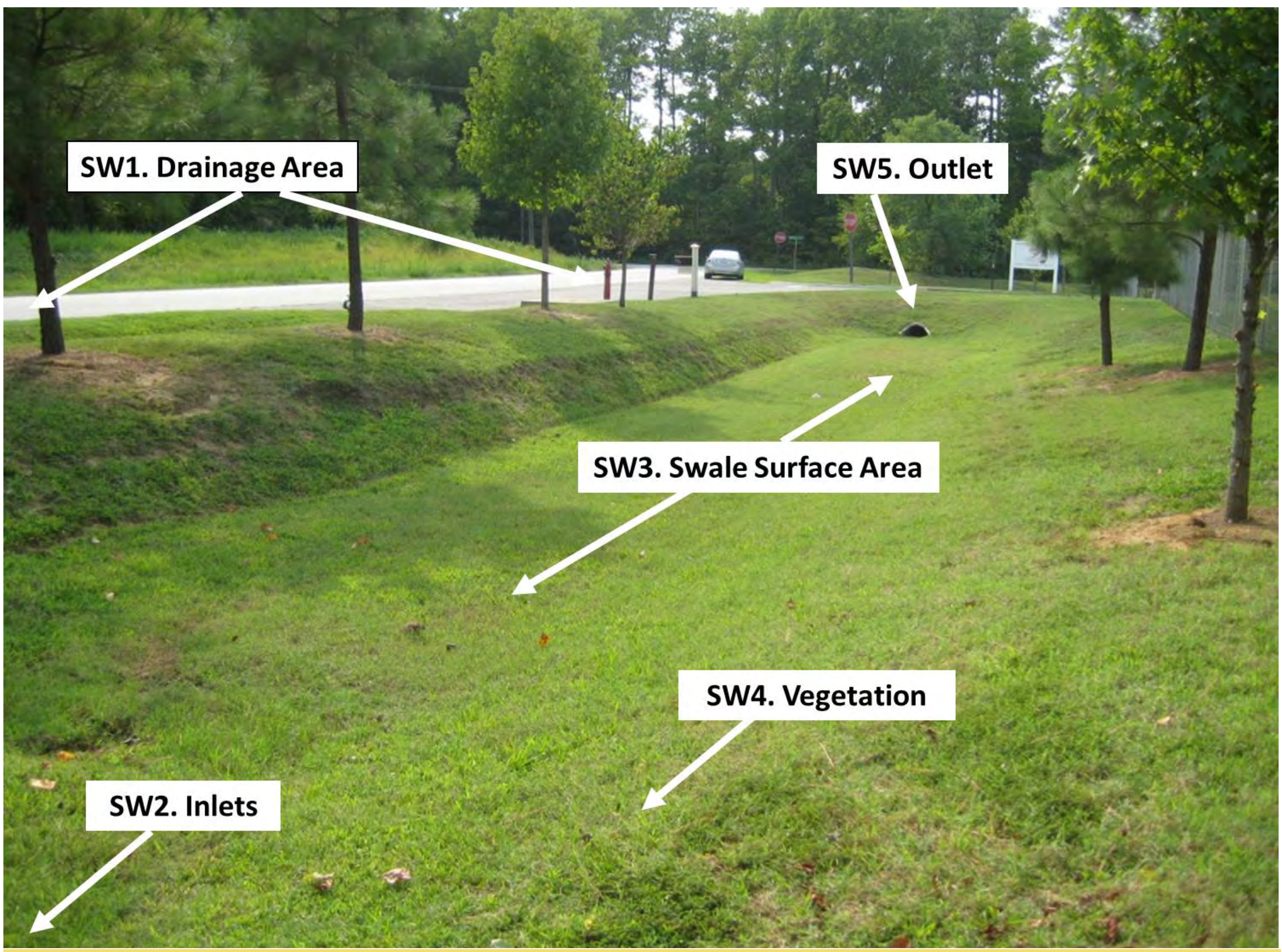


Figure 2.5.1 Key Areas for Level 1 Inspection of Swales Credit

Swale Level 1 Inspection

The Level 1 Inspection focuses on the Drainage Area (SW1), Inlets (SW2), Swale Surface Area (SW3), Vegetation (SW4), and Outlets (SW5). This inspection should be conducted on a regular basis, with an early spring inspection to ensure that the practice has survived the winter, particularly if there has been a significant amount of snow. An inspection during the growing season or in the early fall is also recommended to check on the health of vegetation.

SW 1. Drainage Area

Description: The drainage area sends runoff to and is uphill from the swale. When it rains, water runs off and flows to and along the swale.

Instruction: Look for areas that are uphill from the swale. Consult **Table 2.5.1** below.

Table 2.5.1 SW Drainage Area

Problem (Check if Present)		Follow-Up Actions
	☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and mulch or sod areas of bare soil to establish vegetation. ☐ Fill in erosion areas with soil, compact, and add seed and straw to establish vegetation. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths
	☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
☐ Open containers of oil, grease, paint, or other substances		☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous.
		Kick-Out to Level 2 Inspection: Grass on edge of pavement continues to die off for unknown reasons. Swale edge may need to be replaced with other materials (e.g., stone diaphragm).
☐ Grass dying at edge of road		☐ Seed and mulch; add topsoil or compost if needed. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Grass on edge of pavement continues to die off for unknown reasons. Swale edge may need to be replaced with other materials (e.g., stone diaphragm).

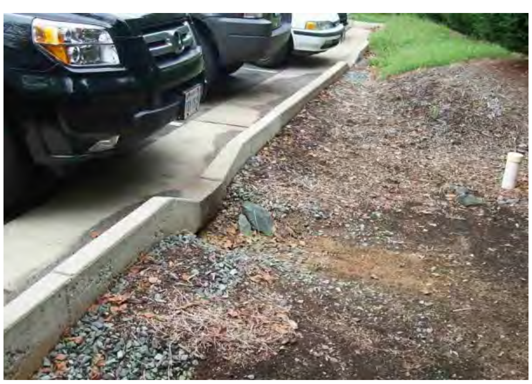
SW 2. Inlets

Description: The inlets to a swale are where water flows in. Depending on the design, water can flow in through:

- Ditch, pipe, or curb opening at top of swale: This is the most common approach, where water enters the swale at the top.
- Along the entire edge of the swale: If the swale is along a roadway or parking lot, water may enter along the long side of the swale through defined curb openings or simply by water flowing into the swale from the pavement edge (known as "sheetflow").

Instruction: Stand in the swale and look for all the places where water flows in. Consult **Table 2.5.2** below for possible problems.

Table 2.5.2 SW Inlets

Problem (Check if Present)	Follow-Up Actions
☐ Inlets or the swale edge are collecting grit, grass clippings, or debris or have grass/weeds growing. Some water may not be getting into the swale. The objective is to have a clear pathway for water to flow into the swale.	☐ Use a flat shovel to remove grit and debris (especially at curb inlets or opening). Parking lots will generate fine grit that will accumulate at these spots. ☐ Pull out clumps of growing grass or weeds, and scoop out the soil or grit that the plants are growing in. ☐ Remove any grass clippings, leaves, sticks, and other debris that is collecting at inlets or along the edge of the swale where water is supposed to enter. ☐ For pipes and ditches, remove sediment and debris that is partially blocking the pipe or ditch opening where it enters the swale. ☐ Dispose of all material properly in an area where it will not re-enter the swale. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Inlets are blocked to the extent that most of the water does not seem to be entering the swale.
 ☐ Some or all of the inlets are eroding so that rills, gullies, and other erosion are present, or there is bare dirt that is washing into the swale.	☐ For small areas of erosion, smooth out the eroded part and apply rock or stone (e.g., river cobble) to prevent further erosion. Usually, filter fabric is placed under the rock or stone. ☐ In some cases, reseeding and applying an erosion control matting can be used to prevent further erosion. Some of these materials may be available at a garden center, but it may be best to consult a landscape contractor. ☐ Other:
	☐ Level 2 Inspection: Erosion is occurring at most of the inlets or along much of the swale edge. The inlet design may have to be modified.

SW 3. Swale Surface Area

Description: The swale surface area is the vegetated area where water flows during a storm and also the side slopes that slope down into the swale bottom. Depending on the design, the swale may also contain “check dams,” which are small dams made out of earth, stone, wood, or other materials. The check dams slow down and temporarily pond water as it flows down the swale.

Instruction: Examine the entire swale surface and side slopes. Consult **Table 2.5.3** below for possible problems.

Table 2.5.3 SW Surface Area

Problem (Check if Present)	Follow-Up Actions
☐ Minor areas of sediment, grit, trash, or other debris are accumulating in the swale.	☐ Use a shovel to scoop out minor areas of sediment or grit, especially in the spring after winter sanding materials may wash in and accumulate. Dispose of the material where it cannot re-enter the swale. ☐ If removing the material creates a hole or low area, fill with good topsoil and add seed and straw to re-vegetate. ☐ Remove trash, vegetative debris, and other undesirable materials. ☐ If the swale is densely vegetated, it may be difficult to do the maintenance; check for excessive ponding or other issues described in this section to see if the accumulated material is causing a problem. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sediment has accumulated more than 3 inches deep and covers 25% or more of the swale surface. ☐ The source of sediment is unknown or cannot be controlled with simple measures.
 ☐ There is erosion in the bottom or on the side slopes. Water seems to be carving out rills as it flows through the swale or on the slopes.	☐ Try filling the eroded areas with clean topsoil, and then seed and mulch to establish vegetation. ☐ If the problem recurs, you may have to use some type of matting, stone (e.g., river cobble), or other material to fill in eroded areas. ☐ If the erosion is on a side slope, fill with soil and cover with erosion-control matting or at least straw mulch after re-seeding.
	☐ Kick-Out to Level 2 Inspection: The problem persists or the erosion is more than 3 inches deep and seems to be an issue with how water enters and moves through the swale. ☐ Kick-Out to Level 2 Inspection: The problem does not seem to be caused by flowing water, but a collapse or sinking of the surface (e.g., “sinkhole”) due to some underground problem.
☐ Water does not flow evenly down the length of the swale, but ponds in certain areas for long periods of time (e.g., 72 hours after a storm). The swale does not seem to have “positive drainage.” Check during or immediately after a rain storm.	☐ If the problem is minor (just small, isolated areas), try using a metal rake or other tools to create a more even flow path; remove excessive vegetative growth, sediment, or other debris that may be blocking the flow. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Water ponds in more than 25% of the swale for three days or more after a storm. The issue may be with the underlying soil or the grade of the swale. ☐ Water ponds behind check dams for three days or more after a storm. Check dams may be clogged or not functioning properly.

Table 2.5.3 SW Surface Area	
Problem (Check if Present)	**Follow-Up Actions**
 ☐ Check dams (if present): water is flowing around the edges of check dams, creating erosion or sinkholes on the uphill or downhill side, or the check dams are breaking apart or breaching.	☐ If the problem is isolated to just a few check dams, try simple repairs. ☐ It is very important for the center of each check dam (where most of the water flows) to be lower (by at least several inches) than the edges of the check dams where they meet the side slopes. Also, the check dams should be keyed into side slopes so water does not flow between the check dam and side slope. ☐ Use a level to check the right check-dam configuration, as noted above. Repair by moving around stone, filling and compacting soil, or adding new material so that water will be directed to the center of the check dam instead of the edges. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Many check dams are impacted and/or the problem seems to be a design issue with height, spacing, shape, or materials used to construct them.

SW 4. Vegetation

Description: The health of vegetation within the swale is perhaps the most critical maintenance item for the property owner or responsible party. Many vegetated swales become overgrown, and “desirable” vegetation becomes choked out by weeds and invasive plants. It is important to know what the swale is supposed to look like and what plants seem to be thriving or doing poorly. Periodic maintenance of vegetation will prevent larger problems that are more difficult and costly to manage.

Instruction: Examine the swale vegetation. Consult **Table 2.5.4** below for possible problems.

Table 2.5.4 SW Vegetation

Problem (Check if Present)	Follow-Up Actions
 ☐ Vegetation is too overgrown to access swale for maintenance activities	☐ Mow or bush-hog the path. ☐ Other:
 ☐ Vegetation requires regular maintenance: pulling weeds, removing dead and diseased plants, adding plants to fill in areas that are not well vegetated, etc.	☐ If you can identify which plants are weeds or not intended to be part of the planting plan, eliminate these, preferably by hand pulling. ☐ If weeds are widespread, check with the local stormwater authority and/or Extension Office about proper use of herbicides for areas connected with the flow of water. ☐ Even vegetation that is intended to be present can become large, overgrown, block flow, and/or crowd out surrounding plants. Prune and thin accordingly. ☐ If weeds or invasive plants have overtaken the whole swale, bush-hog the entire area before seed heads form in the spring. It will be necessary to remove the root mat manually or with appropriate herbicides, as noted above. ☐ Replant with species that are aesthetically pleasing and seem to be doing well in the swale. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: You are unsure of the original planting design or the vegetation maintenance task is beyond your capabilities of time, expertise, or resources. If you are unsure of the health of the vegetation (e.g. salt damage, invasives, which plants are undesirable) or the appropriate season to conduct vegetation management, consult a landscape professional before undertaking any cutting, pruning, mowing, or brush hogging.
☐ Vegetation is too thin, is not healthy, and there are many spots that are not well vegetated.	☐ The original plants are likely not suited for the actual conditions within the swale. If you are knowledgeable about plants, select and plant more appropriate vegetation (preferably native plants) so that almost the entire surface area will be covered by the end of the second growing season. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: For all but small practices (e.g., in residential yards), this task will likely require a landscape design professional or horticulturalist.

SW 5. Outlets

Description: These are where water leaves the swale when it fills up or where water reaches the downstream end of the swale. There may be a small stone apron or rock dam here or even an outlet grate.

Instruction: Examine outlets that release water out of the swale. Consult **Table 2.5.5** below for possible problems.

Table 2.5.5 SW Outlets	
Problem (Check if Present)	**Follow-Up Actions**
☐ Outlet is obstructed with mulch, sediment, debris, trash, etc.	☐ Remove the debris and dispose of it where it cannot re-enter the swale. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Outlet is completely clogged or obstructed; there is too much material to remove by hand or with simple hand tools.

2.6. Tree Planting

Tree Planting Actions for Maintenance

Key actions to take for tree planting maintenance include the following:

- TP1. Watering
- TP2. Mulch
- TP3. Pruning
- TP4. Disease or pests

Note: This is a simple, "non-structural" practice and, as such, maintenance tasks are similar to any landscape maintenance. Tree planting can involve individual trees or more, such as reforesting a riparian buffer.

For this type of practice, inspection is part of maintenance to check on the health of the trees.

Figure 2.6.1. Key Areas for Inspection and Maintenance for Tree Planting

Tree Planting Level 1 Inspection

The Level 1 Inspection goes hand in hand with active maintenance and includes watering (TP1), mulching (TP2), and Pruning (TP3). Watering should occur during the growing season. Mulching and pruning occurs once a year in the spring and early spring, respectively.

TP 1. Watering

Description: Proper water management is perhaps the most crucial maintenance activity to ensure survival of newly planted trees. Watering is essential during periods of drought, while over watering can be fatal. Watering options include regular or soaker hoses, sprinklers, buckets, drip irrigation, or installation of larger capacity watering tanks for irrigation systems. Consult the maintenance plan for instructions on the timing, volume, and method of watering that is appropriate for the specific species of trees.

Instruction: Inspect the trees to determine whether they need watering. Consult **Table 2.6.1** below.

Table 2.6.1 TP Watering	
Problem (Check if Present)	**Follow-Up Actions**
☐ Soil is not moist to the touch and/or it has not rained in a week, and leaves/needles are starting to appear wilted/dry.	☐ Water trees deeply and slowly near the base. Soaker hoses and drip irrigation work best for deep watering of trees and shrubs. ☐ Other:

TP 2. Mulch

Description: Mulching is a common method of weed control and moisture retention. Organic mulch should be spread over the soil surface and extend out to a radius of 5 feet or the tree drip line, whichever is less. Slowly decomposing organic mulches, such as shredded bark, compost, leaf mulch, or wood chips provide many added benefits for trees. Mulch that contains a combination of chips, leaves, bark and twigs is ideal for reforestation sites. Consult the maintenance plan for instructions on the timing, depth, and type of mulch application needed for the specific species of trees present.

Instruction: Mulch should be applied twice per year—in the late spring and during leaf fall. Consult the table below for possible problems. Check the depth of mulch regularly. Rake the old mulch to break up any matted layers and to refresh the appearance. Consult **Table 2.6.2** below.

Table 2.6.2 TP Mulch

Problem (Check if Present)	Follow-Up Actions
☐ Mulch is too thin or thick (should be approximately 3" deep) or does not extend to tree canopy (or 5' radius if tree has a larger than 10' canopy reach).	☐ Add or remove mulch around tree canopy to maximum 5' radius but not within 3" of the bark. ☐ If mulch is against the stems or tree trunks, pull it back several inches to expose the base of the trunk and root crown. ☐ Other:

TP 3. Pruning

Description: Pruning is usually not needed for newly planted trees but may be beneficial for tree structure in older trees. If necessary, prune only dead, diseased, broken or crossing branches at planting. As the tree grows, lower branches may be pruned to provide clearance above the ground or to remove dead or damaged limbs that sprout from the trunk.

- Instruction: Examine the branches and tree shape. Consult Table 2.6.3 below for possible problems.

Table 2.6.3 TP Pruning

Problem (Check if Present)	Follow-Up Actions
☐ Presence of suckers, dead or diseased branches, branches that interfere with pedestrian traffic	☐ Selective cutting ☐ Prune to make the tree more aesthetically pleasing and remove disease. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Use an arborist or landscaper for more extensive pruning jobs.

2.7. Bioretention

Areas of Bioretention

Key areas to inspect for Bioretention include the following:

- BR 1. Drainage Area
- BR 2. Inlets
- BR 3. Bioretention Ponding Area
- BR 4. Vegetation
- BR 5. Outlets

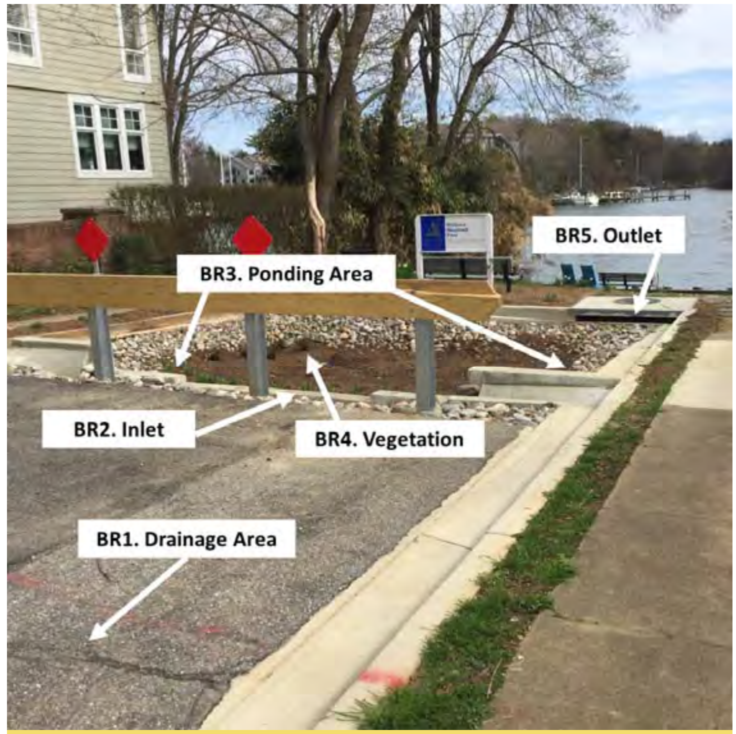


Figure 2.7.1. Key Areas for Level 1 Inspection of Bioretention

Note: The category of Bioretention includes:

- Bioretention cells – areas of soil, mulch, and vegetation that treat runoff
- Dry swales – long, linear bioretention cells, sometimes with check dams along a mildly sloping swale
- Rain gardens – usually small-scale bioretention practices on residential or small commercial properties
- Stormwater planters – usually in more urban settings, with soil and plants in a concrete box that receives roof runoff or perhaps other water from the site
- Tree pits – also a more urban practice where the bioretention is confined within some sort of box (e.g., concrete) and places along road curbs or other areas to treat runoff

For the purposes of this chapter, the term “Bioretention cell” will be used to generally describe these practices.

Bioretention Level 1 Inspection

The Level 1 Inspection focuses on the Drainage Area (BR1), Inlets (BR2), Bioretention Ponding Area (BR3), Vegetation (BR4), and Outlets (BR5). This inspection should be conducted on a regular basis, with an early spring inspection to ensure that the practice has survived the winter, particularly if there has been a significant amount of snow. An inspection during the growing season or in the early fall is also recommended to check on the health of vegetation.

BR 1. Drainage Area

Description: The drainage area sends runoff to and is uphill from the Bioretention cell. When it rains, water runs off and flows to the Bioretention cell and ponds within the cell temporarily (usually for no more than 48 hours). Sometimes, the runoff will contain dirt, grit, grass clippings, oil, or other substances that SHOULD NOT be directed to the Bioretention area.

Instruction: Look for areas that are uphill from the Bioretention cell. Consult **Table 2.7.1** below.

Table 2.7.1 BR Drainage Area

Problem (Check if Present)		Follow-Up Actions
	☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and mulch areas of bare soil to establish vegetation. ☐ Fill in erosion areas with soil, compact, and seed and straw to establish vegetation. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.
	☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
	☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

BR 2. Inlets

Description: The inlets to a Bioretention cell are where water flows into the cell. Depending on the design, water can flow in through:

- Curb cuts or openings in a parking lot or roadway
- Pipes or ditches that carry water into the Bioretention cell from the drainage area
- Flow directly over the land surface (known as “sheetflow”), sometimes across a strip of rock or stone

Curb cut – flow enter through defined place in curb

Curb cut

Gravel diaphragm – flow enters as sheetflow and is evenly distributed across length of practice

Grass filter strip: accepts sheet flow from the parking lot

Figure 2.7.2 Bioretention Cell Inlets

CSN, 2013

Instruction: Stand in the Bioretention cell itself and look for all the places where water flows in. Often there will be multiple points of inflow to the practice. Consult **Table 2.7.2** below for possible problems.

Table 2.7.2 BR Inlets

Problem (Check if Present)	Follow-Up Actions
 ☐ Inlets collect grit and debris or grass/weeds. Some water may not be getting into the Bioretention cell. The objective is to have a clear pathway for water to flow into the cell.	☐ Use a flat shovel to remove grit and debris (especially at curb inlets or openings). Parking lots generate fine grit that will accumulate at these spots. ☐ Pull out clumps of growing grass or weeds and scoop out the soil or grit that the plants are growing in. ☐ Remove any grass clippings, leaves, sticks, and other debris that is collecting at inlets. ☐ For pipes and ditches, remove sediment and debris that is partially blocking the pipe or ditch opening where it enters the Bioretention cell. ☐ Dispose of all material properly where it will not re-enter the Bioretention cell. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Inlets are blocked to the extent that most of the water does not seem to be entering the Bioretention cell.
 ☐ Some or all of the inlets are eroding so that rills, gullies, and other erosion is present, or there is bare dirt that is washing into the Bioretention cell.	☐ For small areas of erosion, smooth out the eroded part and apply rock or stone (e.g., river cobble) to prevent further erosion. Usually, filter fabric is placed under the rock or stone. ☐ In some cases, reseeding and applying erosion-control matting can be used to prevent further erosion. Some of these materials may be available at a garden center, but it may be best to consult a landscape contractor. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Erosion is occurring at most of the inlets, and it looks like there is too much water that is concentrating at these points. The inlet design may have to be modified.

BR 3. Bioretention Ponding Area

Description: The ponding area fills up with water during a rainstorm. If you picture the Bioretention cell as a bathtub, there is the *bottom* (usually flat surface), *side slopes* (areas that slope down to the bottom from the surrounding ground), and *berms or structures that control the depth to which water ponds.*

Instruction: Examine the entire Bioretention surface and side slopes. Consult the table below for possible problems.

Table 2.7.3 BR Ponding Area

Problem (Check if Present)	Follow-Up Actions
 ☐ Mulch (if used) needs to be replaced or replenished. The mulch layer had decomposed or is less than 1-inch thick.	☐ Add new mulch to a total depth (including any existing mulch that is left) of 2 to 3 inches. The mulch should be shredded hardwood mulch that is less likely to float away during rainstorms. ☐ Avoid adding too much mulch so that inlets are obstructed or certain areas become higher than the rest of the Bioretention surface. ☐ Other:
 ☐ Minor areas of sediment, grit, trash, or other debris are accumulating on the bottom.	☐ Use a shovel to scoop out minor areas of sediment or grit, especially in the spring after winter sanding materials may wash in and accumulate. Dispose of the material where it cannot re-enter the Bioretention cell. ☐ If removing the material creates a hole or low area, fill with soil mix that matches original mix and cover with mulch so that the Bioretention surface area is as flat as possible. ☐ Remove trash, vegetative debris, and other undesirable materials. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sediment has accumulated more than 2-inches deep and covers 25% or more of the Bioretention surface. ☐ Kick-Out to Level 2 Inspection: The Bioretention cell is too densely vegetated to assess sediment accumulation or ponding; see BR-4, Vegetation.

- ☐ There is erosion in the bottom or on the side slopes. Water seems to be carving out rills as it flows across the Bioretention surface or on the slopes, or sinkholes are forming in certain areas.
- ☐ Source: Stormwater Maintenance, LLC.

- ☐ Try filling the eroded areas with clean topsoil or sand, and cover with mulch.
- ☐ If the problem recurs, you may have to use stone (e.g., river cobble) to fill in problem areas.
- ☐ If the erosion is on a side slope, fill with clay that can be compacted and seed and mulch the area.
- ☐ Other:

- ☐ Kick-Out to Level 2 Inspection: The problem persists or the erosion is more than 3-inches deep and seems to be an issue with how water enters and moves through the Bioretention cell.
- ☐ Kick-Out to Level 2 Inspection: The problem does not seem to be caused by flowing water, but a collapse or sinking of the surface (e.g., “sinkhole”) due to some underground problem.

- ☐ The bottom of the Bioretention cell is not flat, and the water pools at one end, along an edge, or in certain pockets. The whole bottom is not uniformly covered with water. See design plan to verify that Bioretention surface is intended to be flat. Check during or immediately after a rainstorm.

- ☐ If the problem is minor (just small, isolated areas are not covered with water), try raking the surface OR adding mulch to low spots to create a more level surface. You may need to remove and replace plantings in order to properly even off the surface.
- ☐ Check the surface with a string and bubble level to get the surface as flat as possible.
- ☐ Other:

- ☐ Kick-Out to Level 2 Inspection: Ponding water is isolated to less than half of the Bioretention surface area, and there seem to be elevation differences of more than a couple of inches across the surface.

- ☐ Water stands on the surface more than 72 hours after a rainstorm and /or wetland-type vegetation is present. The Bioretention cell does not appear to be draining properly.

- ☐ Kick-Out to Level 2 Inspection: This is generally a serious problem, and it will be necessary to activate a Level 2 Inspection.

BR 4. Vegetation

Description: The health of vegetation within the Bioretention cell is perhaps the most critical maintenance item for the property owner or responsible party. Many Bioretention cells become overgrown, and "desirable" vegetation becomes choked out by weeds and invasive plants. It is important to know what the Bioretention cell is supposed to look like and what plants seem to be thriving or doing poorly. Periodic maintenance of vegetation will prevent larger problems that are more difficult and costly to manage.

Instruction: Examine all Bioretention cell vegetation. Consult the table below for possible problems.

Table 2.7.4 BR Vegetation

Problem (Check if Present)	Follow-Up Actions
 ☐ Vegetation requires regular maintenance—pulling weeds, removing dead and diseased plants, replacing mulch around plants, adding plants to fill in areas that are not well vegetated, etc.	☐ If you can identify which plants are weeds or not intended to be part of the planting plan, eliminate these, preferably by hand pulling. ☐ If weeds are widespread, check with the local stormwater authority and/or Extension Office about proper use of herbicides for areas connected with the flow of water. ☐ Even vegetation that is intended to be present can become large, overgrown, and/or crowd out surrounding plants. Prune and thin accordingly. ☐ If weeds or invasive plants have overtaken the whole Bioretention cell, bush-hog the entire area before seedheads form in the spring. It will be necessary to remove the root mat manually or with appropriate herbicides, as noted above. ☐ Re-plant with species that are aesthetically pleasing and seem to be doing well in the Bioretention cell. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: You are unsure of the original planting design, or the vegetation maintenance task is beyond your capabilities of time, expertise, or resources. If you are unsure of the health of the vegetation (e.g. salt damage, invasives, which plants are undesirable) or the appropriate season to conduct vegetation management, consult a landscape professional before undertaking any cutting, pruning, mowing, or brush hogging.
 ☐ Vegetation is too thin, is not healthy, and there are many spots that are not well vegetated.	☐ The original plants are likely not suited for the actual conditions within the Bioretention cell. If you are knowledgeable about plants, select and plant more appropriate vegetation (preferably native plants) so that almost the entire surface area will be covered by the end of the second growing season. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: For all but small practices (e.g., rain gardens), this task will likely require a landscape design professional or horticulturalist.

BR 5. Outlets

Description: Outlets are where water leaves the Bioretention cell when there is too much ponded water. There are various ways that outlets are configured. They can be a yard drain type of structure in the Bioretention cell itself or a rock weir where water flows during large storms. Many Bioretention practices have an underdrain, which is like a French drain, that helps the Bioretention cell drain properly after storms. The underdrain pipe may “daylight” (come to the ground surface) at some point downhill from the Bioretention cell.

Instruction: Examine outlets that release water out of the Bioretention cell. Consult the table below for possible problems.

Table 2.7.5 BR Outlets

Problem (Check if Present)	Follow-Up Actions
☐ Erosion at outlet	☐ Add stone to reduce the impact from the water flowing out of the outlet pipe or weir during storms. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Rills have formed and erosion problem becomes more severe.
 ☐ Outlet obstructed with mulch, sediment, debris, trash, etc.	☐ Remove the debris and dispose of it where it cannot re-enter the Bioretention cell. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Outlet is completely clogged or obstructed; there is too much material to remove by hand or with simple hand tools.

2.8. Green Roof

Areas of the Green Roof

Key areas to inspect for green roofs include the following:

GR 1. Vegetation and Surface
GR 2. Overflows and Drains

Note: Green Roofs consist of green infrastructure practices applied on rooftops, wherein stormwater is filtered through a vegetated planting bed. Green Roofs are a unique practice in that they are often covered by a professional ongoing maintenance contract, and their design is highly variable depending on the specific product. This section highlights some key inspection items.

Figure 2.8.1. Key Areas for Level 1 Inspection of Green Roof

Green Roof Level 1 Inspection

The Level 1 Inspection focuses on the Vegetation (GR1), Overflows and Drains (GR2), and the Surface and Soil Medium (GR3). This inspection should be conducted on a regular basis, with an early spring inspection to ensure that the practice has survived the winter, particularly if there has been a cold year.

On a routine basis, the Level 1 Inspector should also ensure that the vegetation is surviving any harsh roof conditions, particularly during dry periods.

GR 1. Vegetation and Surface

Description: The green roof vegetation usually consists of succulent plants, such as sedums, and should form a dense cover over the course of several growing seasons.

Instruction: Visually inspect the surface and vegetation of the practice. Consult **Table 2.8.1** below:

Table 2.8.1 GR Vegetation and Surface

Problem (Check if Present)	Follow-Up Actions
☐ Wilting or nutrient-deprived vegetation; bare areas developing on the roof	☐ Water or irrigate. ☐ Prune or remove dead or dying vegetation. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Greater than 20% plant dieoff or wilting, even after rainy periods. May require new vegetation or indicate a problem with the soil medium. ☐ Kick-Out to Level 2 Inspection: Yellowing vegetation may indicate a need for fertilizer, but do not fertilize unless explicitly included in the management plan or with a Level 2 Inspection. ☐ Kick-Out to Level 2 Inspection: Bare areas with no vegetation growing. These may become weed problems in the future.
 ☐ Weeds or moss	☐ Remove weeds by hand. ☐ Apply lime to kill moss. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Weeds cover more than 25% of the surface, or the original planting plan has been compromised.
☐ Ponding between storm events	☐ Kick-Out to Level 2 Inspection: Surface ponding more than 24 hours after a storm event presents a hazard and needs to be addressed immediately.

GR 2. Overflows and Drains

Description: Green roofs typically drain through a network of underdrains to outlet at roof drainage infrastructure. These drainage structures need to be inspected and cleaned periodically to ensure that the medium drains properly.

Instruction: Review the specific maintenance plan for this practice to determine where inspection ports are. Remove the cover and inspect the port.

Table 2.8.2 GR Overflows and Drains

Problem (Check if Present)	Follow-Up Actions
☐ Inspection port for roof drainage (can be clogged with debris)	☐ Remove debris by hand or flush through with a hose. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Debris cannot be removed, or it appears that debris has accumulated in the underdrains.
☐ Damage to other roof drainage structures (e.g., roof scuppers)	☐ Call contractor or individual in charge of regular building maintenance. This is a building maintenance issue. ☐ Other:

2.9. Permeable Pavement

Areas of Permeable Pavement

Key areas to inspect for permeable pavement include the following:

- PP1. Drainage Area
- PP2. Pavement Surface

Note: Permeable pavements include several materials, including porous asphalt materials, which appear similar to an asphalt parking lot, permeable concrete, and “interlocking concrete pavers,” which are individual paving blocks. References to removing and replacing individual blocks of pavement refer only to this last category.

Figure 2.9.1. Key Areas for Level 1 Inspection of Permeable Pavement

Permeable Pavement Level 1 Inspection

The Level 1 Inspection focuses on the Drainage Area (PP1) and the Pavement Surface (PP2). This inspection should be conducted on a regular basis, with an early spring inspection to ensure that the practice has survived the winter, particularly if there has been a significant amount of snow.

On a routine basis, the Level 1 Inspector should also ensure that the pavement area and its drainage are properly managed. Some key activities to avoid include:

1. Applying sand during winter months
2. Certain types of permeable pavement should not be plowed with steel-bladed plows.
3. Poor management of dumpsters
4. Storing or placing dirt, grit, mulch, sand, or other similar materials on or near the pavement surface

PP 1. Drainage Area

Description: The drainage area sends runoff to the Permeable pavement area and is uphill from the Permeable pavement. When it rains, water runs off and flows to the Permeable pavement area, and it may pond there temporarily.

Instruction: Look for areas that are uphill from the Permeable pavement. Consult **Table 2.9.1** below:

Table 2.9.1 PP Drainage Area

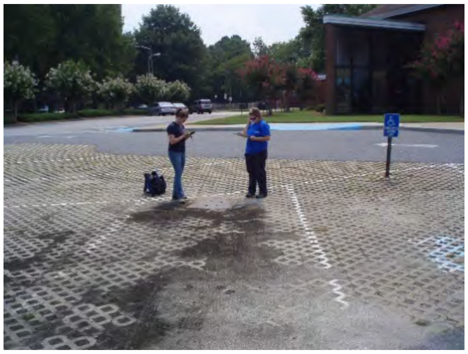
Problem (Check if Present)		Follow-Up Actions
	☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and straw areas of bare soil to establish vegetation. ☐ Fill in erosion areas with soil, compact, and seed and straw to establish vegetation. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.
	☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
	☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

PP 2. Permeable Pavement Surface

Description: The surface of the Permeable pavement should be relatively clean (not a lot of dirt and grit on the surface), free of cracks and broken pavement, and should NOT hold water after a rainstorm for more than a few hours.

Instruction: Examine the entire permeable pavement surface. Consult **Table 2.9.2** below for possible problems.

Table 2.9.2 PP Surface

Problem (Check if Present)		Follow-Up Actions
	☐ Dirt and grit accumulating on pavement surface	☐ For small areas (e.g., driveways, patios), try a leaf blower or sweep the area to remove the dirt/grit from the Permeable pavement and properly dispose of the material. ☐ If dirt/grit remain in the joint areas between paver blocks, agitate with a rough brush and vacuum the surface with a wet/dry vac. ☐ Remove and replace clogged blocks in segmented pavers. ☐ For larger areas (e.g., parking lots, courtyards), hire a vacuum sweeper to restore the surface to a cleaner condition. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Grit is widespread and cannot be removed by manual sweeping.
	☐ Grass and weeds are growing on the permeable pavement surface (applies only to pavement types that are not intended to be covered in vegetation).	☐ If paver type is not intended to be covered in vegetation, remove the grass/weeds either mechanically (pulling, by hand or with a flame weeder) or with a herbicide approved for use in or near water (consult your local Extension Office for suggestions). ☐ Follow the actions listed above for removing dirt/grit from the pavement surface. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Grass/weeds cover more than 25% of surface area.
	☐ Slumping, sinking, cracking, or breaking of the pavement surface *(Source: CSN, 2013)*	☐ For small areas (e.g., patios, small driveway), it may be possible to remove the damaged pavers, check and fill in the underlying gravel, and replace with new materials. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Problem affects more than a small, isolated area. Will typically require a qualified contractor to fix it. ☐ Problem recurs or occurs in multiple small locations.
	☐ Water stands on Permeable pavement for days after a rainstorm; the Permeable pavement is clogged and doesn't let water through. *(Source: CSN, 2013)*	☐ Kick-Out to Level 2 Inspection: This is generally a serious problem, and it will be necessary to activate a Level 2 Inspection.

2.10. Ponds and Wetlands

Areas of Ponds and Wetlands

Key areas to inspect for ponds and wetlands include the following:

- PO 1. Drainage area
- PO 2. Inlet pipes and swales
- PO 3. Pond area and embankments
- PO 4. Pond outlet

Note: This category includes the following practices:

- *Wet ponds* – have a permanent pool of water and may be divided into various "cells"
- *Stormwater wetlands* – have a variety of depth zones ranging from deep pools to shallow wetlands and are characterized by wetland vegetation

It is recommended strongly to have as-built drawings and copies of previous inspections at hand, if available. Aerial photos may be needed to help direct the inspector to the pond or wetland location if it is obscured by vegetation.

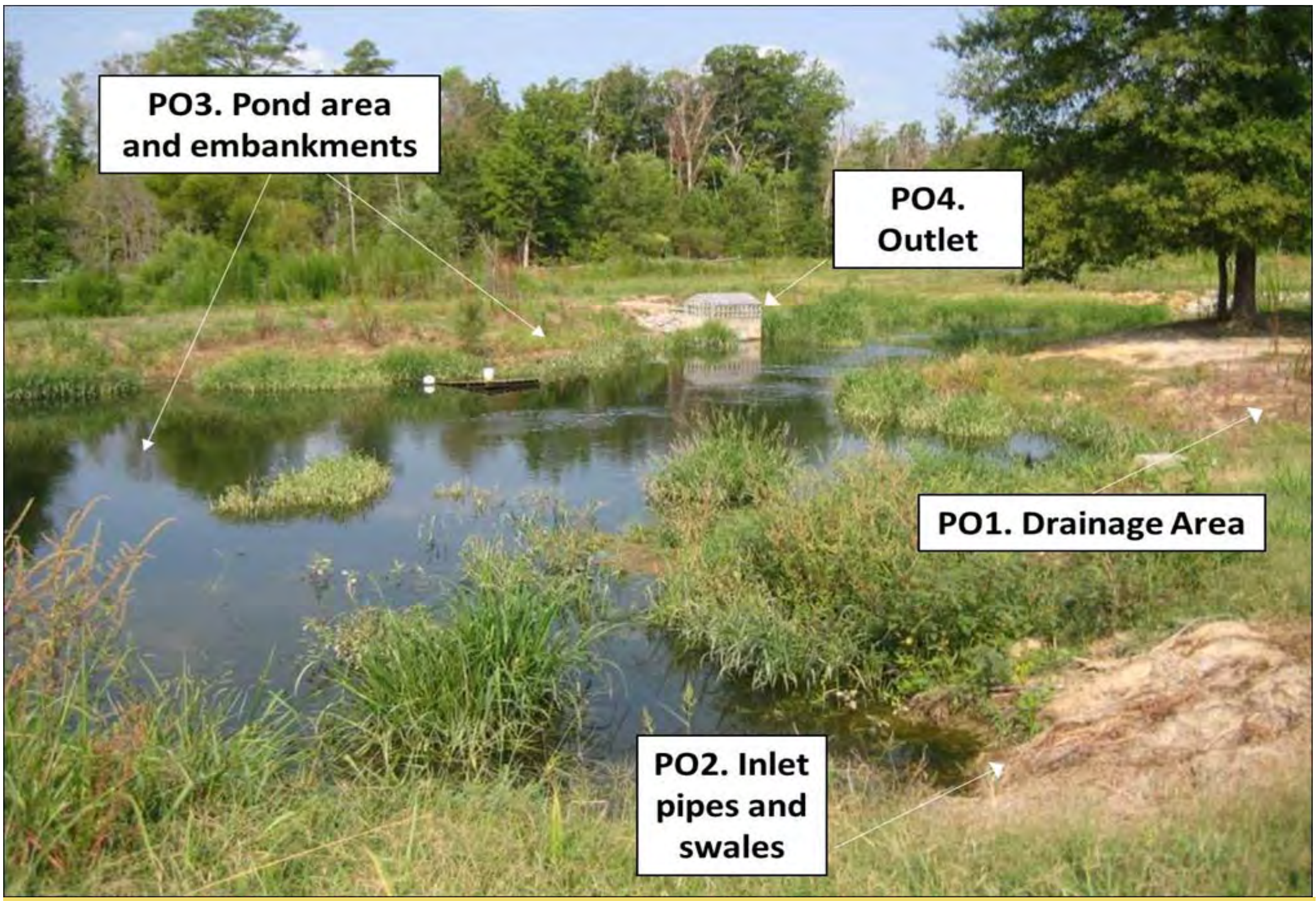


Figure 2.10.1. Key Areas for Level 1 Inspection of a Pond/Wetland

Pond and Wetland Level 1 Inspection

The Level 1 Inspection focuses on the drainage area (PW 1), inlet pipes or swales (PW 2), pond area and embankments (PW 3) and pond outlet structures and outfall (PW 4). This inspection should be conducted on a regular basis to ensure that a buildup of trash, vegetation, or sediment does not interfere with the pre-treatment, pond or wetland, and the outfall's normal flow or function. Pond embankments and dams should be regularly inspected for evidence of erosion, burrowing or tunneling animals, and large woody vegetation growing on the dam.

PW 1. Drainage Area

Description: The drainage area conveys runoff to and is uphill from the pond inlet. When it rains, water runs off through roof drains, yard drains, parking lots, roadways and underdrains to the ponds. Flow is through underground piping systems, overland via swales, or across the ground as sheetflow. Sometimes, the runoff will contain dirt, grit, grass clippings, leaves and woody debris that can collect in the drainage system. If left alone, blockages can occur and increase the chance of shallow flooding or standing water. Standing water in drainage systems foster mosquitos, pipe corrosion, and possible nuisance and odor conditions.

Instruction: Look for areas that are uphill from the pond. Consult **Table 2.10.1** below:

Table 2.10.1 PW Drainage Area

Problem (Check if Present)	Follow-Up Actions
☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and straw areas of bare soil to establish vegetation. ☐ Fill in eroded areas with soil, compact, seed and mulch with straw to establish vegetation. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ If large areas of soil have been eroded or larger channels are forming, this may require rerouting of flow paths or use of an erosion-control seed mat or blanket to reestablish acceptable ground cover or anchor sod where it is practical.
 ☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Remove excessive vegetation or woody debris that can block drainage systems. ☐ Other:
 ☐ Open containers of oil, grease, paint, or other substances exposed to rain in the drainage area	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

PW 2. Pond Inlets

Description: Free, unobstructed flow from the drainage area to stormwater ponds is necessary to prevent shallow flooding and even structural damage from flooding. Pond inlets can consist of pipes, ditches, swales, or other means to convey stormwater to the pond or wetland.

Instruction: Look for all areas where water flows into the pond during storms. Note that there may be multiple points of inflow and types of structures (e.g., pipes, open ditches, etc.). Consult **Table 2.10.2** below:

Table 2.10.2 Pond Inlets

Problem (Check if Present)		Follow-Up Actions
 	☐ Inlets are buried, covered or filled with silt, debris, or trash, or blocked by excessive vegetation.	☐ If the problem can be remedied with hand tools and done in a safe manner, remove vegetation, trash, woody debris, etc. from blocking inlet structures. ☐ Other:
		☐ Kick-Out to Level 2 or 3 Inspection: If the amount of material is too large to handle OR there are ANY safety concerns about working in standing water, soft sediment, etc., the work will likely have to be performed by a qualified contractor.
	☐ Inlets are broken, and, with pieces of pipe or concrete falling into the pond, there is erosion around the inlet, there is open space under the pipe, or there is erosion where the inlet meets the pond	☐ Kick-Out to Level 2 Inspection: These types of structural or erosion problems are more serious and will require a qualified contractor to repair.

PW 3. Pond Area and Embankments

Description: The pond area and embankment can consist of the following elements:

- Pre-treatment cell or small holding area where water first flows into the pond from the various inlets. These are commonly referred to as “forebays” and will be demarcated from the main pond area by small dams made of earth or rock. The purpose of forebays is to capture some of the sediment and pollutants before they reach the deep pool, making maintenance easier over time. Not all ponds will have forebays.
- The pond surface can be open water or a combination of open water and areas with wetland vegetation. Sometimes there is a shallow bench around the perimeter of a pond, known as an “aquatic bench.”
- The “side slopes” are areas around the perimeter of the pond where the surrounding land slopes down to the pond surface.
- Most ponds will have a “riser structure,” where the water exits a pond during storms. This can be a concrete or metal pipe that is open at the top, often with some type of trash rack. Some ponds also have an “emergency spillway,” which is an open, rock-lined channel that carries water from large storms safely across the embankment.
- The dam or embankment holds water in the pond and is constructed of compacted soil, such as clay. There is often a pipe through the embankment that carries water from the riser structure safely through the embankment to the downstream channel.

The pond’s pre-treatment areas or forebays should not be choked with vegetation or full of sediment. Removal of excessive vegetation and sediment and selective replanting are often annual maintenance activities.

Likewise, the pond’s deep pool should not to be choked with vegetation or filled with sediment. Vegetation and sediment bars can restrict flow and cause short circuiting that reduces capture of sediment. Pond volume is to be maintained at the original design capacity and free of sediment bars or debris piles. Sometimes ponds are over-maintained and have no vegetation. Algae and turbidity (muddy water) are common problems in many ponds.

Instruction: Examine both interior and exterior pond banks as well as the pond body. Observe from the inlet pipes to the outfall structure and emergency overflow.

Table 2.10.3 PW Pond Area and Embankments

Problem (Check if Present)		Follow-Up Actions
	☐ The pretreatment area(s) or forebay(s) are filled with sediment, trash, vegetation, or other debris.	☐ If the problem can be remedied with hand tools and done in a safe manner, use a flat shovel or other equipment to remove small amounts of sediment. ☐ Remove trash and excessive vegetation from forebays if this can be done in a safe manner. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Large amounts of sediment or debris will have to be removed by a qualified contractor. ANY condition that poses a safety concern for working in standing water or soft sediments should be referred to a Level 2 Inspection or qualified contractor.

Table 2.10.3 PW Pond Area and Embankments		
Problem (Check if Present)		**Follow-Up Actions**
	☐ The pond area itself has accumulated sediment, trash, debris, or excessive vegetation that is choking the flow of the water, OR the pond area is covered with algae or aquatic plants.	☐ Level 1 includes handling only small amounts of material that can be removed by hand, or with rakes or other hand tools. Do not attempt any repair that poses a safety issue. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Most cases will call for a Level 2 Inspection and/or a qualified contractor. ☐ You are not sure what type and amount of vegetation is supposed to be in the pond. ☐ The algae or aquatic plants should be identified so that proper control techniques can be applied.
	☐ The side slopes of the pond are unstable, eroding, and have areas of bare dirt.	☐ If there are only minor areas, try filling in small rills or gullies with topsoil, compacting, and seeding and mulching all bare dirt areas with an appropriate seed. Alternatively, try using herbaceous plugs to get vegetation established in tricky areas, such as steep slopes. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Erosion and many bare dirt areas on steep side slopes will require a Level 2 Inspection and repair by a qualified contractor.
 	☐ The riser structure is clogged with trash, debris, sediment, vegetation, etc., OR is open, unlocked, or has a steep drop and poses a safety concern. The pond level may have dropped below its "normal" level.	☐ If you can safely access the riser on foot or with a small boat, clear minor amounts of debris and remove it from the pond area for safe disposal. ☐ Other: ☐ Kick-Out to Level 2 Inspection: The riser cannot be accessed safely, the amount of debris is substantial, or the riser seems to be completely clogged and the water level has risen too high. ☐ There are safety issues with the riser and concern about access to pipes, drops, or any other life safety concern. ☐ The riser is leaning, broken, settling or slumping, corroded, eroded or any other structural problem.

Table 2.10.3 PW Pond Area and Embankments

Problem (Check if Present)		Follow-Up Actions
	☐ The dam/embankment is slumping, sinking, settling, eroding, or has medium or large trees growing on it.	☐ If there are small isolated areas, try to fix them by adding clean material (clay and topsoil) and seeding and mulching. ☐ Periodically mow embankments to enable inspection of the banks and to minimize establishment of woody vegetation. ☐ Remove any woody vegetation that has already established on embankments. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Most of these situations will require a Level 2 Inspection or evaluation and repair by a qualified contractor. Seepage through the dam or problems with the pipe through the dam can be a serious issue that should be addressed to avoid possible dam failure.
	☐ The emergency spillway or outfall (if it exists) has ☐ erosion, settlement, or loss of material. Rock-lined spillways have excessive debris or vegetation.	☐ Clear light debris and vegetation. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Displacement of rock lining, excessive vegetation and erosion/settlement may warrant review and decision by Level 2 Inspector to check against original plan. ☐ Any uncertainty about the integrity of the emergency spillway should be referred to a Level 2 Inspector. ☐ Erosion or settlement such that design has been compromised should be reviewed by an engineer.

PW 4. Pond Outlet

Description: The pond's outlet enables the ponded water to discharge to downstream drainage systems or stream channels. The outlet is often at the base of the dam/embankment on the downstream side. Inspection of this point can help prevent flooding of the pond and upstream drainage systems and prevent pond failure at a weak point of a pond's containment system.

Instruction: Examine the outlet of the pipe on the downstream side of the dam/embankment where it empties into a stream, channel, or drainage system. Consult the table below for possible problems.

Table 2.10.4 PW Pond Outlet

Problem (Check if Present)	Follow-Up Actions
 ☐ The pond outlet is clogged with sediment, trash, debris, vegetation, or is eroding, caving in, slumping, or falling apart.	☐ If there is a minor blockage, remove the debris or vegetation to allow free flow of water. ☐ Remove any accumulated trash at the outlet. ☐ Outlet: ☐ Kick-Out to Level 2 Inspection: ☐ If the area at the outlet cannot be easily accessed or if the blockage is substantial, a Level 2 Inspection is warranted. ☐ Erosion at and downstream of the outfall should be evaluated by a qualified professional. ☐ Any structural problems, such as broken pipes, structures falling into the stream, or holes or tunnels around the outfall pipe, should be evaluated by a Level 2 Inspector and will require repair by a qualified contractor. ☐ The pool of water at the outlet pipe is discolored, has an odor, or has excessive algae or vegetative growth.

2.11. Infiltration

Areas of Infiltration

Key areas to inspect for Infiltration include the following:

- IN 1. Drainage Area
- IN 2. Inlets
- IN 3. Infiltration Area
- IN 4. Outlets

Note: The category of Infiltration includes:

- Infiltration Trench – Long, narrow infiltration practice, usually with small gravel at the surface and a reservoir of larger gravel or stone beneath
- Infiltration Basin – Larger practice, usually covered with grass and highly permeable soil beneath
- Dry Well – Small pit filled with stone or gravel, or precast concrete chamber surrounded by stone that receives and stores runoff to enable it to infiltrate into the underlying ground.

Figure 2.11.1 Key Areas for Level 1 Inspection of Infiltration Practice

Infiltration Level 1 Inspection

The Level 1 Inspection focuses on the Drainage Area (IN1), Inlets (IN2), Infiltration Area (IN3), and Outlets (IN4). The purpose of an infiltration practice is to temporarily store collected runoff so that it can percolate into the underlying soil. Using this practice is dependent on having a good on-site soil that is capable of infiltrating the amount of runoff generated by the drainage area. The Level 1 Inspection should be conducted at least twice a year, especially in early spring, to ensure that the practice has survived the winter, particularly if there has been a significant amount of snow.

IN 1. Drainage Area

Description: The drainage area conveys runoff to and is uphill from the Infiltration cell. When it rains, water runs off and flows to the Infiltration cell and soaks into its underlying layers.

Instruction: Look for both pervious and impervious areas that are uphill from the Infiltration cell. Consult **Table 11.1.1** below.

Table 11.1.1 IN Drainage Area

Problem (Check if Present)		Follow-Up Actions
	☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and straw areas of bare soil to establish vegetation. ☐ Fill in erosion areas with soil, compact, and seed and straw to get vegetation established. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.
☐ For Dry Wells: Leaves, sticks, or other debris in gutters and downspouts		☐ Remove all debris by hand. ☐ Other:
	☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
	☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

IN 2. Inlets

Description: The inlets to an Infiltration practice are where water flows into the cell. Depending on the design, inlets can be:

- *Curb cuts or openings* in a parking lot or roadway
- *Downspouts* that deliver runoff directly from a rooftop to the Infiltration practice
- *Pipes or ditches* that carry water into the Infiltration practice from the drainage area
- *Flow directly over the land surface* (known as "sheetflow"), sometimes across a strip of rock or stone

Instruction: Look for all the places where water flows into the Infiltration practice. Consult **Table 11.1.2** below for possible problems.

Table 11.1.2 IN Inlets

Problem (Check if Present)	Follow-Up Actions
 ☐ Inlets are collecting grit and debris or grass/weeds are growing. Some water may not be getting into the Infiltration practice.	☐ Use a flat shovel to remove grit and debris (especially at curb inlets or openings). Parking lots generate fine grit that will accumulate at these spots. ☐ Pull out clumps of growing grass or weeds and scoop out the soil or grit that the plants are growing in. ☐ Remove any grass clippings, leaves, sticks, and other debris that is collecting at inlets. ☐ For pipes and ditches, remove sediment and debris that is partially blocking the pipe or ditch opening where it enters the Infiltration practice. ☐ Dispose of all material properly in an area where it will not re-enter the practice. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Inlets are blocked to the extent that most of the water does not seem to be entering the Infiltration practice.
☐ Some or all of the inlets are eroding so that rills, gullies, and other erosion is present, or there is bare dirt that is washing into the Infiltration practice.	☐ For small areas of erosion, smooth out the eroded part and apply rock or stone (e.g., river cobble) to prevent further erosion. Usually, filter fabric is placed under the rock or stone. ☐ In some cases, reseeding and applying erosion-control matting can be used to prevent further erosion. Some of these materials may be available at a garden center, but it may be best to consult a landscape contractor. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Erosion is occurring at most of the inlets and it looks like there is too much water that is concentrating at these points. The inlet design may have to be modified.

IN 3. Infiltration Area

Description: The infiltration area is the area that collects water and allows it to seep into the underlying soil. Some infiltration areas also have a vertical perforated pipe called an *observation well,* which is used to view the water level in the infiltration practice after a storm. If the infiltration practice is working properly, the water in the observation well should be completely drained down within 2 to 3 days of a storm. Depending on the design, the infiltration area can be covered with grass, gravel, or stone.

Instruction: Examine the surface of the infiltration area and the observation well. Consult **Table 11.1.3** below for possible problems. Note: The following Problem and Follow-Up Actions apply to infiltration practice pretreatment areas also.

Table 11.1.3 IN Infiltration Area

Problem (Check if Present)	Follow-Up Actions
 ☐ For grass-covered Infiltration practices: grass has grown very tall, *(Photo credit: Stormwater Maintenance, LLC)*	☐ Mow infiltration area at least twice per year. ☐ Other:
 ☐ For grass-covered Infiltration practices: sparse vegetation cover or bare spots	☐ Add topsoil (as needed), grass seed, straw, and water during the growing season to re-establish consistent grass coverage. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sparse vegetation cover can be a sign that the infiltration area is not infiltrating at the proper rate and water is standing too long after a storm. The surface may be saturated or squishy, and the conditions do not enable grass to grow. This situation should be evaluated by a Level 2 Inspection and likely corrected by a qualified contractor.
☐ Minor areas of sediment, grit, trash, or other debris are accumulating on the surface.	☐ Use a shovel to scoop out minor areas of sediment or grit, especially in the spring after winter sanding materials may wash in and accumulate. Dispose of the material where it cannot re-enter the Infiltration practice. ☐ If removing the material creates a hole or low area, rake the surface smooth and level. ☐ Remove trash, debris, and other undesirable materials. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sediment has accumulated more than 2-inches deep and covers 25% or more of the surface of the Infiltration area.

Table 11.1.3 IN Infiltration Area

Problem (Check if Present)	Follow-Up Actions
 ☐ There is erosion on the surface; water seems to be carving out rills as it flows across the surface of the Infiltration area or sinkholes are forming in certain areas.	☐ For minor areas of erosion, try filling the eroded areas with clean topsoil, sand, or stone (whatever the existing cover is). ☐ If the problem recurs, you may have to use larger stone (e.g., river cobble) to fill in problem areas. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: The problem persists or the erosion is more than 3-inches deep and seems to be an issue with how water enters and moves through the infiltration area. ☐ Kick-Out to Level 2 Inspection: The problem does not seem to be caused by flowing water but a collapse or sinking of the surface (e.g., “sinkhole”) due to some underground problem.
 ☐ Observation well is damaged or cap is missing	☐ Kick-Out to Level 2 Inspection: Requires replacing pipes or caps.
 ☐ Water still visible in the observation well more than 72 hours after a rain storm. The Infiltration practice does not appear to be draining properly.	☐ Kick-Out to Level 2 Inspection: This is generally a serious problem, and it will be necessary to activate a Level 2 Inspection.

IN 4. Outlets

Description: Outlets are where water exits the surface of the infiltration area during larger storms when the underground infiltration reservoir fills up and the excess water needs somewhere to go. Note that not all infiltration practices will have an identifiable outlet if the design is for all the water to infiltrate into the ground. Outlets may be a berm, stone weir, or pipe.

Instruction: Locate and inspect all outlets. Consult **Table 2.11.4** below for possible problems.

<table>
<tr><th colspan="2">Table 2.11.4 IN Outlets</th></tr>
<tr><th>Problem (Check if Present)</th><th>Follow-Up Actions</th></tr>
<tr><td rowspan="2">
☐ Outlet obstructed with sediment, debris, trash, etc.</td><td>☐ Remove the debris and dispose of it where it cannot re-enter the infiltration area.
☐ Other:</td></tr>
<tr><td>☐ Kick-Out to Level 2 Inspection: Outlet is completely obstructed; there is too much material to remove by hand or with simple hand tools.</td></tr>
<tr><td rowspan="2">☐ Rills or gullies are forming at outlet.</td><td>☐ For minor rills, fill in with soil, compact, and seed and straw to establish vegetation.
☐ Other:</td></tr>
<tr><td>☐ Kick-Out to Level 2 Inspection: Rills are more than 2" to 3" deep and require more than just hand raking and re-seeding.</td></tr>
</table>

2.12. Sand and Organic Filters

Components of Sand and Organic Filters

Key areas to inspect for these types of practices include the following:

- SF 1. Drainage Area
- SF 2. Inlets and Pre-treatment
- SF 3. Filter Area

Note: The category of Sand and Organic Filters includes:

- Surface Sand Filters – Surface sand filters (Figure 2.12.1) have a sand layer and often an underdrain layer beneath. Water comes in on the surface.
- Underground Sand Filters – Sand filters can also be in an underground vault or concrete trench in a parking lot or near a building. These are typically accessed through manholes or heavy grates.

Figure 2.12.1. Key Areas for Level 1 Inspection of Sand and Organic Filters

- Underground Organic Filters – These are similar to underground sand filters but may also contain canisters of peat or other organic media that helps filter pollutants from runoff. These types of underground structures will be difficult for Level 1 Inspectors to inspect because they involve pulling off heavy manhole covers or grates. The Level 1 Inspection will focus on any evidence of clogging as observed from the surface.

Figure 2.12.2. Examples of underground filters: Left –Perimeter sand filter in a concrete box (photo shows the filter with the grate top off as the filter is being maintained). The right-hand side is a sedimentation chamber filled with water and the left-hand side is the sand filter chamber. Right –Underground vault filter with special organic filter media inside cartridges.

Sand and Organic Filter Level 1 Inspection

The Level 1 Inspection for Sand and Organic Filters focuses on the Drainage Area (SF1), Inlets (SF2), and Filter Area (SF3). The purpose of a filter practice is to temporarily store collected runoff and have it percolate through a filter media, such as sand, that filters pollutants before the water continues downstream. Most filters have an underdrain system (perforated pipe in a gravel layer) to let the water out of the filter once the filtration takes place. The Level 1 Inspection should be conducted at least annually, especially in early spring, to ensure that the practice has survived the winter, particularly if there has been a significant amount of snow.

SF 1. Drainage Area

Description: The drainage area conveys runoff to and is uphill from the filter.

Instruction: Look for both pervious and impervious areas that are uphill from the filter. Consult **Table 2.12.1** below.

Table 2.12.1 SF Drainage Area

Problem (Check if Present)	Follow-Up Actions
 ☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and straw areas of bare soil to get vegetation established. ☐ Fill in erosion areas with soil, compact, and seed and straw to establish vegetation. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.
 ☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
 ☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

SF 2. Inlets

Description: The inlets to a filter are where water flows into the filter. Depending on the design, inlets can be:

- Curb cuts or inlets in a parking lot or roadway
- Downspouts that deliver runoff directly from a rooftop to the filter
- Pipes or ditches that carry water into the filter from the drainage area
- Flow directly over the land surface (known as "sheetflow")

Above-ground filters can have any of the above. Underground filters most likely have curb inlets or flow directly into a grate that is part of the filter itself (see left-hand side of perimeter sand filter shown in **Figure 2.12.3**).

Figure 2.12.3. Key Areas for Level 1 Inspection of Sand and Organic Filters

Instruction: Look for all the places where water flows into the filter practice. Consult **Table 2.12.2** below for possible problems.

Table 2.12.2 SF Inlets

Problem (Check if Present)		Follow-Up Actions
	☐ Inlets are collecting grit and debris or grass/weeds growing. Some water may not be getting into the filter practice.	☐ Use a flat shovel to remove grit and debris (especially at curb inlets or openings). Parking lots generate fine grit that accumulates at these spots. ☐ Pull out clumps of growing grass or weeds and scoop out the soil or grit that the plants are growing in. ☐ Remove any grass clippings, leaves, sticks, and other debris that is collecting at inlets. ☐ For pipes and ditches, remove sediment and debris that is partially blocking the pipe or ditch opening where it enters the Filter practice. ☐ Dispose of all material properly in an area where it will not re-enter the practice. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Inlets are blocked to the extent that most of the water does not seem to be entering the filter practice.
	☐ Some or all of the inlets are eroding so that rills, gullies, and other erosion are present, or there is dirt washing into the filter practice.	☐ For small areas of erosion, smooth out the eroded part and apply rock or stone (e.g., river cobble) to prevent further erosion. Usually, filter fabric is placed under the rock or stone. ☐ In some cases, reseeding and applying erosion-control matting can be used to prevent further erosion. Some of these materials may be available at a garden center, but it may be best to consult a landscape contractor. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Erosion is occurring at most of the inlets and it looks like there is too much water concentrating at these points. The inlet design may have to be modified.

Table 2.12.2 SF Inlets	
Problem (Check if Present)	**Follow-Up Actions**
 ☐ For an underground filter, water is ponding and doesn't seem to be getting through the filter.	☐ Kick-Out to Level 2 Inspection: This is generally a more serious problem and should be referred for a Level 2 Inspection because it will require opening up the filter vault to check for clogging.

SF 3. Filter Area (for Surface Sand Filters)

Description: The Filter Area is the area that collects water and allows it to seep into the filter media. Some filters also have a vertical perforated pipe that is the cleanout for the underdrain pipe.

Instruction: Examine the surface of the filter and the observation well, if present. Consult **Table 2.12.3** below for possible problems.

Table 2.12.3 SF Filter Area (for Surface Sand Filters)	
Problem (Check if Present)	**Follow-Up Actions**
 ☐ Filter has grass and vegetation growing on more than 25% of the filter bed, threatening to clog the filter.	☐ Vegetation growing in the filter bed should be removed either manually or with a water-safe herbicide (e.g., glysophate without surfactants). ☐ Other:
	☐ Kick-Out to Level 2 Inspection: The filter seems clogged, or vegetation and weeds have proliferated past the point where the Level 1 person can manage it.
☐ Minor amounts of sediment, grit, trash, or other debris are accumulating on the surface.	☐ Use a shovel to scoop out minor amounts of sediment or grit, especially in the spring after winter sanding materials wash in and accumulate. Dispose of the material where it cannot re-enter the filter. ☐ If removing the material creates a hole or low area, rake the surface smooth and level. ☐ Remove trash, debris, and other undesirable materials. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sediment (other than sand) has accumulated more than 2-inches deep and covers 25% or more of the surface of the filter area.

Table 2.12.3 SF Filter Area (for Surface Sand Filters)	
Problem (Check if Present)	**Follow-Up Actions**
 ☐ There is erosion on the surface; water seems to be carving out rills as it flows across the filter surface, or sinkholes are forming in certain areas.	☐ For minor areas of erosion, try filling the eroded areas with clean, coarse construction sand. ☐ Other: ☐ Kick-Out to Level 2 Inspection: The problem persists or the erosion is more than 3-inches deep and seems to be an issue with how water enters and moves through the filter area. ☐ Kick-Out to Level 2 Inspection: The problem does not seem to be caused by flowing water but by a collapse or sinking of the surface (e.g., “sinkhole”) due to some underground problem.
 ☐ Water is still visible on the surface and/or the standpipe (if present) more than 72 hours after a rainstorm. The filter practice drains very slowly or is completely clogged.	☐ Kick-Out to Level 2 Inspection: This is generally a serious problem, and it will be necessary to activate a Level 2 Inspection.

Section 3. Level 2 and 3 Inspections

3.1. How to Use this Section

This section provides guidance for Level 2 and 3 inspections for 10 groups of stormwater management practices (SMPs). See Section 1 of this chapter for an explanation of the Maintenance Hierarchy approach.

- Section 3.2 provides general guidance for Level 2 and 3 inspections.
- Sections 3.3 through 3.12 provide detailed Level 2 and 3 inspection guidance for each of the 10 practice categories:
    - o 3.3 Rainwater Harvesting
    - o 3.4 Disconnection and Sheetflow
    - o 3.5 Swales
    - o 3.6 Tree Planting
    - o 3.7 Bioretention
    - o 3.8 Green Roofs
    - o 3.9 Permeable Pavement
    - o 3.10 Ponds and Wetlands
    - o 3.11 Infiltration
    - o 3.12 Sand and Organic Filters
- Each section has **tables** containing guidance for Level 2 inspectors on specific SMP conditions and possible repairs for those problems (in left column), as well as lists of conditions that would likely trigger a Level 3 evaluation or maintenance action (right column). In addition, **Appendix B** contains detailed checklists for Level 2 inspectors to use in the field during their inspections.
- **Section 3.13** provides a brief overview for Level 3 inspections and how these fit into the overall hierarchy. However, most of the content for Level 3 maintenance actions is contained in **Section 4.**

3.2. General Guidance for Level 2 and 3 Inspections

The Level 2 inspection will typically be performed by a municipal employee or landscape contractor with some training in stormwater operations and maintenance. Regardless of which type of practice is being inspected, some key procedures and equipment are necessary. Read through this guidance before going on an inspection, and use the specific guidance in **Sections 3.3 through 3.12** for the practice you are inspecting. While much of the equipment and general procedures are somewhat similar to Level 1 inspections, additional information is provided for Level 2 inspectors below.

When to Conduct a Level 2 Inspection

The Level 2 Inspection is needed for two reasons. First, routine inspections to comply with local stormwater regulations typically require a Level 2 inspector. In addition, a Level 2 inspection may be triggered to address or diagnose problems identified during a Level 1 inspection. In this situation, the Level 2 inspector should confer with the Level 1 inspector about problems they have identified and then conduct a follow-up inspection that focuses more on diagnosing the causes of the problems and possible solutions. The checklists in **Appendix B** and other resources cited in **Sections 3.3 through 3.12** can be used as tools.

The frequency of this type of inspection may be defined by the municipality. As with Level 1 inspections, the frequency may change with the age of the SMP, with higher frequencies the first couple of years after installation. Well-established and well-maintained practices may only need to be inspected every few years.

Notifying the Responsible Party

Consult the plan file and maintenance agreement to ascertain the responsible party. Confirm that there is right of access through the local code, signed maintenance agreement, or other means. Contact the responsible party at least three business days in advance of the proposed inspection. If the responsible party cannot be found or contacted, make a reasonable effort through file research to contact a property representative, and document these efforts in writing. If the inspection is in response to a Level 1 inspection and referral to your agency, try to speak with the person who conducted the Level 1 inspection and get any documentation they may have. For publicly owned and managed SMPs, the responsible party will likely be the municipality or other regulated MS4.

What to Take in the Field

Level 2 inspections may require more measurement and, as a result, need some additional materials. In addition, the Level 2 inspection may involve gaining access to private property. Consequently, additional identification is needed for these inspections. A list of recommended items to take in the field is provided in **Table 2.2.1**.

Table 3.2.1 What to Take in the Field for a Level 2 Inspection
• Safety equipment: safety vest, steel-toe shoes, traffic cones if working near traffic, etc. • Approved plan and as-built (record drawing) if available • Records of previous inspections if available • Engineering scale • Hand level and pocket rod if needed to measure relative elevations • Digital camera • Several copies of SMP checklist if paper forms are used (**Appendix B**) • Clipboard and pencils if paper forms are used • Dry erase white board and marker (optional) to include in photos to keep track of SMP tracking # in municipal database (see **Figure 3.2** as example) • Letter on municipal letterhead granting access and/or agency photo badge • Pipe wrench to open underdrain clean-out caps • Flashlight to look into underdrain cleanouts and/or manholes • Manhole puller • Soil probe or auger • 100' measuring tape • Shovel • Bug spray

Conducting the Inspection

Figure 3.2. A white board and digital camera can be handy to note SMP tracking #, date of inspection, and other forms of documentation. Note that an inspector may alternatively tag photographs, particularly if they are recorded on a smartphone or Tablet.

In general, the inspection should follow a consistent, logical approach, such as outlined below.

- Conduct a quick tour of the practice to identify any obvious issues and important components: inlets (number, location), surface area, overflow structures, berms or impoundments, outfalls, downstream conveyance channels or receiving waters. Check these components against the design plan or as-built drawing (if available).
- Starting at the outlet or low point, use the checklists provided in Appendix B to evaluate the practice. The inspection will proceed from the outlet or outfall to the stormwater treatment area, berms, side slopes, inlets, and drainage area. Make sure to fill in key information on the inspection form, such as SMP identifier number, site name, inspector name, date, and weather conditions.
- Take photos of important components or maintenance concerns, and mark photo locations and direction on a sketch.
- Review the inspection form before leaving the site to make sure that all necessary information has been collected.

Follow-Up Actions

Immediate follow-up actions include entering the inspection information in the appropriate database or hard copy file, downloading and labeling photos, and providing other necessary documentation.

Another possible follow-up action would be to activate a Level 3 inspection in certain situations. The Level 2 inspector will have to make a judgement call as to whether observed problems warrant a Level 3 investigation, and will also have to coordinate with the responsible party to pursue such an investigation. The Level 2 guidance in this chapter summarizes follow-up actions associated with various observations of SMP condition. Note that these tables are divided into “Level 2” and “Triggers for Level 3” follow-up actions, with Level 2 actions in *blue* cells and Level 3 in *green* cells. Consult **Section 4** of this chapter for more guidance on how to diagnose and correct some of the maintenance items included in these tables.

Another follow-up action involves communicating problems and corrective measures to the responsible party (private or public). This may involve instructing the responsible party to undertake a Level 3 inspection or to provide a timeframe for correcting simpler issues that do not require Level 3 involvement. Many local programs have existing procedures for sending letters or activating a compliance procedure. These procedures include verifying that repairs and corrections are completed by the responsible party.

Level 3 Inspection Guidance

The Level 3 inspection is typically conducted by a Qualified Professional such as a professional engineer or Landscape Architect. It is assumed that the Level 3 inspector is knowledgeable in stormwater management, as well as engineering and construction practices. The Level 3 inspector will not typically be completing a full practice inspection. This inspection is conducted only in response to problems identified during the Level 2 inspection, is more diagnostic in nature, assumes a greater degree of initial knowledge, and may require more extensive intervention.

The Level 3 inspection is also more results based in that it will lead to a specific repair to address the issue that triggered the inspection. **Section 4** identifies 12 problems typically addressed in a Level 3 inspection and discusses measures to diagnose the cause of the problem, as well as repairs needed to address it. It should be noted that the problems addressed in each **Section 4** subsection can occur in a variety of SMPs (e.g., erosion is a common issue in almost every type of SMP). As a result, each subsection identifies the SMPs where the problem most commonly occurs and, in some cases, an SMP-specific diagnosis procedure.

3.3. Rainwater Harvesting – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Rainwater Harvesting practices are:

- Structural or mechanical problems (e.g., malfunction of the first-flush diverter or vortex filter)
- Accumulation of debris in the tank that cannot be easily removed by hand
- Severe erosion at the outlet

Table 3.3.1 Level 2 Inspection – RAINWATER HARVESTING

Recommended Repairs	Triggers for Level 3 Inspection
Observed Condition: Tank is not filling properly or water level drops quickly	
Condition 1: Tank is not filling properly Look for signs of water bypassing the tank. Inspect the conveyance system and filters to make sure that all parts are properly connected and not leaking. Observe the system during a rainstorm to make sure that water is not backing up and spilling out of the gutters or getting excessively diverted by the filter. Adjust angles and placement of filter as needed. Condition 2: Water level drops quickly after filling Requires diagnosis and resolution of problem: • Leaking valve or spigot? • Crack in tank wall? • Pump turning on unnecessarily?	• Gutters, pipes, and/or filter appear to be undersized or not properly designed. • Structural or mechanical problem requires special expertise in rainwater harvesting systems.
Observed Condition: Tank is sinking, leaning, or at risk of collapse	
Condition 1: Foundation is not stable This repair may need specialized equipment and skill, depending on the size and type of tank. For smaller tanks (like rain barrels), drain and disconnect the tank to move it aside. Compact the underlying soil and create a solid, level base for the tank with concrete blocks or gravel. Seek professional help for larger tanks. Condition 2: Other structural problem Seek professional help.	• Tanks cannot be easily adjusted or fixed by hand.
Observed Condition: Severe erosion at outlet	
Condition 1: Erosion gets worse even after re-seeding or adding stone There are several potential solutions to this continued erosion. Add geotextile fabric below the stone to protect the soil. Dig out a pit at the outfall and fill with gravel or stone to absorb the velocity of the water spilling out the tank. If the outlet flows onto a steep slope, consider extending the pipe length to a flatter area. Some of these actions may require help from a contractor.	• Erosion control cannot easily be installed by hand. • Erosion recurs after previous repairs. • Downstream drainage concerns

3.4. Disconnection & Sheet Flow – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Disconnection and Sheetflow practices are:

- Significant damage to level spreader/energy dissipator
- Major erosion

Table 3.4.1 Level 2 Inspection – DISCONNECTION AND SHEETFLOW

Recommended Repairs	Triggers for Level 3 Inspection
Observed Condition: Significant sediment on pavement that drains to disconnection area (e.g., grass strip)	
Condition 1: Sediment on parking lot is widespread Enlist a mechanical sweeper or vacuum sweeper to remove sediment across entire pavement surface. Pay special attention to downhill edges of pavement where more sediment may have accumulated.	• Sediment accumulation is so serious that it cannot be sufficiently removed with mechanical sweeper. May indicate a high sediment load from uphill in the drainage area that needs to be mitigated.
Observed Condition: Pavement edge deteriorating	
Condition 1: Dips or damage at pavement edge causing runoff to concentrate Determine whether the damaged edge is causing significant enough concentration of runoff to warrant repair or regrading of the pavement.	• Edge must be patched or re-paved to make secure and level. • Parking lot not draining properly to the energy dissipator and treatment area.
Observed Condition: Level spreader/energy dissipator	
Condition 1: Level spreader sinking or uneven If basic equipment can be used, prop up and secure any section of level spreader that is sinking. Regrade soil all around level spreader and add stone as necessary to prevent erosion and bypassing. Condition 2: Level spreader is broken These repairs can be simple for small, residential-scale practices, such as at a downspout. Ensure the level spreader is level across, keyed in to soil at the edges, and made of durable material that can withstand the flow of water running across it. Larger or more complicated level spreaders (e.g., concrete) will likely require specialized skill and equipment.	• Level spreader requires specialized equipment, regrading, or large amount of material to make level again. • Level spreader needs to be re-designed and replaced.
Observed Condition: Erosion in treatment area	
Condition 1: Rills from concentrated flow Inspect energy dissipator to see whether it needs to be improved to better spread out incoming flow. Regrade flow path to ensure that it is relatively flat (if minor). If major re-grading is needed, the treatment area may need to be redesigned and fixed with specialized equipment.	• Major rills and gullies • Treatment area needs to be re-designed and major grading needed.

3.5. Swales – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Swales are:

- Standing water, swale not draining properly (not applicable to wet swales)
- Severe erosion around or under check dams
- Large area of vegetation overrun with weeds and/or invasive species
- Severe erosion at outlet that requires redesign

Table 3.5.1 Level 2 Inspection: SWALE

Recommended Repairs	Triggers for Level 3 Inspection
Observed Condition: Water Stands on Surface for More than 72 Hours after Storm	
Condition 1: Small pockets of standing water Use a soil probe or auger to examine the soil profile. If isolated areas have accumulated grit, fines, or vegetative debris or have compacted soil, try scraping off top 3 to 6 inches of soil and replacing with clean material. Also check to see that surface is level and water is not ponding selectively in certain areas. Condition 2: Standing water is widespread or covers entire surface Requires diagnosis and resolution of problem: Bad or compacted soil Filter fabric on the swale bottom Too much sediment/grit washing in from drainage area? Too much ponding depth? Longitudinal slope is too flat?	• Soil is overly compacted or clogged and problem is not evident from Level 2 inspection. • Level 2 inspection identifies problem, but it cannot be resolved easily or is associated with the original design of the practice (e.g., not enough slope down through the swale).
Observed Condition: Vegetation is predominantly weeds and invasive species	
For a small area, weed and dig up invasive plants. Replant with natives or plants from original planting plan. If longer than 100 feet, develop a new planting plan and have it professionally reviewed.	• Vegetation deviates significantly from original planting plan; swale has been neglected and suffered from deferred maintenance. • Owner/responsible party does not know how to maintain the practice. • For large area, hire a professional to develop a grading plan and develop a planting plan.

Observed Condition: Severe erosion of check dams, inlets, swale bottom, or side slopes	
	• Erosion (rills, gullies) is more than 12-inches deep at inlets or the swale bottom or more than 3-inches deep on side slopes. • Flow paths from the drainage area are higher than expected, such that the swale needs to be redesigned to handle higher flow rates and velocities.
Observed Condition: Significant sediment accumulation, indicating an uncontrolled source of sediment	
Condition 1: Isolated areas of sediment accumulation, generally less than 3-inches deep Sediment source may be from a one-time or isolated event. Remove accumulated sediment and top 2 to 3 inches of swale soil media; replace with clean material. Check drainage area for any ongoing sources of sediment. Condition 2: Majority of the surface is caked with “hard pan” (thin layer of clogging material) or accumulated sediment that is 3-inches deep or more This can be caused by improper construction sequence (drainage area not fully stabilized prior to installation of the swale) or another chronic source of sediment in the drainage area. Augering several holes down along the swale can indicate how severe the problem is; often the damage is confined to the first several inches of soil. Removing and replacing this top layer (or to the depth where sediment incursion is seen in auger holes) can be adequate, as long the problem does not recur.	• More than 2 inches of accumulated sediment cover 25% or more of the swale surface area. • “Hard pan” of thin, crusty layer covers majority of swale surface area and seems to be impeding flow of water along the swale. • New sources of sediment seem to be accumulating with each significant rainfall event.

3.6. Tree Planting – Level 2 Inspections and Triggers for Level 3

A Level 2 Tree Planting inspection should be conducted periodically during the growing season by the Cooperative Extension or an arborist.

Table 3.6.1 Level 2 Inspection: TREE PLANTING	
Recommended Repairs	**Triggers for Level 3 Inspection**
Observed Condition: Appearance of fungus or pest damage	
Condition 1: Fungus, discoloration, browning leaves or holes in leaves Check with arborist or other tree professional about the best way to proceed. This requires a Level 3 inspection. Condition 2: Burrowing insects, holes Check with arborist or other tree professional about the best way to proceed. This requires a Level 3 inspection.	• Any concerns about how to address infestation or disease

3.7. Bioretention – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Bioretention are:

- Standing water, clogged media
- Vegetation management
- Bioretention does not conform to original design plan in surface area or storage.
- Severe erosion of filter bed, inlets, or around outlets
- Significant sediment accumulation, indicating an uncontrolled source of sediment

Table 3.7.1 Level 2 Inspection: BIORETENTION **NOTE: Key Source for this Information *(CSN, 2013)***	
Recommended Repairs	**Triggers for Level 3 Inspection**
Observed Condition: Water Stands on Surface for More than 72 Hours after Storm	
Condition 1: Small pockets of standing water Use a soil probe or auger to examine the soil profile. If isolated areas have accumulated grit, fines, or vegetative debris or have bad soil media, try scraping off top 3 inches of media and replacing with clean material. Also check to see that surface is level and water is not ponding selectively in certain areas. Condition 2: Standing water is widespread or covers entire surface Requires diagnosis and resolution of problem: • Clogged underdrain? • Filter fabric between soil media and underdrain stone? • Need to install underdrain if not present? • Too much sediment/grit washing in from drainage area? • Too much ponding depth? • Improper soil media?	• Soil media is clogged and problem is not evident from Level 2 inspection. • Level 2 inspection identifies problem, but it cannot be resolved easily or is associated with the original design of the practice.

Observed Condition: Vegetation is sparse or out of control	
Condition 1: Original design planting plan seems good but has not been maintained, so there are many invasives and/or dead plants Will require some horticultural experience to restore vegetation to intended condition by weeding, pruning, removing plants, and adding new plants. Condition 2: Original design planting plan is unknown or cannot be actualized A landscape architect or horticulturalist will be needed to redo the planting plan. Will likely require analysis of soil pH, moisture, organic content, sun/shade, and other conditions to make sure plants match conditions. Plan should include invasive plant management and maintenance plan to include mulching, watering, disease intervention, periodic thinning/pruning, etc.	• Vegetation deviates significantly from original planting plan; Bioretention has been neglected and suffered from deferred maintenance. • Owner/responsible party does not know how to maintain the practice.
Observed Condition: Bioretention does not conform to original design plan in surface area or storage	
Condition 1: Level 2 Inspection reveals that practice is too small based on design dimension, does not have adequate storage (e.g., ponding depth) based on the plan, and/or does not treat the drainage area runoff as indicated on the plan Small areas of deviation can be corrected by the property owner or responsible party, but it is likely that a Qualified Professional will have to revisit the design and attempt a redesign that meets original objectives or that can be resubmitted to the municipality for approval.	• More than a 25% departure from the approved plan in surface area, storage, or drainage area; sometimes less than this threshold at the discretion of the Level 2 inspector.
Observed Condition: Severe erosion of filter bed, inlets, or around outlets	
Condition 1: Erosion at inlets The lining (e.g., grass, matting, stone, rock) may not be adequate for the actual flow velocities coming through the inlets. First line of defense is to try a more non-erosive lining and/or to extend the lining further down to where inlet slopes meet the Bioretention surface. If problem persists, analysis by a Qualified Professional is warranted. Condition 2: Erosion of Bioretention filter bed This is often caused by “preferential flow paths” through and along the Bioretention surface. The source of flow should be analyzed and methods employed to dissipate energy and disperse the flow (e.g., check dams, rock splash pads). Condition 3: Erosion on side slopes Again, the issue is likely linked with unanticipated flow paths down the side slopes (probably overland flow that concentrates as it hits the edge of the slope). For small or isolated areas, try filling, compacting, and re-establishing healthy ground cover vegetation. If the problem is more widespread, further analysis is required to determine how to redirect the flow.	• Erosion (rills, gullies) is more than 12 inches deep at inlets or the filter bed or more than 3 inches deep on side slopes. • If the issue is not caused by moving water but some sort of subsurface defect. This may manifest as a sinkhole or linear depression and be associated with problems with the underdrain stone or pipe or underlying soil.
Observed Condition: Significant sediment accumulation, indicating an uncontrolled source of sediment	
Condition 1: Isolated areas of sediment accumulation, generally less than 3-inches deep Sediment source may be from a one-time or isolated event. Remove accumulated sediment and top 2 to 3 inches of Bioretention soil media; replace with clean material. Check drainage area for any ongoing sources of sediment. Condition 2: Majority of the surface is caked with “hard pan” (thin layer of clogging material) or accumulated sediment that is 3-inches deep or more This can be caused by an improper construction sequence (drainage area not fully stabilized prior to installation of Bioretention soil media) or another chronic source of sediment in the drainage area. Augering several holes down through the media can indicate how severe the problem is; often the damage is confined to the first several inches of soil media. Removing and replacing this top layer (or to the depth where sediment incursion is seen in auger holes) can be adequate, as long as the problem does not recur.	• More than 2 inches of accumulated sediment cover 25% or more of the Bioretention surface area. • “Hard pan” of thin, crusty layer covers majority of Bioretention surface area and seems to be impeding flow of water down through the soil media. • New sources of sediment seem to be accumulating with each significant rainfall event.

3.8. Green Roof – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Green Roofs are:

- Standing water
- Vegetation management
- Structural damage

Table 3.8.1 Level 2 Inspection: GREEN ROOF	
Recommended Repairs and Required Skills	**Triggers for Level 3 Inspection**
Observed Condition: Unhealthy or Dying Vegetation	
	• More than 25% die off • Plants are unhealthy for a prolonged period of time or need to be replanted repeatedly, indicating that a new planting plan may be necessary, or the planting medium is not functioning properly. • pH or other media constituents are not conducive to plant growth, and the media needs to be amended (e.g., lime, fertilizer). This should be handled by a green roof vendor or green roof plant specialist.
Observed Condition: Ponding Between Storm Events or Debris Accumulation	
Condition 1: Further inspection shows debris is clogging the outflow drainpipe Remove debris by hand and revisit within 24 hours to see whether this action fixed the problem. Condition 2: Debris has backed up to include the underdrain Attempt to remove by hand or flush out with a hose.	• Ponding continues even after debris has been removed. This may indicate a problem with either the media or the underdrain system.
Observed Condition: Structural Damage to Overflows	
Condition: If the damage is minor, repair damage directly, per original design drawings	• Most instances of structural damage will need to be referred to the designer or a qualified green roof vendor.
Observed Condition: Roof is Leaking or indication that the membrane has a leak	
Condition: Roof is leaking	• Any leaks in the membrane trigger a Level 3 inspection or an inspection by the original installer or designer.

3.9. Permeable Pavement – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Permeable Pavement are:

- Ponding or
- Highly clogged pavement

Table 3.9.1 Level 2 Inspection: PERMEABLE PAVEMENT	
Recommended Repairs and Required Skills	**Triggers for Level 3 Inspection**
Observed Condition: Bare Soil or Erosion in the Drainage Area	
	• Large rills or gullies are forming in the drainage area. • An attempt to regrade the drainage area has been unsuccessful • Fixing the problem would require major regrading (i.e., redirecting more than a 100-square-foot area. • It is not clear why the problem is occurring.
Observed Condition: Dirt or Grit Accumulating, or Grass Growing on Pavement Surface	
Condition 1: Grit beginning to form but is isolated to a small area or does not fill the joints between paver blocks Try to agitate and sweep by hand, or hire a contractor with a vacuum sweeper. Also investigate the drainage area for potential sediment sources. If no obvious sources are found, discuss winter sanding and salting operations with the property owner to identify whether this could be the source. Condition 2: Grit is forming and cannot be removed with agitation and hand sweeping Hire a vendor with a regenerative air vacuum sweeper, maximum power 2,500 rpm; avoid sweepers that use water.	• More than 2 inches of sand/dirt/grit are on some of the pavement surface. • More than 25% of the pavement surface is covered with sand/dirt/grit to the extent that joints between paver blocks are filled. • Regenerative air sweeper cannot remove grit.
Observed Condition: Structural Damage	
Condition 1: Portions of porous asphalt or permeable pavers are damaged, and the cause is known to be at the surface. If the damage is from a single event such as heavy equipment or heavy fallen objects, or the surface has been damaged by wear over time, hire a contractor experienced in permeable pavement installation to repair the damaged areas. Condition 2: Damage to other structures, such as drainage infrastructure If possible, repair or replace damaged items, or hire a contractor with permeable pavement experience if the damaged infrastructure is within the pavement surface.	• More than 25% of the surface needs to be repaired or replaced. • It appears that the underlying material has “caved in,” indicating an underlying water conveyance or soil stabilization issue. • Problem is repaired but recurs within less than five years.

Table 3.9.1 Level 2 Inspection: PERMEABLE PAVEMENT	
Recommended Repairs and Required Skills	**Triggers for Level 3 Inspection**
Observed Condition: Ponding on the Pavement Surface	
Condition 1: Underdrains (if present) may be clogged Check to see whether underdrains are clogged by inspecting cleanouts (if present) or catch basins and looking for debris. If underdrains appear clogged, it may be necessary to hire a router service to ream out the underdrains. Condition 2: At time of Level 2 inspection, water is not ponded, and there is no obvious clogging of the surface. Conduct a flood test to determine whether the ponding is an ongoing problem.	• Water stands on the pavement surface more than 72 hours after a storm, and the problem cannot be resolved by unclogging underdrains. • More than 25% of the pavement surface is covered with sand/dirt/grit to the extent that joints between paver blocks are filled.

Figure 3.9.1. Winter salting, sanding, plowing, and snow storage can cause problems for permeable pavement surfaces, which will trigger a Level 3 investigation.

Figure 3.9.2. A Level 3 investigation is warranted if more than 25% of the permeable pavement surface appears to be clogged, or joints are filled in, or, as shown in the photo, vegetation is growing.

3.10. Ponds & Wetlands – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Ponds and Wetlands are:

- Severe erosion
- Excessive algae or aquatic plants
- Settlement and pipe corrosion
- Major sediment buildup

Table 3.10.1 Level Inspection: PONDS and WETLANDS

Recommended Repairs and Required Skills	Triggers for Level 3 Inspection
Observed Condition: Bare Soil or Erosion in the Drainage Area	
Condition 1: Extensive problem spots, but no channels or rills forming Reseed problem areas. If problem persists or grass does not take, consider hiring a landscape contractor. Condition 2: Problem is extensive, and rills/channels are beginning to form May be necessary to divert or redirect water that is causing the erosion problem. If it appears that simple regrading—such as installing a berm or leveling a low spot–will fix the problem, make repairs and ensure that the problem is repaired after the next storm.	• Large rills or gullies are forming in the drainage area. • An attempt to regrade the drainage area has been unsuccessful. • Fixing the problem would require major regrading (i.e., redirecting more than a 100-square-foot area. • It is not clear why the problem is occurring.
Observed Condition: Manholes or Inlet Pipe Buried or Covered with Vegetation	
Condition 1: Nearest manhole and inlet pipe not found Consult as-built drawings to get to closest suspected location and use metal detector to search for metal manhole cover. If unsuccessful, identify nearest drain inlets and approximate pipe direction to locate next manhole. Condition 2: Manhole located and inspected Never enter a manhole, except by following confined-space entry protocols. If outlet pipe is not visible or greater than 25% full of sediment/debris or trash, it will typically require a qualified contractor to flush, clean and clear blockages. Condition 3: Inlet pipe not found at pond Clear vegetation and brush that may be covering the inlet pipe. Buried inlet pipes may be found through use of a metal probe. Condition 4: Inlet pipe buried in sediment or blocked by vegetation Once located, the pipe path can be cleared of vegetation with brush hook or other brush tools. Light digging may clear sediment from the end of the pipe.	• To locate buried manholes and lost storm lines, it is sometimes necessary to hire a pipeline inspection contractor with televising equipment or ground-penetrating radar and enter at the closest upstream access point. • Locating a buried inlet pipe may require wading in the edge of the pond and using a metal probe and brush axe to find and expose the pipe. • If other than light digging is necessary to remove accumulated sediment, a contractor with heavy equipment may be required.

Table 3.10.1 Level Inspection: PONDS and WETLANDS	
Recommended Repairs and Required Skills	**Triggers for Level 3 Inspection**
Observed Condition: Pipe or Headwall Settlement, Erosion, Corrosion or Failure	
Condition 1: Pipe or headwall settlement or failure Severe sinkholes, settlement or corrosion should be kicked out to Level 3 Inspection. Condition 2: Flow not confined to pipe and visible outside pipe wall With flashlight, observe the inside of the pipe and note its condition. Take photographs. Look for sinkholes developing that indicate pipe failure beneath the surface. Kick out to Level 3 inspection.	• Where blockages are visible, a decision is needed on whether to clear them or leave in place. If a third of the pipe is full of sediment, it should be removed by a contractor with pipe-cleaning equipment. • Corrosion of inlet pipes that allows flow around the pipe exterior is a structural concern because it can lead to settlement, sinkholes and undermining pond embankment. Evidence of this type of failure may require specialized pipe-inspection equipment and investigation by an engineer.
Observed Condition: Pond Conditions	
Condition 1: Pond pre-treatment zone is full of sediment or not constructed as shown on as-built drawings. Condition 2: Excessive buildup of sediment or overgrowth If the pre-treatment area or pond pool is overgrown or filled with sediment so that the original design is compromised, corrective measures are required. If plants have died, then replanting is necessary. If none of the original design exists due to alteration or sediment, kick out to Level 3 inspection.	• It may require inspection by an engineer to determine next steps for clearing, replanting or reconstruction. • Erosion or settlement such that design has been compromised should be reviewed by an engineer. Recurring erosion may require redesign and/or regrading to direct flow away from eroding area. • If sediment has filled more than 50% of the pond's capacity, dredging is likely needed and should be evaluated by a qualified contractor. • Removal or control of excessive algae or aquatic plants can be assessed by a qualified pond maintenance company.

3.11. Infiltration – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Infiltration practices are:

- Standing water, clogged media
- Severe erosion of infiltration area, inlets, or around outlets
- Significant sediment accumulation, indicating an uncontrolled source of sediment

<table>
<tr><th colspan="2">Table 3.11.1 Level Inspection: INFILTRATION</th></tr>
<tr><th>Recommended Repairs</th><th>Triggers for Level 3 Inspection</th></tr>
<tr><td colspan="2">Observed Condition: Water Stands on Surface for More than 72 Hours after Storm</td></tr>
<tr><td>Condition 1: Small pockets of standing water

For infiltration basins with soil, use a soil probe or auger to examine the soil profile. For gravel infiltration trenches or basins, use a shovel to dig into the gravel layer where the problem is occurring. If isolated areas have accumulated grit, fine silt, or vegetative debris or have bad soil or clogged gravel, try removing and replacing with clean material. If the practice is supposed to have grass cover, it will likely be necessary to replant once the problem is resolved.

Condition 2: Standing water is widespread or covers entire surface

Look in the observation well (if it exists) and use a tape measure to estimate the depth of water standing in the soil or gravel. Requires diagnosis and resolution of problem:
• Too much sediment/grit washing in from drainage area?
• Too much ponding depth?
• Improper infiltration media?
• Underlying soil not suitable for infiltration?
As above, the resolution will likely require replanting and re-establishment of good grass cover if this is part of the design.</td><td>• Infiltration media is clogged and problem cannot be diagnosed from Level 2 inspection.
• Level 2 inspection identifies problem, but it cannot be resolved easily or it is associated with the original design of the practice.</td></tr>
<tr><td colspan="2">Observed Condition: Severe erosion of infiltration bed, inlets, or around outlets</td></tr>
<tr><td>Condition 1: Erosion at inlets

The lining (e.g., grass, matting, stone, rock) may not be adequate for the actual flow velocities coming through the inlets. First line of defense is to try a less erosive lining and/or extending the lining further down to where inlet slopes meet the infiltration surface. If problem persists, analysis by a Qualified Professional is warranted.

Condition 2: Erosion of infiltration bed

This is often caused by “preferential flow paths” along the surface. The source of flow should be analyzed and methods employed to dissipate energy and disperse the flow (e.g., check dams, rock splash pads).</td><td>• Erosion (rills, gullies) is more than 12 inches deep
• The issue is not caused by moving water but some sort of subsurface defect, which may manifest as a sinkhole or linear depression and be associated with problems with the underlying stone or soil.</td></tr>
</table>

Observed Condition: Significant sediment accumulation, indicating an uncontrolled source of sediment	
Condition 1: Isolated areas of sediment accumulation, generally less than 3-inches deep Sediment source may be from a one-time or isolated event. For practices with soil cover, remove accumulated sediment and top 2 to 3 inches of soil; replace with clean material. Check drainage area for any ongoing sources of sediment. Condition 2: Majority of the surface is caked with "hard pan" (thin layer of clogging material) or accumulated sediment that is 3-inches deep or more This can be caused by an improper construction sequence (drainage area not fully stabilized prior to installation of infiltration practice) or another chronic source of sediment in the drainage area. For infiltration basins with soil, augering several holes down through the media can indicate how severe the problem is; often the damage is confined to the first several inches of soil media. Removing and replacing this top layer (or to the depth where sediment incursion is seen in auger holes) can be adequate, as long the problem does not recur.	• Trenches or dry wells with stone or gravel at surface may need to be cleaned out with a vacuum truck because the process of removing the top layer of stone may cause fine silt to drop further down. • More than 2 inches of accumulated sediment cover 25% or more of the infiltration surface area. • "Hard pan" of thin, crusty layer covers majority of Infiltration surface area and seems to be impeding flow of water down through the soil media. • New sources of sediment seem to be accumulating with each significant rainfall event.

3.12. Sand and Organic Filters – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Sand and Organic Filters are:

- Standing water, clogged filter media
- Need to pump out sedimentation chamber
- Response to fuel or other spills that make it into the filter

Table 3.12.1 Level 2 Inspection: SAND AND ORGANIC FILTERS

Recommended Repairs	Triggers for Level 3 Inspection
Observed Condition: Water Stands on Surface for More than 72 Hours after Storm	
Condition 1: Small pockets of standing water Use a soil probe or auger to examine the sand or filter profile. If isolated areas have accumulated grit, fine silt, vegetative debris, oily sludge or bad sand media, try scraping off top 3 inches of media and replacing with clean, coarse construction sand. Condition 2: Standing water is widespread or covers entire surface Look in the underdrain cleanout (if present) and use a tape measure to estimate the depth of water standing in the sand layer. Requires diagnosis and resolution of problem: • Clogged underdrain • Filter fabric between the sand layer and underdrain gravel OR on top of the sand filter layer (usually held in place by a thin layer of gravel) • Too much sediment/grit/vegetative debris/oily sludge washing in from drainage area • Too much ponding depth • Improper sand media	• Sand or organic media is clogged, but problem was not evident from Level 2 inspection. • Level 2 inspection identifies problem, but it cannot be resolved easily or is associated with the original design of the practice. • The problem seems to be filter fabric placement, but this is specified in the original design. • The entire filter media layer or filter cartridges need to be replaced. • The problem is associated with improper configuration of underdrain pipes or outlet structures.

Observed Condition: Severe erosion of filter bed, inlets, or around outlets

	• Erosion (rills, gullies) is more than 12 inches deep. • The issue is not caused by moving water but some sort of subsurface defect, which may manifest as a sinkhole or linear depression and be associated with problems with the underlying stone or soil.

Observed Condition: Significant sediment accumulation, indicating an uncontrolled source of sediment

Condition 1: Isolated areas of sediment accumulation, generally less than 3-inches deep Sediment source may be from a one-time or isolated event. Remove accumulated sediment and top 2 to 3 inches of sand or filter media; replace with clean material. Check drainage area for any ongoing sources of sediment. Condition 2: Majority of the surface is caked with “hard pan” (thin layer of clogging material) or accumulated sediment that is 3-inches deep or more This can be caused by an improper construction sequence (drainage area not fully stabilized prior to installation of filter practice) or another chronic source of sediment in the drainage area. Augering several holes down through the sand media can indicate how severe the problem is; often the damage is confined to the first several inches of media. Removing and replacing this top layer (or to the depth where sediment incursion is seen in auger holes) can be adequate, as long the problem does not recur.	• More than 2 inches of accumulated sediment cover 25% or more of the filter surface area. • “Hard pan” of thin, crusty layer covers majority of filter surface area that seems to be impeding flow of water down through the filter media. • New sources of sediment seem to be accumulating with each significant rainfall event.

Observed Condition: Underground vault system has standing water and oily sludge floating on top, or other issues that indicate clogging, malfunction, or need for maintenance

Condition: Compare observation to the design or as-built plans to see whether existing conditions match the plan details.	• This condition will almost always warrant conferring with the manufacturer or vendor and/or using the Level 3 inspection process to further diagnose the problem.

Section 4. Diagnostics and Maintenance Measures

4.1. About this Section

Section 4 summarizes the most common problems found in SMPs, as well as typical maintenance or repair solutions. The guidance provided in this section has some similarities to **Section 3** but differs in the following ways:

1. The primary audience for Section 4 is the Level 3 inspector, often a professional engineer, or landscape architect tasked with diagnosing and repairing SMPs that are not working properly. However, the information in Section 4 may also be quite useful for a Level 2 inspector seeking to diagnose a particular problem.
2. The maintenance measures described in this section are more detailed and focus on repairs to specific problems rather than on routine maintenance such as weeding or minor sediment removal.
3. Because the problems described in this section can be applied to several different practices, this section is organized by the type of problem rather than the practice type.

Problems addressed during Level 3 inspection/maintenance are summarized in **Table 4.1**. This list is not exhaustive but does address the most common issues in the SMPs that require some advanced knowledge and skill to inspect and fix. Each problem category is discussed in a separate sub-section.

Table 4.1: Common Inspection/Maintenance Issues for Level 3

Sub-Section/Category	Description
4.2 Contributing Drainage Area – Pollutant Sources	Sediment or pollution sources in the Drainage Area
4.3 Physical Obstructions	Physical obstructions to maintenance access, overflow, or emergency spillway
4.4 Erosion	Erosion on side slopes, practice bottom, at inlet or outlets. Rills and gullies forming where there should be sheetflow
4.5 Departures from Design Dimensions	Practice dimensions have been altered, either due to filling with sediment, redesign or filling in, or improper implementation.
4.6 Improper Flow Pathways	Flow is shortcircuiting the practice, or drainage pathways have been otherwise modified.
4.7 Sediment Buildup	Sediment has accumulated in a pool, practice bottom, pre-treatment area, or vault.
4.8 Clogging	The soil media or other components are clogged, and there may be standing water for longer than intended.
4.9 Vegetation	Excessive, inadequate, and/or unhealthy vegetation to support a practice
4.10 Embankment and Overflow Condition	Issues with an embankment or overflow weir or channel
4.11 Structural Damage	SMP infrastructure, such as concrete or metal elements, have been damaged.
4.12 Pool Stability	Permanent pool of water is at the improper elevation.
4.13 Pool Quality	Permanent pool of water suffers from poor quality due to algal growth or other issues.

4.2. Contributing Drainage Area – Pollutant Sources

Issue applies most commonly to: Sheetflow/Disconnection, Swales, Bioretention, Permeable Pavement, Ponds/Wetlands, Infiltration, and Sand/Organic Filters.

Problem #1: Bare soil washing into SMP from drainage area

General Approach for All Practices:

- Identify the specific source(s) of sediment in the drainage area by tracking sediment flow during a rainfall or looking for a track of sediment staining during dry weather.
- For an active sedimentation event, attempt to filter incoming runoff if conditions allow (e.g., enough space upstream of the practice for temporary ponding). Consider installing a silt fence, silt socks (at curb inlets), staked straw bales, or other filtering material at the inlets of the SMP. This will keep at least some of the sediment from getting into the practice.
- Runoff from active construction should not enter the SMP; divert to a temporary and approved sediment control practice.
- For areas of bare soil *not* due to active construction **(bottom photo)**, prep the soil and re-seed/plant with grass species or other thick ground cover appropriate for the region. May also need starter fertilizer, topsoil, and/or compost.
- For steep slopes with bare soil, consider also installing erosion-control matting to hold soil, seed, and straw in place until the vegetation becomes well established.
- For fill and topsoil stockpiles in the drainage area, provide temporary or permanent cover as soon as possible. Alternatively, surround the base of the stockpile with silt fence, or equivalent, to prevent the transport of sediment-laden runoff.

Helpful Skills:

- Erosion and sediment control knowledge and skills
- Landscaping knowledge to understand appropriate ground cover species for re-vegetating bare areas

Equipment Typically Used for Fixing Sediment Sources:

- Silt fencing and other sediment barriers
- Erosion-control matting and/or straw
- Rakes and shovels
- Light excavation or grading equipment for larger jobs
- Equipment to deliver topsoil or compost as needed
- Plants and/or seed mix, plus a way to move and store plant stock without damaging it or drying it out
- Starter fertilizer, topsoil, and/or compost

Problem #2: Other pollution sources in the drainage area

General Approach for All Practices:

- Pollutants may include: road salt, oils, fuels, food grease, wash water, paints and solvents, trash, and many others.
- Identify the source(s) of pollution.
- For pollutants spilled on the ground, remove by hand or use absorbents to soak up wet material. Absorbents and other waste materials shall be disposed of properly.
- For materials stored outside, move them to a covered area or build/add cover over the materials. Provide secondary containment, if possible.
- Make sure all waste containers have lids and fix any leaks (**see poor practices in photo at right**).
- For sites prone to frequent oil leaks and staining (e.g., vehicle maintenance yards), consider installing an oil/water separator to pre-treat runoff that enters the SMP.
- For routine dumping of wash water, grease, paints, or other pollutants, enforce behavior change and explain good housekeeping practices.
- Develop a pollution prevention plan for the site to ensure that hazardous materials and other potential pollutants are not stored where they are exposed to rainfall.
- For areas that receive a heavy salt and/or sand load during the winter, consider diverting upslope runoff, especially for practices such as permeable pavement. Some monitoring of winter road or parking lot clearing activities may also be warranted.

Helpful Skills:

- Knowledge of good housekeeping and pollution prevention practices
- Good communication with employees and managers at site (e.g., for correcting bad site operations)

Equipment Typically Used for Correcting Other Pollutant Sources:

- Tarps to cover stockpiles
- Absorbents to soak up spills
- Secondary containment barriers that will hold back any liquids or solids that may leak out of their primary container
- Storage barns, sheds, pole barns and other permanent cover for potential pollutants

4.3. Physical Obstructions

Issue Applies Most Commonly To: Rainwater Harvesting, Sheetflow/Disconnection, Swales, Bioretention, Green Roofs, Ponds/Wetlands, Infiltration, and Sand/Organic Filters

Problem #1: Maintenance access is obstructed

Ground-Level SMPs:

- Where a path for vehicles and construction equipment to access the practice was established during construction but is now overgrown, remove woody vegetation and any other tall vegetation. This path should be bush hogged once or twice a year.
- If the SMP needs a large quantity of trash and/or sediment removed in areas where access is limited due to steep grades, overgrown vegetation, etc., it will be necessary to establish safe vehicular access by clearing and possibly re-grading the area. It is advisable to have a maintained, all-weather surface to critical parts of the SMP.
- It is most important to provide access nearest to parts of the practice where sediment and trash tend to accumulate the most: forebay and riser structure.
- For an SMP blocked by fences **(photo at right)**, install a gate that is wide enough for vehicles to enter for any current or future maintenance.
- Sometimes access is blocked by unauthorized structures, such as sheds, property fences, retaining walls, etc. Confer with the local stormwater authority on the presence of any maintenance easements and means to gain access to the practice.
- The solutions above should also provide for safe foot access for routine inspection and maintenance.

Rainwater Harvesting:

- Ensure that no structures are covering the filter or the tank's access/inspection port.

Green Roofs

- Ensure that individuals can safely reach the roof with tools in hand (e.g., buckets, pruners, hoses). If the roof cannot be accessed via a walk-through door, this may require installing a wide ladder or fire escape-style stairs on the inside or outside of the building.
- If there is a concern of getting too close to the roof's edge while doing maintenance, install a railing around the edge for safety. Alternatively, for sloped roofs, workers may need to use harnesses during maintenance activities.

Helpful Skills:

- Use of motorized landscaping equipment
- Chainsaw skills
- Use of grading equipment for larger jobs
- *Note*: OSHA safety requirements and certifications may apply to green roof maintenance.

Equipment Typically Used to Regain Proper Access:

- Mower, trimmer
- For very overgrown areas, chainsaw and/or bush hog
- For areas that need to be regraded, excavator, skid steer, or other grading equipment

Problem #2: Flow is obstructed in or out of the practice

General Approach for All Practices:

- Flow can bypass an SMP when there is too much sediment/debris buildup near the inlets or due to grading changes in the drainage area (e.g., repaving of parking lot). If the cause of blockage or bypass is not obvious, inspect the practice during rainfall to watch the flow paths. (See **Section 4.6 – Improper Flow Pathways** for additional guidance.)

- Obstruction of overflow or emergency spillway structures is most often due to buildup of debris, such as trees, sticks, trash. It is *very* important to keep these structures clear of such blockages in order to avoid flooding or a dam breach (**avoid conditions caused by beaver activity - top photo**).

- Where debris cannot easily be cleared by hand, special equipment and skills may be needed. An obstructed riser structure in a wet pond may need to be accessed by boat **(bottom photo)**. In cases where large sticks, tree branches, trash, or other debris obstruct the overflow or spillway, they may need to be cut up by chainsaw. Large debris will usually need to be hauled away with a truck.

Helpful Skills:

- Chainsaw skills
- Muscle strength to haul large debris
- Boating capabilities

Equipment Typically Used to Clear Obstructions:

- Gloves, shovels, pruners, rakes, and other hand tools
- Waders for wetlands
- Chainsaw for large sticks and branches
- Cable puller (come-along) to remove large branches that cannot be pulled out by hand
- Boat and personal floatation device for riser structures in wet ponds
- Truck to haul away debris

4.4. Erosion

Issue Applies Most Commonly To: Sheetflow/Disconnection, Swales, Bioretention, and Ponds/Wetlands

Problem: Erosion on practice surface, inlets, and/or outlets

General Approach for All Practices:

- See **Section 4.10 – Embankment and Overflow Condition** for how to repair erosion on side-slope embankments.
- Rill and gully erosion occurs when runoff flow is concentrated. Deep rills and gully erosion on the practice surface **(top photo)** will require the surface to be regraded to make uniform again. Use the lightest equipment possible in order to minimize soil compaction during excavation.
- After excavation, reseed/plant the area with ground cover that is appropriate for the moisture conditions of the practice. Amend or enhance soil as needed according to a soil test; soil may need more organic material to support plants.
- To prevent further erosion on the surface of the practice, ensure that flow from the inlets can spread out adequately and has enhanced energy dissipation features. This may require installing or enhancing a stone apron outlet protection that flares out and down to the level of the practice to slow and spread out the flow. Other options include check dams, energy dissipation devices, or an armored low-flow channel. A stilling basin **(bottom photo)** can also dissipate flow as it comes out of an inlet or outlet pipe. Apply similar treatments to any outlets that are experiencing erosion.
- Any sloped soils that are disturbed during excavation will likely need erosion-control matting to hold it in place while vegetation becomes established.

Helpful Skills:

- Landscaping/Gardening
- Consult with Cooperative Extension Office or independent laboratory for soil testing
- Skills with excavation equipment
- Knowledge of sediment and erosion control practices and resources appropriate for the area

Equipment Typically Used for Fixing Erosion:

- Rakes, shovels, wheelbarrows, and other "landscaping" equipment
- Light excavation or grading equipment for larger jobs
- Equipment to deliver, unload, and move stone and other materials around
- Plants and/or seed mix, plus a way to move and store plant stock without damaging it or drying it out

4.5. Departure from Design Dimensions

Issue Applies Most Commonly To: Swales, Bioretention, Ponds/Wetlands, Infiltration, and Sand/Organic Filters

Problem: Practice dimensions have been altered

General Approach for All Practices:

- Once constructed, the dimensions of an SMP may become altered from the original design for a variety of reasons. These reasons can include:
- The SMP was not constructed to the proper dimensions at initial installation.
- Sediment accumulation in the SMP reduces the intended storage volume of the practice **(top photo).**
- Redevelopment or regrading of the site encroaches into the footprint of the SMP.
- Dumping of leaves, trash, or other debris into the SMP reduces the intended storage volume of the practice.
- If it appears that the dimensions of an SMP have been altered, proceed as follows:
- Consult the original design or as-built plans and sizing computations for the SMP to identify the intended dimensions and storage volume of the practice. Measure the length, width, and depth of the practice to estimate the current storage volume. Calculate the difference in volume to determine whether it is significant enough to warrant restoring the practice to its original dimensions. If the loss in volume is greater than about 10%, this likely warrants action.
- If the SMP's original storage volume cannot practically be restored because of current site conditions, an additional SMP may need to be built elsewhere on the site in order to regain adequate storage and treatment volume for the site.
- For problems of dumping by individuals on or near the site, install "No Dumping" or similar signage to inform people that this is not an appropriate place to dispose of debris. Any debris that has already been dumped should be removed from the practice either by hand or with equipment.

Helpful Skills:

- Basic surveying
- Understanding stormwater design plans and sizing computations
- Stormwater management design
- Skills with excavation equipment and erosion and sediment control

Equipment Typically Used to Investigate and Fix Dimensions:

- Simple level or survey equipment, tape measure, and other tools to measure SMP dimensions
- Light excavation or grading equipment for larger jobs
- Rakes, shovels, wheelbarrows, and other "landscaping" equipment for small jobs
- Soil stabilization materials

4.6. Improper Flow Paths

Issue Applies Most Commonly To: Rainwater Harvesting, Sheetflow/Disconnection, Swales, Bioretention, Infiltration, and Sand/Organic Filters

Problem #1: Flow intended to go into a practice is diverted by debris or grit buildup or capacity issues at inlets

Bioretention, Swales, Infiltration, Sand/Organic Filters:

- Grit, sediment, leaves, and other debris builds up at curb inlets or other inlets, sometimes to the point where flow is diverted completely around the practice (photos above). This is a common issue for practices that rely on curb cuts or other small inlet structures to get water into the practice for treatment. A minor amount of debris may be OK and not affect the ability of water to enter the practice. However, be aware of conditions where flow *that is supposed to be treated* is diverted to a downgradient storm drain or other structures in such a way that the stormwater treatment is entirely or partially bypassed.

- In many cases, correcting the problem may simply involve removing debris or unclogging the inlet.
- However, this problem can be chronic if the inlet design is susceptible to clogging. This can occur if the slope from the inlet into the practice is flat and/or there are controllable sources of sediment and debris in the drainage area.
- For chronic problems, consider redesigning inlets to be more clog proof. One solution is to build in a 2 to 3-inch drop from the curb inlet onto a gravel or stone diaphragm along the edge of the practice (see example in photo are right).
- Inlets that are undersized for the flow coming to them should be enlarged and armored with an appropriate erosion-resistant lining.

Rainwater Harvesting:

- Water intended to be collected in rainwater harvesting systems is sometimes not delivered to the tank or cistern if the system of gutters, downspouts, pipes, etc. is not sized properly or if the first-flush diverter or vortex filter is not functioning correctly and diverting too much water away from the tank.
- As with inlets, this may simply be a matter of routine cleaning of gutters, downspouts, vortex filters, etc.
- It may also be a design or capacity issue, in which case, installing larger gutters or a more robust piping system may be in order.

Source: Rainwater Management Solutions 1

Example of enhancing the gutter and piping system leading to a rainwater harvesting system

Helpful Skills:
• Basic surveying • Typical landscaping skills using materials such as soil, rock/stone, edging material, mulch, etc. • Light construction of gutters, downspouts, piping • Some knowledge of first-flush diverter and vortex filter products

Problem #2: Flow is not uniformly accessing the entire treatment area

Bioretention, Swales, Infiltration, Disconnection and Sheetflow, Sand/Organic Filters:

Improper flow path issues in this category include:

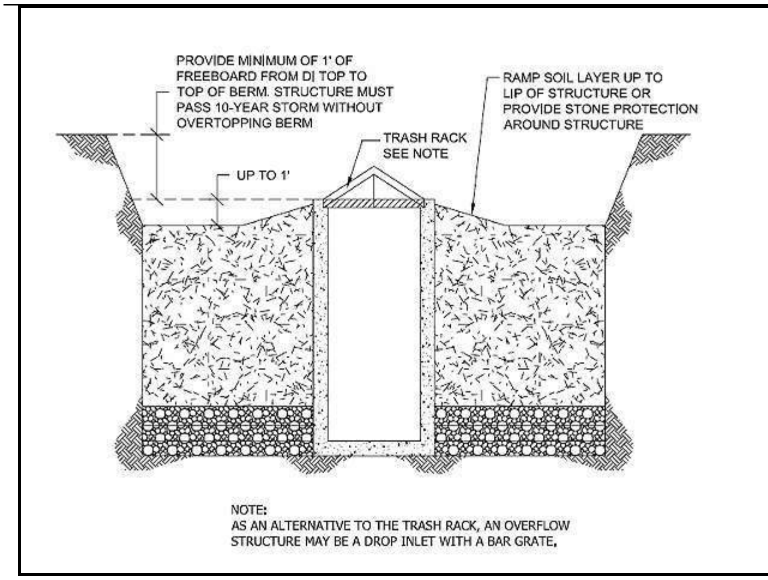
- Water forming channels or rills through the treatment bed of bioretention, swales, infiltration, or surface sand filters, and thus not spreading out across the treatment area surface
- Water ponding only at one end of the treatment area because the surface is not level
- Water piping through weak spots to an outlet or underdrain, such as where soil media meets a concrete structure
- See Section 4.4, Erosion for issues of channeling or erosion on the treatment surface.
- For uneven treatment area and preferential ponding, assess the severity of the problem. Compare the relative elevations of the “high” part of the treatment area (the area where water does NOT seem to pond) and any overflow structure or weir where high water flows will leave the practice. If there is still some freeboard (such that the overflow structure is higher than ALL of the treatment bed surface), then there will still be some ponding for larger rainfall events. Try some minor raking or moving soil media and mulch around to even out the filter bed.
- However, the problem is more serious if parts of the treatment area are higher than the overflow structure. These areas will never be valuable for treatment purposes. The treatment area is supposed to fill up like a bathtub, so some regrading is needed to level out the treatment area.
- If water is piping or shortcircuiting through the soil or sand media, forming sinkholes or otherwise bypassing the intended treatment mechanism, it will be necessary to repair these spots. Around concrete or metal overflow structures, use soil material right around the structure that can be compacted (bioretention soil media tends to be light, sandy, and fluffy and won’t compact very well). Another option is to “ramp up” the soil layer to the lip of the structure so that there won’t be a hydraulic jump at this potentially weak point. See the figure below.

These three issues are illustrated below:

Water from the inlet at top of photo is channeling through the bioretention area.

Water is preferentially ponding only at one end of the bioretention because the surface is not flat.

Water is “piping” down to the underdrain at the weak spot where the soil media meets the concrete overflow structure.



Ramp up soil layer to the lip of the structure to address this being a weak interface where water can work down and create bypassing. (Source: Virginia 2013 Stormwater BMP Specifications, Specification #9, Bioretention, Figure 9.13.)

Impervious Disconnection:

The most likely flow path issues with Impervious Disconnection are: (1) owners intentionally diverting downspouts away from pervious area and onto impervious area **(left photo below),** and (2) slight grading issues diverting the water away from the intended pervious receiving area **(right photo below).**

Both issues are fairly straightforward to address but involve communicating and working with property owners to explain the purpose of disconnection and how to properly maintain it. The second issue may involve some minor regrading or building low-profile berms to get water to flow to the intended disconnection area.

Helpful Skills:

- Rudimentary surveying
- Typical landscaping skills—using materials such as soil, rock/stone, edging material, mulch, etc.

Equipment Typically Used for Inspecting and Fixing Flow Paths

- Surveying equipment (i.e. Site level or total station) to get relative elevations among different parts of treatment area, inlets, overflow structures, etc.
- Small, simple tools—flat shovels, wheelbarrows, rakes, other common landscape/gardening tools
- Large, more complicated equipment—small excavators to move material around or do regrading. Always work from the side of the practice and NOT within the practice itself.

4.7. Sediment Buildup

Issue Applies Most Commonly To: Swales, Bioretention, Permeable Pavement, Ponds/Wetlands, Infiltration, and Sand/Organic Filters

Problem: Sediment accumulation more than 2 inches thick covering 25% or more of the practice surface area

Bioretention, Swales:

- Determine the source(s) of sediment. The most likely sources are: (1) premature installation of the practice during the construction process and discharge of construction site sediment loads; (2) erosion in the contributing drainage area *after* construction is complete; and (3) erosion along the practice side slope or within the practice itself. If it is an ongoing source, it must be abated (see **Sections 4.2, Contributing Drainage Area, and 4.4, Erosion).**
- Use a soil auger to auger holes in various places across the Bioretention or Swale surface area, especially in areas where sediment is accumulating. Determine how deep the sediment is penetrating into the soil media layer. Usually, it will be the top 2 to 3 inches that are most affected. Note that for swales *without* an engineered soil media, the sediment layer will likely be confined to the surface.
- Remove the “fouled” soil media to the affected depth (using flat shovels or small excavators and working from the side) and replace with clean material from an approved vendor (bioretention soil media or equivalent). If no vendors are available in your area, use the soil media specifications from the **Design Manual** to replicate the right mix of sand, topsoil, and composted organic material.
- Check to ensure that the practice is filtering at the proper rate after the next several storm events.

Infiltration:

- For infiltration practices excavated to a suitable infiltrating soil layer (e.g., not stone reservoir layer), use the same procedures as for Bioretention/Swales above.
- For infiltration trenches and basins that have a stone reservoir layer, use similar procedures, but use a shovel to dig into the stone layer to ascertain how deep the sediment incursion is into the stone. Remove down to this layer and replace with clean material.
- If the infiltration practice is clogged, see **Section 4.8: Clogging.**
- As with Bioretention, check for controllable sources of sediment in the Drainage Area (**Section 4.2**).

Permeable Pavement:

- NOTE: Routine sweeping with a regenerative air vacuum (maximum power 2,500 rpm) is important to avoid more costly repairs that result from deferred maintenance. It is best to sweep the pavement surface in the early spring after winter sanding/salting materials or snow piles have led to sediment or winter slag accumulation. Also, if the area is surrounded by tree canopy, fall cleanup is essential, as vegetative debris tends to get pulverized by vehicle traffic and ground into the pavement surface.
- Observe the pavement surface during a storm event to see whether the sediment is clogging the pavement (i.e., standing water on the surface after the storm stops). If so, see **Section 4.8: Clogging.**
- Remove several of the paver blocks in different parts of the structure to ascertain how deep the sediment is penetrating into the bedding and reservoir layers. Most of the time, sediment incursion will be limited to the top 1 or 2 inches of the pavement bedding layer (for permeable interlocking concrete pavers and concrete grid pavers).
- Based on the above observations, it may be worthwhile to quantify the infiltration rate using ASTM C-1701/1701M. This is most useful in conducting the test in the *same place within the pavement surface through the course of several years* to document reduction in infiltration rates. Repair or restorative sweeping is warranted when infiltration rates drop below around 10 inches per hour. NOTE: As stated above, this can likely be avoided if routine annual sweeping is conducted.
- If sediment covers more than 25% of the surface, is deeper than 2 inches, or vegetation is starting to grow where sediment has accumulated, consult a street-sweeping vendor about *restorative* sweeping. In this case, it will be necessary to use a higher RPM sweeper or vacuum sweeper to suck out more of the bedding pea gravel that has been fouled, then replace with clean material.

Infiltration test using ASTM C-1701

Pulling grass and weeds from the joints can damage parking surface if roots are firmly established in the bedding layer.

- Vegetation growing in the pavement joints should be removed either manually or with a water-safe herbicide (e.g., glysophate without surfactants). It is important to not let weeds proliferate in the pavement surface because pulling them out by the roots may damage the pavement structure. (Note: The application of herbicides to control invasive or undesirable vegetation within wetlands or other waters of the U.S. may require an Aquatic Pesticide Permit from the NYS DEC)
- Check the pavement surface after a storm event to ensure that it is draining properly.

The North Carolina State University (NCSU) Stormwater Engineering Group has an informative Urban Waterways publication, *Maintaining Permeable Pavements (2011):*
http://www.bae.ncsu.edu/stormwater/pubs.htm

Routine, air-vacuum sweeping in the early spring and fall is the best approach for permeable pavement maintenance (Photo source: Toronto and Region Conservation)

Ponds and Wetlands:

- Sedimentation is an inevitable process in ponds and wetlands. NOTE that upstream erosion, especially along stream channels or ditches leading to the practice will accelerate the sedimentation process and lead to more frequent and costly sediment removal operations. Whenever possible, it is important to mitigate any upstream erosion issues.
- Forebays and/or pre-treatment areas should be cleaned out when they reach 50% of their design capacity. Once cleanout is complete, it will be worthwhile to install a graduated rod into the forebay with a clear marking of future sediment clean-out levels.
- The main body of a pond or wetland may need to be dredged on an infrequent basis or when sediment has replaced 50% of the design capacity. There are many dredging methods available. Excavators with long arms can handle most small or moderate-sized ponds. Other methods may be necessary for larger facilities. Dredging can be a complicated operation involving dewatering, storage of wet sediment, and possibly hauling to on-site or off-site disposal or reuse areas. Consult a qualified contractor to explore available methods and costs for the particular application. Once again, installation of a graduated rod can help mark future clean-out levels. Note: The dredging of accumulated sediment within regulated wetlands, ponds or at outlet structure may require permits from NYS DEC and/or USACE. In addition, removed sediment should be properly disposed of in a regulated solid waste management facility or in an upland area that is at least 100 feet from regulated wetlands or streams. Sediment managed in upland disposal areas shall be graded, seeded and mulched.

Sand/Organic Filters:

- See the section above on Bioretention/Swales as some of the procedures will be similar, especially for above-ground filters. It is important to determine whether the drainage area is generating a controllable source of sediment that can be abated.
- Underground trench or vault filters will require routine maintenance to: (1) remove accumulated sediment, trash, and floatables from the sedimentation chamber, usually with a vac truck; and (2) remove sediment, grit, and sludge from the top layer of the filter media and replace with clean material. NOTE: Depending on the configuration of the underground filter, confined-space procedures may apply. For a normally operating practice, these maintenance tasks should be conducted every two to three years. If the filter is treating a stormwater hotspot or a particularly dirty drainage area (e.g., vehicle maintenance, washing, repair), the frequency may increase to annually or more often, as dictated by Level 2 inspections. Also, in these cases, it may be warranted to test the material to ensure proper disposal.
- Some proprietary filters require replacement of special cartridges or filter material. Consult the vendor or manufacturer for special maintenance procedures.

Routine cleaning of a perimeter or “Delaware” sand filter. This can be done from the surface, but deeper, vault-type filters will require confined-space entry procedures.

Helpful Skills:

- Most common contracting skills
- Excavation, dewatering, and sediment disposal in some cases
- Knowledge of maintenance equipment, such as vac trucks, street sweepers, etc.
- Knowledge of preferred conditions for bioretention soil media
- Soil testing in some cases where sediment is being removed from stormwater hotspots

Equipment Typically Used for Sediment Removal Activities:

- Small, simple tools—flat shovels, wheelbarrows, rakes, other common tools
- Larger jobs—small or large excavators, loaders, dewatering equipment (pumps, dirt bags, etc.), trucks to haul material to on-site or off-site disposal or reuse areas, erosion and sediment-control supplies.

4.8. Clogging

Issue Applies Most Commonly To: Bioretention, Permeable Pavement, Infiltration, and Sand/Organic Filters

Problem: Filter media clogged; water standing on practice surface for 48 to 72 hours or longer after a storm

Bioretention:

Standing water on the bioretention surface 48 to 72 hours after a storm event is a sure indication of clogging (top photo). Clogging of bioretention practices can be tricky to diagnose as there are several probable causes:

a. Clogged underdrain
b. Filter fabric between soil media and underdrain stone
c. Too much sediment/grit washing in from drainage area
d. Too much ponding depth
e. Improper soil media

The following procedure can be used to work through diagnosing the most common causes, beginning with the simplest and easiest to fix and progressing through more complex remedies:

1. Look for a thin, crusty layer of sediment that covers some or all of the soil media. It is often grayish in color. This thin layer can sometimes be enough to cause slow drainage. Scrape this crust off and ascertain sources of sediment in the drainage area (see Section 4.2, Contributing Drainage Area). Often, this problem can be caused by the bioretention soil media being installed too early in the construction process, but other chronic sediment sources should also be checked.
2. Open the underdrain cleanout and pour water in to verify that the underdrains are functioning and not clogged or otherwise in need of repair. The purpose of this check is to see whether there is standing water all the way down through the soil. If there is standing water on the surface, *but not in the underdrain*, then there is clogging somewhere in the soil layer. If the underdrain and cleanout have standing water and there is not water coming out the other end (outlet) of the underdrain pipe, then the underdrain is clogged and will need to be rooted out.
3. Use a soil auger to auger several holes down through the soil media to the underdrain layer (if present) or underlying soil. Check to see whether there is a layer of filter fabric at the bottom of the soil layer. The auger will pierce through any filter fabric that is present, and pieces of fabric in the auger bucket should be removed. Notice if the fabric is "blinded" or clogged with sediment. This is a common issue with older bioretention practices. If the practice has a clogged the filter fabric layer, go to step #6, install wick drain.

Filter fabric, where present, is a likely source of clogging.

4. While checking for filter fabric in auger holes, also note whether there is a layer of saturated soil media or bad soil media (e.g., too much clay content) that may be on top of a good media layer. This will be fairly obvious as the top 3 or 4 inches will be mucky and saturated, with dry and sandy media below. If this is the case, it will be necessary to remove the bad material and replace with good, clean bioretention soil media in accordance with the design specifications. Till or incorporate the good material into the underlying existing soil media to establish a good contact.

5. If the entire profile of soil media is bad, has too much clay content, or does not appear to meet the specifications for soil media, it will be worthwhile to test the soil and compare against the recommended specifications (e.g., clay content, particle sizes, etc.). If the soil does NOT meet specifications, see steps #6 and #9 below.
6. If the problem appears to be filter fabric or bad soil media (steps #3 or #5 above), there is a critical decision to be made. It is an expensive proposition to dig up the entire facility to either remove the filter fabric or replace the entire soil layer. If the clogging problem is not severe in nature, an intermediate (and much cheaper) option may be to install wick drains. Using a 6-inch auger bucket, auger numerous vertical holes around the practice surface area, making sure to auger all the way down to the underdrain stone or underlying soil (if there is no underdrain). Hammer 6-inch perforated PVC or other type of pipe into these holes. Perforations should be about 3/8-inch diameter. Fill the pipes with clean underdrain gravel (#57 stone) mixed in with coarse construction sand. These drains will serve to wick fines from the surrounding soil media and will provide alternative drainage. Check after the next several storm events to see whether the wick drains improve drainage.

Adding sand to a wick drain. The vertical perforated PVC pipe has already been placed in the auger hole.

7. Sometimes the cause of saturated soil media is springs or some type of baseflow coming into the practice. This is a more difficult problem as bioretention is not supposed to receive this type of constant flow. It will be necessary to identify and reroute springs or baseflow or perhaps replace the bioretention practice with a different type of practice.
8. Another possible source of poor drainage or clogging is that there can be too much water on top of the soil media when the bioretention practice fills up. Most specifications call for a maximum ponding depth of 12 inches, but sometimes the ponding depth can be 18 or even 24 inches. While this increases the amount of head pushing water down through the soil media, it can also lead to compaction or too much sediment building up. If the bioretention practice has a ponding depth greater than 12 inches, consider configuring the outlet or large storm overflow to reduce the ponding depth to 12 inches or less. Check with the local stormwater authority to ensure that doing this will not compromise the required treatment volume of the practice.
9. If clogging is too severe to be fixed with wick drains or other remedies listed above, it may be necessary to rebuild the bioretention practice by digging up the existing soil, taking out any filter fabric that is between the soil media and underdrain stone, and rebuilding and replanting according to the design specifications.
10. Whatever the chosen remedy, check to ensure that the practice is filtering at the proper rate after the next several storm events.

The Chesapeake Stormwater Network (CSN) has produced an excellent reference guide for inspecting and diagnosing Bioretention issues, *Technical Bulletin #10, Bioretention Illustrated.* This tool can be used as an additional reference and can be downloaded using this link: http://chesapeakestormwater.net/category/publications/

Infiltration:

- Clogging of infiltration practices can be simple to resolve or fatal:
- On the *simple* side, clogging (or poor drainage) may arise from sediment, vegetative debris, parking lot grit, or other debris clogging the top few inches of soil or stone.
- With luck, the practice will have an observation well (vertical perforated PVC pipe with cap that extends through the stone reservoir in an infiltration trench or basin). Check the observation well three days after a storm event of ½-inch or more. If water is standing in the observation well to the surface, then the whole profile may be clogged (see below under *fatal*). If the observation well has only a few inches or no water and there is still water standing on the surface, then surface clogging is a likely culprit.
- For infiltration practices in soil (no stone reservoir), auger several holes around the infiltration surface area. If saturated soil seems to be on top of good, clean, dry soil, then surface clogging seems likely.
- For infiltration trenches and basins with a gravel reservoir, dig several holes around the surface to determine, again, whether there seems to be a layer of gravel clogged with sediment, leaves, vegetative debris, parking lot grit, etc. If possible, dig down to where the gravel meets the underlying soil to see whether a layer of filter fabric is present (which may be common with older practices). If this is the case, blinding of the filter fabric may be a cause of the clogging.
- For surface clogging, remove the affected material down to the level where the soil or gravel seems clean, and replace with clean material. If filter fabric seems to be a problem, it will be necessary to dig up the gravel, remove the filter fabric, and rebuild the reservoir layer in accordance with the current design specifications. In either case, check after a storm event to ensure that this has resolved the issue.
- On the *fatal* side, the underlying soil may not be suitable for infiltration, either due to soil characteristics, compaction during construction, or other causes. Check the original design package to see whether any soil testing was done at the time. It may be worthwhile to auger down to the infiltration interface layer (e.g., where stone reservoir meets the underlying soil and then another several inches below this interface), and take several soil samples for lab analysis to compare to current soil specifications (see information below about infiltration soil analysis).

- It may be that a geotechnical analysis would reveal that there is a good infiltration soil layer, but it is lower than the existing interface. This would still require a complete rebuild and excavation down to the suitable soil layer. Restoring porosity at the designed elevation would require replacing soil above this suitable layer and avoiding compaction.
- Another option would be to convert the practice to a bioretention practice with an underdrain. Check with the local stormwater authority to see whether this would require any site plan or stormwater plan amendments or other permits.
- Many updated state stormwater manuals and specifications include protocols for infiltration soil testing and analysis that reference various ASTM standards. For example, see: *Virginia 2013 BMP Standards & Specifications, Specification #8: Infiltration, Appendix 8-A, Infiltration and Soil Testing* at: **http://www.deq.virginia.gov/fileshare/wps/2013_DRAFT_BMP_Specs/**

Permeable Pavement:

- AS NOTED IN SECTION 4.7 – sediment buildup, routine sweeping with a regenerative air vacuum (maximum power 2,500 rpm) is important to avoid more costly repairs that result from deferred maintenance. Preventative maintenance is the best and most cost-effective way to prevent clogging in the first place.
- If there is standing water on the pavement surface 48 to 72 hours after a storm event of ½-inch or more, then the pavement surface is clogged.
- Check the design plan or as-built plan to see whether the permeable pavement design includes an underdrain. There may also be underdrain cleanouts at the edge of the permeable pavement.
- If there is an underdrain, the first thing to check is whether the underdrain is clogged, crushed, or broken. Check to see whether there is standing water in the underdrain cleanout 48 to 72 hours after a storm event. If the underdrain is dry, pour water into the underdrain with a hose and see whether it comes out the other end. If the underdrain is clogged, snake it out, as this is the first and easiest thing to try.
- If the underdrain is working, then clogging may be due to: (1) clogged surface or bedding layer; or (2) underlying soil is not suitable for infiltration for designs with no underdrain. First, refer to the guidance in Section 4.7 – Sediment Buildup, and then proceed as follows:
- IF THERE IS NO UNDERDRAIN AND THE DESIGN IS BASED ON SOIL INFILTRATION UNDER THE PAVEMENT, it will be worthwhile to check the soil because unclogging the surface layer will likely not fix the problem. Check the original design package for any soil infiltration testing. It is likely worthwhile to remove the entire pavement section in several places down to the soil layer and to do a geotechnical investigation of the soil profile. See: ASTM C-1701/1701M and/or *Virginia 2013 BMP Standards & Specifications, Specification #8: Infiltration, Appendix 8-A, Infiltration and Soil Testing* for examples of soil infiltration protocols (URL above).
- If the soil is not suitable for an infiltration design, it will probably be necessary to rebuild the pavement using an underdrain design or possibly adding subsurface drainage along the perimeter of the parking area.
- IF THERE IS AN UNDERDRAIN OR THE SOIL IS SUITABLE FOR INFILTRATION, the best approach to try to unclog the pavement is restorative sweeping with a vacuum sweeper. Regenerative air sweepers may not have enough suction to relieve the clogging.
- If vacuum sweeping is not successful, it may be necessary to rebuild any layers fouled with sediment and fines. It is likely that this will be confined to the bedding layer and gravel used in the paver stone joints, but some clogging can possibly move down into the underlying stone reservoir layer.
- The North Carolina State University (NCSU) Stormwater Engineering Group has an informative Urban Waterways publication, *Maintaining Permeable Pavements (2011):* **http://www.bae.ncsu.edu/stormwater/pubs.htm**

Water standing on the parking surface 48 to 72 hours after a storm is an indication of clogging. Snow piles at the edge of the photo point to possible clogging from winter sanding or plowing.

Sand/Organic Filters:

- See the section above on Bioretention/Swales as some of the procedures will be similar, especially for above-ground filters.
- Also see Section 4.7 – Sediment Buildup for guidance on routine maintenance of the sedimentation and filter chambers.
- As with Bioretention, there can be various causes for clogged filters:
- Filter fabric layer under the filter media that has blinded or clogged
- Clogging of the surface of the filter layer or filter cartridges
- Bad filter media (e.g., sand or organic media)
- “Plumbing” issues with configuration of overflow and underdrain pipes
- Fortunately, filters are usually confined within concrete vaults or manholes, so diagnosing and rectifying clogging problems should be more straightforward. Check the original design or as-built plans. Some of the following guidance may also be helpful:
- For proprietary cartridge or special filter media structures, consult the vendor or manufacturer for recommended solutions.
- See Section 4.7 for guidance on removing the top layer of filter media and replacing with clean material, as well as vacuuming out any sedimentation chambers.
- If it is suspected that overflow or outlet pipes are not configured correctly, check against the design plans and also standard drawings from the manufacturer.
- Chronic clogging problems are likely due to excessively dirty drainage areas, including uncontrolled sources of sediment, oil and grease washoff, vegetative debris from surrounding trees or shrubs, or other sources. It will be important to check and resolve any controllable sources of clogging in the drainage area (see **Section 4.2 – Contributing Drainage Area**).

Standing water on the parking lot is evidence that this perimeter sand filter (under the sidewalk) is clogged.

Helpful Skills:

- Soil infiltration analysis techniques as per ASTM and/or current BMP design specifications
- Excavation, dewatering, and sediment disposal in some cases
- Knowledge of maintenance equipment, such as vac trucks, street sweepers, etc.
- Knowledge of preferred conditions for bioretention, sand/organic filter media, or standard permeable pavement types and bedding layers
- General practice of trying easier or less expensive strategies before jumping right to wholesale reconstruction of a practice

Equipment Typically Used for Unclogging Activities:

- Soil infiltration testing or geotechnical equipment
- Small or large excavators, loaders, dewatering equipment (pumps, dirt bags, etc.), trucks to haul material to on-site or off-site disposal or reuse areas, erosion and sediment control supplies
- Pavement demolition and repair equipment
- Mulch, plants, filter media, and other materials needed to rebuild practices

4.9. Vegetation

Issue Applies Most Commonly To: Swales, Tree Planting, Bioretention, Green Roofs, and Ponds/Wetlands

Problem #1: Not enough vegetation; vegetation *is unhealthy*

Bioretention, Swales, Tree Planting:

- Test soil/media to ensure proper conditions exist for plant survival.
- Check water drawdown after a storm to make sure that wet/saturated conditions are not the cause of plant failure. If this IS an issue, see **Section 4.8 – Clogging.**
- Amend or enhance soil as needed; soil may need more organic material to support plants, but do NOT use uncomposted organic material or animal waste, as it will likely export undesirable nutrients to the stormwater system.
- If plants have continued to die, consider a different species or entire planting palette or revised planting plan **(photo to right shows the need for a whole new planting plan)**. Also consider using an appropriate bioretention or swale native seed mix to supplement use of plugs or other nursery stock.
- Consult a horticulturalist or plant nursery if there is evidence of disease or pests.
- Replant and add mulch or ground cover as needed.

Ponds and Wetlands:

- See **Section 4.13 – Pool Quality** for general guidance on pond and wetland vegetation maintenance, as well as the following.
- For emergent vegetation, determine whether water depths are too deep or shallow for survival (i.e., depths are different from design depths, or original design included improper vegetation).
- If a small amount of supplemental vegetation is needed, plant wetland plugs per nursery guidance.
- For large-scale plantings, drain the permanent pool and plant during the early spring.

Green Roof:

- Consult with a green roof plant vendor about possible causes of plant failure. Lack of watering during initial establishment could be the main culprit.
- Work with a qualified vendor to develop and install a new planting plan.
- Speak with building facilities maintenance personnel to ensure they understand need for watering and caring for new plants after they are installed.

Helpful Skills:

- Landscaping/gardening
- Consult with Cooperative Extension Office or independent laboratory for soil testing
- If original planting plan is deemed inadequate, consult a landscape architect or horticulturalist to determine whether a revised planting plan is needed.
- Knowledge of native plant and/or wetland plant nurseries in general region

Problem #2: Too much vegetation, overgrown (with invasive species), not maintained

General Approach for All Practices:

- Determine which invasive plants are present. For a list of regulated and prohibited invasive plants in New York State, see *New York State Prohibited and Regulated Plants* (NYS DEC, NYS Agriculture and Markets, 2014) at: http://www.dec.ny.gov/docs/lands_forests_pdf/isprohibitedplants2.pdf . Invasive plants shall be properly disposed of in a manner that renders them non-living and non-viable to prevent the establishment, introduction or spread of disposed species.
- Review whether the original planting plan relied on these plants; for example, some wetland plans may rely on "aggressive colonizers" such as cat tails.
- For more detailed information regarding appropriate control measures for each species, consult the Cornell Cooperative Extension Invasive Species Program at the following link: http://ccetompkins.org/environment/invasive-nuisance-species/invasive-plants. If invasives have taken over the facility, wholesale removal and replanting with desirable species may be necessary.
- If (non-invasive) plants are overgrown, (**example in photo to right**), remove, thin, or trim back excessive vegetation.
- If an entire new planting plan is deemed necessary, use SMP-Specific Guidance in the remainder of this manual, along with landscaping goals for the site location, to devise a plan that allows for adequate growth over a long period of time. A simple, clear planting design (**example in photo below**) with a long-term plan has the best chance of being maintained through time. Maintenance crews need to know which plants are part of the design versus weeds and how the practice should look from year to year.
- Develop a plan to ensure proper weeding, pruning, trimming, and replanting to maintain the plan over time.
- See **Section 4.13 – Pool Quality** for general guidance on pond and wetland vegetation maintenance, as well as the following.

Helpful Skills:

- Knowledge of exotic and invasive species is needed. Consult a local Cooperative Extension Office.
- Specific measures may include mechanical hand pulling, regrading (requires construction equipment), or herbicide/pesticide application *safe for aquatic environments*.
- Landscape architect
- Knowledge of wetland plants (for ponds/wetlands)
- Knowledge of SMP design (to understand hydrologic regime for plant selection)

Equipment Typically Used for Vegetation Maintenance Activities

- Soil auger to diagnose issues of soil drainage that may affect vegetation health
- Rakes, shovels, wheelbarrows, and other "landscaping" equipment
- Light excavation or grading equipment for larger jobs
- Equipment to deliver, unload, and move soil media, mulch, and other materials
- Plants and/or seed mix, plus a way to move and store plant stock without damaging it or drying it out
- Planting bars, soil drills, etc.
- For planting in standing water (e.g., ponds, wetlands), pumps or pump-around systems and dirt bags or other ways to temporarily dewater planting area

4.10. Embankment and Overflow Condition

Issue Applies Most Commonly To: Swales, Bioretention, and especially Ponds/Wetlands

Problem #1: Rill and channel erosion and bare dirt areas of embankments

Bioretention, Swales:

- Erosion and areas of bare dirt indicate two basic issues: 1) soils and moisture levels are not suitable for the plants or turf used; and 2) vegetation cannot take hold because of concentrated flow, physical wear, or poor soil conditions. Address these issues first with a soil/media test to ensure proper conditions exist for plant survival.
- High salt content from winter deicing of pavement is a common culprit of poor soil conditions for roadside plants. If this is the case, restore area with plant species that can tolerate salt levels, or replace edge plants with a stone diaphragm to intercept runoff from road.
- Amend or enhance soil as needed; soil may need more organic material to support dense ground cover.
- For concentrated flow and physical wear, redirect concentrated flow so that it disperses in mulched and vegetated areas. Stake in mulch and replant with vigorous plants recommended through the soils test.
- If plants have continued to die, consider a different species or entire planting palette or a revised planting plan (see **Section 4.9 – Vegetation and photo to right)**. Also consider using an appropriate bioretention or swale native seed mix to supplement use of plugs or other nursery stock.
- Consult a horticulturalist or plant nursery if there is evidence of disease or pests.
- Replant and add mulch or ground cover as needed.

Ponds and Wetlands:

- Where erosion has deposited soil within the pond or wetland water line, remove this material and reshape the slope.
- If a small amount of supplemental vegetation is needed, plant wetland plugs per nursery guidance.
- To address rill and channel erosion, first obtain a soil sample test to get soil amendment recommendations. Undercut the eroded sections and replace with clean amended soil, based on the soil test, and reseed as appropriate for the season.
- It may be necessary to stake in seed blankets or erosion-resistant lining (e.g., erosion-control matting or even rock in extreme situations) to stabilize eroded areas. Again, choose seed types appropriate for the season.
- Based on soil test guidance, reseed bare areas to prevent further erosion.
- For persistent problems, reroute the flow to more stable receiving areas using berms, diversions, etc.

Helpful Skills:

- Landscaping/gardening
- Consult with Cooperative Extension Office or independent laboratory for soil testing.
- If original planting plan is deemed inadequate, consult a landscape architect or horticulturalist to determine whether a revised planting plan is needed.
- Knowledge of sediment and erosion control practices and resources appropriate for the area

Problem #2: Settlement, loss of armoring material, erosion of emergency overflow

General Approach for All Practices:

- Settlement, loss of armoring material, erosion and accumulated debris can affect the dimension, water velocity or capacity of the emergency overflow such that embankment failure could occur in flood events (**photos below**).
- Inspect for exposure of soil or geotextile base material in the overflow and rearmor areas of exposure.
- In cases of settlement, a qualified engineer should be sought to assess its capacity and impact on pond capacity.
- Erosion of spillways should be repaired and revegetated as described for embankments.

Helpful Skills:

- Knowledge of sediment and erosion control practices for the area
- Completion of self-guided training on dam safety through Association of State Dam Safety Officials: http://www.damsafety.org

Problem #3: Impounding structure (embankment or dam) integrity issues due to tunneling or digging animals, woody vegetation or seepage

Ponds/Wetlands:

- Impounding structure stability is a serious concern, especially where trees have become established on the slopes, or there's evidence of animal burrows or seepage.
- The best approach for trees on the crest, slopes, and adjacent to an impounding structure or embankment is to cut them down before they reach significant size. If large trees have been cut down but their root systems not removed, carefully monitor the area around the remaining stumps for signs of seepage.
- Exercise judgement for trees on the surrounding side slopes that are NOT impounding structures (not designed to hold back water in the pool). Sometimes a forested edge can enhance the appeal of a pond, but access for maintenance must also be available, and some trees can drop debris into ponds, leading to quality issues.
- Animal burrows can be dangerous to the structural integrity of the embankment because they weaken it and can create pathways for seepage. Professional exterminators may be needed to trap and remove animal pests.
- Seepage as water flow or boiling sand on the lower portion of the exterior slope or toe area of an impounding structure should be brought to the attention of a qualified engineer.
- Leakage around conveyance structures such as barrel pipes or spillways should be monitored for increase since the last inspection. A qualified engineer is needed to resolve issues of piping or seepage along the barrel pipe through a dam.
- Turbidity or cloudiness in seepage should also be brought to the attention of a qualified engineer.

Helpful Skills:

- Completion of self-guided training on dam safety through the Association of State Dam Safety Officials: http://www.damsafety.org

Equipment Typically Used for Embankment and Overflow Maintenance Activities

- Excavation or grading equipment for larger jobs
- Equipment to deliver, unload, and move soil media, mulch, and other materials
- Plants and/or seed mix, seed blanket and erosion control materials
- Rod and level for settlement measurements
- Clear glass bottle for seepage visual test

4.11. Structural Damage

Issue Applies Most Commonly To: Any Practice

Problem: Structural damage to pipes, headwalls, standpipes, inlet/outlet structures, grates, curbs, and other structural components

- Structural components are necessary for water to flow into and out of stormwater practices as intended. This is a broad category that involves components composed of concrete, metal, plastic, and other materials. Some common examples include:
- Deteriorated or broken curbs that allow water to bypass a practice
- Slumping or sinkholes where soil meets a concrete drop inlet or outlet structure
- Broken or collapsed inlets
- Connections in an inlet or manhole structure that are not parged and are leaky
- Collapsed or crushed pipes (especially corrugated metal)
- Missing or broken steps or other safety features in a manhole or riser structure
- Root penetration and clogging of underdrain or other pipes
- Broken check dams
- There are too many particular instances to mention here, but the general idea is to inspect and repair any structural components that are affecting the performance of a practice or leading to a potential health or safety issue.

Helpful Skills:

- General contracting skills—concrete work, metal, proper joint sealing
- Routing out clogged pipes
- Perhaps CCTV experience to look for broken or clogged pipes

Equipment Typically Used for Fixing Erosion:

- General contracting
- CCTV

4.12. Pool Stability

Issue Applies Most Commonly To: Ponds/Wetlands

Problem: Flooded or dry pond – outlet issues

General Approach for Ponds and Wetlands:

- Note high-water marks on structures or pond banks and compare with outlet structure weir.
- If the outlet weir is submerged, investigate downstream for plugs such as beaver dams, woody debris or sediment bars. Refer to **Section 4.3 – Physical Obstructions** for removal of obstructions.
- If the pond is retaining more water than it is supposed to and there is no flow from the outlet with no visible blockages in the outlet pipe, look for obstructions above the weir or outlet pipe. Woody debris, vegetation and silt can plug outfall weirs or blind rock outfall protection. Removal of such blockages tends to be a hand exercise. A jet/vacuum truck or other heavy equipment may be needed to clear excessive or precarious blockages (**photo on right**).
- If the pond is too low and not holding water in the designated pool, the outlet structure should be closely inspected to see whether it has settled from the original construction or there is leakage through joints or cracks. Finding no deficiencies with the structure, investigate the pond embankment as described in **Section 4.10** for evidence of seepage.
- If there is no evidence of seepage and the outlet structure has no apparent structural defects, an engineer should be consulted to review the pond design and determine the proper outlet elevation.

Helpful Skills:

- The ability to navigate uneven surfaces, to follow ditch banks and to sight drainage obstructions is implicit with this task.
- Ability to use a level to sight adequate elevation fall is helpful.

Equipment Typically Used for Pool Stability Evaluations

- Bright flashlight for pipe inspection
- Manhole hook for manhole cover access
- Brush hook to clear debris and walking surfaces
- Rod and level to check elevation differentials

4.13. Pool Quality

Issue Applies Most Commonly To: Ponds/Wetlands

Problem #1: Littoral shelves and pond edge: not enough vegetation; vegetation *is unhealthy;* invasive plants have taken over

Ponds and Wetlands:

- If there is not enough vegetation or no vegetation, determine whether maintenance practices have killed the plants. If so, work with the owner to educate those responsible for pond maintenance on correct methods. Consult plans for original planting and replant.
- For emergent vegetation, determine whether water depths are too deep or shallow for survival (i.e., depths are different from design depths, or original design included improper vegetation).
- If a small amount of supplemental vegetation is needed, plant wetland plugs per nursery guidance.
- For large-scale plantings, drain the permanent pool and plant during the early spring.If ponds are overgrown so that less than 25% of the surface area is visible, the pond water level should be lowered to enable selective plant removal.
- Invasive plants, such as phragmites or common reed, should be removed with their roots. Be sure to restore areas that have been disturbed with replacement vegetation because root removal exposes soil to erosion. Invasive plants shall be properly disposed of in a manner that renders them non-living and non-viable to prevent the establishment, introduction or spread of disposed species.
- Native plants selected based on environmental conditions have the greatest chance for survival.
- Consult a horticulturalist or plant nursery if there is evidence of disease or pests.

Helpful Skills:

- Landscaping/gardening
- If original planting plan is deemed inadequate, consult a landscape architect or horticulturalist to determine whether a revised planting plan is needed.
- Knowledge of native plants and/or wetland plant nurseries in general region
- Familiarity with New York invasive terrestrial and wetland plants and their control: http://nyis.info/

Problem #2: Pond color, scum, odor, algae and plant overgrowth

- Ponds that have algae covering more than 20% of the surface should have maintenance to remove it. Raking or mechanical harvesting of filamentous algae offers short-term control, but feasible long-term strategies should be considered.
- Pond maintenance companies should be relied on to identify the algae and appropriately control them. Pond specialists can control the algae growth in ponds, but its growth and reproduction are dependent on nutrients. When nutrients are in abundance, so will be the algae or vegetation.
- Plants can be used in shallow shelfs at inlets to take up nutrients, but they must be maintained and cuttings removed to take nutrients out of the pond system.
- If (non-invasive) plants are overgrown, remove or trim back excessive vegetation. Remove cuttings and trimmings. Do not allow vegetative debris to remain in the pond.
- Pond clarity and color can be impacted by excessive sediment discharge or flow shortcircuiting. For issues of clarity and color, follow the recommendations in **Section 4.7 – Sediment Buildup**.
- If invasive aquatic plants are identified, follow DEC guidelines for reporting and controlling invasives (see **Section 4.9 – Vegetation**).
- Some color, odor, and pond quality issues can be caused by leaks, spills, and other releases in the drainage area. Any petroleum odor or oily sheen (aside from natural rainbow sheen associated with decomposition of organic matter) should be reported to the appropriate state or local response agency. Other peculiar colors or odors can be investigated in collaboration with relevant agencies. Common issues are grease, paint, or other substances poured into storm drains, dumpster management, and stockpiles of various materials exposed to rainfall.

Helpful Skills:
• Ability to recognize invasive aquatic plants • Specific measures may include mechanical hand pulling, regrading (requires construction equipment), or herbicide/pesticide application *safe for aquatic environments*. • Knowledge of wetland plants and common types of algae and aquatic weeds • Knowledge of types of pond maintenance practices
Equipment Typically Used for Pool Quality Investigations
• High-top rubber boots • Canoes or small boats • Brush hook to clear vegetation and access pond bank • Secchi disk to check and compare pond color and clarity • Large-mouth bottle to collect algae and water quality samples • Various materials to control aquatic weeds and algae

Section 5. Planning for Stormwater Maintenance

Often, stormwater practices fall into disrepair because there is no plan in place for ensuring that they are maintained over time. As a result, maintenance can become reactive in nature, resulting in high costs for repairing damaged practices or practices becoming ineffective over time. This section outlines some key elements of stormwater maintenance planning, including:

1. Program models for stormwater maintenance
2. Inspection and maintenance checklists
3. Planning for the costs of stormwater maintenance
4. Identifying the need for infrequent maintenance items

5.1. Program Models for Stormwater Maintenance

The Maintenance Hierarchy concept (See Section 1) is discussed throughout this chapter, but the individuals who will conduct the Level 1, Level 2 and Level 3 inspections and maintenance will vary depending on how the local program is administered. While this chapter does not focus on program elements, it is important to note that the local program requirements will influence who performs ongoing maintenance. This will play an important role in how to develop a comprehensive maintenance plan.

Although there are many options for implementing a stormwater plan, they can be described by three broad categories, including: 1) Private Maintenance; 2) Local Program; and 3) Hybrid Approach. Understanding the program in the local community will influence the best techniques for developing the maintenance plan (**Table 5.1**).

Option 1: Private Maintenance

In this option, maintenance is the responsibility of the private land owner. In regulated MS4s, however, the land owner will periodically report to the local government. In this model, it is important to ensure that the maintenance plan is very easy to understand and includes pictures of key practice elements. If possible, include a list of contractors who will be able to perform maintenance items and how much these will cost. Finally, materials should point homeowners to resources so that they can learn more about the practices on their property. DEC’s Maintenance Photo Library and Training Materials webpage (link) can be useful tools for this purpose.

Option 2: Local Government Maintenance

In this option, the local government takes over maintenance responsibility for all stormwater practices. While it is still important to develop a clear and simple plan, the designer can assume some level of training or supervision for the individuals conducting inspections and maintenance. For publicly maintained practices, it is helpful to find out what resources the local government has in place for developing the plan. These resources may be in the form of existing reporting and tracking procedures, which can be modified for the specific practice, or equipment such as vacuum sweepers. Maintenance access should be made available to local government staff through official easements.

Option 3: Hybrid Approach

In the hybrid approach to stormwater maintenance, larger practices or practices on public land are maintained by the local government, and smaller practices on private property are maintained by the owner. There are other hybrid models, however. For example, the local government may take responsibility for inspections but leave the owner responsible for maintenance items identified during the inspection.

Table 5.1 Maintenance Considerations for Three Program Options

Program Option	Inspection/Maintenance Performed By:	Key Considerations for the Designer
Option 1: Private	Level 1: Property owner or HOA Level 2: Private Contractor Level 3: Certified Contractor	Make the plan very simple and graphic intensive. Include a list of contractors if applicable. Provide links to educational materials.
Option 2: Local Program	Level 1: Interns or Untrained Staff Level 2: Trained Local Staff Level 3: City/Town Engineer or other individual hired by the city or town	Learn about the resources the local program has at its disposal. If government staff are being trained, develop a maintenance plan that is consistent with their knowledge and understanding. Be aware of equipment and materials on hand in this community.
Option 3: Hybrid Approach	Inspection is typically divided, where larger practices or those on private property are maintained by the public entity.	Understand how this maintenance is divided, and develop a plan that is consistent with this arrangement.

Special Considerations for Green Infrastructure Practices

Because many of the Green Infrastructure practices included in this manual, such as Tree Planting, Rain Gardens and Sheetflow and Level Spreaders, are implemented at a very small scale, they present a unique challenge in terms of stormwater maintenance. These practices are more likely to be located on private property. As a result, the designer needs to consider the *Private Maintenance* model. Maintenance plans for these small practices should be as simple as possible, and the designer should ensure that maintenance can be completed with readily available materials.

5.2. Inspection and Maintenance Checklists and Documentation

The checklists included in this chapter are specific to the maintenance hierarchy. The maintenance plan should include inspection checklists for all three hierarchies. In addition, these checklists should be modified to identify the specific practice elements included in each design. The materials developed as a part of the maintenance plan should be provided to the practice owner and local government. (See **Table 5.2**)

Table 5.2. Customizing Checklists and Guidance

Hierarchy	Checklist/Checklist Guidance	Tips for Customizing
Level 1	**Section 2** includes both the checklists and guidance.	Add photographs of the practice (once installed), and include a simple aerial photograph of the site to locate the practice. Include key local government contacts and contractors along with the checklist.
Level 2	**Section 3** includes guidance on how to respond to the Level 1 Inspection and/or activate a Level 3 investigation. **Appendix B** includes routine inspection checklists for the Level 2 Inspector.	Modify to remove elements that are not in this particular practice.
Level 3	Guidance is included in **Sections 3 and 4**.	Typically, this will not need to be modified.

5.3. Budgeting for Maintenance

A maintenance plan should include a budget for annual maintenance. In the Public Maintenance model, a single entity (the local government) will be responsible for maintenance of many practices, so the cost of maintenance for an individual practice may not be as important as estimating the average cost of maintenance across all practices. For privately maintained practices, on the other hand, it is very helpful to develop a cost estimate that is as accurate as possible for the specific location. As a result, two options for estimating costs are presented here, including:

- **Option 1**: Average or Unit Costs
  Generalized cost data are used to estimate an annual cost. This option may be used for a municipality or other institution that manages a large number of practices.
- **Option 2:** Detailed Individual Practice Budget
  Annual costs are estimated using more detailed practice information, as well as more detailed estimates of labor and materials costs.

Option 1: Average or Unit Costs

In this option, annual maintenance costs are estimated on a per-acre basis or based on a percentage of the construction costs. These prices typically range from about 1% to 4% of the construction costs (King and Hagan, 2011; **Table 5.3**).

Table 5.3 Typical Maintenance Costs (Source: King and Hagan, 2011; Adjusted to 2015 Costs)

Practice	Annual Maintenance Cost (% of Construction)	Annual Maintenance Cost ($/cubic foot of the water quality volume–WQV—treated)
Buffers	4%	$0.25-$0.35
Tree Planting	4%	$0.35
Ponds and Wetlands	4%	$0.22-$0.35
Infiltration Trench/ Basin	2%	$0.25
Filtering Practices	4%	$0.41-$0.47
Bioretention	4%	$0.44
Swales	3%	$0.18-$0.26
Permeable Pavement	1%	$0.64-$0.89

While the costs in **Table 5.3** may be a reasonable starting point, it is important to note that the actual data will vary greatly, depending on labor rates and materials costs. For example, the hourly “Open Shop” labor rate for rough grading is approximately $27/hour in Elmira and $38/hour in New York City (Means, 2015). In addition, costs for labor, materials and equipment will vary depending on the maintenance arrangement (**Table 5.4**).

Table 5.4 Variability in Maintenance Costs Based on Maintenance Arrangement			
Maintenance Arrangement	**Labor**	**Materials**	**Equipment**
Public Maintenance (Municipality)	Level 1: Intern Wage Level 2: Staff Salary Level 3: Professional Staff or Contractor	Low: Materials bought in bulk.	Low: Typically owned by Public Works or similar department.
Private Maintenance (Homeowner)	Level 1: Homeowner (Free) or Contractor Level 2: Private Landscaper or Contractor Level 3: Professional Contractor	High: Materials purchased in small quantities.	High: Specialized equipment needs to be rented if needed.
Private Maintenance (Commercial or HOA)	Level 1: Free (with HOA volunteers) or Contracted Labor Rate Level 2: Private Landscaper or Contractor Level 3: Professional Contractor	Varies: Materials may be bought in bulk or on a small scale, depending on the size of the private entity.	High: Specialized equipment needs to be rented if needed.

Option 2: Site-Based Costs

Because both the unit costs of labor and materials and the average annual costs of maintenance can be so highly variable, more detailed data will be needed to estimate costs at a particular site. One approach for estimating these costs is to generate a list of routine maintenance items, along with associated unit costs for labor, materials and equipment. This approach requires the user to enter basic design data for the practice, as well as information regarding local labor rates and other general costs. In the bioretention example below, unit costs are used to estimate routine maintenance costs, including inspections and regular maintenance.

Example Annual Cost Estimation: Bioretention

An example cost estimation for a bioretention cell follows below. The cost estimation tool used in the Maintenance Chapter will be automated. This example demonstrates how the unit cost and typical frequency data will be used to estimate average annual maintenance costs. In it, we are estimating annual maintenance costs for a bioretention practice with characteristics summarized in **Table 5.5**. **Table 5.6** then summarizes activities, their frequency and extent, and associated labor costs.

Using the assumptions for this practice, the annual costs for routine maintenance would be $1,828 ($1.15/cubic foot of Water Quality Volume) in the first year and $1,468 ($0.90/cf WQv) in subsequent years. This value is much higher than the $0.44/cf estimated using general cost data (**Table 5.3**). However, significant cost savings could be realized by using volunteer or intern-level labor for Level 1 inspections and routine maintenance.

Table 5.5. Assumptions for Bioretention Cost Example

Practice Design		**Unit Costs**	
Water Quality Volume (cf)	1,600	Level 1 Labor ($/hr)	$15
Forebay Volume (cf)	400	Level 2 Labor ($/hr)	$35
Total Practice Area (sf)	2,000	Mulch ($/cy)	$10
Filter Area (sf)	1,000	Plants ($/plant)	$1
Ponding Area (sf)	1,500	Trash Tipping Fee	$25
Slope Area (sf)	500	Seed/Mulch for a small area	$10
Turf Area (sf)	No Turf	Average Cost for a PVC Replacement Part (Planning Level)	$100
Inlets (#)	1		

Table 5.6. Bioretention Example - Routine Maintenance Costs

Task	Frequency (x/year, Decimal)	Typical Extent	Extent	Hours (Unit)	Hours/yr	Level	Materials and Equipment	Annual Costs		
								Labor	Materials and Equipment	Total
Level 1 Inspection - 1 to 5-acre drainage	1	Practice	1	1 per inspection	1	1		$15		$15
Level 2 Inspection - 1 to 5-acre drainage	0.2	Practice	1	2 per inspection	0.4	2		$14		$14
Watering - grass and plants: Year 1	16	Weekly for first growing season, over filter surface area	1,000	0.5 per 400 sf area	24	1	Assume minimal cost for water	$360		$360
Trash and Debris Removal	4	Ponding area	1,500	1 per 400 sf practice surface area	15	1	Assume $25 Tipping Fee for Each Trip	$225	$100	$325
Weeding	2	Assume 50% of practice area	1,000	4 per 400 sf practice surface area	20	1		$300		$300
Mulching	1	Ponding area	1,500	4 per 400 sf area	15	1	Bark mulch; assume 15 cy/application	$225	$150	$375
Sediment Removal (minor)	1	Assume one small area per inlet	1	1 per small area	1	1		$15		$15
Erosion Repair (minor)	1	Inlets; assume 25 sf/practice	25	1 per 25 sf	1	1	Seed, mulch and topsoil	$15	$10	$25
Erosion Repair (minor)	1	10% of slope area	50	1 per 25 sf	2	1	Seed, mulch and topsoil	$30	$20	$40
Minor Regrading	0.5	1 spot per 400 sf of practice area	5	1 per repair	2.5	2	Assume done by hand	$88		$88
Planting (plants)	0.2	Assume 50% of practice area	1,000	8 per200 sf	8	1	Assume 500 plants/planting	$120	$100	$220
Minor PVC or Metal Repairs (observation well cap, PVC riser, grates)	0.2	1 per practice	1	1 per repair	0.2	2	Assume about a $100 piece of equipment	$7	$20	$27
Sediment Removal (small forebay)	0.2	per forebay	1	2 per forebay	0.4	2	Assume removal by hand	$14		$14
							Total Costs - Year 1	**$1,428**	**$400**	**$1,828**
							Total Costs - Subsequent Years	**$1,068**	**$400**	**$1,468**

5.4. Planning for “Non-Routine” Maintenance

If the guidance provided in this chapter is followed and practices are designed properly, the routine maintenance (and budget guidance in **Section 5.3**) should be sufficient to keep a practice functioning indefinitely, but planning is needed for infrequent maintenance items. In the initial maintenance plan, identify a few of the most likely infrequent items. If initial routine inspections start to identify a more serious problem, develop a plan and budget for performing the repairs. To be more conservative, another option is to provide a contingency budget to plan for non-routine repairs over the life of the practice.

Note: Maintenance and repairs that rise to a Level 3 inspection may require permits from the NYS DEC and/or US Army Corps of Engineers if they are undertaken within or adjacent to regulated wetlands or other waters of the U.S.

Stormwater Management System Maintenance/Inspection Summary List						
		Inspection/Maintenance Frequency				
Item	**Notes**	**Monthly**	**Quarterly**	**Semi-Annual**	**Annual**	**Long Term**
	Rain Garden					
	Bioretention area & contributing areas	x				
	Yard Waste	x				
Debris Clean Out	Litter includes branches and trash	x				
	Plant height less than water depth	x				
	Fertilized per specifications	x				
	Plant composition	x				
	No placement of inappropriate plants	x				
	Grass height not greater than 6"	x				
Vegetation	No evidence of erosion	x				
	No evidence of sediment buildup				x	After Every Major Storm
	Sumps should not be more than 50% full of sediment				x	
Check Dams/Energy Dissipaters	No evidence of erosion at downstream toe of slope structures				x	
	Dewatering	x				
Dewatering	No evidence of standing water	x				
	Swale clean of sediments				x	
Sediment Deposition	Sediment should not be ≥ 20% of swale design depth				x	
	Good condition, no need for repair				x	After Every Major Storm
	No evidence of erosion				x	
Outlet/Overflow Spillway	No evidence of any blockage				x	
Integrity of Filter Bed	Filter bed has not been blocked or filled inappropriately				x	
	Infiltration Basin					
	Basin Surface	x				
	Inflow pipes	x				
	Inlet Area	x				
Debris Clean Out	Overflow soillways	x				
	Obviously trapping sediment				x	
Sediment Traps/Forebays	Greater than 50% of storage volume remaining				x	
Dewatering	Basin dewatering between storms	x				
	No evidence of sedimentation in trench				x	
Sediment Cleanout of Basin	Sediment accumulation doesn't yet require cleanout				x	
	Good condition				x	
Inlets	No evidence of erosion				x	
	Good condition, no need for repair				x	
Outlet/Overflow Spillway	No evidence of erosion				x	
	Open Channel					
Debris Clean Out	Contributing areas clean of debris	x				
	No evidence of flow going around structures	x				
	No evidence of erosion at downstream toe	x				
	Soil permeability	x				
Check Dams/Energy Dissipaters	Groundwater/bedrock	x				
	Mowing done when needed	x				
	Minimum mowing depth not exceeded	x				
	No evidence of erosion	x				
Vegetation	Fertilized per specifications	x				
Dewatering	Dewaters between storms	x				
Sediment Deposition	Clean of sediment				x	
	Good condition, no need for repairs				x	
Outlet/Overflow Spillway	No evidence of erosion				x	
	Dry Well					
	Overflow pipes	x				
	Inflow pipes	x				
Debris Clean Out	Gutters & Down spouts				x	
	Observe sediment				x	50% of storage volume-Cleanout
	Condition (no need for repairs)				x	
Sediment Sump	Inlet & Outlet Pipe Condition				x	
Dry Well Dewatering	Dewatering between storms (48 hours)	x				
	Sediment accumulation-Observation port				x	
	Inlet & Overflow Pipe Conditions				x	
Dry Well	Condition/repairs				x	
	Soil Restoration					
	General condition	x			x	First year/ Annual-ongoing
	Grass condition (reseed as necessary)	x			x	As needed
	Evidence of erosion	x			x	First year/Annual-ongoing
Restored Areas	Water every 3 days	x				First month
	Water 1/2 inch per week	x				First year/after first month
	Fertilization-Fall (after first growing season)				x	
	Evidence of compaction				x	
	Green Roof					
	Weeding of invasive species	x		x (after 1st year)		
	Watering	x (first 2-years)	x (starting 3-year)			
Vegetation	Fertilizing per specification			x		
	Membrane integrity & safety			x		
	Leakage			x		
Membranes	Nondestructive testing of waterproofing assembly					Before expiration of contractors warranty Every 5 years
Debris Clean Out	Roof drains cleared of soils substrate, vegetation or clogs			x		
	Sealant on sheet metal flashing				x	
Structural	Metal counter flashings					After major wind events
	Porous Pavement					
	Ensure paving area clean of debris	x				
Debris Clean Out	Vacuum sweep/Pressure washing frequently to keep surface free of sediments		x			
Dewatering	Ensure paving area dewaters between storms	x				After >0.5" storm events
Sediment Deposition	Ensure area is clean of sediments	x				
	Mow upland and adjacent areas					As needed
Vegetation	Seed bare areas					As needed
Surface	Inspect for deterioration or spalling				x	
	Ponds					
	Vegetation and ground cover					
	Embankment erosion					
	Animal burrows					
	Unauthorized plantings					
	Cracking, bluding, or sliding of dam					
Embankment & Emergency Spillway	Upstream and downstream face					
	At or beyond toe upstream and downstream				x	After major storm event
	Emergency spillway					
	Pond toe and chimney drains clear and functioning					
	Seeps/leaks on downstream face					
	Slope protection or riprap failure					
	Vertical/horizontal alignment of top of dam "As-built"					
	Emergency spillway clear of obstructions and debris					
	Low flow ofrice obstruction					
	Low flow trash rack-removal of debris & corrosion control					
	Weir trash rack-debris removal & corrosion control					
	Excessive sediment accumulation insider riser					
Riser and Principal Spillway	Concrete/masonry condition riser and barrels: cracks/displacement, major/minor spalling, joint fractures, water tightness				x	
	Metal piping condition					
	Control valve: operational/exercised, chained & locked					
	Pond valve: operational/exercised, chained & locked					
	Outfall channels functioning					
	Sediment noted	x				
Sediment Forebays	Sediment cleanout when depth <50% design depth	x				
	Undesirable vegetative growth	x				
	Floating or floatable debris removal required	x				
	Visible pollution	x				
Permanent Pool	Shoreline problem	x				
	Riprap failures				x	After major storm events
	Slope erosion					
	Storm drain pipes					
Outfalls	Enwalls/headwalls					
	Encroachment on pond, wetland or easements	x				
	Complaints from residents	x				
Other	Aesthetics: grass mowing, graffiti removal, condition of maintenance access routes, signs of hydrocarbon buildup and public hazards	x				
	General					
Sweeping	Paved areas parking lots and roads				x	
Mowing	Grass tributary areas				x	
	Check for erosion areas					
Site Inspections	Vegetation growth-80%			x		Monthly inspection first 3 months post-construction
	Depth of sediment in all structures					
Debris and Litter	Removal form catch basins, culvert inlets and outlets	x				Daily litter removal from identified areas

Open Channel Operation, Maintenance, and Management Inspection Checklist		
Project:		
Location:		
Site Status:		
Date:		
Time:		
Inspector:		
Note: See the Stormwater Management System Maintenance/Inspection Summary List for Inspection Frequency		
Maintenance Item	**Satisfactory/Unsatisfactory**	**Comments**
A. Debris		
Contributing Areas Clean of Debris		
B. Check Dams or Energy Dissipaters		
No evidence flow going around structure		
No evidence of erosion at downstream toe		
Soil Permeability		
Groundwater/bedrock		
C. Vegetation*		
Mowing done when needed		
Minimum mowing depth not exceeded		
No evidence of erosion		
Fertilized per specification		
D. Dewatering		
Dewaters between storm		
Comments		
Actions to be taken or have been taken		

*Dry swale shall have a vegetation height of no greater than 4 to 6 inches to be maintained during the growing season.

Soil Restoration Operation, Maintenance, and Management Inspection Checklist		
Project:		
Location:		
Site Status:		
Date:		
Time:		
Inspector:		
Note: See the Stormwater Management System Maintenance/Inspection Summary List for Inspection Frequency		
Maintenance Item	**Satisfactory/Unsatisfactory**	**Comments**
A. Restored Areas-First Year		
Grass area condition (Reseed as necessary)		
Evidence of erosion		
Water every 3 days (First Month)		
Water weekly (First year-1/2 inch per week)		
B. Restored Areas-Ongoing		
Grass area condition (Reseed as necessary)		
Evidence of erosion		
Evidence of compaction		
Fertlization		
Comments		
Actions to be taken or have been taken		

General Site Operation, Maintenance, and Management Inspection Checklist		
Project:		
Location:		
Site Status:		
Date:		
Time:		
Inspector:		
Note: See the Stormwater Management System Maintenance/Inspection Summary List for Inspection Frequency		
Maintenance Item	**Satisfactory/Unsatisfactory**	**Comments**
A. Sweeping		
Paved areas (driveways/parking areas)		
B. Mowing		
Grass Areas		
C. Debris & Litter		
Removal from culverts, swales, grass areas		
D. Overall Site		
Check for erosion areas		
Depth of sediment in all structures		
Vegetation growth (80%)		
Comments		
Actions to be taken or have been taken		

Appendix I: Spill or Incident Report Form

Spill or Incident Report Form

Instructions: Complete for any type of petroleum product or hazardous materials/waste spill or incident. Provide a copy of this report to management.

1. **Personnel Involved in Spill Reporting:**

Project Office: Name, Title, and Phone Number:

____

Regional Environmental Office: Name, Title, and Phone Number:

____

2. **Contractor**

Name and Title of Person Responsible for Spill Response:

____

Phone Number: ____

3. **General Spill Information**

Common Name of Spilled Substance: ____

Quantity Spilled (Estimate): ____

Describe Concentration of Material (Estimate): ______________________________________

Date of Spill: ____/____/_____

Time Spill Started: _____AM _____PM Time Spill Ended: ____AM ____PM

4. **Spill Location and Conditions**

Project Title: ____

Street Address and/or Milepost, City: ____

Weather Conditions: ____

If Spill to Water: ____

Name of Water Body (if ditch or culvert, identify the water body that the structure discharges to):

____

Identify the Discharge Point: ____

Estimate the Depth and Width of the Water body: ____________________________________

Estimate Flow Rate (i.e. slow, moderate, or fast): ___________________________________

Describe Environmental Damage (i.e. fish kill): ______________________________

5. **Actions Taken**

To Contain Spill or Impact of Incident: ______________________________

To Cleanup Spill or Recover from Incident: ______________________________

To Remove Cleanup Material: ______________________________

To Document Disposal: ______________________________

To Prevent Reoccurrence: ______________________________

6. **Reporting the Spill**

Spills to water: Immediately call the National Response Center (1-800-424-8802), Emergency Management/NYSDEC Spill Response Hotline (1-800-457-7362) and appropriate Ecology Regional Office.

Spills to soil that may be an immediate threat to health or the environment (i.e. explosive, flammable, toxic vapors, shallow groundwater, nearby creek, etc.): Call the appropriate Ecology Regional Office immediately. If not immediately threating, but may be a threat to human health or the environment, report to Ecology within 90 days.

Note: Project specific permits may have additional reporting requirements.

List all agencies contacted; including names, dates, and phone numbers for people you spoke with:

____

____

____

Record ERTS #, if issued by Ecology: ______________________________

7. **Person Responsible for Managing Termination/Closure of Incident or Spill**:

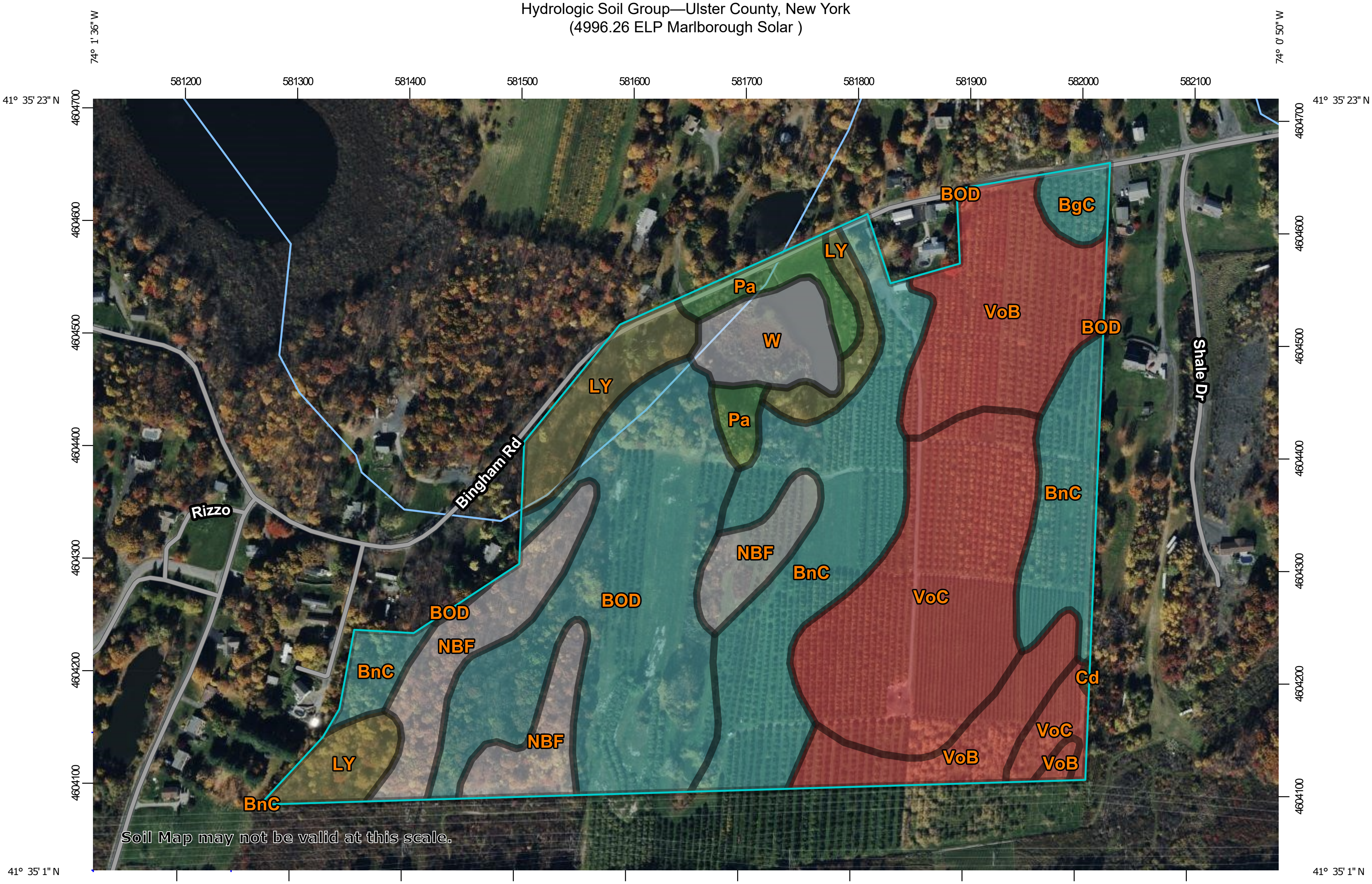
Name and Phone: ______________________________

Address and Fax: ______________________________

8. **Additional Notes/Information (if necessary)**:

Appendix J: USDA Soil Survey Maps

Hydrologic Soil Group—Ulster County, New York
(4996.26 ELP Marlborough Solar)



Map Scale: 1:4,830 if printed on A landscape (11" x 8.5") sheet.

0 50 100 200 300 Meters

0 200 400 800 1200 Feet

N

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 1:15,800.

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:
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: Ulster County, New York
Survey Area Data: Version 22, Sep 5, 2023

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

Date(s) aerial images were photographed: Oct 21, 2022—Oct 27, 2022

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

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BgC	Bath gravelly silt loam, 8 to 15 percent slopes	C	0.9	1.4%
BnC	Bath-Nassau complex, 8 to 25 percent slopes	C	13.8	20.9%
BOD	Bath-Nassau-Rock outcrop complex, hilly	C	13.6	20.5%
Cd	Canandaigua silt loam, till substratum	C/D	0.0	0.1%
LY	Lyons-Atherton complex, very stony	C/D	5.2	7.8%
NBF	Nassau-Bath-Rock outcrop complex, very steep		7.0	10.6%
Pa	Palms muck	A/D	2.0	2.9%
VoB	Volusia gravelly silt loam, 3 to 8 percent slopes	D	9.9	14.9%
VoC	Volusia gravelly silt loam, 8 to 15 percent slopes	D	11.5	17.3%
W	Water		2.4	3.7%
Totals for Area of Interest			**66.4**	**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.

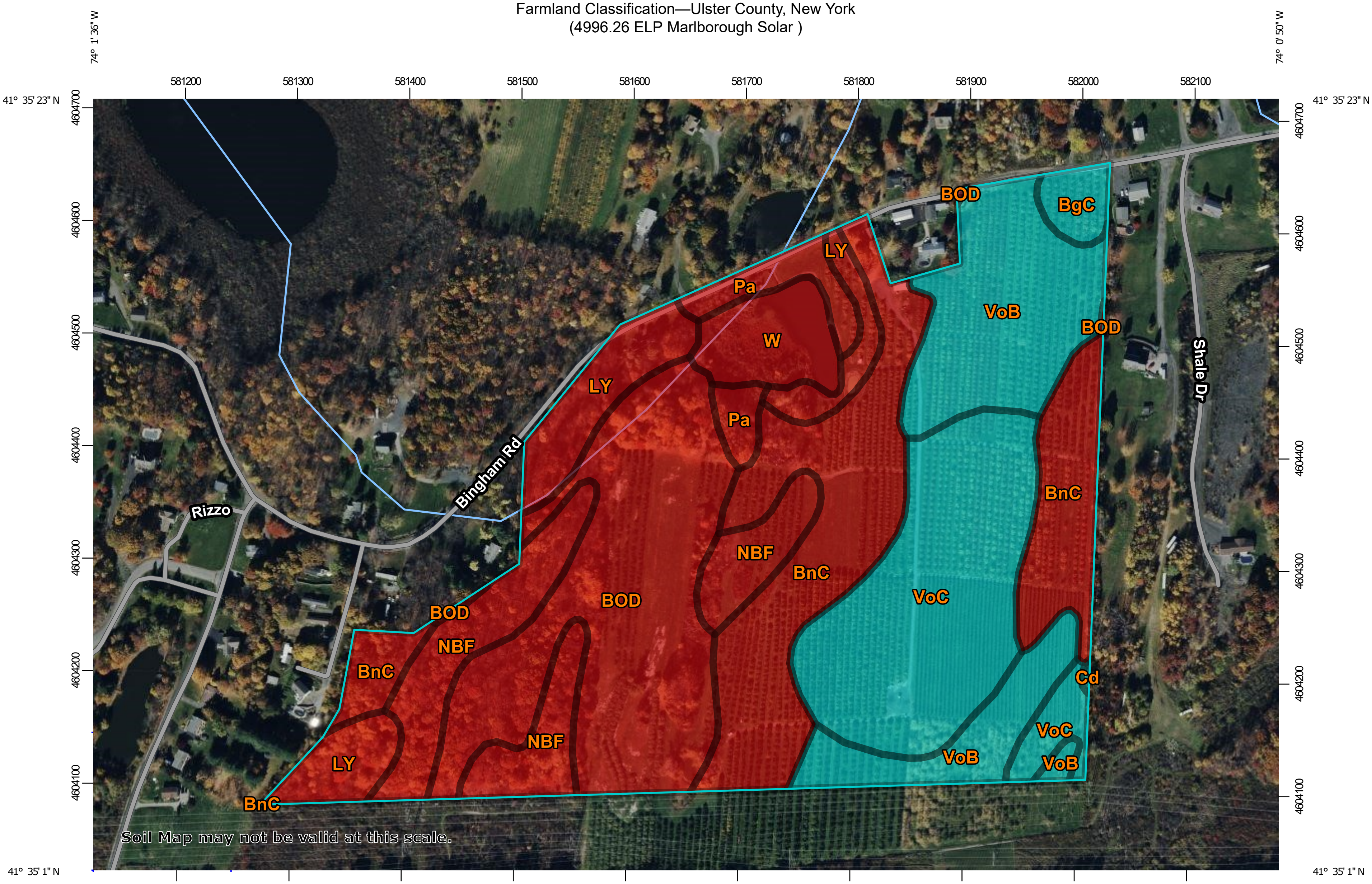
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Farmland Classification—Ulster County, New York
(4996.26 ELP Marlborough Solar)



Map Scale: 1:4,830 if printed on A landscape (11" x 8.5") sheet.

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

N

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

Not prime farmland

All areas are prime farmland

Prime farmland if drained

Prime farmland if protected from flooding or not frequently flooded during the growing season

Prime farmland if irrigated

Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Prime farmland if irrigated and drained

Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

Prime farmland if subsoiled, completely removing the root inhibiting soil layer

Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Prime farmland if irrigated and reclaimed of excess salts and sodium

Farmland of statewide importance

Farmland of statewide importance, if drained

Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if irrigated

Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if irrigated and drained

Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer

Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium

Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if warm enough

Farmland of statewide importance, if thawed

Farmland of local importance

Farmland of local importance, if irrigated

Farmland of unique importance

Not rated or not available

Soil Rating Lines

Not prime farmland

All areas are prime farmland

Prime farmland if drained

Prime farmland if protected from flooding or not frequently flooded during the growing season

Prime farmland if irrigated

Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Prime farmland if irrigated and drained

Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated
- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated

Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if irrigated and drained

Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer

Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium

Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if warm enough

Farmland of statewide importance, if thawed

Farmland of local importance

Farmland of local importance, if irrigated

Farmland of unique importance

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:15,800.

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:
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: Ulster County, New York
Survey Area Data: Version 22, Sep 5, 2023

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

Date(s) aerial images were photographed: Oct 21, 2022—Oct 27, 2022

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.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BgC	Bath gravelly silt loam, 8 to 15 percent slopes	Farmland of statewide importance	0.9	1.4%
BnC	Bath-Nassau complex, 8 to 25 percent slopes	Not prime farmland	13.8	20.9%
BOD	Bath-Nassau-Rock outcrop complex, hilly	Not prime farmland	13.6	20.5%
Cd	Canandaigua silt loam, till substratum	Farmland of statewide importance	0.0	0.1%
LY	Lyons-Atherton complex, very stony	Not prime farmland	5.2	7.8%
NBF	Nassau-Bath-Rock outcrop complex, very steep	Not prime farmland	7.0	10.6%
Pa	Palms muck	Not prime farmland	2.0	2.9%
VoB	Volusia gravelly silt loam, 3 to 8 percent slopes	Farmland of statewide importance	9.9	14.9%
VoC	Volusia gravelly silt loam, 8 to 15 percent slopes	Farmland of statewide importance	11.5	17.3%
W	Water	Not prime farmland	2.4	3.7%
Totals for Area of Interest			**66.4**	**100.0%**

Description

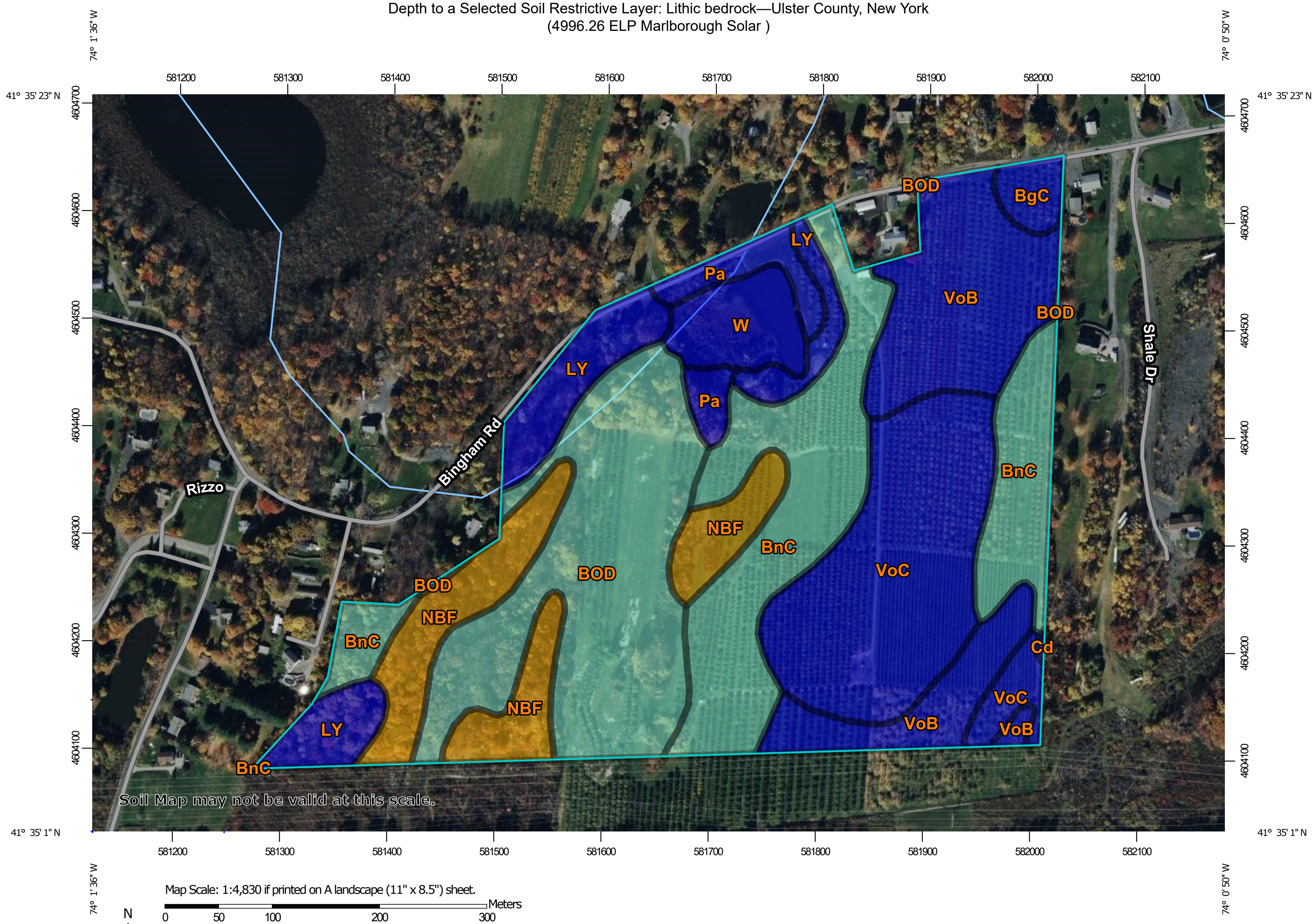
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Depth to a Selected Soil Restrictive Layer: Lithic bedrock—Ulster County, New York
(4996.26 ELP Marlborough Solar)



Map Scale: 1:4,830 if printed on A landscape (11" x 8.5") 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

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- Not rated or not available

Soil Rating Lines

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- Not rated or not available

Soil Rating Points

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- 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 1:15,800.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Survey Area Data: Version 22, Sep 5, 2023

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Date(s) aerial images were photographed: Oct 21, 2022—Oct 27, 2022

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Depth to a Selected Soil Restrictive Layer: Lithic bedrock

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
BgC	Bath gravelly silt loam, 8 to 15 percent slopes	>200	0.9	1.4%
BnC	Bath-Nassau complex, 8 to 25 percent slopes	122	13.8	20.9%
BOD	Bath-Nassau-Rock outcrop complex, hilly	122	13.6	20.5%
Cd	Canandaigua silt loam, till substratum	>200	0.0	0.1%
LY	Lyons-Atherton complex, very stony	>200	5.2	7.8%
NBF	Nassau-Bath-Rock outcrop complex, very steep	41	7.0	10.6%
Pa	Palms muck	>200	2.0	2.9%
VoB	Volusia gravelly silt loam, 3 to 8 percent slopes	>200	9.9	14.9%
VoC	Volusia gravelly silt loam, 8 to 15 percent slopes	>200	11.5	17.3%
W	Water	>200	2.4	3.7%
Totals for Area of Interest			**66.4**	**100.0%**

Description

A "restrictive layer" is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers.

This theme presents the depth to the user selected type of restrictive layer as described in for each map unit. If no restrictive layer is described in a map unit, it is represented by the "greater than 200" depth class.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Restriction Kind: Lithic bedrock

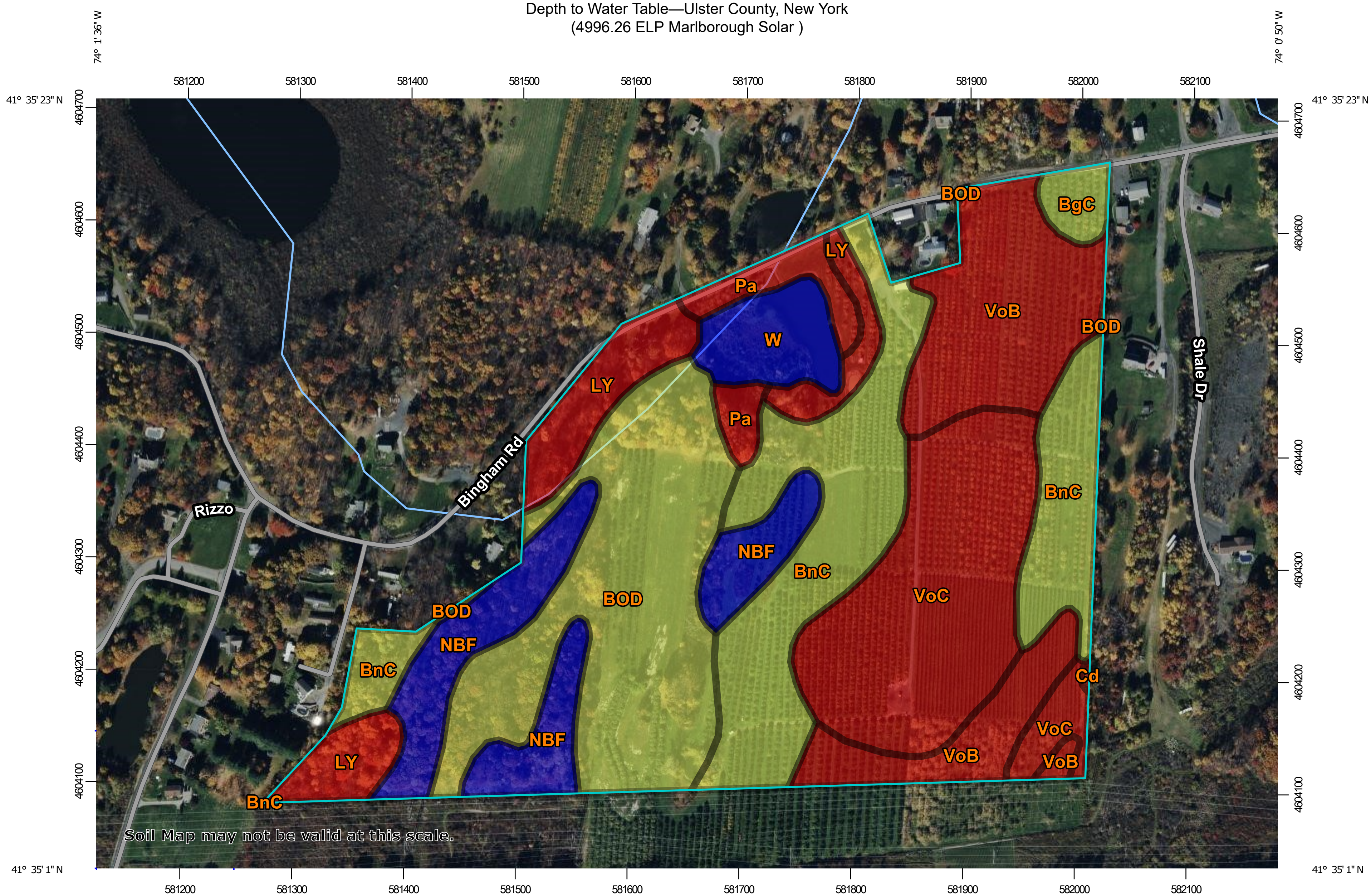
Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Depth to Water Table—Ulster County, New York
(4996.26 ELP Marlborough Solar)



Map Scale: 1:4,830 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 50, 100, 200, 300

Feet: 0, 200, 400, 800, 1200

N

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

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

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 1:15,800.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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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.

Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
BgC	Bath gravelly silt loam, 8 to 15 percent slopes	69	0.9	1.4%
BnC	Bath-Nassau complex, 8 to 25 percent slopes	69	13.8	20.9%
BOD	Bath-Nassau-Rock outcrop complex, hilly	69	13.6	20.5%
Cd	Canandaigua silt loam, till substratum	0	0.0	0.1%
LY	Lyons-Atherton complex, very stony	0	5.2	7.8%
NBF	Nassau-Bath-Rock outcrop complex, very steep	>200	7.0	10.6%
Pa	Palms muck	0	2.0	2.9%
VoB	Volusia gravelly silt loam, 3 to 8 percent slopes	21	9.9	14.9%
VoC	Volusia gravelly silt loam, 8 to 15 percent slopes	21	11.5	17.3%
W	Water	>200	2.4	3.7%
Totals for Area of Interest			**66.4**	**100.0%**

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December

Appendix K: Agency Correspondence

April 09, 2024

Jamie Fordyce
VC Renewables
14 Arrow St
Suite 22
Cambridge, MA 02139

Re: DEC
ELP Marlborough Solar/5MW/28 Acres of 80.1 Acre Parcel
335 Bingham Rd, Marlborough, Ulster County, NY 12542
24PR02195

Dear Jamie Fordyce:

Thank you for requesting the comments of the Office of Parks, Recreation and Historic Preservation (OPRHP). We have reviewed the project in accordance with the New York State Historic Preservation Act of 1980 (Section 14.09 of the New York Parks, Recreation and Historic Preservation Law). These comments are those of the OPRHP and relate only to Historic/Cultural resources. They do not include potential environmental impacts to New York State Parkland that may be involved in or near your project.

Based upon this review, it is the opinion of OPRHP that no properties, including archaeological and/or historic resources, listed in or eligible for the New York State and National Registers of Historic Places will be impacted by this project.

If further correspondence is required regarding this project, please be sure to refer to the OPRHP Project Review (PR) number noted above. If you have any questions, please contact Tabitha O'Connell at the following email address:

Tabitha.OConnell@parks.ny.gov

Sincerely,

Roger Daniel Mackay

R. Daniel Mackay

Deputy Commissioner for Historic Preservation
Division for Historic Preservation

Appendix L: NYSDEC Blue Book Specification Sheets

STANDARD AND SPECIFICATIONS FOR COMPOST FILTER SOCK

Definition & Scope

A **temporary** sediment control practice composed of a degradable geotextile mesh tube filled with compost filter media to filter sediment and other pollutants associated with construction activity to prevent their migration offsite.

Condition Where Practice Applies

Compost filter socks can be used in many construction site applications where erosion will occur in the form of sheet erosion and there is no concentration of water flowing to the sock. In areas with steep slopes and/or rocky terrain, soil conditions must be such that good continuous contact between the sock and the soil is maintained throughout its length. For use on impervious surfaces such as road pavement or parking areas, proper anchorage must be provided to prevent shifting of the sock or separation of the contact between the sock and the pavement. Compost filter socks are utilized both at the site perimeter as well as within the construction areas. These socks may be filled after placement by blowing compost into the tube pneumatically, or filled at a staging location and moved into its designed location.

Design Criteria

1. Compost filter socks will be placed on the contour with both terminal ends of the sock extended 8 feet upslope at a 45 degree angle to prevent bypass flow.

2. Diameters designed for use shall be 12” – 32” except that 8” diameter socks may be used for residential lots to control areas less than 0.25 acres.

3. The flat dimension of the sock shall be at least 1.5 times the nominal diameter.

4. The **Maximum Slope Length** (in feet) above a compost filter sock shall not exceed the following limits:

Dia. (in.)	Slope %						
	2	5	10	20	25	33	50
8	225*	200	100	50	20	—	—
12	250	225	125	65	50	40	25
18	275	250	150	70	55	45	30
24	350	275	200	130	100	60	35
32	450	325	275	150	120	75	50

* Length in feet

5. The compost infill shall be well decomposed (matured at least 3 months), weed-free, organic matter. It shall be aerobically composted, possess no objectionable odors, and contain less than 1%, by dry weight, of man-made foreign matter. The physical parameters of the compost shall meet the standards listed in Table 5.2 - Compost Standards Table. **Note: All biosolids compost produced in New York State (or approved for importation) must meet NYS DEC’s 6 NYCRR Part 360 (Solid Waste Management Facilities) requirements. The Part 360 requirements are equal to or more stringent than 40 CFR Part 503 which ensure safe standards for pathogen reduction and heavy metals content. When using compost filter socks adjacent to surface water, the compost should have a low nutrient value.**

6. The compost filter sock fabric material shall meet the

7. Compost filter socks shall be anchored in earth with 2" x 2" wooden stakes driven 12" into the soil on 10 foot centers on the centerline of the sock. On uneven terrain, effective ground contact can be enhanced by the placement of a fillet of filter media on the disturbed area side of the compost sock.

8. All specific construction details and material specifications shall appear on the erosion and sediment control constructions drawings when compost filter socks are included in the plan.

Maintenance

1. Traffic shall not be permitted to cross filter socks.

2. Accumulated sediment shall be removed when it reaches half the above ground height of the sock and disposed of in accordance with the plan.

3. Socks shall be inspected weekly and after each runoff event. Damaged socks shall be repaired in the manner required by the manufacturer or replaced within 24 hours of inspection notification.

4. Biodegradable filter socks shall be replaced after 6 months; photodegradable filter socks after 1 year. Polypropylene socks shall be replaced according to the manufacturer's recommendations.

5. Upon stabilization of the area contributory to the sock, stakes shall be removed. The sock may be left in place and vegetated or removed in accordance with the stabilization plan. For removal the mesh can be cut and the compost spread as an additional mulch to act as a soil supplement.

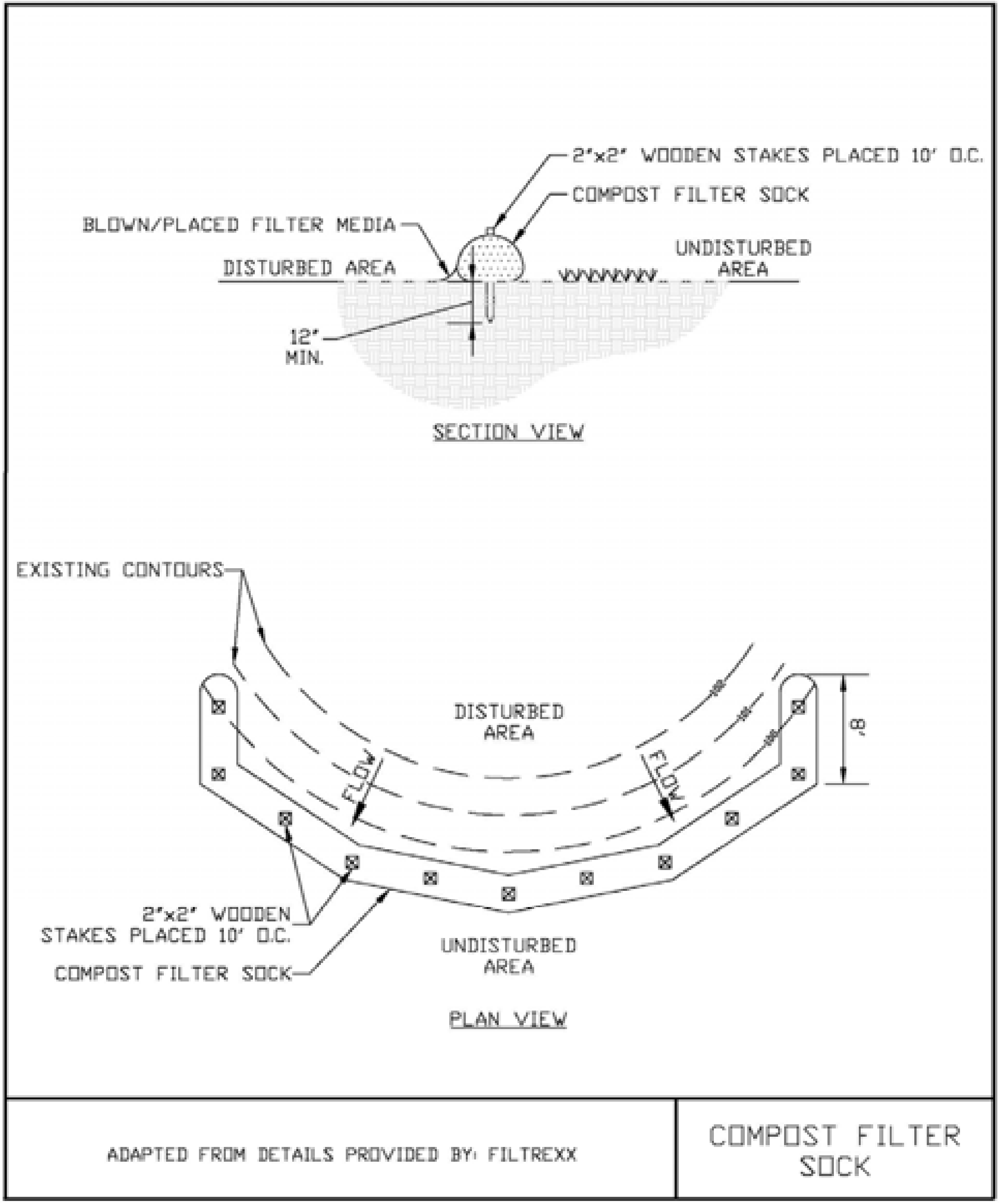
Table 5.1 - Compost Sock Fabric Minimum Specifications Table

Material Type	3 mil HDPE	5 mil HDPE	5 mil HDPE	Multi-Filament Polypropylene (MFPP)	Heavy Duty Multi-Filament Polypropylene (HDMFPP)
Material Characteristics	Photodegradable	Photodegradable	Biodegradable	Photodegradable	Photodegradable
Sock Diameters	12" 18"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"
Mesh Opening	3/8"	3/8"	3/8"	3/8"	1/8"
Tensile Strength		26 psi	26 psi	44 psi	202 psi
Ultraviolet Stability % Original Strength (ASTM G-155)	23% at 1000 hr.	23% at 1000 hr.		100% at 1000 hr.	100% at 1000 hr.
Minimum Functional Longevity	6 months	9 months	6 months	1 year	2 years

Table 5.2 - Compost Standards Table

Organic matter content	25% - 100% (dry weight)
Organic portion	Fibrous and elongated
pH	6.0 – 8.0
Moisture content	30% - 60%
Particle size	100% passing a 1" screen and 10 - 50% passing a 3/8" screen
Soluble salt concentration	5.0 dS/m (mmhos/cm) maximum

Figure 5.2
Compost Filter Sock



STANDARD AND SPECIFICATIONS FOR SILT FENCE

Definition & Scope

A **temporary** barrier of geotextile fabric installed on the contours across a slope used to intercept sediment laden runoff from small drainage areas of disturbed soil by temporarily ponding the sediment laden runoff allowing settling to occur. The maximum period of use is limited by the ultraviolet stability of the fabric (approximately one year).

Conditions Where Practice Applies

A silt fence may be used subject to the following conditions:

1. Maximum allowable slope length and fence length will not exceed the limits shown in the Design Criteria for the specific type of silt fence used ; and
2. Maximum ponding depth of 1.5 feet behind the fence; and
3. Erosion would occur in the form of sheet erosion; and
4. There is no concentration of water flowing to the barrier; and
5. Soil conditions allow for proper keying of fabric, or other anchorage, to prevent blowouts.

Design Criteria

1. Design computations are not required for installations of 1 month or less. Longer installation periods should be designed for expected runoff.
2. All silt fences shall be placed as close to the disturbed area as possible, but at least 10 feet from the toe of a slope steeper than 3H:1V, to allow for maintenance and roll down. The area beyond the fence must be undisturbed or stabilized.
3. The type of silt fence specified for each location on the plan shall not exceed the maximum slope length and maximum fence length requirements shown in the following table:

		Slope Length/Fence Length (ft.)		
Slope	Steepness	Standard	Reinforced	Super
<2%	< 50:1	300/1500	N/A	N/A
2-10%	50:1 to 10:1	125/1000	250/2000	300/2500
10-20%	10:1 to 5:1	100/750	150/1000	200/1000
20-33%	5:1 to 3:1	60/500	80/750	100/1000
33-50%	3:1 to 2:1	40/250	70/350	100/500
>50%	> 2:1	20/125	30/175	50/250

Standard Silt Fence (SF) is fabric rolls stapled to wooden stakes driven 16 inches in the ground.
Reinforced Silt Fence (RSF) is fabric placed against welded wire fabric with anchored steel posts driven 16 inches in the ground.
Super Silt Fence (SSF) is fabric placed against chain link fence as support backing with posts driven 3 feet in the ground.

4. Silt fence shall be removed as soon as the disturbed area has achieved final stabilization.

The silt fence shall be installed in accordance with the appropriate details. Where ends of filter cloth come together, they shall be overlapped, folded and stapled to prevent sediment bypass. Butt joints are not acceptable. A detail of the silt fence shall be shown on the plan. See Figure 5.30 on page 5.56 for Reinforced Silt Fence as an example of details to be provided.

Criteria for Silt Fence Materials

1. Silt Fence Fabric: The fabric shall meet the following specifications unless otherwise approved by the appropriate erosion and sediment control plan approval authority. Such approval shall not constitute statewide acceptance.

Fabric Properties	Minimum Acceptable Value	Test Method
Grab Tensile Strength (lbs)	110	ASTM D 4632
Elongation at Failure (%)	20	ASTM D 4632
Mullen Burst Strength (PSI)	300	ASTM D 3786
Puncture Strength (lbs)	60	ASTM D 4833
Minimum Trapezoidal Tear Strength (lbs)	50	ASTM D 4533
Flow Through Rate (gal/min/sf)	25	ASTM D 4491
Equivalent Opening Size	40-80	US Std Sieve ASTM D 4751
Minimum UV Residual (%)	70	ASTM D 4355

2. Fence Posts (for fabricated units): The length shall be a minimum of 36 inches long. Wood posts will be of sound quality hardwood with a minimum cross sectional area of 3.5 square inches. Steel posts will be standard T and U section weighing not less than 1.00 pound per linear foot. Posts for super silt fence shall be standard chain link fence posts.

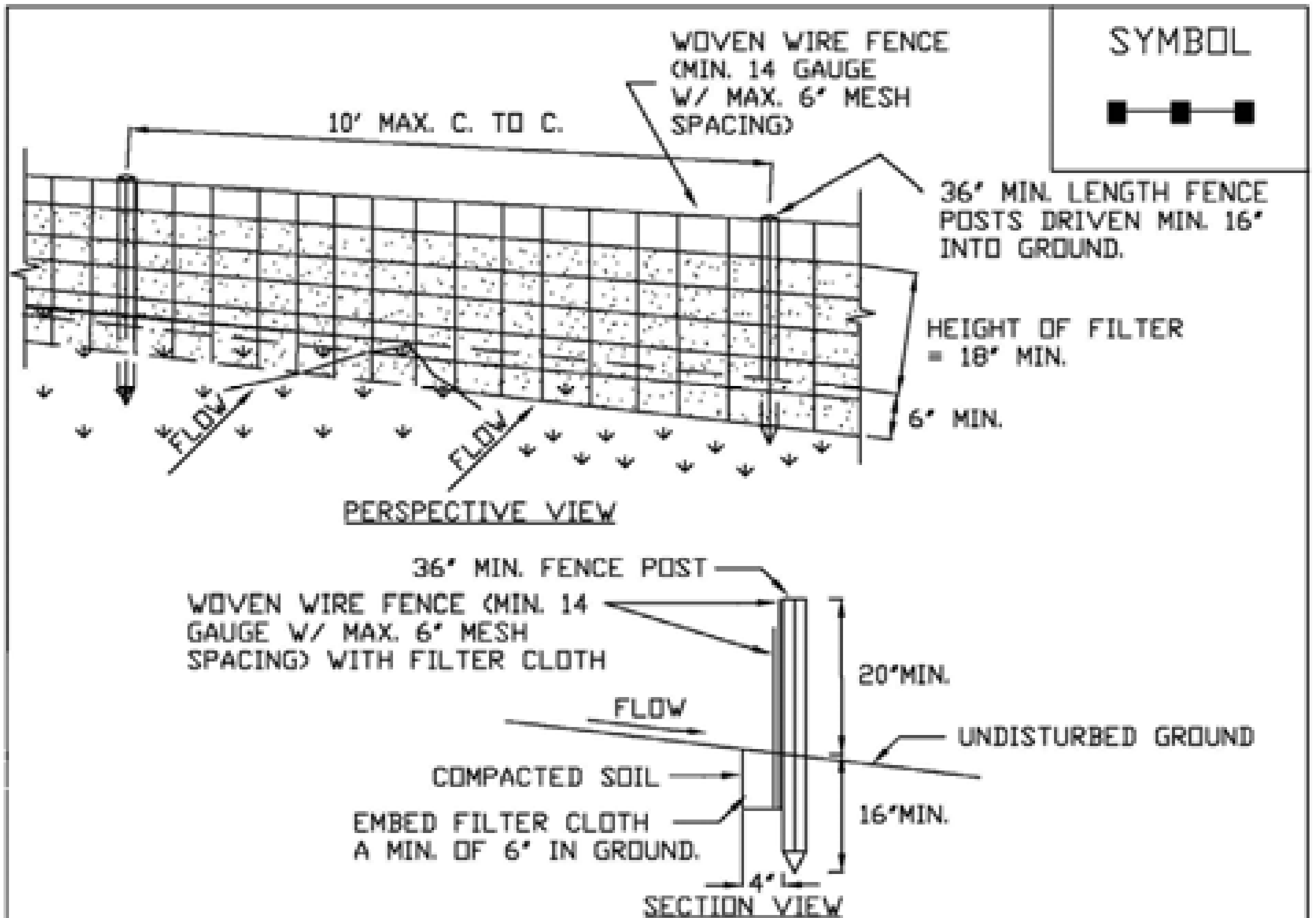
3. Wire Fence for reinforced silt fence: Wire fencing shall be a minimum 14 gage with a maximum 6 in. mesh opening, or as approved.

4. Prefabricated silt fence is acceptable as long as all material specifications are met.

Reinforced Silt Fence

Super Silt Fence

Figure 5.30
Reinforced Silt Fence



CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER-LAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL MEET THE MINIMUM REQUIREMENTS SHOWN.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

REINFORCED
SILT FENCE

STANDARD AND SPECIFICATIONS FOR STORM DRAIN INLET PROTECTION

Definition & Scope

A **temporary** barrier with low permeability, installed around inlets in the form of a fence, berm or excavation around an opening, detaining water and thereby reducing the sediment content of sediment laden water by settling thus preventing heavily sediment laden water from entering a storm drain system.

Conditions Where Practice Applies

This practice shall be used where the drainage area to an inlet is disturbed, it is not possible to temporarily divert the storm drain outfall into a trapping device, and watertight blocking of inlets is not advisable. **It is not to be used in place of sediment trapping devices.** This practice shall be used with an upstream buffer strip if placed at a storm drain inlet on a paved surface. It may be used in conjunction with storm drain diversion to help prevent siltation of pipes installed with low slope angle.

Types of Storm Drain Inlet Practices

There are five (5) specific types of storm drain inlet protection practices that vary according to their function, location, drainage area, and availability of materials:

I. Excavated Drop Inlet Protection
II. Fabric Drop Inlet Protection
III. Stone & Block Drop Inlet Protection
IV. Paved Surface Inlet Protection
V. Manufactured Insert Inlet Protection

Design Criteria

Drainage Area – The drainage area for storm drain inlets shall not exceed one acre. Erosion control/temporary stabilization measures must be implemented on the disturbed drainage area tributary to the inlet. The crest elevations of these practices shall provide storage and minimize bypass flow.

Type I – Excavated Drop Inlet Protection

This practice is generally used during initial overlot grading after the storm drain trunk line is installed.

Limit the drainage area to the inlet device to 1 acre. Excavated side slopes shall be no steeper than 2:1. The minimum depth shall be 1 foot and the maximum depth 2 feet as measured from the crest of the inlet structure. Shape the excavated basin to fit conditions with the longest dimension oriented toward the longest inflow area to provide maximum trap efficiency. The capacity of the excavated basin should be established to contain 900 cubic feet per acre of disturbed area. Weep holes, protected by fabric and stone, should be provided for draining the temporary pool.

Inspect and clean the excavated basin after every storm. Sediment should be removed when 50 percent of the storage volume is achieved This material should be incorporated into the site in a stabilized manner.

Type II – Fabric Drop Inlet Protection

This practice is generally used during final elevation grading phases after the storm drain system is completed.

Limit the drainage area to 1 acre per inlet device. Land area slope immediately surrounding this device should not exceed 1 percent. The maximum height of the fabric above the inlet crest shall not exceed 1.5 feet unless reinforced.

The top of the barrier should be maintained to allow overflow to drop into the drop inlet and not bypass the inlet to unprotected lower areas. Support stakes for fabric shall be a minimum of 3 feet long, spaced a maximum 3 feet apart. They should be driven close to the inlet so any overflow drops into the inlet and not on the unprotected soil. Improved performance and sediment storage volume can be obtained by excavating the area.

Inspect the fabric barrier after each rain event and make repairs as needed. Remove sediment from the pool area as necessary with care not to undercut or damage the filter fabric. Upon stabilization of the drainage area, remove all materials and unstable sediment and dispose of properly. Bring the adjacent area of the drop inlet to grade, smooth and compact and stabilize in the appropriate manner to the site.

Type III – Stone and Block Drop Inlet Protection

This practice is generally used during the initial and intermediate overlot grading of a construction site.

Limit the drainage area to 1 acre at the drop inlet. The stone barrier should have a minimum height of 1 foot and a maximum height of 2 feet. Do not use mortar. The height should be limited to prevent excess ponding and bypass flow.

Recess the first course of blocks at least 2 inches below the crest opening of the storm drain for lateral support. Subsequent courses can be supported laterally if needed by placing a 2x4 inch wood stud through the block openings perpendicular to the course. The bottom row should have a few blocks oriented so flow can drain through the block to dewater the basin area.

The stone should be placed just below the top of the blocks on slopes of 2:1 or flatter. Place hardware cloth of wire mesh with ½ inch openings over all block openings to hold stone in place.

As an optional design, the concrete blocks may be omitted and the entire structure constructed of stone, ringing the outlet ("doughnut"). The stone should be kept at a 3:1 slope toward the inlet to keep it from being washed into the inlet. A level area 1 foot wide and four inches below the crest will further prevent wash. Stone on the slope toward the inlet should be at least 3 inches in size for stability and 1 inch or smaller away from the inlet to control flow rate. The elevation of the top of the stone crest must be maintained 6 inches lower than the ground elevation down slope from the inlet to ensure that all storm flows pass over the stone into the storm drain and not past the structure. Temporary diking should be used as necessary to prevent bypass flow.

The barrier should be inspected after each rain event and repairs made where needed. Remove sediment as necessary to provide for accurate storage volume for subsequent rains. Upon stabilization of contributing drainage area, remove all materials and any unstable soil and dispose of properly.

Bring the disturbed area to proper grade, smooth, compact and stabilize in a manner appropriate to the site.

Type IV – Paved Surface Inlet Protection

This practice is generally used after pavement construction has been done while final grading and soil stabilization is occurring. These practices should be used with upstream buffer strips in linear construction applications, and with temporary surface stabilization for overlot areas, to reduce the sediment load at the practice. This practice includes sand bags, compost filter socks, geo-tubes filled with ballast, and manufactured surface barriers. Pea gravel can also be used in conjunction with these practices to improve performance. When the inlet is not at a low point, and is offset from the pavement or gutter line, protection should be selected and installed so that flows are not diverted around the inlet.

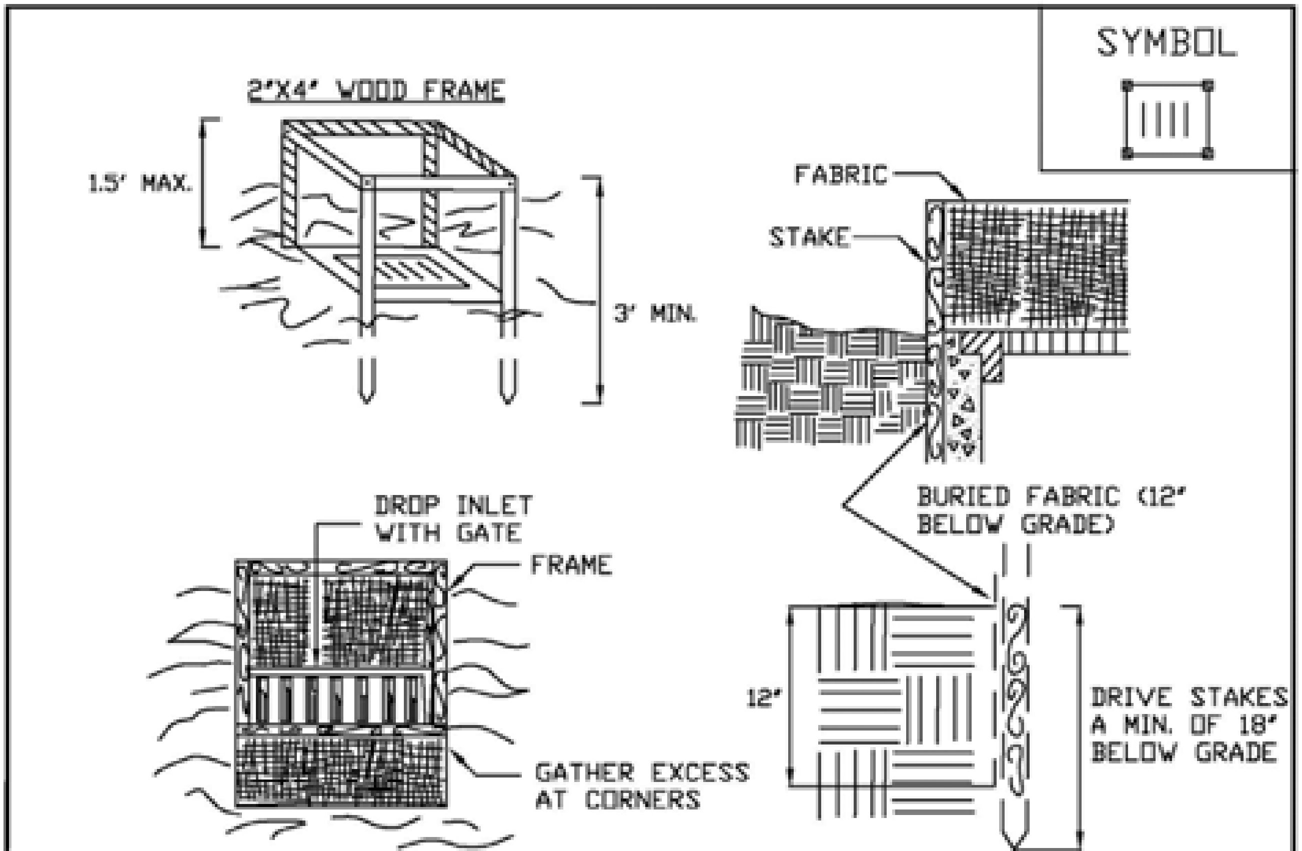
The drainage area should be limited to 1 acre at the drain inlet. All practices will be placed at the inlet perimeter or beyond to maximize the flow capacity of the inlet. Practices shall be weighted, braced, tied, or otherwise anchored to prevent movement or shifting of location on paved surfaces. Traffic safety shall be integrated with the use of this practice. All practices should be marked with traffic safety cones as appropriate. Structure height shall not cause flooding or by-pass flow that would cause additional erosion.

The structure should be inspected after every storm event. Any sediment should be removed and disposed of on the site. Any broken or damaged components should be replaced. Check all materials for proper anchorage and secure as necessary.

Type V - Manufactured Insert Inlet Protection

The drainage area shall be limited to 1 acre at the drain inlet. All inserts will be installed and anchored in accordance with the manufacturers recommendations and design details. The fabric portion of the structure will equal or exceed the performance standard for the silt fence fabric. The inserts will be installed to preserve a minimum of 50 percent of the open, unobstructed design flow area of the storm drain inlet opening to maintain capacity for storm events.

Figure 5.32
Fabric Drop Inlet Protection



CONSTRUCTION SPECIFICATIONS

1. FABRIC SHALL HAVE AN EOS OF 40-85. BURLAP MAY BE USED FOR SHORT TERM APPLICATIONS.
2. CUT FABRIC FROM A CONTINUOUS ROLL TO ELIMINATE JOINTS. IF JOINTS ARE NEEDED THEY WILL BE OVERLAPPED TO THE NEXT STAKE.
3. STAKE MATERIALS WILL BE STANDARD 2" x 4" WOOD OR EQUIVALENT. METAL WITH A MINIMUM LENGTH OF 3 FEET.
4. SPACE STAKES EVENLY AROUND INLET 3 FEET APART AND DRIVE A MINIMUM 18 INCHES DEEP. SPANS GREATER THAN 3 FEET MAY BE BRIDGED WITH THE USE OF WIRE MESH BEHIND THE FILTER FABRIC FOR SUPPORT.
5. FABRIC SHALL BE EMBEDDED 1 FOOT MINIMUM BELOW GROUND AND BACKFILLED. IT SHALL BE SECURELY FASTENED TO THE STAKES AND FRAME.
6. A 2" x 4" WOOD FRAME SHALL BE COMPLETED AROUND THE CREST OF THE FABRIC FOR OVER FLOW STABILITY.

MAXIMUM DRAINAGE AREA 1 ACRE

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	FABRIC DROP INLET PROTECTION

Table 5.8 The Two Design Variations of the Filter Strip and Vegetative Buffer		
Design Issue	**Sheetflow to Riparian Buffer**	**Sheetflow to Grass Filter Strip**
Soil and Ground Cover	Undisturbed Soils and Native Vegetation	Amended Soils and Dense Turf Cover
Construction Stage	Located Outside the Limits of Disturbance and Protected by ESC controls	Prevent Soil Compaction by Heavy Equipment
Typical Application	Adjacent Drainage to Stream Buffer or Forest Conservation Area	Treat small areas of impervious cover (e.g., 5,000 sf) close to source
Compost Amendments	No	Yes
Boundary Spreader	GD at top of filter	GD at top of filter PB at toe of filter
Boundary Zone	10 feet of level grass	At 25 feet of level grass
Concentrated Flow	ELS with 40 to 65 feet long level spreader* per one cfs of low, depending on width of conservation area	ELS with 1ength of level spreader per one cfs of flow
Maximum Slope, First Ten Feet of Filter	Less than 4%	Less than 2%
Maximum Overall Slope	6%	8%
GD: Gravel Diaphragm PB: Permeable Berm. ELS: Engineered Level Spreader, * See the NY Standards and Specifications for Erosion and Sediment Control for the design of level spreaders		

Recommended Application of Practice

- Direct runoff towards undisturbed riparian buffers or filter strips, using sheet flow or a level spreader to ensure sheet flow
- Use natural depressions for runoff storage
- Examine the slope, soils and vegetative cover of the buffer/filter strip
- Disconnect impervious areas to these areas
- Buffers may also be used as pretreatment

STANDARD AND SPECIFICATIONS FOR CONCRETE TRUCK WASHOUT

Definition & Scope

A temporary excavated or above ground lined constructed pit where concrete truck mixers and equipment can be washed after their loads have been discharged, to prevent highly alkaline runoff from entering storm drainage systems or leaching into soil.

Conditions Where Practice Applies

Washout facilities shall be provided for every project where concrete will be poured or otherwise formed on the site. This facility will receive highly alkaline wash water from the cleaning of chutes, mixers, hoppers, vibrators, placing equipment, trowels, and screeds. Under no circumstances will wash water from these operations be allowed to infiltrate into the soil or enter surface waters.

Design Criteria

Capacity: The washout facility should be sized to contain solids, wash water, and rainfall and sized to allow for the evaporation of the wash water and rainfall. Wash water shall be estimated at 7 gallons per chute and 50 gallons per hopper of the concrete pump truck and/or discharging drum. The minimum size shall be 8 feet by 8 feet at the bottom and 2 feet deep. If excavated, the side slopes shall be 2 horizontal to 1 vertical.

Location: Locate the facility a minimum of 100 feet from drainage swales, storm drain inlets, wetlands, streams and other surface waters. Prevent surface water from entering the structure except for the access road. Provide appropriate access with a gravel access road sloped down to the structure. Signs shall be placed to direct drivers to the facility after their load is discharged.

Liner: All washout facilities will be lined to prevent leaching of liquids into the ground. The liner shall be plastic sheeting with a minimum thickness of 10 mils with no holes or tears, and anchored beyond the top of the pit with an earthen berm, sand bags, stone, or other structural appurtenance except at the access point.

If pre-fabricated washouts are used they must ensure the capture and containment of the concrete wash and be sized based on the expected frequency of concrete pours. They shall be sited as noted in the location criteria.

Maintenance

- All concrete washout facilities shall be inspected daily. Damaged or leaking facilities shall be deactivated and repaired or replaced immediately. Excess rainwater that has accumulated over hardened concrete should be pumped to a stabilized area, such as a grass filter strip.
- Accumulated hardened material shall be removed when 75% of the storage capacity of the structure is filled. Any excess wash water shall be pumped into a containment vessel and properly disposed of off site.
- Dispose of the hardened material off-site in a construction/demolition landfill. On-site disposal may be allowed if this has been approved and accepted as part of the projects SWPPP. In that case, the material should be recycled as specified, or buried and covered with a minimum of 2 feet of clean compacted earthfill that is permanently stabilized to prevent erosion.
- The plastic liner shall be replaced with each cleaning of the washout facility.
- Inspect the project site frequently to ensure that no concrete discharges are taking place in non-designated areas.

STANDARD AND SPECIFICATIONS FOR DUST CONTROL

Definition & Scope

The control of dust resulting from land-disturbing activities, to prevent surface and air movement of dust from disturbed soil surfaces that may cause off-site damage, health hazards, and traffic safety problems.

Conditions Where Practice Applies

On construction roads, access points, and other disturbed areas subject to surface dust movement and dust blowing where off-site damage may occur if dust is not controlled.

Design Criteria

Construction operations should be scheduled to minimize the amount of area disturbed at one time. Buffer areas of vegetation should be left where practical. Temporary or permanent stabilization measures shall be installed. No specific design criteria is given; see construction specifications below for common methods of dust control.

Water quality must be considered when materials are selected for dust control. Where there is a potential for the material to wash off to a stream, ingredient information must be provided to the NYSDEC.

No polymer application shall take place without written approval from the NYSDEC.

Construction Specifications

A. **Non-driving Areas –** These areas use products and materials applied or placed on soil surfaces to prevent airborne migration of soil particles.

Vegetative Cover – For disturbed areas not subject to traffic, vegetation provides the most practical method of dust control (see Section 3).

Mulch (including gravel mulch) – Mulch offers a fast effective means of controlling dust. This can also include rolled erosion control blankets.

Spray adhesives – These are products generally composed of polymers in a liquid or solid form that are mixed with water to form an emulsion that is sprayed on the soil surface with typical hydroseeding equipment. The mixing ratios and application rates will be in accordance with the manufacturer's recommendations for the specific soils on the site. In no case should the application of these adhesives be made on wet soils or if there is a probability of precipitation within 48 hours of its proposed use. Material Safety Data Sheets will be provided to all applicators and others working with the material.

B. **Driving Areas** – These areas utilize water, polymer emulsions, and barriers to prevent dust movement from the traffic surface into the air.

Sprinkling – The site may be sprayed with water until the surface is wet. This is especially effective on haul roads and access route to provide short term limited dust control.

Polymer Additives – These polymers are mixed with water and applied to the driving surface by a water truck with a gravity feed drip bar, spray bar or automated distributor truck. The mixing ratios and application rates will be in accordance with the manufacturer's recommendations. Incorporation of the emulsion into the soil will be done to the appropriate depth based on expected traffic. Compaction after incorporation will be by vibratory roller to a minimum of 95%. The prepared surface shall be moist and no application of the polymer will be made if there is a probability of precipitation within 48 hours of its proposed use. Material Safety Data Sheets will be provided to all applicators working with the material.

Barriers – Woven geo-textiles can be placed on the driving surface to effectively reduce dust throw and particle migration on haul roads. Stone can also be used for construction roads for effective dust control.

Windbreak – A silt fence or similar barrier can control air currents at intervals equal to ten times the barrier height. Preserve existing wind barrier vegetation as much as practical.

Maintenance

Maintain dust control measures through dry weather periods until all disturbed areas are stabilized.

STANDARD AND SPECIFICATIONS FOR STABILIZED CONSTRUCTION ACCESS

Definition & Scope

A stabilized pad of aggregate underlain with geotextile located at any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk, or parking area. The purpose of stabilized construction access is to reduce or eliminate the tracking of sediment onto public rights-of-way or streets.

Conditions Where Practice Applies

A stabilized construction access shall be used at all points of construction ingress and egress.

Design Criteria

See Figure 2.1 on page 2.31 for details.

Aggregate Size: Use a matrix of 1-4 inch stone, or reclaimed or recycled concrete equivalent.

Thickness: Not less than six (6) inches.

Width: 12-foot minimum but not less than the full width of points where ingress or egress occurs. 24-foot minimum if there is only one access to the site.

Length: As required, but not less than 50 feet (except on a single residence lot where a 30 foot minimum would apply).

Geotextile: To be placed over the entire area to be covered with aggregate. Filter cloth will not be required on a single-family residence lot. Piping of surface water under entrance shall be provided as required. If piping is impossible, a mountable berm with 5:1 slopes will be permitted.

Criteria for Geotextile: The geotextile shall be woven or nonwoven fabric consisting only of continuous chain polymeric filaments or yarns of polyester. The fabric shall be inert to commonly encountered chemicals, hydro-carbons, mildew, rot resistant, and conform to the fabric properties as shown:

Fabric Properties[3]	Light Duty[1] Roads Grade Subgrade	Heavy Duty[2] Haul Roads Rough Graded	Test Method
Grab Tensile Strength (lbs)	200	220	ASTM D1682
Elongation at Failure (%)	50	60	ASTM D1682
Mullen Burst Strength (lbs)	190	430	ASTM D3786
Puncture Strength (lbs)	40	125	ASTM D751 Modified
Equivalent	40-80	40-80	US Std Sieve
Opening Size			CW-02215
Aggregate Depth	6	10	-

[1]Light Duty Road: Area sites that have been graded to subgrade and where most travel would be single axle vehicles and an occasional multi-axle truck. Acceptable materials are Trevira Spunbond 1115, Mirafi 100X, Typar 3401, or equivalent.

[2]Heavy Duty Road: Area sites with only rough grading, and where most travel would be multi-axle vehicles. Acceptable materials are Trevira Spunbond 1135, Mirafi 600X, or equivalent.

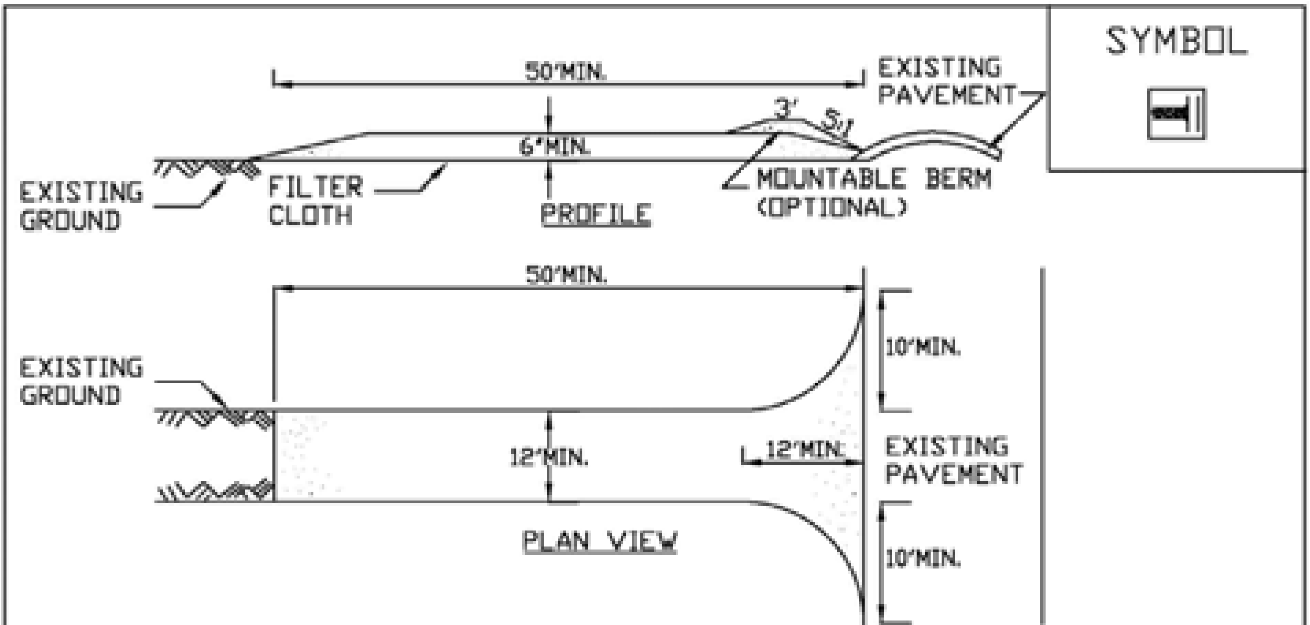
[3]Fabrics not meeting these specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.

Maintenance

The access shall be maintained in a condition which will prevent tracking of sediment onto public rights-of-way or streets. This may require periodic top dressing with additional aggregate. All sediment spilled, dropped, or washed onto public rights-of-way must be removed immediately.

When necessary, wheels must be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with aggregate, which drains into an approved sediment-trapping device. All sediment shall be prevented from entering storm drains, ditches, or watercourses.

Figure 2.1
Stabilized Construction Access



CONSTRUCTION SPECIFICATIONS

1. STONE SIZE - USE 1-4 INCH STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH - NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS - NOT LESS THAN SIX (6) INCHES.
4. WIDTH - TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. GEOTEXTILE - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ACCESS SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON A AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STABILIZED CONSTRUCTION ACCESS

STANDARD AND SPECIFICATIONS FOR WINTER STABILIZATION

Definition & Scope

A temporary site specific, enhanced erosion and sediment control plan to manage runoff and sediment at the site during construction activities in the winter months to protect off-site water resources.

Conditions Where Practice Applies

This standard applies to all construction activities involved with ongoing land disturbance and exposure between November 15th to the following April 1st.

Design Criteria

1. Prepare a snow management plan with adequate storage for snow and control of melt water, requiring cleared snow to be stored in a manner not affecting ongoing construction activities.

2. Enlarge and stabilize access points to provide for snow management and stockpiling. Snow management activities must not destroy or degrade installed erosion and sediment control practices.

3. A minimum 25 foot buffer shall be maintained from all perimeter controls such as silt fence. Mark silt fence with tall stakes that are visible above the snow pack.

4. Edges of disturbed areas that drain to a waterbody within 100 feet will have 2 rows of silt fence, 5 feet apart, installed on the contour.

5. Drainage structures must be kept open and free of snow and ice dams. All debris, ice dams, or debris from plowing operations, that restrict the flow of runoff and meltwater, shall be removed.

6. Sediment barriers must be installed at all appropriate perimeter and sensitive locations. Silt fence and other practices requiring earth disturbance must be installed before the ground freezes.

7. Soil stockpiles must be protected by the use of established vegetation, anchored straw mulch, rolled stabilization matting, or other durable covering. A barrier must be installed at least 15 feet from the toe of the stockpile to prevent soil migration and to capture loose soil.

8. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures should be initiated by the end of the next business day and completed within three (3) days. Rolled erosion control blankets must be used on all slopes 3 horizontal to 1 vertical or steeper.

9. If straw mulch alone is used for temporary stabilization, it shall be applied at double the standard rate of 2 tons per acre, making the application rate 4 tons per acre. Other manufactured mulches should be applied at double the manufacturer's recommended rate.

10. To ensure adequate stabilization of disturbed soil in advance of a melt event, areas of disturbed soil should be stabilized at the end of each work day unless:

    a. work will resume within 24 hours in the same area and no precipitation is forecast or;

    b. the work is in disturbed areas that collect and retain runoff, such as open utility trenches, foundation excavations, or water management areas.

11. Use stone paths to stabilize access perimeters of buildings under construction and areas where construction vehicle traffic is anticipated. Stone paths should be a minimum 10 feet in width but wider as necessary to accommodate equipment.

Maintenance

The site shall be inspected frequently to ensure that the erosion and sediment control plan is performing its winter stabilization function. If the site will not have earth disturbing activities ongoing during the "winter season", **all** bare exposed soil must be stabilized by established vegetation, straw or other acceptable mulch, matting, rock, or other approved material such as rolled erosion control products. Seeding of areas with mulch cover is preferred but seeding alone is not acceptable for proper stabilization.

Compliance inspections must be performed and reports filed properly in accordance with the SWPPP for all sites under a winter shutdown.

References

1. Northeastern Illinois Soil and Sedimentation Control Steering Committee. October 1981. Procedures and Standards for Urban Soil Erosion and Sediment Control in Illinois.
2. J.F. Rushing, V.M. Moore, J.S. Tingle, Q. Mason, and T. McCaffery, 2005. Dust Abatement Methods for Lines of Communication and Base Camps in Temperate Climates. ERDC/GSL TR-05-23, October 2005.

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