PRELIMINARY STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

FLAT CREEK SOLAR PROJECT

TOWNS OF CANAJOHARIE AND ROOT
MONTGOMERY COUNTY, NEW YORK

IN COMPLIANCE WITH THE

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION GENERAL PERMIT GP-0-20-001
FOR
STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITIES

Prepared for:

Flat Creek Solar LLC
c/o Cordelio Power
55 Fifth Avenue, Suite 1805
New York, NY 10003

Prepared by:

TRC
215 Greenfield Parkway, Suite 102
Liverpool, NY 13088

August 2024

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Acronyms:

CRIS	Cultural Resources Information System
DEP	Department of Environmental Protection
DOW	Division of Water
ECL	Environmental Conservation Law
ERM	Environmental Resource Mapper
ESC	Erosion and Sediment Control
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
HDD	Horizontal Directional Drilling
HDPE	High-density polyethylene
HSG	Hydrologic Soil Group
IDF	Intensity-Duration-Frequency
LLC	Limited liability company
MDEP	Maryland Department of Environmental Protection
NCBP	Net Conservation Benefit Plan
NLEB	Northern Long-eared Bat
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NWP	Nationwide Permit
NYCRR	New York Codes, Rules, and Regulations
NYPA	New York Power Authority
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
OPRHP	Office of Parks, Recreation, and Historic Preservation
ORES	Office of Renewable Energy Siting
POI	Point of Interconnection
PVC	Polyvinyl chloride
SDS	Safety data sheets
SMDM	Stormwater Management Design Manual
SMP	Stormwater Management Practices
SPDES	State Pollution Discharge Elimination System
SSA	Sole Source Aquifer
SSESC	Standards and Specifications for Erosion and Sediment Control
SWPPP	Storm Water Pollution Prevention Plan
TCB	Tricolored Bat
USDA	United States Department of Agriculture
USACE	United State Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Service
WRMP	Wetland Restoration and Mitigation Plan

1.0 Introduction

This Stormwater Pollution Prevention Plan (SWPPP) has been prepared by TRC for Flat Creek Solar LLC (the Applicant) in regard to construction activities associated with the Flat Creek Solar Project (the Facility).

The purpose of this SWPPP is to establish requirements and instructions for the management of construction-related stormwater discharges from the Facility Site. Erosion and sediment controls have been designed and shall be installed and maintained to minimize the discharge of pollutants and prevent a violation of the water quality standards.

2.0 Regulatory Requirements

This SWPPP has been prepared in accordance with the "New York State Department of Environmental Conservation (NYSDEC) State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity" General Permit GP-0-20-001, effective January 29, 2020 through January 28, 2025, or most current version. The NYSDEC requires coverage under GP-0-20-001 for any "construction activities involving soil disturbances of one 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."

The Facility is classified as a commercial scale solar project with an increase in impervious area. Per Table 2 of GP-0-20-001 Appendix B, the Facility involves construction activities that require the preparation of a SWPPP that includes post-construction stormwater management practices designed in conformance with Part III.B.2 of the permit. A copy of the General Permit GP-0-20-001 is provided in Appendix B of this SWPPP.

The Facility is located not within a regulated Municipal Separate Storm Sewer System (MS4) therefore, MS4 review and approval of the SWPPP is not required prior to submission of the Notice of Intent (NOI) to NYSDEC to obtain permit coverage.

The Facility is subject to the requirements of the former Major Renewable Energy Development Law (Section 94-c) under the Office of Renewable Energy Siting (ORES) under Matter No. 23-00054, which remain in full force and effect as part of the Renewable Action through Project interconnection and Deployment (RAPID) Act. The Facility shall comply with all applicable local, state, and federal regulations. Discharges to surface waters should be reported to the NYSDEC Division of Water per 6 NYCRR Part 750, including, but not limited to, discharges that cause a violation of water quality standards and discharges that are not permitted by the General Permit.

3.0 Permit Coverage Information

This SWPPP serves as the minimum requirements necessary to address soil exposure and stormwater management during construction activities. This SWPPP is a living document that may be amended for unforeseen circumstances. If unanticipated site conditions warrant changes or additions to existing practices, the Owner/Operator and the Contractor(s), in consultation with the Qualified Inspector or Project Engineer, will be required to implement those measures in accordance with the New York State Standards and Specifications for Erosion and Sediment Control (SSESC) and the New York State Stormwater Management Design Manual (SMDM) and amendments to the SWPPP shall be made as appropriate. The SWPPP and associated documentation must be kept current to ensure the erosion and sediment control practices are accurately documented.

In accordance with GP-0-20-001, documented site inspections will be performed to ensure the required erosion and sediment control measures have been installed properly and are in good condition. Inspections will occur for the duration of construction, until earth-disturbing construction activities have ceased, and final stabilization has been achieved.

4.0 SWPPP Amendments

This SWPPP has been prepared in accordance with the General Permit, SSESC and the SMDM. The SWPPP and associated documents must be kept current at all times. Amendments to the SWPPP and associated documents, including Design Drawings, should be made:

- Whenever the current provisions are ineffective in minimizing impacts to the stormwater discharge from the Facility Site;
- Whenever there is a change in design or construction activities and sequencing that has or could have an impact to the stormwater discharge; and
- To address deficiencies or issues identified during monitoring and inspection.

Planned amendments and modifications to post-construction stormwater management practices proposed in the final SWPPP must be provided, in writing, to the NYSDEC Region 4 Division of Water (DOW) representative. The SWPPP amendments and modifications shall be reviewed and accepted by the NYSDEC representative prior to commencing construction activities for the associated practices.

This Preliminary SWPPP is being submitted as part of the Facility's Application and includes design and calculations for the anticipated stormwater management practices. This Preliminary SWPPP will be amended as necessary prior to Facility construction to detail the final proposed stormwater management practices to be installed (Final SWPPP). The Final SWPPP shall detail proposed stormwater management practices and provide stormwater analysis and design information. The Final SWPPP submitted as a Compliance Filing prior to construction of the Facility.

Refer to GP-0-20-001 for additional information on SWPPP amendment procedures and requirements. Amendments to the SWPPP shall be documented in Appendix M.

5.0 Facility Site Information

The Facility is located south of New York Interstate 90 (I-90) and the Mohawk River, east of State Highway 10, and predominantly west of State Highway 162 in the Towns of Canajoharie and Root, Montgomery County, New York. The Facility is located within the NYSDEC Region 4 jurisdiction and the Canajoharie, Carlisle, and Sharon United States Geological Survey (USGS) 7.5 Minute Topographic Quadrangle. The Facility location is depicted in Figure 1 of Appendix E.

The Applicant proposes an approximate 300-megawatt (MW) photovoltaic solar energy generation facility which will include commercial-scale solar arrays, access roads, buried (and possibly overhead) electric collection lines, and electrical interconnection facilities (i.e., a collection substation and point of interconnection (POI) switchyard). The Applicant intends to interconnect to the existing New York Power Authority (NYPA) 345 kilovolt #352 transmission line.

The general scope of work for the Facility which may result in soil disturbance includes, but is not limited to, site clearing, grading, and installation of inverters, collection lines, a substation and Point of Interconnection (POI) facility, access roads, culverts, security fencing, erosion and sediment control, and stormwater management practices.

The Facility Site consists of approximately 3,794 acres, of which approximately 1,637 acres are anticipated to be disturbed. The existing groundcover of the Facility Site is composed primarily of agricultural land, residential use, and vacant land. The site topography is relatively flat, however steep slopes are present along Flat Creek. Refer to the Design Drawings in Appendix F and the Application for additional Facility Site land cover, environmental resources, and topographic information.

The Facility Site discharges into numerous wetlands and streams, including Flat Creek and associated tributaries as well as tributaries to the Mohawk River. The Facility ultimately discharges to the Mohawk River located north of the Facility. The Facility does not discharge to a 303(d) waterbody segment listed within Appendix E of GP-0-20-001 and is not located within a restricted watershed listed in Appendix C of GP-0-20-001, an AA or AA-s waterbody, or a Sole Source Aquifer (SSA).

5.1 Soils Classification

Review of the United States Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey was completed to determine the predominant soil series mapped within the Facility Site's drainage area. Table 1, below, details the soils and the associated Hydrologic Soil Group (HSG) rating.

Table 1 – Soils within the Facility Site Drainage Area

Map Unit Symbol	Map Unit Name	HSG Rating
AlB	Alton Gravelly loam, 3 to 8 percent slopes	A
AnB	Angola silt loam, 3 to 8 percent slopes	D
AoB	Angola channery silt loam, 3 to 8 percent slopes	D
ApA	Appleton silt loam, 0 to 3 percent slopes	B/D
ApB	Appleton silt loam, 3 to 8 percent slopes	B/D
AZF	Arnot-rock outcrop, very steep	D
BuB	Burdett channery silt loam, 3 to 8 percent slopes	C/D
BuC	Burdett channery silt loam, 8 to 15 percent slopes	C/D
CFL	Cut and fill land	A
ChA	Churchville silty clay loam, 0 to 3 percent slopes	C/D
ChB	Churchville silty clay loam, 3 to 8 percent slopes	C/D
DaA	Darien silt loam, 0 to 3 percent slopes	C/D
DaB	Darien silt loam, 3 to 8 percent slopes	C/D
DaC	Darien silt loam, 8 to 15 percent slopes	C/D
FBD	Farmington-Rock outcrop association, moderately steep	D
FL	Fluvaquents, loamy	B/D
Fo	Fonda mucky silty clay loam	C/D

Map Unit Symbol	Map Unit Name	HSG Rating
Fr	Fredon silt loam	B/D
HoB	Hornell silt loam, 3 to 8 percent slopes	D
HrA	Howard gravelly silt loam, 0 to 3 percent slopes	A
HrB	Howard gravelly silt loam, 3 to 8 percent slopes	A
HrC	Howard gravelly silt loam, 8 to 15 percent slopes	A
IlA	Ilion silt loam, 0 to 3 percent slopes	C/D
IlB	Ilion silt loam, 3 to 8 percent slopes	C/D
LaB	Lansing silt loam, 3 to 8 percent slopes	B
LaC	Lansing silt loam, 8 to 15 percent slopes	B
LaD	Lansing silt loam, 15 to 25 percent slopes	B
LMF	Lansing and Mohawk soils, 25 to 60 percent slopes	B
LoB	Lordstown gravelly silt loam, 3 to 8 percent slopes	C
Ma	Madalin silty clay loam, 0 to 3 percent slopes	C/D
Md	Madalin silty clay loam, moderately shallow variant	D
MmB	Manheim silt loam, 3 to 8 percent slopes	C/D
MoC	Manlius shaly silt loam, 8 to 15 percent slopes	C
MoD	Manlius shaly silt loam, 15 to 25 percent slopes	C
MsB	Mohawk silt loam, 3 to 8 percent slopes	B
MsC	Mohawk silt loam, 8 to 15 percent slopes	B
MsD	Mohawk silt loam, 15 to 25 percent slopes	B
NuB	Nunda channery silt loam, 3 to 8 percent slopes	C/D
NuC	Nunda channery silt loam, 8 to 15 percent slopes	C/D
NuD	Nunda channery silt loam, 15 to 25 percent slopes	C/D
PaB	Palatine silt loam, 3 to 8 percent slopes	C
PaC	Palatine silt loam, 8 to 15 percent slopes	C
PaD	Palatine silt loam, 15 to 25 percent slopes	C
PpA	Phelps gravelly loam, 0 to 3 percent slopes	B/D
PpB	Phelps gravelly loam, 3 to 8 percent slopes	B/D
Pr	Phelps gravelly loam, fan	C
RhB	Rhinebeck silty clay loam, 3 to 8 percent slopes	C/D
RLF	Rock outcrop	D
W	Water	D

The Soil Conservation Service defines the HSGs as follows:

- Type A Soils: Soils having a high infiltration rate (low runoff potential).
- Type B Soils: Soils having a moderate infiltration rate.
- Type C Soils: Soils having a slow infiltration rate.
- Type D Soils: Soils having a very slow infiltration rate (high runoff potential).

For soils assigned to a dual hydrologic group, the first letter refers to drained areas and the second refers to undrained areas. In areas of unknown soil type or areas not within agricultural land, the more conservative soil classification is assumed.

Geotechnical investigations were conducted at the Facility Site in August 2021, June 2022, June 2023, and May 2024. Soils were visually classified by texture, color, relative density, consistency, moisture, etc. In total, 50 borings were advanced at the Facility Site to depths ranging from 4.6 feet to 35.1 feet. Table 2, below, details the test boring and infiltration results from the four geotechnical investigations. Test borings and infiltration testing were performed in conformance with the SMDM.

Table 2 – Soil Boring Results

Testing Date	Boring Location	Depth to Very Dense Soils (ft)	Depth to Auger Refusal or Boring Termination (ft)	Groundwater Level (ft)
August 2021	FC-1	8	18.4	0
	FC-2	6	18.2	0
	FC-3	10	20	3
	FC-4	8	18.4	0
	FC-5	8	20	0
	FC-6	10	18.1	0
	FC-7	7	13.1	0
	FC-8	6	18.4	0
	FC-9	>20	20	9
	FC-10	4	18.9	0
	FC-11	6	18.2	0
	FC-12	>20	20	0
	FC-13	8	18.4	6
	FC-14	18	20	0
	FC-15	4	18.4	8
	FC-16	8	18.3	0
June 2022	B-101	>15	>15	8.5
	B-102	8	>15	>15
	B-103	11	13.1	6
	B-104	2.5	5.5	>5.5
	B-105	6	>15	>15
	B-106	8.5	>15	>15
	B-107	7	>15	5.5
	B-108	8	>15	>15
	B-109	7.5	>15	>15
	B-111	2.5	4.6	7.8
	B-112	4.5	5.2	>5.2
	B-113	3.5	5.2	>5.2
	B-114	>15	>15	>15
	B-115	4	5.2	4
	B-116	>15	>15	22.5
June 2023	B-200	9.5	30	0
	B-201	>15	15	0
	B-202	9	15	0
	B-204	8	13.8	0
	B-205	9.5	10.5	0
	B-206	5.5	6.8	5.8
	B-207	>15	15	0
	B-208	9	15	0

Testing Date	Boring Location	Depth to Very Dense Soils (ft)	Depth to Auger Refusal or Boring Termination (ft)	Groundwater Level (ft)
May 2024	B-301	10	15	0
	B-302	9	25	0
	B-303	13	30	18
	B-304	18	25	0
	B-305	>25	25	23
	B-306	>15	15	0
	B-307	>35	35	23
	B-308	22	25	0
	B-309	23	35	27.5
	B-310	8.5	35.1	17
	B-311	28	33.6	0

Additional information on the soil testing can be found in the Geotechnical Engineering Reports provided as Appendices 10-1 through 10-4 of the Application.

5.2 Wetlands and Waterbodies

Review of the NYSDEC Environmental Resource Mapper (ERM) identified three NYSDEC-mapped freshwater wetlands and five NYSDEC-mapped streams within the Survey Area. Field delineations were completed in 2020, 2021, 2022, 2023, and 2024 to identify existing waterbodies and wetland at the Facility Site. Field delineations identified 144 wetlands and 122 streams within the Facility Survey Area.

The Applicant has carefully designed the Facility to minimize impacts to state and federal jurisdictional streams, wetlands, and adjacent 100-foot areas. Through avoidance and minimization efforts including a thorough design process and multiple drafts and revisions of the Facility, the Applicant has minimized impacts to a total of 6.08 acres to State-jurisdictional wetlands, and 15.25 acres for 100-foot adjacent areas. Mitigation requirements for Facility impacts are 1:1, resulting in a total of 6.08 acres of in-kind mitigation. A Draft Conceptual Wetland Restoration and Mitigation Plan (WRMP) is included as Appendix 14-4 and outlines permanent impacts and required mitigation, and mitigation options in further detail. The proposed Facility will also result in 50.97 linear feet of stream impacts due to access road construction, grading, culvert installation, and collection line trenching. The Application intends to obtain an individual Water Quality Certificate (WQC) from ORES in accordance with Section 401 of the Clean Water Act (CWA) indicating the proposed activity will be in compliance with water quality standards. The Applicant anticipated applying for an individual WQC concurrently with the Section 404 permit for the Facility.

Facility construction will result in approximately 2.4 acres of wetland loss and approximately 2.3 acres of forested wetland conversion to United States Army Corps of Engineers (USACE) jurisdictional wetlands. These impacts will be permitted under the USACE Nationwide Permit (NWP) program through the Joint Permit Application Process. Required mitigation measures will be implemented after Facility construction.

The Applicant will obtain the necessary permits prior to the commencement of construction. The wetlands and streams are detailed further in Exhibits 13 and 14 of the Application.

5.3 Floodplains

The following Federal Emergency Management Agency (F) Flood Insurance Rate Maps (FIRM) associated with the Facility Site have been printed:

- Panel 36057C0139E, effective January 19, 2018
- Panel 36057C0143E, effective January 19, 2018
- Panel 36057C0144E, effective January 19, 2018
- Panel 36057C0310E, effective January 19, 2018
- Panel 36057C0330E, effective January 19, 2018

The Facility Site is located primarily within Flood Zone X, defined as areas determined to be outside the 0.2% (500-year) annual chance floodplain. Eastern portions of the Facility Site along the border of Flat Creek are identified by FEMA as Flood Zone A, defined as a special flood hazard area subject to inundation by the 1% (100-year) annual chance flood where no base flood elevations have been determined. Additionally, Canajoharie Creek located to the west of the Facility is identified as Flood Zone A. Copies of the printed FEMA FIRM panels are provided in Appendix E.

In addition, the NYSDEC ERM did not identify the Facility Site to be located within a base flood elevation plus 72/75” sea-level rise.

5.4 Rainfall Information

Facility specific rainfall information for the 90% rainfall event was obtained from Figure 4.1 of the SMDM. The 90% rainfall event is used to determine the volume (WQv) of runoff generated from the 90th percentile (90%) rainfall event. Rainfall data for the Facility Site was obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Point Precipitation Frequency Estimate Tables. These values were used to evaluate the pre- and post-development stormwater hydraulic and hydrologic characteristics. Table 2, below, details the 24-hour rainfall amounts for the Facility Site.

Table 3 – Rainfall Event Quantities

Rainfall Event	24-Hour Rainfall Amount (inches)
90%	1.10
1-Year	2.04
2-Year	2.39
10-Year	3.42
25-Year	4.07
100-Year	5.07

The precipitation information obtained from the NOAA is included in Appendix E.

5.5 Environmental Resource Information

A review of the NYSDEC ERM indicated the potential for rare plants or animals in the Facility Site. Significant natural communities were not identified on the ERM to be present within or immediately adjacent to the Facility Site.

A review of the United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) system listed the following threatened, endangered, and/or candidate species to have the potential to be present within the Facility Site:

- Northern Long-eared Bat (NLEB) (*Myotis septentrionalis*) – federally and state listed endangered species
- Tricolored Bat (TCB) (*Perimyotis subflavus*) – federally proposed endangered species

Consultation with the USFWS via IPaC indicated the potential presence of the NLEB within the vicinity of the Facility Site. The Facility Site is not within one and a half (1.5) miles of a maternity roost site but is within one mile of two known NLEB hibernacula. The entire Facility Site is within occupied habitat for NLEB. Additionally, the northwest portion of the Facility Site is within 0.25 mile of a known bald eagle nest. To avoid impacts to the NLEB, the Applicant will conduct tree clearing during winter hibernation (November 1 to March 31). Listing of the TCB is still pending. Consultation wit USFWS will be completed as necessary to avoid impacts to the TCB during construction.

Regarding grassland birds, the southwestern portion of the Facility Site overlaps with Mohawk River Valley Grassland Focus Area #4, and state-listed endangered short-eared owls and state listed threatened northern harrier were documented on site during avian surveys. No records of federally-listed avian species were identified within the vicinity of the Facility.

The Applicant consulted with ORES regarding the potential impact on grassland and wintering bird species within or in the vicinity of the Facility Site. A Determination of Occupied Habitat, Incidental Take, and Net Conservation Benefit Plan (NCBP) was issued by ORES. The Applicant is proposed a NCBP involving grassland bird habitat conservation in lieu of payment of a mitigation fee. Refer to Exhibit 12 of the Application for additional information on threatened and endangered species.

The Facility has been sited to avoid and minimize potential impacts to the species of concern during construction and operation of the Facility to the maximum extent practicable. Refer to Exhibit 12 of the Application for additional information and agency consultation documentation for the listed species.

5.6 Cultural Resource Information

A review of the NYS Office of Parks Recreation and Historic Preservation (OPRHP) Cultural Resources Information System (CRIS) database indicates a majority of the Facility Site is located within an archaeologically sensitive area. Eighty-five historic structures were identified with one mile of the Facility Site, of which seven properties are eligible for listing on the National Register of Historic Places (NRHP). The remaining historic properties have undetermined eligibility. No NRHP listed properties are located within the Facility Site. In addition, five cemeteries are located in the vicinity of the Facility Site. Additional archaeological surveys and consultation with OPRHP is ongoing. Refer to Exhibit 9 of the Application for additional information on cultural resources within or adjacent to the Facility Site.

6.0 Contract Documents

The Contractor is responsible for the implementation of this SWPPP, as well as the installation, construction, repair, replacement, inspection and maintenance of erosion and sediment control practices. Each Contractor shall sign the Contractor Certification Form provided in Appendix C prior to the commencement of construction activities.

This SWPPP and associated documentation, including but not limited to, a copy of the GP-0-20-001, NOI, NYSDEC NOI Acknowledgement Letter, Contractor Certification Form, Design Drawings, inspection reports, and permit eligibility forms, must be maintained in a secure location for the duration of the Facility construction.

7.0 Personnel Contact List

The Construction Personnel Contact List for the Facility is provided in Appendix C. The listed personnel are responsible for ensuring compliance with the SWPPP and associated permit conditions. Personnel responsibilities include, but are not limited to, the following:

- Implement the SWPPP;
- Oversee maintenance practices identified in the SWPPP;
- Conduct or provide for inspection and monitoring activities;
- Identify potential erosion, sedimentation, and pollutant sources during construction and ensure issues are addressed appropriately and in a timely manner;
- Identify necessary amendments to the SWPPP and ensure proper implementation; and,
- Document activities associated with the implementation of this SWPPP and supporting documents.

Refer to GP-0-20-001 for information regarding specific personnel responsibilities.

8.0 SWPPP Construction Requirements and Sequencing

This section provides the Owner/Operator and the Contractor with a suggested order of construction that will minimize erosion and the transport of sediments. The individual objectives of the construction techniques described herein shall be considered an integral component of the Facility design. The construction sequence is not intended to prescribe definitive construction methods and should not be interpreted as a construction specification document. The Contractor shall follow the general principles outlined below throughout the construction phase:

- Protect and maintain existing vegetation wherever possible;
- Minimize the area of disturbance;
- To the extent possible, route unpolluted flows around disturbed areas;
- Install approved erosion and sediment control devices as early as possible;
- Minimize the time disturbed areas are left un-stabilized; and,
- Maintain erosion and sediment control devices in proper condition.

The Contractor should use the suggested construction sequence and techniques as a general guide and modify the suggested methods and procedures as required to best suit seasonal and site-specific physical constraints for the purpose of minimizing the environmental impact due to construction.

The Facility is anticipated to involve three stages of work; site preparation, construction, and site restoration. Prior to the commencement of construction activities, temporary erosion and sediment control measures shall be installed per the Design Drawings provided in Appendix F. The construction stages are detailed below.

Stage 1: Facility Site Preparation

- Establish access to the site including the stabilized construction entrances and access roads;
- Stake/flag construction limits, staging/storage areas, concrete washout locations, environmentally sensitive areas, and other associated work areas;
- Mark existing utilities and infrastructure;
- Conduct tree clearing and vegetation management, if necessary, and grading of work areas, as required; and,
- Install the erosion and sediment controls as detailed on the Erosion and Sediment Control Plans.

Stage 2: Facility Construction

- Conduct grading activities as required.
- Install posts and racking for solar arrays.
- Install solar panels.
- Install inverter pads, substation, and associated electrical equipment.
- Install stormwater management practices and complete final site grading.
- Install perimeter fencing and gates.

Stage 3: Site Restoration

- Remove and dispose of construction-related waste material at an approved disposal facility;
- Prepare soils as needed (restoration of original grade, de-compaction, soil amendments, etc.), and seed and mulch all disturbed areas. Restore disturbed soils per NYSDEC standards and specifications;
- Construct the pervious access roads and turnarounds.
- Remove the temporary erosion and sediment controls when 80% of natural vegetative cover has been achieved and erosion issues are no longer present; and,
- Submit the NOT Form to the NYSDEC in accordance with the General Permit.

The Facility anticipates disturbance of greater than five acres at any one time throughout construction. As such, a Five-Acre Disturbance Waiver Request will be prepared and submitted to the NYSDEC prior to the commencement of construction for approval in accordance with the General Permit requirements. A Phasing Plan will be prepared for the Facility as part of the Five-Acre Waiver Request to detail the maximum disturbed area and amount of cut/fill required per phase. A copy of the Request and the Phasing Plan shall be provided in Appendix D. Refer to Section 12.2 for additional information regarding the approval of the Request and the associated inspection requirements.

9.0 Stormwater Management and Pollution Controls

Prior to the commencement of construction activities, temporary erosion and sediment controls shall be installed to prevent erosion of the soils and prevent water quality degradation in wetlands and waterbodies. Erosion and sediment controls will be utilized to limit, control, and mitigate construction related impacts. The stormwater management and pollution controls shall include practices that involve runoff control, soil stabilization practices, and sediment control.

The erosion and sediment controls utilized at the Facility Site must be installed and maintained in accordance with GP-0-20-001, the SSESC and the SMDM. Improper installation of practices may result in an increase in water quality impacts to nearby waterbodies or sedimentation impacts to undisturbed lands. Deviations from the SSESC and SMDM standards should be discussed with the Qualified Inspector/Qualified Professional prior to utilizing the alternative practice. If the alternative practice is acceptable, documentation is required to detail the reasoning for the alternative practice and to provide evidence that the alternative design is equivalent to the technical standard. The SWPPP shall be amended as appropriate to incorporate the alternative practice. In the event that an alternative practice fails and a standard SSESC practice is required, the Contractor shall install the required practice upon approval from the Qualified Inspector/ Qualified Professional and Owner/Operator. The SWPPP shall be amended as appropriate to document changes to the practice.

The following sections detail potential stormwater contamination sources due to construction related activities and the temporary and permanent erosion and sediment controls to be utilized throughout the construction of the Facility to mitigate impacts. Refer to the SSESC and SMDM for additional guidance on installation, maintenance and removal.

9.1 Potential Impacts for Stormwater Contamination

Construction activities and processes that result in either increased stormwater runoff or the potential to add pollutants to runoff are subject to the requirements of this SWPPP. These activities may include areas of land disturbed by grading, excavation, construction, or material storage. Water that comes in contact with the surface of the Facility Site as a result of precipitation (snow, hail, rain, etc.) is classified as stormwater associated with the Facility and is subject to the requirements of this SWPPP.

Construction activities that may negatively impact stormwater include, but are not limited to, the following:

- <u>Tree Clearing and Vegetation Removal</u>: Removal of vegetation can expose and weaken soils and may result in erosion.

- Construction Site Entrance: Vehicles leaving the Facility Site can track soils onto public roadways.
- Grading Operations: Exposed soils have the potential for erosion and sedimentation when not stabilized.
- Fugitive Dust: Dust generated by vehicles or from strong winds during a drought period can be deposited in wetlands, waterways, and other environmentally sensitive areas, or may negatively impact the air quality.
- General Site Construction Activities: Maintenance and heavy use of access roads can expose soils, creating significant erosion potential. Soil stockpiling from site excavations and grading may promote erosion and sedimentation. Dewatering activities may result in concentrated flows and have the potential to increase erosion.
- Construction Vehicles and Equipment: Refueling of vehicles may result in spilling or dripping gasoline and diesel fuel onto the ground. On-site maintenance of excavating equipment may result in hydraulic oil, lubricants, or antifreeze dripping onto the ground. Sediment tracking and the spread of invasive species may occur if construction vehicles are improperly maintained. Ruts caused by equipment can create paths for concentrated water flows.
- Waste Management Practices: Typical construction projects have the potential to generate significant quantities of solid waste, such as wrappings, personnel-generated trash and waste, and construction debris.

Proper utilization of staging and storage areas, stockpiling areas, and erosion and sediment controls will mitigate potential impacts to the stormwater. Refer to Section 10.1 for additional information on spill prevention and waste management procedures for the Facility.

9.2 Protection of Existing Vegetation

Natural vegetation shall be preserved to the maximum extent practicable. Preserving natural vegetation will reduce soil erosion and maintain the inherent integrity of the Facility Site. Protection practices may include barrier fencing to prevent equipment and vehicle traffic in vegetated and environmentally sensitive areas.

9.3 Temporary Erosion and Sediment Controls

Temporary erosion and sediment controls shall be utilized to reduce erosion, sedimentation, and pollutants in stormwater discharges, and to prevent impacts to undisturbed areas, natural resources, wetlands, waterbodies, and downstream areas. Both stabilization techniques and structural methods will be utilized, as needed, to meet these objectives.

Temporary erosion and sediment control measures shall be applied during construction to:

- Minimize soil erosion and sedimentation through the stabilization of disturbed areas and removal of sediment from construction site discharges.
- Preserve existing vegetation to the maximum extent practicable and establish permanent vegetation on exposed soils following the completion of soil disturbance activities.

- Minimize the area and duration of soil disturbance through site preparation activities and construction sequencing.

Table 4, below, lists the erosion and sediment controls anticipated to be utilized at the Facility.

Table 4 – Proposed Erosion and Sediment Control Measures

Construction Road Stabilization	Concrete Truck Washout
Dust Control	Protecting Vegetation During Construction
Site Pollution Prevention	Stabilized Construction Access
Temporary Access Waterway Crossing	Winter Stabilization
Check Dam	Earth Dike
Flow (Level) Spreader	Perimeter Dike/Swale
Rock Outlet Protection	Water Bar
Anchored Stabilization Matting	Armored Slope and Channel Stabilization
Fertilizer Application	Land grading
Loose Stabilization Blankets	Mulching
Permanent Construction Area Planting	Soil Restoration
Surface Roughening	Temporary Construction Area Seeding
Topsoiling	Vegetating Waterways
Buffer Filter Strip	Compost Filter Sock
Geotextile Filter Bag	Silt Fence
Straw Bale Dike	

The standards and specifications for the erosion and sediment control measures listed in Table 4 are provided in Appendix G. Refer to the SSESC and SMDM for the Standards and Specifications of alternate measures and practices, as needed. The temporary erosion and sediment control measures not detailed in the SSESC or SMDM are detailed below.

9.3.1 Temporary Stockpiling

Temporary stockpiling of granular material (gravel, excavated spoils, select backfill, topsoils, etc.) is expected on-site throughout the construction process. Stockpiling of materials is not permitted in areas where health or safety risks are present, or where impacts to water quality may occur. Stockpiling is not permitted in wetland or wetland buffer areas, environmentally sensitive areas, and designated avoidance areas.

Stockpile areas shall be contained and protected with the proper erosion and sediment controls such as silt fencing and mulch. Soil stockpiles shall be stabilized with vegetation, geotextile fabric, or plastic covers if not utilized for seven days.

Stockpile areas should be inspected and maintained as needed or directed by the Project Engineer (or Qualified Inspector/Qualified Professional).

9.3.2 Temporary Spoil Stockpiling

Spoil material shall be segregated, conserving topsoil for revegetation and disposing of the inorganic sub-soils. Spoils shall be free of construction debris including foreign chunks of concrete, and other construction-related materials.

A procedure for spoil disposal will be developed and included in the Final SWPPP prior to excavation, including the proposed quantities of spoil and the proposed location(s) and procedures for stockpiling and disposal. Spoils shall not be disposed of within wetlands, waterbodies, agricultural areas, or other environmentally sensitive areas. Excess topsoil is encouraged to be spread within the immediate disturbed areas, including agricultural areas, if the material is free of rocks. Inorganic spoils shall be buried and capped with the previously stripped, native topsoil to ensure revegetation. Additional topsoil may be required to adequately cover the spoil area. If additional space is needed for on-site disposal, the SWPPP shall be amended as appropriate. For spoils needing to be disposed of off-site, the spoils shall be disposed of at an authorized facility off-site.

If the disposal plan does not detail the spoil stockpiling or disposal information, the SWPPP shall be amended as appropriate to document the necessary procedures. The amendment shall include the anticipated amount of spoils, the spoil stockpiling location, and the disposal method and location.

9.3.3 Timber Matting

Timber (“swamp”) matting is often utilized to distribute vehicle loads on agricultural, lawn, and wetland areas. The matting aids in reducing rutting, soil compaction, and restoration activities in protected areas. Poorly drained upland soils, such as wetland transitional areas, may be matted to reduce rutting and sediment tracking.

An additional benefit of matting in wetlands is that mats can be arranged to act as a containment surrounding excavations. This may be especially helpful in standing water situations were conventional erosion and sediment controls are not practicable. The Contractor should be cognizant of the hydrology of the area by recognizing water staining and bank full indicators. The Qualified Inspector can assist in this identification.

Headers and stringers shall be used in deeper or open water wetlands to allow wetland inundation under the matted drivable surface. The SWPPP specified wetland access does not account for poorly drained or poorly structured soils that are not wetlands. Transitional areas may experience severe rutting due to high traffic associated with the installation of the wetland access matting. Additional matting is recommended to reduce track out and restoration efforts, however it is not required for access.

Submerged wetland matting can create a “pumping” effect as vehicles pass, resulting in disturbed wetland soils, turbidity and sedimentation. This disturbance is a violation of the associated wetland permits. Although the presence of matting in this situation is still better than the alternative, pumping mats will require additional stabilization and sediment control practices not planned for in the Design Drawings. Matting will need to be re-installed, or access will be shut down until water recedes to eliminate the erosion concern.

9.3.4 Construction Access Systems

Temporary construction access systems may be utilized to prevent or reduce impacts to sensitive areas, such as soft soil or wetlands. The construction access systems may include, but are not limited to, the use of portable mats, plastic roads, slash matting, or access during frozen weather conditions.

Portable mats are reusable mats typically composed of fiberglass or high-density polyethylene (HDPE). The mats may be used in wetland areas or in areas of soft soils to prevent rutting and soil disturbance impacts.

Plastic road mats are composed of linking HDPE mats using a one-inch polyvinyl chloride (PVC) stringer. The mats are utilized to protect wetlands and prevent rutting by distributing the vehicle load across the roadway surface.

Access during frozen conditions may occur once the ground freezes. Snow cover may be packed down or removed for access. The frozen ground conditions will not experience rutting or sediment tracking. Periodic inspection of ground conditions is recommended to ensure frozen ground conditions are present.

Alternative construction access systems shall be approved by the Owner/Operator and the Qualified Professional prior to use. The alternate system shall be documented in the SWPPP amendments.

9.3.5 Horizontal Directional Drilling (HDD)

To avoid unnecessary disturbance or impact to the bed, banks, and aquatic habitat of the streams, horizontal directional drilling (HDD) will be utilized for the construction of the collection lines at the stream crossings. The HDD process involves drilling boreholes with a fluid mixture, primarily composed of water and bentonite, a naturally occurring clay. The drilling fluid aids in the removal of cuttings from the borehole, stabilizes the borehole, and acts as a coolant and lubricant throughout the drilling process. The bentonite-water mixture is not classified as a toxic or hazardous substance, however, if released into waterbodies, bentonite has the potential to temporarily reduce water quality, and therefore, adversely impact fish and other aquatic species.

To protect public health and safety and natural resources, the Contractor shall establish operational procedures and responsibilities for the prevention, containment, and cleanup of inadvertent releases associated with the proposed HDD. The operational procedures should:

1. Minimize the potential for an inadvertent release of drilling fluids associated with HDD activities;
2. Provide for the timely detection of inadvertent returns;

3. Protect environmentally sensitive areas (streams, wetlands, etc.) while responding to an inadvertent release;
4. Ensure an organized, timely and "minimum-impact" response in the event of an inadvertent return and release of drilling fluids; and,
5. Ensure that all appropriate notifications are made immediately.

The Contractor shall comply with the Owner's/Operator's operational procedures for HDD.

9.4 Temporary Stabilization for Frozen Conditions

Winter stabilization standards apply to construction activities with ongoing soil disturbance and exposure between November 15th and April 1st. Temporary winter stabilization measures shall be employed prior to frozen conditions, as detailed in the SSESC.

Erosion and sediment control measures shall be inspected to ensure proper performance and winter stabilization function. Repairs should be made as necessary to prevent erosion and sedimentation during thawing or rain events.

10.0 Post-Construction Stormwater Management

Chapter 3 of the SMDM sets forth the required planning process that must be followed when addressing stormwater management planning for new development and redevelopment projects. The five steps included in the process are as follows:

- Site planning to preserve natural site features and reduce impervious cover.
- Calculation of the Water Quality Volume (WQv) of the Facility Site.
- Incorporations of runoff reduction techniques and standard SMPs with Runoff Reduction Volume (RRv) capacity.
- Use standard SMPs, where applicable, to treat the portion of WQv not reduced through RRv techniques and SMPs with RRv capacity.
- Design for volume and peak rate control practices where required.

The five steps have been classified as Site Planning to Preserve Natural Features, WQv, RRv, Channel Protection Volume, and Overbank Flood and Extreme Storm Attenuation. These items will be addressed in the sections below.

10.1 Design Justification

The proposed Facility will result in greater than one acre of soil disturbance and results in an increase in impervious surface, therefore post-construction stormwater management practices are required for the Facility.

The WQv and stormwater quantity requirements shall be met by projects requiring post-construction stormwater controls. The SMDM details the stormwater management practices that may be implemented at the Facility Site to aid in the reduction of stormwater effects to newly developed areas. Effects from new development may include changes in runoff volume, flow rates, timing of runoff, habitat destruction, and degradation of receiving waterbodies and downstream areas.

The following site constraints were considered when determining the appropriate stormwater management practices to be implemented on the Facility Site:

- Practices cannot impact existing structures or utilities;
- Facility Site use limitations; and,
- The proposed new development conditions need to mimic the existing runoff patterns to the maximum extent practicable.

The peak runoff rates for the pre-development and post-development conditions have been analyzed to aid in maintaining the pre-development runoff rates. Regulating the runoff rate will minimize the impacts to adjacent and downstream properties and waterbodies and minimize impacts to the stormwater runoff quality.

10.2 Stormwater Quality Analysis

10.2.1 Water Quality Volume (WQv) Analysis

The Facility requires treatment of the WQv, which is intended to improve water quality by capturing and treating runoff from small, frequent storm events. The NYSDEC has defined WQv as the volume of runoff generated from the 90th percentile (90%) rainfall event. Practices sized to treat the WQv will capture and treat 90% of all 24-hour rainfall events. The WQv is determined using the following equation:

$$WQ_v = \frac{P * R_v * A}{12}$$

Where:

- WQv = Water Quality Volume (acre-feet)
- P = 90% Rainfall Event Number
- Rv = 0.05 + 0.009(I), where I is percent impervious cover
- A = Site Area (acres)

The 90% rainfall event number has been obtained from Figure 4.1 of the SMDM. The WQv is directly correlated to the amount of impervious cover at the Facility Site. Approximately 38.5 acres of new impervious cover is proposed within the Facility Site, composed of gravel access roads, inverter pads, and the substation and switchyard. The total required WQv for the Facility was calculated to be 8,801 ft^3 (0.20 ac-ft). A summary of the calculated WQv for each subcatchment within the Facility Site is provided in Appendix J.

10.2.2 Runoff Reduction Volume (RRv) Analysis

The RRv is intended to reduce the WQv through infiltration, groundwater recharge, reuse, recycle, evaporation/evapotranspiration of the post-development runoff in order to replicate the pre-development hydrology. Replication of the pre-development hydrology includes maintaining pre-construction infiltration, peak runoff flow, discharge volume and minimizing concentrated flow through the use of runoff control techniques.
The RRv is determined using the following equation:

$$RR_v = \frac{[(P)(R_v^*)(A_i]}{12}$$

Where:

- RRv = Minimum Runoff Reduction Volume (acre/feet)
- P = 90% Rainfall Event Number
- Rv^* = 0.05 + 0.009(I), where I is 100% impervious
- A_i = Impervious cover targeted for runoff reduction, calculated as $A_i = (S)(A_{ic})$
- S = Specific Runoff Reduction Factor (per HSG)
- A_{ic} = Total area of new impervious cover

The runoff reduction techniques have been selected based on the proposed Facility use type and the existing site constraints as detailed in Section 10.1, above.

New development projects that cannot achieve 100% runoff reduction for the WQv due to site limitations, must direct runoff from newly constructed impervious areas to runoff reduction or SMP practices, unless infeasible. The percentage of reduction required is determined from the specific runoff reduction factor (S), which is based on the site's HSG. Table 4, below, details the specific reduction factors per HSG.

Table 5 – RRv Reduction by Soil Type

HSG	Specific Reduction Factor (S)
A	0.55
B	0.40
C	0.30
D	0.20

Infiltration trenches are proposed to capture and treat the required WQv and RRv for the access roads within the Facility. Infiltration trenches store the WQv in the void space of the gravel trench allowing the runoff to infiltrate into the ground. In total, 54 infiltration trenches are proposed throughout the Facility. The infiltration trenches will provide a total WQv and RRv reduction of 18,124 ft^3 (0.42 ac-ft), which greatly exceeds the required WQv and RRv. Refer to Appendix J for detailed WQv and RRv calculations.

10.2.3 Green Infrastructure Techniques

Runoff reduction is the reduction of WQv achieved through application of green infrastructure techniques and standard SMPs having RRv capacity. Green infrastructure for stormwater management reduces the Facility Site's impact on the aquatic ecosystem by replicating the pre-development hydrology while minimizing concentrated flows. The green infrastructure techniques are practices which indirectly reduce runoff and are detailed in Table 6 below, which was adapted from Table 3.1 in the SMDM. The green infrastructure practices were considered for this Facility to the maximum extent practicable.

Table 6 – Green Infrastructure Planning (Adapted from SMDM Table 3.1)

NYSDEC Stormwater Management Design Manual Table 3.1
Green Infrastructure Planning General Categories and Specific Practices

Group	Practice	Description	Application to Facility
Preservation of Natural Resources	Preservation of Undisturbed Areas	Delineate and place into permanent conservation easement undisturbed forests, native vegetated areas riparian corridors, wetlands, and natural terrain.	Earth disturbance have been reduced to the maximum extent practicable.
	Preservation of Buffers	Define, delineate and place in permanent conservation easement naturally vegetated buffers along perennial streams, rivers, shorelines, and wetlands.	Natural areas and buffers (undisturbed vegetated areas) have been conserved to the maximum extent practicable.
	Reduction of Clearing and Grading	Limit clearing and grading to the minimum amount needed for roads, driveways, foundations, utilities, and stormwater management facilities.	The amount of land clearing and grading will be kept to the minimum necessary and required to construct the Facility.
	Locating Development in Less Sensitive Areas	Avoid sensitive resource areas such as floodplains, steep slopes, erodible soils, wetlands, mature forests and critical habitats by locating development to fit the terrain in areas that will create the least impact.	The Facility has been designed in a relatively flat location and outside of environmentally sensitive areas to the maximum extent practicable.
	Open Space Design	Using clustering, conservation design, or open space design to reduce impervious cover, preserve more open space and protect water resources.	Open space design has not been applied to the Facility.
	Soil Restoration	Restore the original properties and porosity of the soil by deep till and amendment with compost to reduce the generation of runoff and enhance the runoff reduction performance of practices such as grass channels, filter strips, and tree clusters.	This practice will be employed throughout the Facility to restore the original properties of the soil and replicate pre-development hydrology conditions to the maximum extent practicable.
Reduction of Impervious Cover	Roadway Reduction	Minimize roadway widths and lengths to reduce site impervious area.	Access roads have been designed to the minimum necessary for the Facility.
	Sidewalk Reduction	Minimize sidewalk lengths and widths to reduce site impervious area.	Sidewalks are not proposed for the Facility.
	Driveway Reduction	Minimize driveway lengths and widths to reduce site impervious area.	Driveway width and length are limited to the minimum required for access to the Facility.
	Cul-de-sac Reduction	Minimize the number of cul-de-sacs and incorporate landscaped areas to reduce their impervious cover.	Cul-de-sacs are not proposed for the Facility. Turnarounds are located along access roads and will be constructed in accordance with the NYSDEC pervious access road specification.
	Building Footprint Reduction	Reduce the impervious footprint of residences and commercial buildings by using alternate or taller buildings while maintaining the same floor to area ratio.	Proposed buildings/structures will be limited to the substation yard.
	Parking Area Reduction	Reduce imperviousness on parking lots by eliminating unneeded spaces, providing compact car spaces and efficient parking lanes, minimizing stall dimensions, using porous pavement surfaces in overflow parking areas, and using multistoried parking decks where appropriate.	Parking areas are limited to designated temporary laydown areas adjacent to access roads.

10.2.4 Runoff Reduction Techniques

The stormwater management plan must demonstrate that green infrastructure planning and design options were evaluated in order to meet the RRv requirement. Projects that cannot reduce 100% of the WQv shall direct runoff from all newly construction impervious areas to a runoff reduction (RR) technique or standard SMP with RRv capacity unless infeasible. The runoff reduction techniques are practices in which runoff reduction is quantified and are detailed in Table 7 below, which was adapted from Table 3.2 in the SMDM. The runoff reduction techniques were considered for this Facility to the maximum extent practicable.

Table 7 – Runoff Reduction Techniques (Adapted from SMDM Table 3.2)

NYSDEC Stormwater Management Design Manual Table 3.2 Acceptable Runoff Reduction Techniques			
Group	**Practice**	**Description**	**Application to Facility**
Runoff Reduction Techniques	Conservation of Natural Areas	Retain the pre-development hydrologic and water quality characteristics of undisturbed natural areas, stream and wetland buffers by restoring and/or permanently conserving these areas on a site.	Natural areas have been conserved to the maximum extent practicable.
	Sheetflow to Riparian Buffers or Filter Strips	Undisturbed natural areas such as forested conservation areas and stream buffers or vegetated filter strips and riparian buffers can be used to treat and control stormwater runoff from some areas of a development project.	Natural areas have been conserved to the maximum extent practicable. Filter strips are proposed throughout the Facility Site and provide treatment for inverters and access roads.
	Vegetated Open Swale	The natural drainage paths, or properly designed vegetated channels, can be used instead of constructing underground storm sewers or concrete open channels to increase time of concentration, reduce the peak discharge, and provide infiltration.	Vegetated open swales are not proposed for the Facility.
	Tree Planting/ Tree Box	Plant or conserve trees to reduce stormwater runoff, increase nutrient uptake, and provide bank stabilization. Trees can be used for applications such as landscaping, stormwater management practice areas, conservation areas and erosion and sediment control.	Tree clearing has been kept to the minimum necessary for construction. Landscaping will be employed to provide visual buffers for sensitive areas. Tree boxes are not proposed for the Facility.
	Stream Daylighting for Redevelopment Projects	Stream Daylight previously-culverted/piped streams to restore natural habitats, better attenuate runoff by increasing the storage size, promotion infiltration, and help reduce pollutant loads.	Stream daylighting is not proposed. The Facility is not a redevelopment project.
	Rain Garden	Manage and treat small volumes of stormwater runoff using a conditioned planting soil bed and planting materials to filter runoff stored within a shallow depression.	Rain gardens are not proposed for the Facility.
	Green Roof	Capture runoff by a layer of vegetation and soil installed on top of a conventional flat or sloped roof. The rooftop vegetation allows evaporation and evapotranspiration processes to reduce volume and discharge rate of runoff entering conveyance system.	Green roof techniques are not applicable to the Facility.
	Stormwater Planter	Small, landscaped stormwater treatment devices that can be designed as infiltration or	Stormwater planters are not applicable to the Facility.

NYSDEC Stormwater Management Design Manual Table 3.2 Acceptable Runoff Reduction Techniques			
Group	**Practice**	**Description**	**Application to Facility**
		filtering practices. Stormwater planters use soil infiltration and biogeochemical processes to decrease stormwater quantity and improve water quality.	
	Rain Tank/Cistern	Capture and store stormwater runoff to be used for irrigation systems or filtered and reused for non-contact activities.	Rain tanks/cisterns are not proposed for the Facility.
	Porous Pavement	Pervious types of pavements that provide an alternative to conventional paved surfaces, designed to infiltrate rainfall through the surface, thereby reducing stormwater runoff from a site and providing some pollutant uptake in the underlying soils.	The Facility proposed the use of the NYSDEC limited-use pervious access road, which acts similar to porous pavement. The pervious access roads are proposed for turnrounds and various sections of the access roads within the Facility Site.

10.2.5 Standard Stormwater Management Practices (SMPs) for Treatment

Table 8 below, adapted from Table 3.3 in the SMDM, details standard SMPs that are acceptable for water quality treatment. These practices are designed to capture and treat the WQv which was not reduced from RR techniques.

Table 8 – Stormwater Management Practices for Water Quality Volume (Adapted from SMDM Table 3.3)

NYSDEC Stormwater Management Design Manual Table 3.3 Stormwater Management Practices Acceptable for Water Quality Volume			
Group	**Practice**	**Description**	**Application to Facility**
Pond	Micropool Extended Detention Pond (P-1)	Pond that treats the majority of the water quality volume through extended detention and incorporates a micropool at the outlet of the pond to prevent sediment resuspension.	This practice has not been applied to the Facility.
	Wet Pond (P-2)	Pond that provides storage for the entire water quality volume in the permanent pool	This practice has not been applied to the Facility.
	Wet Extended Detention Pond (P-3)	Pond that treats a portion of the water quality volume by detaining storm flows above a permanent pool for a specified minimum detention time.	Two detention ponds are proposed for the Facility at the substation and switchyard area.
	Multiple Pond System (P-4)	A group of ponds that collectively treat the water quality volume.	This practice has not been applied to the Facility.
	Pocket Pond (P-5)	A stormwater wetland design adapted for the treatment of runoff from small drainage areas that has little or no baseflow available to maintain water elevations and relies on ground water to maintain a permanent pool.	This practice has not been applied to the Facility.
Wetland	Shallow Wetland (w-1)	A wetland that provides water quality treatment entirely in a wet shallow marsh.	This practice has not been applied to the Facility.
	Extended Detention Wetland (W-2)	A wetland system that provides some fraction of the water quality volume by detaining storm flows above the marsh surface.	This practice has not been applied to the Facility.

NYSDEC Stormwater Management Design Manual Table 3.3
Stormwater Management Practices Acceptable for Water Quality Volume

Group	Practice	Description	Application to Facility
	Pond/Wetland System (W-3)	A wetland system that provides a portion of the water quality volume in the permanent pool of a wet pond that precedes the marsh for a specified minimum detention time.	This practice has not been applied to the Facility.
	Pocket Wetland (W-4)	A shallow wetland design adapted for the treatment of runoff from small drainage areas that has variable water levels and relies on groundwater for its permanent pool.	This practice has not been applied to the Facility.
Infiltration	Infiltration Trench (I-1)	An infiltration practice that stores the water quality volume in the void spaces of a gravel trench before it is infiltrated into the ground.	Infiltration trenches are proposed to capture and treat new access roads.
	Infiltration Basin (I-2)	An infiltration practice that stores the water quality volume in a shallow depression, before it is infiltrated it into the ground	This practice has not been applied to the Facility.
	Dry Well (I-3)	An infiltration practice similar in design to the infiltration trench, and best suited for treatment of rooftop runoff.	This practice has not been applied to the Facility.
Filtering Practices	Surface Sand Filter (F-1)	A filtering practice that treats stormwater by settling out larger particles in a sediment chamber, and then filtering stormwater through a sand matrix.	This practice has not been applied to the Facility.
	Underground Sand Filter (F-2)	A filtering practice that treats stormwater as it flows through underground settling and filtering chambers.	This practice has not been applied to the Facility.
	Perimeter Sand Filter (F-3)	A filter that incorporates a sediment chamber and filer bed as parallel vaults adjacent to a parking lot.	This practice has not been applied to the Facility.
	Organic Filter (F-4)	A filtering practice that uses an organic medium such as compost in the filter, in the place of sand.	This practice has not been applied to the Facility.
	Bioretention (F-5)	A shallow depression that treats stormwater as it flows through a soil matrix and is returned to the storm drain system.	This practice has not been applied to the Facility.
Open Channels	Dry Swale (O-1)	An open drainage channel or depression explicitly designed to detain and promote the filtration of stormwater runoff into the soil media.	This practice has not been applied to the Facility.
	Wet Swale (O-2)	An open drainage channel or depression designed to retain water or intercept groundwater for water quality treatment.	This practice has not been applied to the Facility.

10.3 Stormwater Quantity Analysis

A runoff analysis for this Facility was performed in order to demonstrate compliance with the requirements for stormwater quantity control found in Chapter 4 of the SMDM. This analysis includes of a comparison of the pre- and post-development peak runoff rates from the Facility Site.
Appendices K and L include Pre-Development and Post-Development Subcatchment Maps with contours information, land cover types, hydrologic soil groups, subcatchment area boundaries, time of concentration flow lines, existing features and drainage ways. The post-development stormwater management plan also shows the locations of the proposed development.

The analyses include computations for determining the times of concentration for the subcatchments, as well as the HydroCAD output which includes composite curve number

(CN) calculations, peak discharge calculations for the design storms, and routing calculations. Detailed discussions of the analyses are provided in the following sections.

10.3.1 Stormwater Management Performance Criteria

In accordance with the General Permit, stormwater management practices shall be designed in conformance with the performance criteria detailed in Chapter 6 of the SMDM for each practice type. The performance criteria were developed for the following performance goals:

- Feasibility: Identify site considerations that may restrict the use of a practice.
- Conveyance: Convey runoff to the practice in a manner that is safe, minimizes erosion and disruption to natural channels, and promotes filtering and infiltration.
- Pretreatment: Trap coarse elements before they enter the facility, thus reducing the maintenance burden and ensuring a long-lived practice.
- Treatment Geometry: Produce water quality treatment, through design elements that provide the maximum pollutant removal as water flows through the practice.
- Environmental/Landscaping: Reduce secondary environmental impacts of facilities through features that minimize disturbance of natural stream systems and comply with environmental regulations. Provide landscaping that enhances the pollutant removal and aesthetic value of the practice.
- Maintenance: Maintain the long-term performance of the practice through regular maintenance activities, and through design elements that ease the maintenance burden.

10.3.2 Methodology

Stormwater runoff was estimated using HydroCAD, Version 10.0. HydroCAD software is based on methodologies developed by the USDA NRCS, namely “Urban Hydrology for Small Watersheds”, Technical Release 55 and Technical Release 20 (TR-50 and TR-20, respectively), in conjunction with other hydrologic and hydraulic calculations. Based on site specific information, including land cover, slopes, soils, and rainfall data, the program calculates inflow and outflow hydrographs for subcatchments, reach routing, and pond routing. See Appendices K and L for copies of this information.

For the HydroCAD analysis, the Facility Site was divided by watershed and drainage systems, which contribute to the overall stormwater network. The watersheds and drainage systems were classified by the following components:

- Subcatchment: Utilized to model the runoff from a given area of land.
- Pond: Used to model a reservoir, dam, catch basin, manhole, drywell, storage chamber, vault, or other impoundment that fills with water. Ponds may empty through a weir, culvert, orifice, or other outlet device.
- Reach: Used to perform independent routing through an open channel or overland flows.
- Link: A multi-purpose node used to link a hydrograph to another system.

10.3.3 Rainfall Data

Rainfall data was obtained from the NOAA Atlas 14 Point Precipitation Frequency Estimate Tables for the 1, 10 and 100-year, 24-hour storm events. HydroCAD uses the local 24-hour precipitation data to generate local 24-hour Intensity-Duration-Frequency (IDF) curves and rainfall distributions. The software then uses the rainfall amounts and distributions to generate runoff hydrographs for each of the design storms. Storm events modeled for the runoff analyses assumed precipitation events with a 24-hour duration and return frequencies of 1, 10, and 100 years. The corresponding precipitation depths for these storm events are 2.04, 3.42, 5.07 inches, respectively. Refer to Appendix E of the SWPPP for rainfall data obtained for the Facility.

10.3.4 Curve Number (CN) Computations

Runoff CNs are based on the land cover and HSGs for the Facility Site. Cover types for the Facility Site were determined from survey and aerial photography. Due to the presence of agricultural land at the Facility Site, existing agricultural land cover was classified as “non-grazed meadow,” per the SMDM’s requirement. These CNs and their respective soil types are indicated in the pre-development and post-development HydroCAD models. The soil classifications and HSGs of soils on or adjacent to the Facility Site were obtained from the USDA NRCS Soil Survey of Montgomery County, New York.

HydroCAD provided CNs based on the selected land use and HSG. HydroCAD’s CN table is based on Table 2-2 of the NRCS TR-55 publication.

10.3.5 Time of Concentration Calculations

Times of concentration (Tc) were calculated using NRCS TR-55 methodologies considering the hydrologic flow lengths, land slope, cover type, and surface roughness. The type and length of each hydrologic flow line are indicated in the HydroCAD modeling output (Appendices K and L). The maximum sheet flow length used for this analysis was 100 feet. Shallow concentrated flow lengths were extended until they reached a subcatchment boundary or a concentrated flow channel.

10.4 Subcatchments and Study Points

The pre-development and post-development conditions for the Facility Site were divided into subcatchments, which depict the watershed conditions, methods of collection, conveyance, points of discharge and topography. In addition, the drainage pattern, drainage structures, soil types, and ground covers are utilized to analyze the rate of runoff in the existing and proposed conditions. The subcatchments include off-site contributing areas as determined by the site topography and site features. The Facility Site was divided into 48 subcatchments for both the pre- and post-development condition. The overall bounds of the subcatchments and study points remain unchanged from the pre-development condition. The study points are were used to compare the pre-development and post-development runoff conditions across the Facility Site and determine the need for stormwater management practices.

10.4.1 Pre-Development Conditions

Pre-development runoff rates were determined by identifying the subcatchments within the pre-construction Facility Site drainage area. Table 9 below provides a summary of the land cover conditions in the pre-development condition.

Table 9 – Pre-Development Land Covers

Land Cover	Curve Number	Area (acres)
>75% Grass Cover, Good, HSG B	61	0.768
>75% Grass Cover, Good, HSG C	74	0.155
Brush, Good, HSG A	30	0.284
Brush, Good, HSG B	48	4.083
Brush, Good, HSG C	65	8.589
Brush, Good, HSG D	73	75.859
Gravel, HSG D	96	11.105
Impervious Surface, HSG D	98	9.791
Meadow, non-grazed, HSG A	30	11.500
Meadow, non-grazed, HSG B	58	385.599
Meadow, non-grazed, HSG C	71	313.074
Meadow, non-grazed, HSG D	78	1,881.769
Pavement, HSG D	98	21.783
Unconnected Roofs, HSG D	98	1.302
Surface Water, HSG D	98	8.586
Woods, Good, HSG A	30	2.690
Woods, Good, HSG B	55	124.384
Woods, Good, HSG C	70	87.844
Woods, Good, HSG D	77	539.268
Total	**74**	**3,488.43**

Additional information on the pre-development land covers can be found in Appendix K.

10.4.2 Post-Development Conditions

Post-development runoff rates were determined by identifying the subcatchments within the Facility Site drainage area. Table 10 below provides a summary of the land cover conditions in the post-development condition.

Table 10 – Post-Development Land Covers

Land Cover	Curve Number	Area (acres)
>75% Grass Cover, Good, HSG B	61	0.768
>75% Grass Cover, Good, HSG C	74	0.155

Land Cover	Curve Number	Area (acres)
Brush, Good, HSG A	30	0.280
Brush, Good, HSG B	48	6.711
Brush, Good, HSG C	65	11.320
Brush, Good, HSG D	73	81.216
Gravel, HSG D	96	47.139
Impervious Surface, HSG D	98	31.106
Meadow, non-grazed, HSG A	30	10.951
Meadow, non-grazed, HSG B	58	390.754
Meadow, non-grazed, HSG C	71	305.204
Meadow, non-grazed, HSG D	78	1,905.770
Pavement, HSG D	98	4.913
Unconnected Roofs, HSG D	98	0.234
Water Surface, HSG D	98	7.699
Woods, Good, HSG A	30	2.921
Woods, Good, HSG B	55	109.654
Woods, Good, HSG C	70	83.951
Woods, Good, HSG D	77	487.674
Total	**74**	**3,485.502**

The Facility proposes construction of impervious surfaces and land cover conversion that may increase runoff from the pre- to post-development conditions. The Facility proposed to use the NYSDEC limited-use pervious access road design for turnarounds and various segments of the access roads as determined necessary during the engineering design. The land cover for the pervious access roads are modeled to match the pre-construction condition since the soil compact and infiltration rates are required to match the pre-construction condition. Refer to Appendix L for a summary of the post-development land cover conditions.

10.5 Runoff Analysis Results

10.5.1 Stormwater Quantity Analysis

The SMDM Section 4.4-4.6 requires the Facility to meet the following separate stormwater quantity criteria:

- <u>Channel Protection Volume (Cpv):</u> The Cpv requirement is designed to protect stream channels from erosion by providing 24 hours of extended detention for a 1-year, 24-hour storm event.
- <u>Overbank Flood Control (Qp):</u> The Qp requirement is designed to prevent an increase in frequency and magnitude of out-of-bank flooding generated by urban development. The overbank control requires storage to attenuate the post-development 10-year, 24-hour peak discharge rate to pre-development rates.
- <u>Extreme Flood Control (Qf):</u> The Qf requirement is designed to prevent the increased risk of flood damage from large storm events, maintain boundaries of

the pre-development 100-year floodplain, and protect the physical integrity of the stormwater management practices. The extreme flood control requires storage to attenuate the post-development 100-year, 24-hour peak discharge rate to pre-development rates.

10.5.2 Runoff Analysis

In order to compare the pre-development and post-development runoff conditions, study points were selected across the Facility Site. Table 11 provides a summary of the pre- and post-development peak runoff rates for the various storm events at each study point. The rate of runoff is impacted by the land cover and topography of the pre- and post-development conditions.

Table 11 – Peak Runoff Rates and Volumes

Study Point	Pre-Development Rate (cfs)			Post-Development Rate (cfs)		
	1-Year Storm	10-Year Storm	100-Year Storm	1-Year Storm	10-Year Storm	100-Year Storm
SP1	2.37	22.85	64.68	2.37	22.85	64.68
SP3	0.27	4.00	11.58	0.27	4.00	11.58
SP4	26.54	140.28	334.30	26.54	140.28	334.30
SP5	7.29	32.00	70.28	7.29	32.00	70.28
SP6	2.03	9.64	21.72	2.03	9.64	21.72
SP7	17.50	93.03	221.62	17.50	93.03	221.62
SP8	4.04	20.86	47.97	4.04	20.86	47.97
SP9	2.35	8.47	17.57	2.35	8.47	17.57
SP10	4.95	17.83	36.88	4.95	17.83	36.88
SP11	3.85	1.92	23.21	3.85	1.92	23.21
SP12	4.99	16.04	31.94	4.99	16.04	31.94
SP13	6.23	25.18	54.39	6.23	25.18	54.39
SP14	3.12	11.25	23.15	3.12	11.25	23.15
SP15	0.43	4.01	10.85	0.43	4.01	10.85
SP16	6.02	19.62	39.01	6.02	19.62	39.01
SP16A	3.73	13.47	27.80	3.73	13.47	27.80
SP17	22.97	78.53	159.48	22.97	78.53	159.48
SP18	17.46	59.93	121.31	17.46	59.93	121.31
SP19	17.12	61.10	126.47	17.12	61.10	126.47
SP20	7.34	29.55	63.77	5.34	21.46	46.20
SP21	0.80	5.05	12.32	0.80	5.05	12.32
SP22	1.36	8.22	20.19	1.36	8.22	20.19
SP23	55.11	196.79	406.51	55.11	196.79	406.51
SP24	2.43	7.47	14.48	2.43	7.47	14.48
SP25	35.47	135.13	284.98	35.47	135.13	284.98

Study Point	Pre-Development Rate (cfs)			Post-Development Rate (cfs)		
	1-Year Storm	10-Year Storm	100-Year Storm	1-Year Storm	10-Year Storm	100-Year Storm
SP26	5.50	17.88	35.47	5.50	17.88	35.47
SP27	3.47	17.67	41.02	3.47	17.70	41.00
SP28	12.82	56.32	123.53	12.82	56.32	123.53
SP29	4.92	19.81	42.16	4.92	19.81	42.16
SP30	2.15	10.18	22.97	2.15	10.18	22.97
SP31	9.88	39.94	86.25	9.88	39.94	86.25
SP32	2.23	22.66	65.60	2.23	22.66	65.60
SP33	6.14	40.42	102.33	6.13	40.40	102.54
SP34	4.66	23.92	55.38	4.66	23.92	55.38
SP35	20.26	72.29	147.83	20.26	72.29	147.83
SP36	43.74	147.27	301.27	43.74	147.27	301.27
SP37	25.26	86.22	174.46	25.32	86.40	174.63
SP38	4.83	16.44	33.18	4.83	16.44	33.18
SP39	7.84	34.06	75.20	7.84	34.06	75.20
SP40	17.96	58.44	116.03	18.70	58.02	113.06
SP41	3.07	14.38	32.59	3.06	14.43	32.57
SP42	24.88	85.06	172.59	25.84	88.40	179.72
SP43	14.50	49.77	100.68	14.50	49.77	100.68
SP44	18.78	60.50	120.52	18.78	60.50	120.52
SP44A	7.63	24.34	47.87	7.63	24.34	47.87
SP45	6.26	18.30	34.82	6.26	18.30	34.82
SP46	8.67	33.26	70.08	8.67	33.26	70.08
SP47	12.52	40.83	81.11	10.33	37.57	77.19
Total	**523.74**	**2,012.18**	**4,329.40**	**521.29**	**2,003.99**	**4,312.41**

The Facility proposed two detention ponds adjacent to the substation and switchyard to capture and treat stormwater runoff from the impervious surfaces. The design of the two detention ponds is preliminary and will be finalized in the Final SWPPP. As noted previously, infiltration trenches are proposed along the access road to capture and treat stormwater runoff from the road surface. Additionally, vegetated filter strips and vegetated buffer areas will be utilized to provide stormwater treatment.

Pre-development drainage patterns and sheet flow will be maintained throughout the Facility Site and all attempts have been made to minimize tree/vegetation removal and earth disturbance and minimize impervious areas to the maximum extent practicable. Negative impacts to downstream areas due to this Facility are not anticipated. Refer to Appendices K and L for the stormwater calculations and modeling for the pre- and post-development condition. Refer to the Design Drawings in Appendix F and the sizing calculations in Appendix J for details regarding the sizing of the SMPs.

The SMPs proposed within this Preliminary SWPPP are anticipated practices to be installed at the Facility. These practices will be modified as necessary for the Final SWPPP prior to Facility construction.

11.0 Construction Pollution Prevention

Proper material storage, handling, and disposal practices shall be implemented during construction to reduce the risk of exposure of materials and hazardous substances to stormwater and environmental resources. The storage, handling, and disposal procedures to be enforced by the Owner/Operator, Contractor(s) and the Qualified Inspector are described below.

11.1 Management of Spills and Releases

The Owner/Operator must be notified in the event of a non-stormwater (fuel, oil, chemical, etc.) spill or release to ensure proper reporting and clean up. The Owner/Operator shall proceed as appropriate in accordance with the Owner/Operator's, local, state, and federal environmental policies and procedures.

A spill or release shall be reported to the NYSDEC Spill Hotline (1-800-457-7362), as applicable, within two hours of the release. The Contractor is responsible for retaining documentation containing the NYS spill number and spill information to provide to the Owner/Operator and the Qualified Inspector. The Contractor is responsible for the cleanup and response actions, in accordance with the on-site spill prevention procedures manual. Contaminated soil shall be removed from the Facility Site and disposed of in accordance with the product specific Safety Data Sheets (SDS) and environmental guidance.

Potential pollutant sources are likely to be stored on the construction site. Bulk petroleum storage (1,100 gallon above ground tank and/or 110 below ground tank) and chemical storage (185 gallon above ground tank and/or any below ground tank) shall not be present onsite. Construction materials typically present on construction sites, as noted in the National Pollutant Discharge Elimination System (NPDES) Construction General Permit, include, but are not limited to, the following:

- Building Products: Asphalt sealants, copper flashing, roofing materials, adhesives, concrete admixtures, and gravel and/or mulch stockpiles;
- Chemicals: Pesticides, herbicides, insecticides, fertilizers, and landscape materials;
- Petroleum Products: Diesel fuel, oil, hydraulic fluids, gasoline, etc.;
- Hazardous or Toxic Waste: Paints, caulks, sealants, fluorescent light ballasts, solvents, petroleum-based products, wood preservatives, additives, curing compounds, and acids;
- Sanitary Facilities: Portable toilets; and,
- Construction Debris: Fill, vegetative debris, stumps, and construction waste.

Specific quantities cannot be estimated until construction methodology and contractor(s) are secured for construction.

Spill cleanup and response guidance is provided in Appendix H of this SWPPP.

11.2 Construction Housekeeping

The Owner/Operator or the Contractor shall coordinate with local fire officials regarding on-site fire safety and emergency response. The Contractor shall keep the Construction Supervisor and the Qualified Inspector/Qualified Professional aware of chemicals and waste present on site. The Contractor shall periodically conduct safety inspections at the Facility Site to identify housekeeping issues and employ spill prevention procedures.

11.2.1 Material Stockpiling

Material resulting from clearing and grubbing, grading, and other construction activities, or new material delivered to the Facility Site, shall be stockpiled upslope of disturbed areas. The stockpile areas shall have the proper erosion and sediment controls installed to prevent the migration of sediments and materials. Materials shall be properly stored and kept away from water resources and environmentally sensitive areas, including, but not limited to, wetlands, streams, storm drains, and ditches.

11.2.2 Staging, Storage, and Laydown Yards

Construction materials and equipment should be stored in designated staging areas as indicated on the Design Drawings or as directed by the Project Engineer (or Qualified Inspector). The staging, storage, and laydown yards should be located in an area that minimizes impacts to stormwater quality.

Chemicals, solvents, fertilizers, and other toxic materials must be stored in waterproof containers and must be kept in the proper storage facilities, except during use or application. Runoff containing such materials must be collected and disposed of at an approved solid waste or chemical disposal facility.

Bulk storage of materials will be staged at the Facility laydown yard per SDS specification and Environmental Health and Safety Standards, whichever is more restrictive. Contractor laydown yards may be associated with other projects not covered under this SWPPP and General Permit. If the laydown area is associated with this SWPPP, the yard shall be inspected by the Qualified Inspector until Facility related activities have ceased. A Qualified Inspector shall inspect the laydown yard to assess for environmental impacts prior to and throughout its use. If additional laydown yards are required, they must abide by this SWPPP and GP-0-20-001. Amendments shall be made to the SWPPP, as necessary, for the additional laydown areas.

11.2.3 Equipment Cleaning and Maintenance

All on-site construction vehicles, including employee vehicles, shall be monitored for leaks and shall receive regular preventative maintenance to reduce the risk of leakage. Any equipment leaking oil, fuel, or hydraulic fluid shall be repaired immediately or removed from the Facility Site. Construction equipment and Contractor personal vehicles shall be parked, refueled and serviced at least 100 feet from a wetland, waterbody, or other ecologically sensitive area, at an upland location away from conveyance channels, unless approved by the Qualified Inspector/Qualified Professional.

Where there is no reasonable alternative, refueling may occur within these setbacks, but only under the observation of the Qualified Inspector or Trained Contractor and after proper precautions are taken to prevent an accidental spill. The Contractor shall take precautions to ensure that drips, spills, or seeps do not enter the ground. The use of absorbent towels and/or a portable basin beneath the fuel tank is recommended. Refueling activities shall be performed under continual surveillance with extreme care. In the event of a release, the spill shall be promptly cleaned up in accordance with the spill response and clean up procedures.

Petroleum products and hydraulic fluids that are not in vehicles shall be stored in tightly sealed containers that are clearly labeled. All gasoline and fuel storage vessels with greater than a 25-gallon capacity must have secondary containment constructed of an impervious material and be capable of holding 110% of the vessel capacity.

11.2.4 Concrete Washout Areas

Designated concrete washout areas should be provided as needed to allow concrete trucks to wash out or discharge surplus concrete and wash water on site. The concrete washout areas shall be a diked impervious area, located a minimum of 100 feet from a drainage way, waterbody, or wetland area. The concrete washout areas should be designed to prevent contact between the concrete wash and stormwater. The concrete washout areas shall have the proper signage to indicate the location of the facility. The Contractor is responsible for the maintenance of the concrete washout areas. Waste collected at the concrete washout areas shall be disposed of as non-hazardous construction waste material.

The washout facility should have sufficient volume to contain the concrete waste resulting from washout and a minimum freeboard of 12 inches. The washout areas should not be filled beyond 95% capacity and shall be cleaned out once 75% capacity has been met unless a new facility has been constructed. Refer to the SSESC and SMDM for guidance on the construction and use of concrete washout areas.

11.3 Waste Management

The Contractor shall comply with all required regulations governing the on-site management and off-site disposal of solid and hazardous waste generated during construction of the Facility. Substances and materials with the potential to pollute surface and groundwaters must be handled, controlled and contained as appropriate to ensure they do not discharge from the Facility Site.

A solid waste management program will be implemented to support proper solid waste disposal and recycling practices. Solid waste and debris that cannot be recycled, reused, or salvaged shall be stored in on-site containers for off-site disposal. The containers shall be emptied periodically by a licensed waste transport service and hauled away from the site for proper disposal. No loose materials shall be allowed at the Facility Site and all waste material shall be disposed of promptly and properly. The burning of crates, waste, and other refuse is not permitted.

If a hazardous material spill occurs, it must be contained and disposed of immediately. Contaminated soil shall be removed from the Facility Site and disposed of in accordance with product specific SDS and associated guidelines. Reporting spills to the NYSDEC may be required per 17 New York Code, Rules and Regulations (NYCRR) 32.3 and 32.4, and the Environmental Conservation Law (ECL) 17-1734.

12.0 Maintenance Inspections and Reporting Requirements

12.1 Pre-Construction Inspection

A site assessment shall be conducted by the Qualified Inspector prior to commencement of construction activities to ensure erosion and sediment controls have been adequately and appropriately installed. The Contractor is responsible for contacting the Qualified Inspector for the pre-construction inspection following the installation of the erosion and sediment control measures.

12.2 Construction Phase Inspections

A Qualified Inspector shall conduct regular site inspections for the implementation of this SWPPP through final stabilization of the Facility Site. Inspections shall occur at an interval of once every seven calendar days unless greater than five acres of soil is disturbed at any one time or if the Facility Site directly discharges to a 303(d) waterbody segment or is located in one of the watersheds listed in Appendix C of GP-0-20-001, in which inspections shall occur at least twice per every seven calendar days. The two inspections shall be separated by a minimum of two full calendar days. If a portion of the Facility Site is permanently stabilized, inspections can cease in that area as long as the condition has been documented by amending the SWPPP.

The Qualified Inspector shall conduct site inspections to assess the performance of the erosion and sediment controls and identify areas requiring modification or repair. The Qualified Inspector shall complete an inspection report following each inspection.

The Owner/Operator and the Contractor(s) must ensure the erosion and sediment control practices implemented at the Facility Site have been maintained in accordance with GP-0-20-001, the SSESC and SMDM. The trained Contractor shall regularly inspect the erosion and sediment control practices and pollution prevention measures to ensure they are being maintained in effective operating condition at all times. The Contractor shall begin implementing corrective actions to the identified deficiencies within one business day and shall be completed within a reasonable time frame.

In areas where temporary or permanent soil disturbing activities have ceased, soil stabilization measures shall be applied in accordance with the NYSDEC SSESC specifications. Soil stabilization measures shall be initiated by the end of the next business day and completed within 14 days of the soil disturbing activity ceasing in that area. If greater than five acres of soil has been disturbed at any one time during construction, the application of soil stabilization measures shall be initialed by the end of the next business day and completed within seven days of the soil disturbing activity ceasing.

The Qualified Inspector/Qualified Professional shall inspect the debris removal on a continual basis during construction to ensure proper management and disposal. When construction and restoration are complete, the Contractor is responsible for ensuring the Facility Site is free of all construction debris and materials.

12.3 Temporary Construction Activity Suspension

The Contractor must temporarily stabilize all disturbed areas prior to temporary suspension of construction activities. For construction sites where soil disturbance activities have been temporarily suspended and the appropriate temporary stabilization measures have been installed and applied to all disturbed areas, the Qualified Inspector shall begin conducting site inspections in accordance with Part IV.C.2 of GP-0-20-001. The trained Contractor may cease the regular maintenance inspections until soil disturbance activities resume.

The Owner/Operator must notify the NYSDEC Division of Water (DOW) Program contact at the Regional Office in writing prior to reducing the frequency of inspections. Correspondence with the NYSDEC DOW shall be included in Appendix D of this SWPPP.

12.4 Partial Facility Completion

Construction sites where soil disturbance activities have been shut down with partial Facility completion, the Qualified Inspector can stop conducting inspections once all disturbed areas have achieved final stabilization in conformance with this SWPPP.

The Owner/Operator must notify the NYSDEC DOW Program contact at the Regional Office in writing prior to shut down. Correspondence with the NYSDEC DOW shall be included in Appendix D of this SWPPP.

If soil disturbance activities have ceased for two years from the date of shutdown, the Owner/Operator shall have the Qualified Inspector complete a final inspection to certify final stabilization has been achieved and all temporary erosion and sediment control measures have been removed. The Owner/Operator shall complete the NOT form and submit the form to the NYSDEC. A copy of the completed NOT shall be included in Appendix A of this SWPPP.

12.5 Reporting Requirements

Inspection and maintenance reports shall be prepared in accordance with GP-0-20-001 from the commencement of construction activities until the NOT has been submitted to the NYSDEC. The Qualified Inspector shall provide a copy of the completed inspection report to the Owner/Operator and the Contractor(s) within one business day of inspection. A copy of the inspection report shall be included in Appendix N of the on-site SWPPP. A blank SWPPP Inspection Form is provided in Appendix N.

12.6 Post-Construction Operation and Maintenance Record Archiving

Post-construction operation and maintenance (O&M) activities shall be performed in accordance with the O&M Manual provided in Appendix I of this SWPPP and the requirements outlined in the Section 3.5 of the SMDM. Post-construction operation and maintenance shall occur once stormwater management practices have been installed and are in operation, and the disturbed areas have achieved final stabilization.

12.7 Records Archiving

The Owner/Operator shall retain a copy of the SWPPP, permit coverage forms and associated documentation that were prepared in conjunction with GP-0-20-001 for a period of at least five years from the date that the NYSDEC received the competed NOT.

Appendix A – Permit Coverage Forms

- Notice of Intent (NOI) -

- SWPPP Preparer Certification Form -

- Owner/Operator Certification Form -

- NYSDEC NOI Acknowledgement Letter for Permit Coverage -

- Notice of Termination (NOT) Form -

Appendix A – Notice of Intent (NOI)

Note: The Notice of Intent will be completed in the Final SWPPP prior to construction.

0644089821

NOTICE OF INTENT

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

NYR
(for DEC use only)

Stormwater Discharges Associated with Construction Activity Under State Pollutant Discharge Elimination System (SPDES) General Permit # GP-0-15-002

All sections must be completed unless otherwise noted. Failure to complete all items may result in this form being returned to you, thereby delaying your coverage under this General Permit. Applicants must read and understand the conditions of the permit and prepare a Stormwater Pollution Prevention Plan prior to submitting this NOI. Applicants are responsible for identifying and obtaining other DEC permits that may be required.

-IMPORTANT-

RETURN THIS FORM TO THE ADDRESS ABOVE

OWNER/OPERATOR MUST SIGN FORM

Owner/Operator Information

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

Owner/Operator Contact Person Last Name (NOT CONSULTANT)

Owner/Operator Contact Person First Name

Owner/Operator Mailing Address

City

State

Zip -

Phone (Owner/Operator) - -

Fax (Owner/Operator) - -

Email (Owner/Operator)

FED TAX ID - (not required for individuals)

Project Site Information

Project/Site Name

Street Address (NOT P.O. BOX)

Side of Street
○ **North** ○ **South** ○ **East** ○ **West**

City/Town/Village (THAT ISSUES BUILDING PERMIT)

State: N Y
Zip: -
County
DEC Region

Name of Nearest Cross Street

Distance to Nearest Cross Street (Feet)

Project In Relation to Cross Street
○ **North** ○ **South** ○ **East** ○ **West**

Tax Map Numbers
Section-Block-Parcel

Tax Map Numbers

1. Provide the Geographic Coordinates for the project site in NYTM Units. To do this you **must** go to the NYSDEC Stormwater Interactive Map on the DEC website at:

www.dec.ny.gov/imsmaps/stormwater/viewer.htm

Zoom into your Project Location such that you can accurately click on the centroid of your site. Once you have located your project site, go to the tool boxes on the top and choose "i"(identify). Then click on the center of your site and a new window containing the X, Y coordinates in UTM will pop up. Transcribe these coordinates into the boxes below. For problems with the interactive map use the help function.

X Coordinates (Easting)

Y Coordinates (Northing)
4

2. What is the nature of this construction project?

○ **New Construction**

○ **Redevelopment with increase in impervious area**

○ **Redevelopment with no increase in impervious area**

3. Select the predominant land use for both pre and post development conditions.
SELECT ONLY ONE CHOICE FOR EACH

Pre-Development
Existing Land Use

○ FOREST
○ PASTURE/OPEN LAND
○ CULTIVATED LAND
○ SINGLE FAMILY HOME
○ SINGLE FAMILY SUBDIVISION
○ TOWN HOME RESIDENTIAL
○ MULTIFAMILY RESIDENTIAL
○ INSTITUTIONAL/SCHOOL
○ INDUSTRIAL
○ COMMERCIAL
○ ROAD/HIGHWAY
○ RECREATIONAL/SPORTS FIELD
○ BIKE PATH/TRAIL
○ LINEAR UTILITY
○ PARKING LOT
○ OTHER
☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Post-Development
Future Land Use

○ SINGLE FAMILY HOME
○ SINGLE FAMILY SUBDIVISION
○ TOWN HOME RESIDENTIAL
○ MULTIFAMILY RESIDENTIAL
○ INSTITUTIONAL/SCHOOL
○ INDUSTRIAL
○ COMMERCIAL
○ MUNICIPAL
○ ROAD/HIGHWAY
○ RECREATIONAL/SPORTS FIELD
○ BIKE PATH/TRAIL
○ LINEAR UTILITY (water, sewer, gas, etc.)
○ PARKING LOT
○ CLEARING/GRADING ONLY
○ DEMOLITION, NO REDEVELOPMENT
○ WELL DRILLING ACTIVITY *(Oil, Gas, etc.)
○ OTHER
☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Number of Lots
☐☐☐

***Note**: for gas well drilling, non-high volume hydraulic fractured wells only

4. In accordance with the larger common plan of development or sale, enter the total project site area; the total area to be disturbed; existing impervious area to be disturbed (for redevelopment activities); and the future impervious area constructed within the disturbed area. (Round to the nearest tenth of an acre.)

Total Site Area	**Total Area To Be Disturbed**	**Existing Impervious Area To Be Disturbed**	**Future Impervious Area Within Disturbed Area**
☐☐☐☐.☐	☐☐☐☐.☐	☐☐☐☐.☐	☐☐☐☐.☐

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

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

A	**B**	**C**	**D**
☐☐☐%	☐☐☐%	☐☐☐%	☐☐☐%

7. Is this a phased project? ○ **Yes** ○ **No**

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

Start Date		**End Date**
☐☐/☐☐/☐☐☐☐	-	☐☐/☐☐/☐☐☐☐

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

Name

9a. Type of waterbody identified in Question 9?

○ Wetland / State Jurisdiction On Site (Answer 9b)
○ Wetland / State Jurisdiction Off Site
○ Wetland / Federal Jurisdiction On Site (Answer 9b)
○ Wetland / Federal Jurisdiction Off Site
○ Stream / Creek On Site
○ Stream / Creek Off Site
○ River On Site
○ River Off Site
○ Lake On Site
○ Lake Off Site
○ Other Type On Site
○ Other Type Off Site

9b. How was the wetland identified?

○ Regulatory Map
○ Delineated by Consultant
○ Delineated by Army Corps of Engineers
○ Other (identify)

10. Has the surface waterbody(ies) in question 9 been identified as a 303(d) segment in Appendix E of GP-0-15-002? ○ **Yes** ○ **No**

11. Is this project located in one of the Watersheds identified in Appendix C of GP-0-15-002? ○ **Yes** ○ **No**

12. Is the project located in one of the watershed areas associated with AA and AA-S classified waters? ○ **Yes** ○ **No**
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 an E or F on the USDA Soil Survey? ○ **Yes** ○ **No**
If Yes, what is the acreage to be disturbed?

.

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

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

16. What is the name of the municipality/entity that owns the separate storm sewer system?

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

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

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

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

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** ○ **No**

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)? ○ **Yes** ○ **No**
If No, skip questions 23 and 27-39.

23. Has the post-construction stormwater management practice component of the SWPPP been developed in conformance with the current NYS Stormwater Management Design Manual? ○ **Yes** ○ **No**

24. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:

○ **Professional Engineer (P.E.)**

○ **Soil and Water Conservation District (SWCD)**

○ **Registered Landscape Architect (R.L.A)**

○ **Certified Professional in Erosion and Sediment Control (CPESC)**

○ **Owner/Operator**

○ **Other**

SWPPP Preparer

Contact Name (Last, Space, First)

Mailing Address

City

State Zip -

Phone - - Fax - -

Email

SWPPP Preparer Certification

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-0-15-002. 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

Signature

Date / /

25. Has a construction sequence schedule for the planned management practices been prepared? ○ Yes ○ No

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

Temporary Structural

- ○ **Check Dams**
- ○ **Construction Road Stabilization**
- ○ **Dust Control**
- ○ **Earth Dike**
- ○ **Level Spreader**
- ○ **Perimeter Dike/Swale**
- ○ **Pipe Slope Drain**
- ○ **Portable Sediment Tank**
- ○ **Rock Dam**
- ○ **Sediment Basin**
- ○ **Sediment Traps**
- ○ **Silt Fence**
- ○ **Stabilized Construction Entrance**
- ○ **Storm Drain Inlet Protection**
- ○ **Straw/Hay Bale Dike**
- ○ **Temporary Access Waterway Crossing**
- ○ **Temporary Stormdrain Diversion**
- ○ **Temporary Swale**
- ○ **Turbidity Curtain**
- ○ **Water bars**

Biotechnical

- ○ **Brush Matting**
- ○ **Wattling**

Vegetative Measures

- ○ **Brush Matting**
- ○ **Dune Stabilization**
- ○ **Grassed Waterway**
- ○ **Mulching**
- ○ **Protecting Vegetation**
- ○ **Recreation Area Improvement**
- ○ **Seeding**
- ○ **Sodding**
- ○ **Straw/Hay Bale Dike**
- ○ **Streambank Protection**
- ○ **Temporary Swale**
- ○ **Topsoiling**
- ○ **Vegetating Waterways**

Permanent Structural

- ○ **Debris Basin**
- ○ **Diversion**
- ○ **Grade Stabilization Structure**
- ○ **Land Grading**
- ○ **Lined Waterway (Rock)**
- ○ **Paved Channel (Concrete)**
- ○ **Paved Flume**
- ○ **Retaining Wall**
- ○ **Riprap Slope Protection**
- ○ **Rock Outlet Protection**
- ○ **Streambank Protection**

Other

Post-construction Stormwater Management Practice (SMP) Requirements

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.

○ **Preservation of Undisturbed Areas**
○ **Preservation of Buffers**
○ **Reduction of Clearing and Grading**
○ **Locating Development in Less Sensitive Areas**
○ **Roadway Reduction**
○ **Sidewalk Reduction**
○ **Driveway Reduction**
○ **Cul-de-sac Reduction**
○ **Building Footprint Reduction**
○ **Parking Reduction**

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 (2010 version).

○ All disturbed areas will be restored in accordance with the Soil Restoration requirements in Table 5.3 of the Design Manual (see page 5-22).

○ Compacted areas were considered as impervious cover when calculating the **WQv Required**, and the compacted areas were assigned a post-construction Hydrologic Soil Group (HSG) designation that is one level less permeable than existing conditions for the hydrology analysis.

28. Provide the total Water Quality Volume (WQv) required for this project (based on final site plan/layout).

Total WQv Required

☐☐☐.☐☐☐ **acre-feet**

29. Identify the RR techniques (Area Reduction), RR techniques(Volume Reduction) and Standard SMPs with RRv Capacity in Table 1 (See Page 9) that were used to reduce the Total WQv Required(#28).

Also, provide in Table 1 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 Tables 1 and 2 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.

Table 1 - Runoff Reduction (RR) Techniques and Standard Stormwater Management Practices (SMPs)

	Total Contributing Area (acres)		Total Contributing Impervious Area(acres)
RR Techniques (Area Reduction)			
○ Conservation of Natural Areas (RR-1) ...	.	and/or	.
○ Sheetflow to Riparian Buffers/Filters Strips (RR-2)	.	and/or	.
○ Tree Planting/Tree Pit (RR-3)	.	and/or	.
○ Disconnection of Rooftop Runoff (RR-4)..	.	and/or	.
RR Techniques (Volume Reduction)			
○ Vegetated Swale (RR-5)			.
○ Rain Garden (RR-6)			.
○ Stormwater Planter (RR-7)			.
○ Rain Barrel/Cistern (RR-8)			.
○ Porous Pavement (RR-9)			.
○ Green Roof (RR-10)			.
Standard SMPs with RRv Capacity			
○ Infiltration Trench (I-1)			.
○ Infiltration Basin (I-2)			.
○ Dry Well (I-3)			.
○ Underground Infiltration System (I-4)			.
○ Bioretention (F-5)			.
○ Dry Swale (O-1)			.
Standard SMPs			
○ Micropool Extended Detention (P-1)			.
○ Wet Pond (P-2)			.
○ Wet Extended Detention (P-3)			.
○ Multiple Pond System (P-4)			.
○ Pocket Pond (P-5)			.
○ Surface Sand Filter (F-1)			.
○ Underground Sand Filter (F-2)			.
○ Perimeter Sand Filter (F-3)			.
○ Organic Filter (F-4)			.
○ Shallow Wetland (W-1)			.
○ Extended Detention Wetland (W-2)			.
○ Pond/Wetland System (W-3)			.
○ Pocket Wetland (W-4)			.
○ Wet Swale (O-2)			.

Table 2 - Alternative SMPs
(DO NOT INCLUDE PRACTICES BEING USED FOR PRETREATMENT ONLY)

Alternative SMP	**Total Contributing Impervious Area(acres)**
○ **Hydrodynamic**	.
○ **Wet Vault**	.
○ **Media Filter**	.
○ **Other**	.

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

Name

Manufacturer

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.

30. Indicate the Total RRv provided by the RR techniques (Area/Volume Reduction) and Standard SMPs with RRv capacity identified in question 29.

Total RRv provided

. **acre-feet**

31. Is the Total RRv provided (#30) greater than or equal to the total WQv required (#28). ○ **Yes** ○ **No**

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)]

Minimum RRv Required

. **acre-feet**

32a. Is the Total RRv provided (#30) greater than or equal to the Minimum RRv Required (#32)? ○ **Yes** ○ **No**

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, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

33. Identify the Standard SMPs in Table 1 and, if applicable, the Alternative SMPs in Table 2 that were used to treat the remaining
total WQv(=Total WQv Required in 28 - Total RRv Provided in 30).

Also, provide in Table 1 and 2 the total impervious area that contributes runoff to each practice selected.

Note: Use Tables 1 and 2 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.

WQv Provided

☐☐☐.☐☐☐ **acre-feet**

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 - RRv 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). ☐☐☐.☐☐☐

35. Is the sum of the RRv provided (#30) and the WQv provided (#33a) greater than or equal to the total WQv required (#28)? ○ **Yes** ○ **No**

If Yes, go to question 36.
If No, sizing criteria has not been met, so 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	**CPv Provided**
☐☐☐.☐☐☐ **acre-feet**	☐☐☐.☐☐☐ **acre-feet**

36a. The need to provide channel protection has been waived because:

○ Site discharges directly to tidal waters or a fifth order or larger stream.

○ Reduction of the total CPv is achieved on site through runoff reduction techniques or infiltration systems.

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

Total Overbank Flood Control Criteria (Qp)

Pre-Development	**Post-development**
☐☐☐.☐☐☐ **CFS**	☐☐☐.☐☐☐ **CFS**

Total Extreme Flood Control Criteria (Qf)

Pre-Development	**Post-development**
☐☐☐.☐☐☐ **CFS**	☐☐☐.☐☐☐ **CFS**

37a. The need to meet the Qp and Qf criteria has been waived because:

○ Site discharges directly to tidal waters or a fifth order or larger stream.
○ Downstream analysis reveals that the Qp and Qf controls are not required

38. Has a long term Operation and Maintenance Plan for the post-construction stormwater management practice(s) been developed? ○ Yes ○ No

If Yes, Identify the entity responsible for the long term Operation and Maintenance

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.

40. Identify other DEC permits, existing and new, that are required for this project/facility.

- ○ Air Pollution Control
- ○ Coastal Erosion
- ○ Hazardous Waste
- ○ Long Island Wells
- ○ Mined Land Reclamation
- ○ Solid Waste
- ○ Navigable Waters Protection / Article 15
- ○ Water Quality Certificate
- ○ Dam Safety
- ○ Water Supply
- ○ Freshwater Wetlands/Article 24
- ○ Tidal Wetlands
- ○ Wild, Scenic and Recreational Rivers
- ○ Stream Bed or Bank Protection / Article 15
- ○ Endangered or Threatened Species(Incidental Take Permit)
- ○ Individual SPDES
- ○ SPDES Multi-Sector GP NYR
- ○ Other
- ○ None

41. Does this project require a US Army Corps of Engineers Wetland Permit? ○ Yes ○ No
If Yes, Indicate Size of Impact. .

42. Is this project subject to the requirements of a regulated, traditional land use control MS4? ○ Yes ○ No
(If No, skip question 43)

43. Has the "MS4 SWPPP Acceptance" form been signed by the principal executive officer or ranking elected official and submitted along with this NOI? ○ Yes ○ No

44. 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. NYR

Owner/Operator Certification

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.

Print First Name **MI**

Print Last Name

Owner/Operator Signature

Date
/ /

Appendix A – SWPPP Preparer Certification Form

Note: The signed SWPPP Preparer Certification Form will be completed in the Final SWPPP prior to construction.

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

Owner/Operator Information

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

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

Signature Date

Revised: January 2020

Appendix A – Owner/Operator Certification Form

Note: The signed Owner/Operator Certification Form will be completed in the Final SWPPP prior to construction.

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: ____

eNOI Submission Number: ____

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

____
Signature

____
Date

Appendix A – NYSDEC NOI Acknowledgement Letter for Permit Coverage

Note: The NYSDEC NOI Acknowledgement Letter will be provided in the Final SWPPP prior to construction.

Appendix A – Notice of Termination (NOT) Form

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 DEC Notice of Termination - January 2015)

Appendix B – General Permit GP-0-20-001

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

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

Authorized Signature

1-23-20

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 discharges*;

   (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 **not** 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 not 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 not 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* 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. 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, with the exception of:

    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 not located in one of the watersheds listed in Appendix C and <u>not</u> 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 <u>not</u> located in one of the watersheds listed in Appendix C and <u>not</u> 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* <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. 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,* <u>and</u> 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; <u>and</u> all areas of disturbance have achieved *final stabilization*; <u>and</u> all temporary, structural erosion and sediment control measures have been removed; <u>and</u> 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; <u>and</u> all areas disturbed as of the project shutdown date have achieved *final stabilization*; <u>and</u> all temporary, structural erosion and sediment control measures have been removed; <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. 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

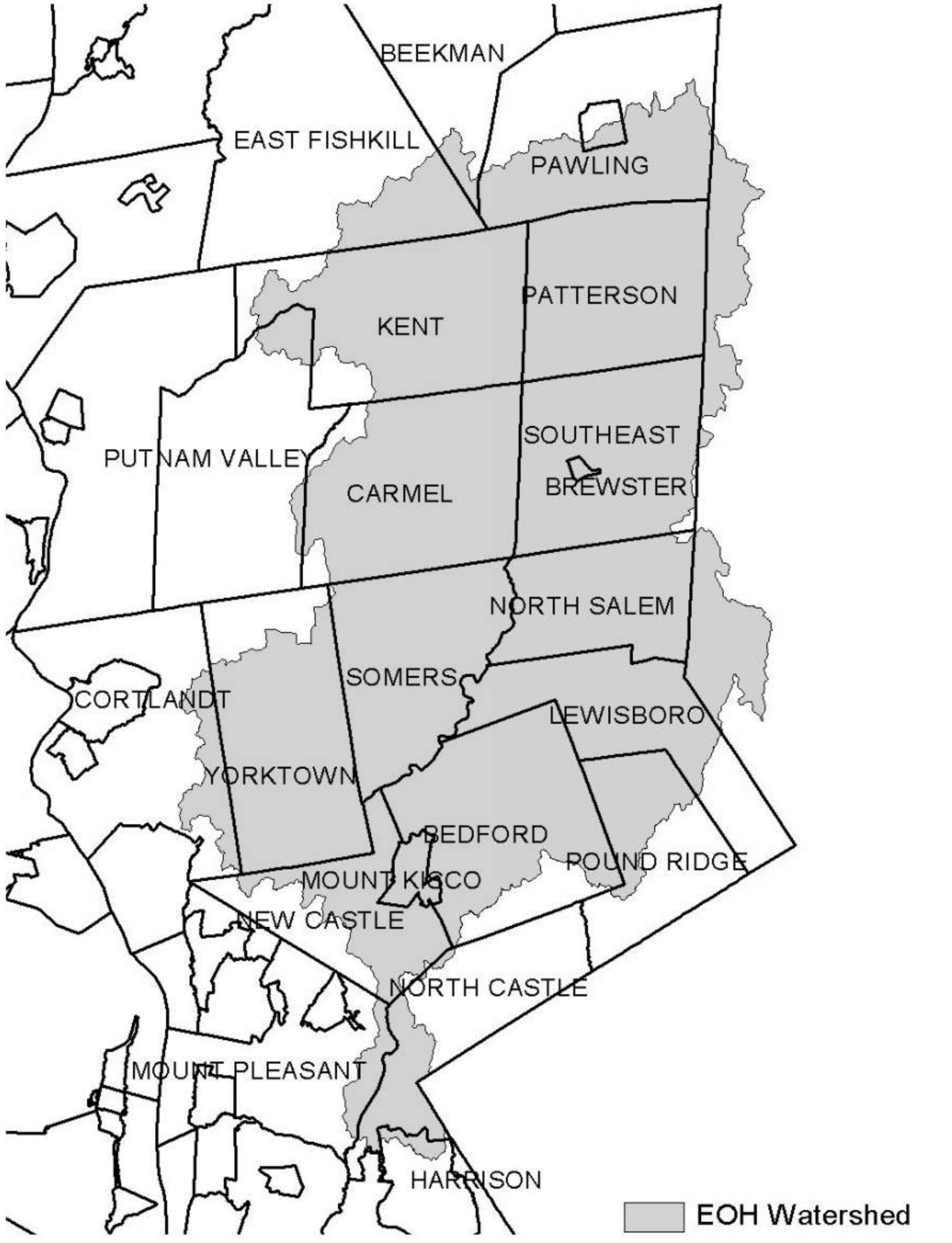


Figure 2 - Onondaga Lake Watershed

Figure 3 - Greenwood Lake Watershed

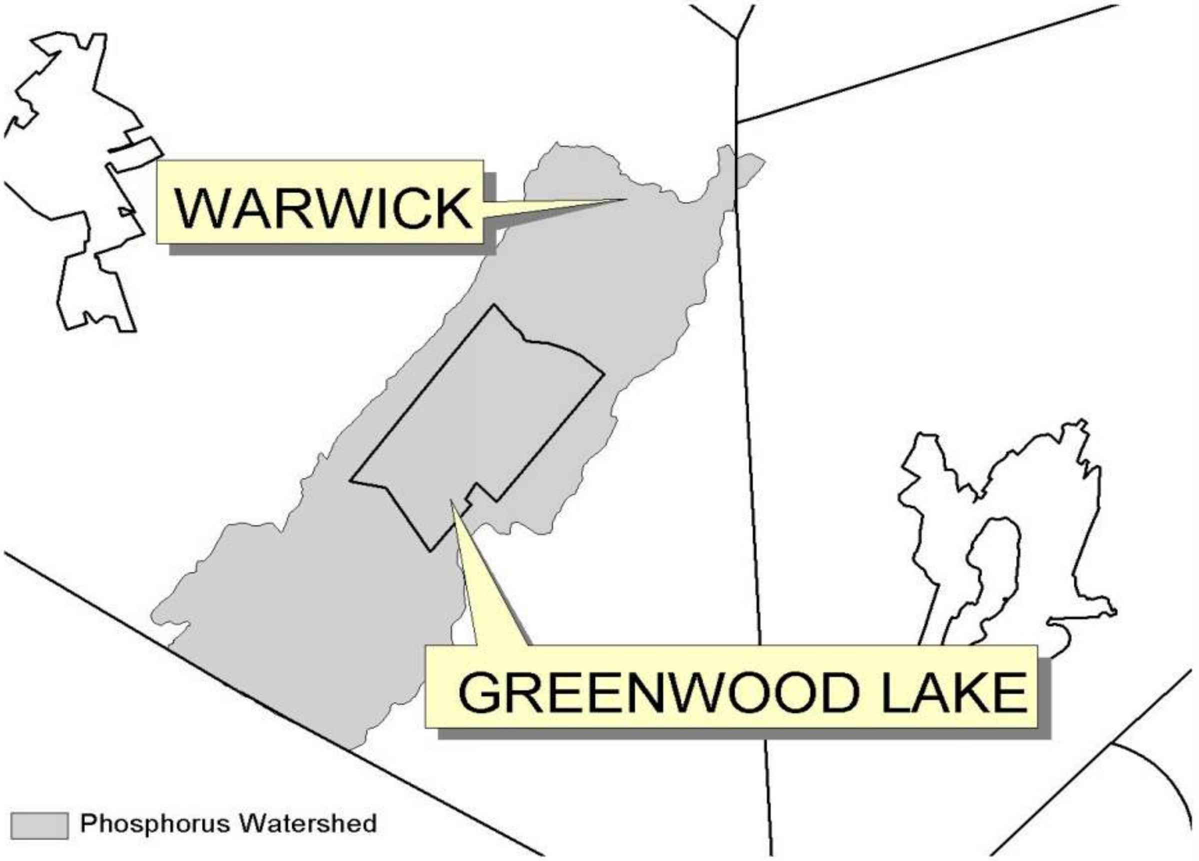


Figure 4 - Oscawana Lake Watershed

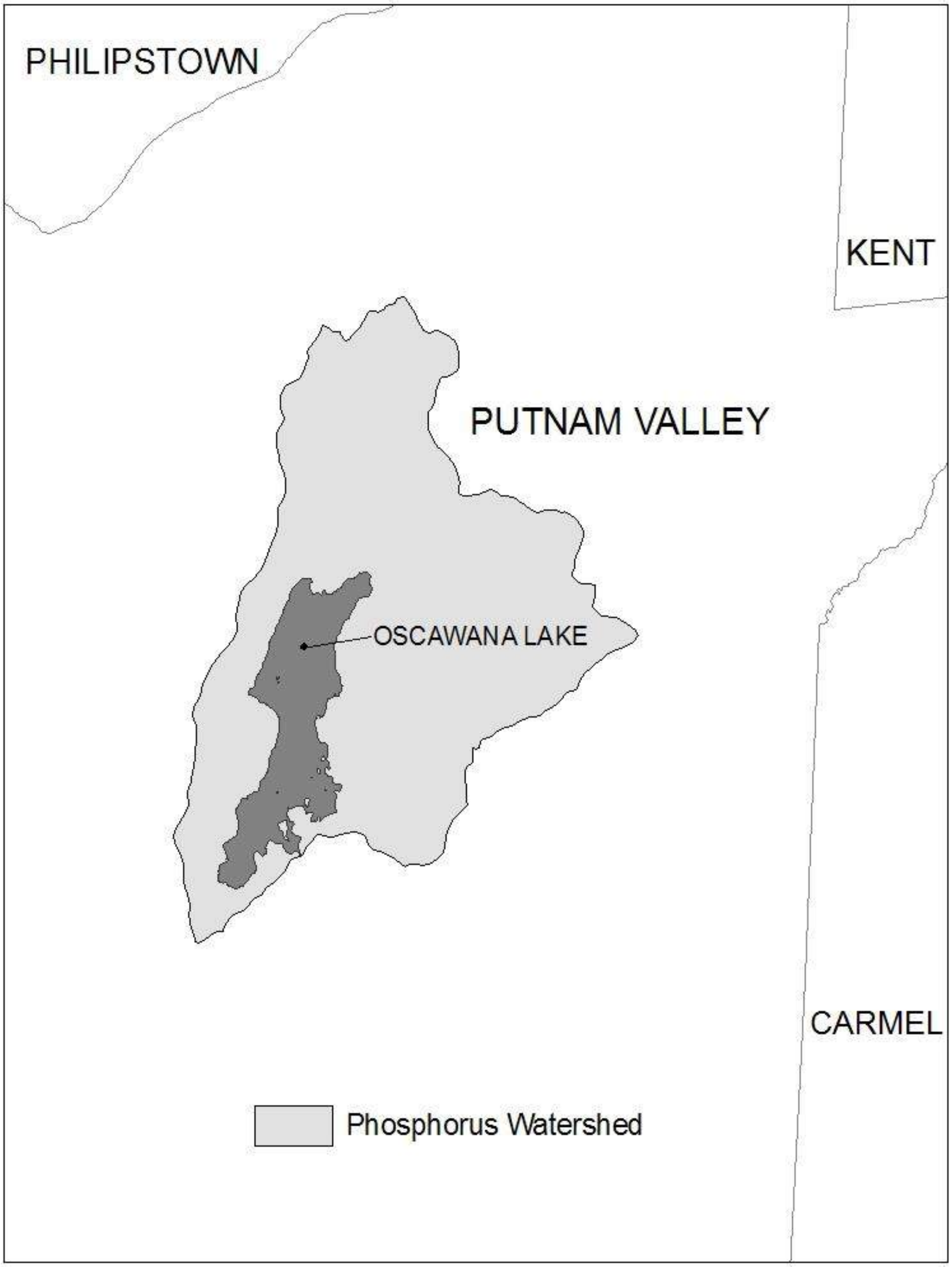
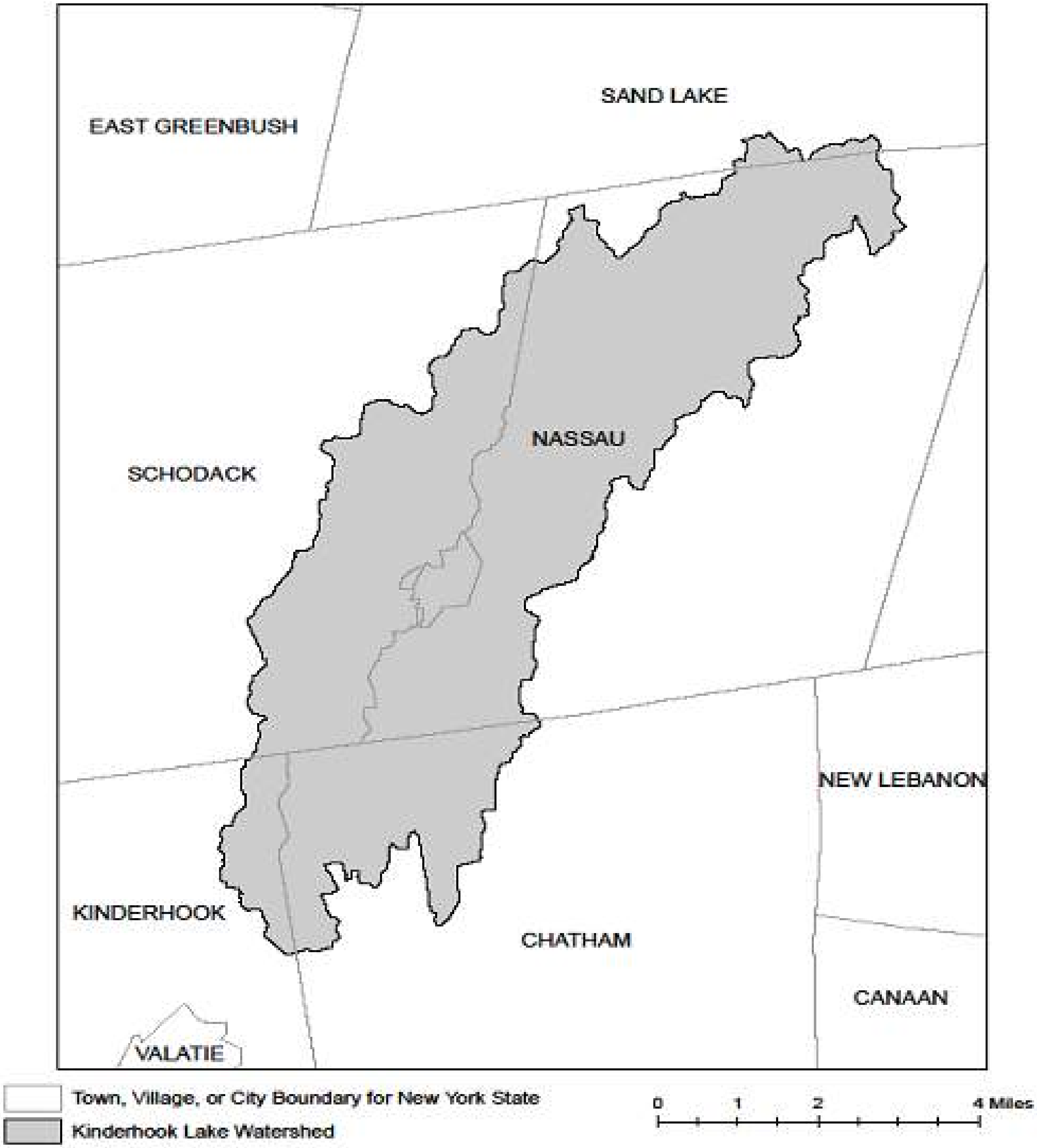


Figure 5 - Kinderhook Lake Watershed



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 C – Construction Personnel Contact List

- Construction Contact List -

- Contractor Certification Form -

- NYSDEC 4-hour Erosion and Sediment Control Training Certificates -

Appendix C – Construction Contact List

Note: The Construction Contact List will be provided in the Final SWPPP prior to construction

TRC

SWPPP Construction Contact List

Name	Title/Role	Company	Phone Number
	Project Engineer		
	Project Field Construction Coordinator		
	Project Environmental Engineer		
	Division Environmental Engineer (Spill Reporting)		
	SWPPP Preparer		
	Qualified Inspector		

Appendix C – Contractor Certification Form

Note: The signed Contractor Certification Form will be completed in the Final SWPPP prior to construction.

Contractor Certification Form

Stormwater Pollution Prevention Plan (SWPPP)
State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity
GP-0-20-001

Flat Creek Solar
Towns of Canajoharie and Root, Montgomery County, New York

All Contractors and Subcontractors performing construction activities shall sign the following certification before they commence construction activities. A copy of the certification shall be included in Appendix A of the on-site SWPPP. All Contractors and Subcontractors must identify at least one trained person from their company, who has met the requirements of a *Trained Contractor* as defined in GP-0-20-001, that will be responsible for the implementation of the SWPPP.

> "I hereby certify under penalty of the 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 SPDES General Permit for Stormwater Discharges from Construction Activities (GP-0-20-001) and that 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."

____

____
Name of Construction Company

____
Address of Construction Company Telephone Number

____
Printed Name of Authorized Representative Title

____
Signature of Authorized Representative Date

____
Printed Name of Trained Contractor(s) Title(s)

Type of construction services to be provided: ______________________

____

____

Appendix C – NYSDEC 4-hour Erosion and Sediment Control Training Certificates

Provide copies of the NYSDEC 4-hour erosion and Sediment Control Training certificates for the Contractor(s), Subcontractor(s), and Qualified Inspector.

Note: Copies if the Contractor's NYSDEC 4-hour ESC Training Certificate will be provided in the Final SWPPP prior to construction.

Appendix D – Agency Correspondence and Notifications

Provide copies of correspondence and notifications with agencies during construction and prior to temporary shutdown or Facility termination. At a minimum, the following documentation shall be provided if necessary:

- Five-Acre Waiver request letter, Phasing Plan, and approval.
- Construction inspection reduction notices to NYSDEC or MS4 representative.
- Notification of partial Facility shutdown to NYSDEC.

Appendix D – Five-Acre Waiver Request Letter and Phasing Plan

Note: A Five-Acre Waiver request will be submitted to the NYSDEC for approval with the Final SWPPP prior to construction.

Appendix E – Environmental Background Information

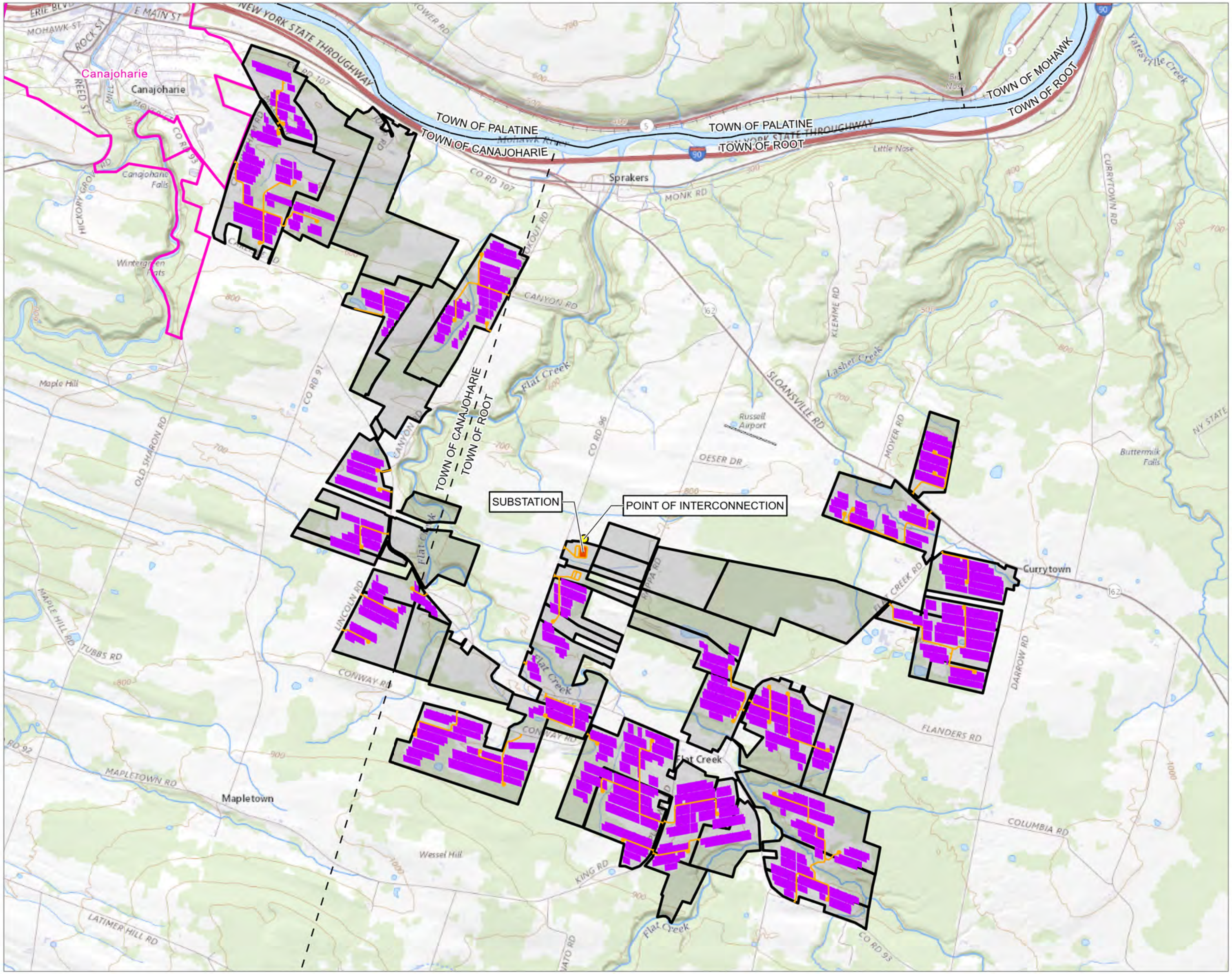
- Figure 1: Site Location Map -

- Environmental and Cultural Resource Information -

- Geotechnical Engineering Report -

- NOAA Atlas 14 Point Precipitation Frequency Estimate Tables -

Appendix E – Figure 1: Site Location Map



LEGEND

▭ FACILITY SITE

● PROPOSED POINT OF INTERCONNECTION

🟧 PROPOSED ACCESS ROAD

▭ PROPOSED PV ARRAY

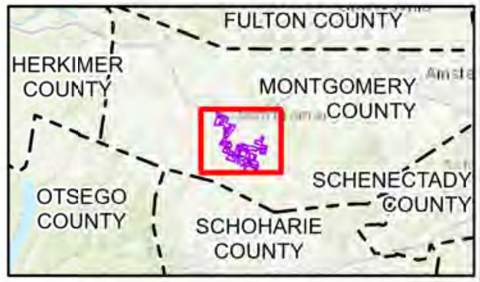
🟥 PROPOSED SUBSTATION

▭ VILLAGE BOUNDARY

- - TOWN BOUNDARY

NOTES:
1. THIS FIGURE IS DESIGNED TO BE VIEWED OR PRINTED IN COLOR AT 11X17.

BASE MAP: USGS NATIONAL MAP
DATA SOURCES: SUNEAST, ESRI, TRC, USGS



1:36,000
1" = 3,000'
0 3,000 6,000 US FEET

PROJECT:
FLAT CREEK SOLAR
TOWNS OF CANAJOHARIE AND ROOT
MONTGOMERY COUNTY, NY

TITLE:
TOPOGRAPHIC MAP OF FACILITY SITE

DRAWN BY:	R. BARBER	PROJ. NO.:	427281.0000.0000
CHECKED BY:	G. CORYELL	**FIGURE 3-1**	
APPROVED BY:	S. KRANES		
DATE:	MARCH 2024		

TRC
102 WEST STATE STREET
ITHACA, NY 14850

Appendix E – Environmental and Cultural Resource Information

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 18N. The **horizontal datum** was NAD 83, GRS1980. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by the New York State Office of Cyber Security & Critical Infrastructure Coordination. This information was provided as 60-centimeter resolution panchromatic orthoimagery from photography dated April 2005.

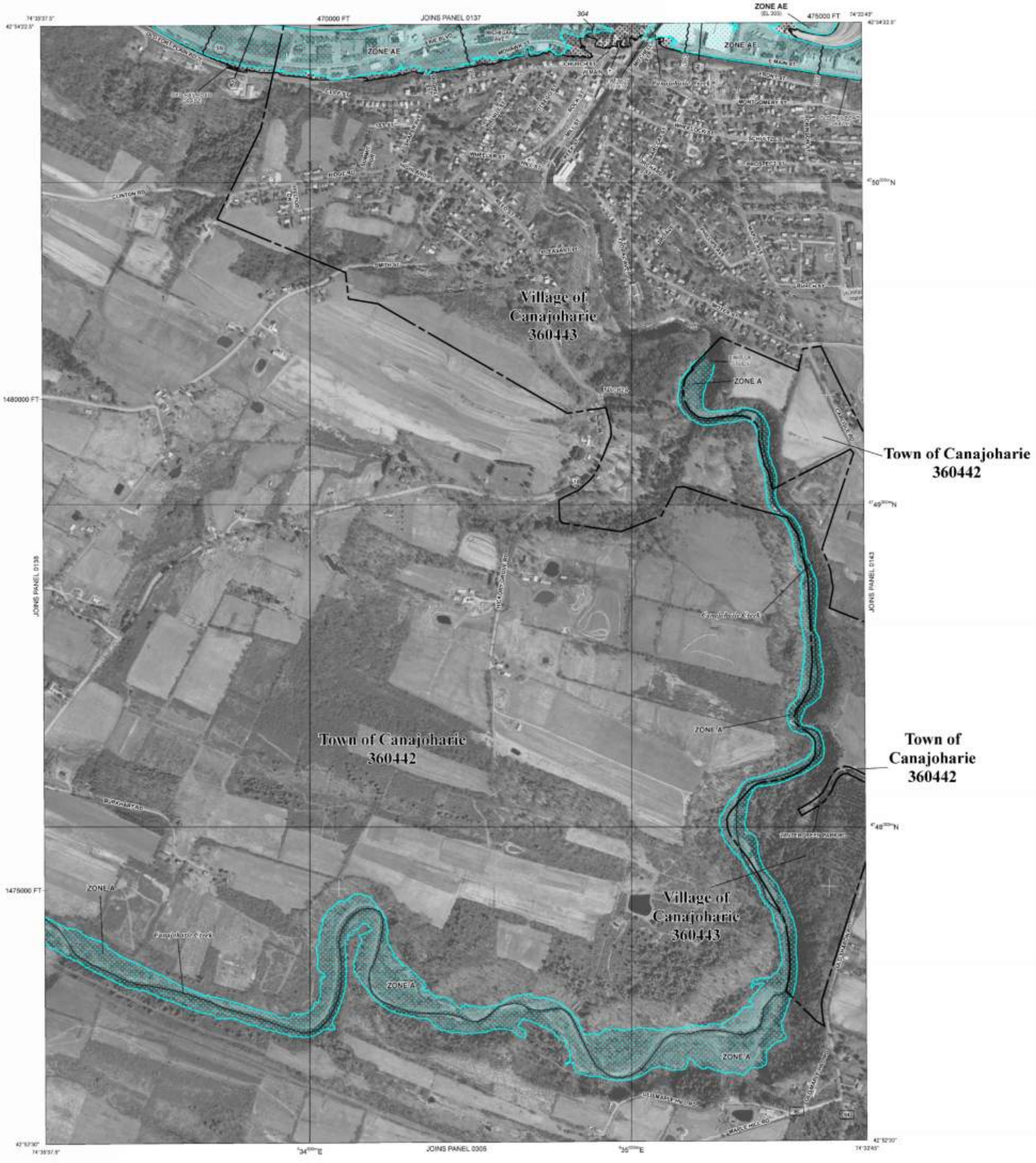
This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Information eXchange or FMIX** at **1-877-FEMA MAP** (1-877-336-2627) for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The **FEMA Map Information eXchange or FMIX** may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

🟦	SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.
▨	FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

░	OTHER FLOOD AREAS
ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
☐	OTHER AREAS
ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.
▧	COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
▨	OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

———	1% annual chance floodplain boundary
———	0.2% annual chance floodplain boundary
— — —	Floodway boundary
— — — —	Zone D boundary
••••••••••••••••	CBRS and OPA boundary
▬	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
▬	Limit of Moderate Wave Action
~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

Ⓐ———Ⓐ	Cross section line
㉓- - - - -㉓	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4276000mN	1000-meter Universal Transverse Mercator grid values, zone NAD 1983 UTM Zone 18N
600000 FT	5000-foot grid ticks: New York State Plane coordinate system, East zone (FIPSZONE 3101), Transverse Mercator projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

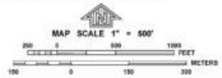
MAP REPOSITORIES
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
JANUARY 19, 2018

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.



NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0139E

FIRM

FLOOD INSURANCE RATE MAP

for MONTGOMERY COUNTY, NEW YORK
ALL JURISDICTIONS

CONTAINS:

COMMUNITY	NUMBER
CANAJOHARIE, TOWN OF	360442
CANAJOHARIE, VILLAGE OF	360443

PANEL 139 OF 385
MAP SUFFIX: E
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
36057C0139E

EFFECTIVE DATE
JANUARY 19, 2018

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 18N. The **horizontal datum** was NAD 83, GRS1980. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by the New York State Office of Cyber Security & Critical Infrastructure Coordination. This information was provided as 60-centimeter resolution panchromatic orthoimagery from photography dated April 2005.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

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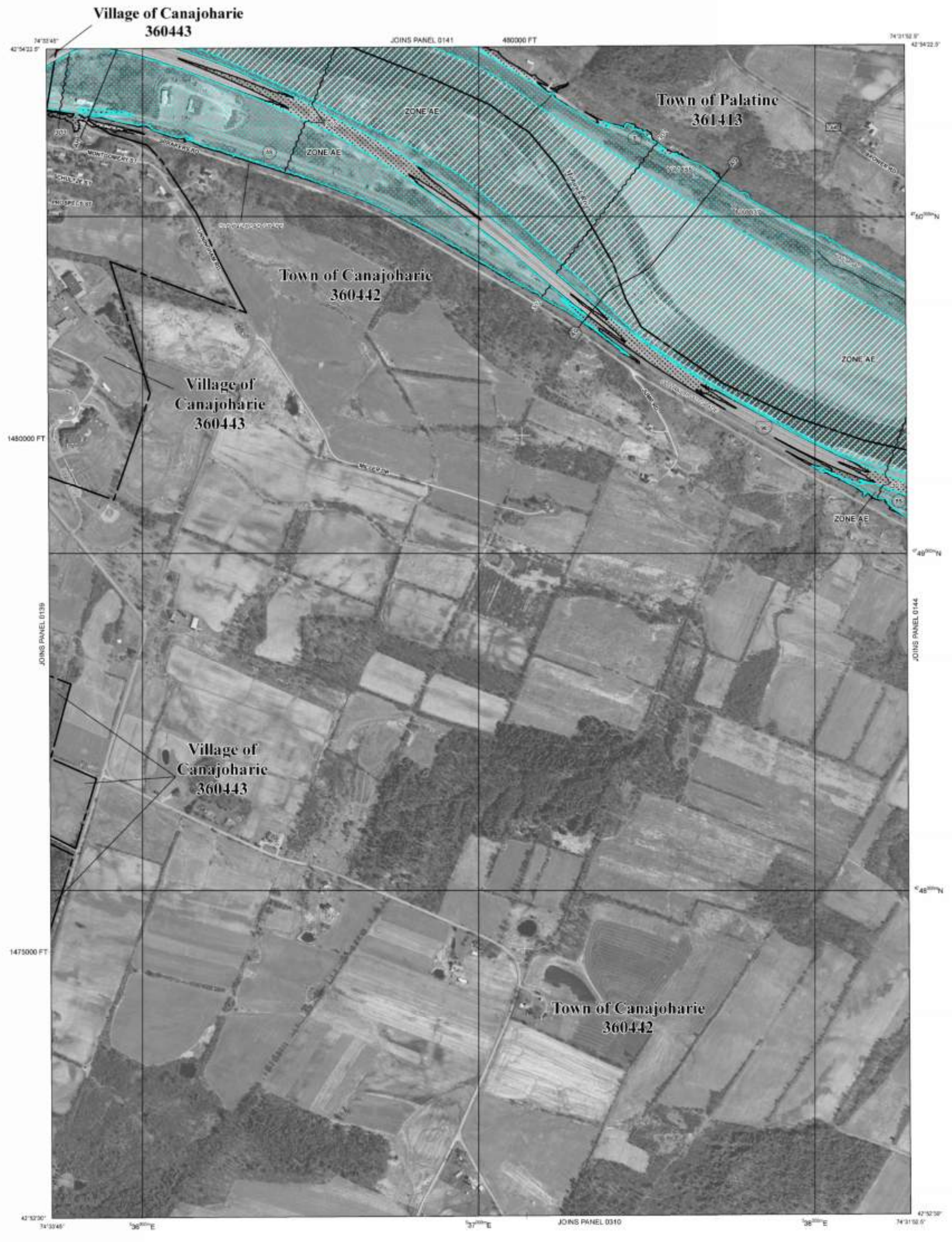

LEGEND

▨	SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

▨	FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

░	OTHER FLOOD AREAS
ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
□	OTHER AREAS
ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.
▧	COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
▨	OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

━━━━	1% annual chance floodplain boundary
━━━━	0.2% annual chance floodplain boundary
━ ━ ━	Floodway boundary
— — — —	Zone D boundary
················	CBRS and OPA boundary
━━━━	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
-•-•-•-•-	Limit of Moderate Wave Action
~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

Ⓐ———Ⓐ	Cross section line
ⓓ- - - -ⓓ	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4276000N	1000-meter Universal Transverse Mercator grid values, zone NAD 1983 UTM Zone 18N
600000 FT	5000-foot grid ticks: New York State Plane coordinate system, East zone (FIPSZONE 3101), Transverse Mercator projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORIES
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
JANUARY 19, 2018

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0143E

FIRM
FLOOD INSURANCE RATE MAP

for MONTGOMERY COUNTY, NEW YORK
ALL JURISDICTIONS

CONTAINS:

COMMUNITY	NUMBER
CANAJOHARIE, TOWN OF	360442
CANAJOHARIE, VILLAGE OF	360443
PALATINE, TOWN OF	361413

PANEL 143 OF 385
MAP SUFFIX: E
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
36057C0143E

EFFECTIVE DATE
JANUARY 19, 2018

Federal Emergency Management Agency

NOTES TO USERS

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LEGEND

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▨ FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

▨ OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

☐ OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

▨ COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

▨ OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

——	1% annual chance floodplain boundary
——	0.2% annual chance floodplain boundary
— — —	Floodway boundary
— — —	Zone D boundary
••••••••••••••••	CBRS and OPA boundary
——	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- • - • - • -	Limit of Moderate Wave Action
~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

Ⓐ——Ⓐ	Cross section line
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87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4276000m N	1000-meter Universal Transverse Mercator grid values, zone NAD 1983 UTM Zone 18N
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DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORIES
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
JANUARY 19, 2018

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0144E

FIRM
FLOOD INSURANCE RATE MAP

for MONTGOMERY COUNTY, NEW YORK
ALL JURISDICTIONS

CONTAINS:

COMMUNITY	NUMBER
CANAJOHARIE, TOWN OF	360442
PALATINE, TOWN OF	361413
ROOT, TOWN OF	360455

PANEL 144 OF 385
MAP SUFFIX: E
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

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MAP NUMBER
36057C0144E

EFFECTIVE DATE
JANUARY 19, 2018

Federal Emergency Management Agency

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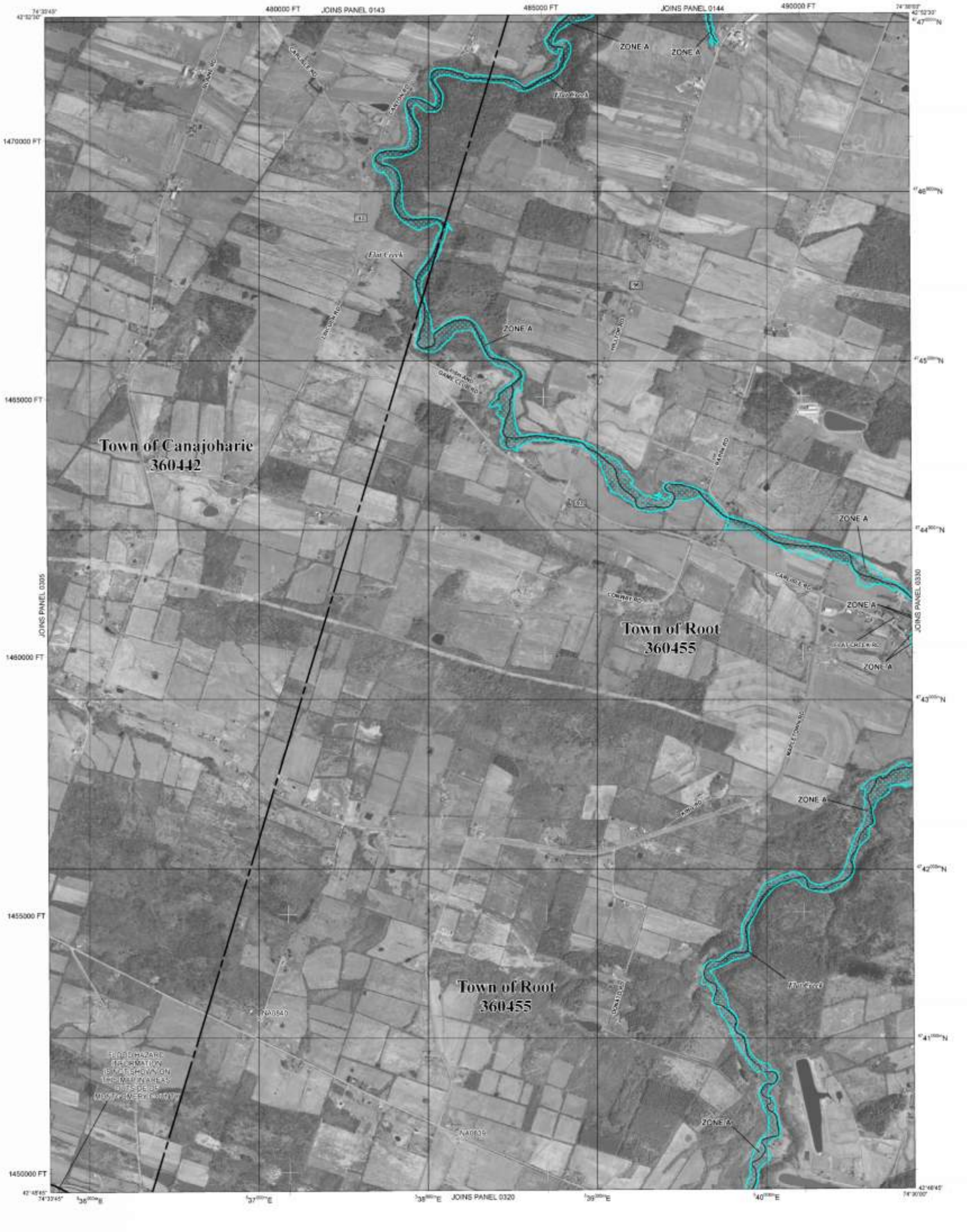

LEGEND

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ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
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ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

▨	FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

▒	OTHER FLOOD AREAS
ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
☐	OTHER AREAS
ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
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▧	OTHERWISE PROTECTED AREAS (OPAs)

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———	1% annual chance floodplain boundary
———	0.2% annual chance floodplain boundary
— — —	Floodway boundary
— — — —	Zone D boundary
••••••••••••••••	CBRS and OPA boundary
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M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
JANUARY 19, 2018

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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N

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0310E

FIRM
FLOOD INSURANCE RATE MAP

for MONTGOMERY COUNTY, NEW YORK
ALL JURISDICTIONS

CONTAINS:

COMMUNITY	NUMBER
CANAJOHARIE, TOWN OF	360442
ROOT, TOWN OF	360455

PANEL 310 OF 385
MAP SUFFIX: E
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
36057C0310E

EFFECTIVE DATE
JANUARY 19, 2018

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 18N. The **horizontal datum** was NAD 83, GRS1980. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by the New York State Office of Cyber Security & Critical Infrastructure Coordination. This information was provided as 60-centimeter resolution panchromatic orthoimagery from photography dated April 2005.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Information eXchange or FMIX** at **1-877-FEMA MAP** (1-877-336-2627) for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The **FEMA Map Information eXchange or FMIX** may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

LEGEND

🟦	SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

▨	FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

▒	OTHER FLOOD AREAS
ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
☐	OTHER AREAS
ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.
▧	COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
▧	OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

———	1% annual chance floodplain boundary
———	0.2% annual chance floodplain boundary
— — —	Floodway boundary
— — —	Zone D boundary
••••••••••••	CBRS and OPA boundary
———	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- • - • -	Limit of Moderate Wave Action
~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

Ⓐ———Ⓐ	Cross section line
⑳- - - - -⑳	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
$^{42}76^{000}$N	1000-meter Universal Transverse Mercator grid values, zone NAD 1983 UTM Zone 18N
600000 FT	5000-foot grid ticks: New York State Plane coordinate system, East zone (FIPSZONE 3101), Transverse Mercator projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
JANUARY 19, 2018

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

N

MAP SCALE 1" = 1000'

500	0	1000	2000	FEET
300	0	300	600	METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0330E

FIRM

FLOOD INSURANCE RATE MAP

for MONTGOMERY COUNTY, NEW YORK
ALL JURISDICTIONS

CONTAINS:

COMMUNITY	NUMBER
ROOT, TOWN OF	360455

PANEL 330 OF 385
MAP SUFFIX: E
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
36057C0330E

EFFECTIVE DATE
JANUARY 19, 2018

Federal Emergency Management Agency

TRC

1356 Washington St, Suite A
Bath, ME 04350

T. 207-215-2872
TRCcompanies.com

March 2, 2022

Daniel Mackay, Deputy Commissioner/Deputy SHPO
New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island Resource Center, PO Box 189
Waterford, NY 12188-0189

RE: Request for Consultation: SunEast Flat Creek Solar LLC Project in the Towns of Root and Canajoharie, Montgomery County, New York

Dear Mr. Mackay:

SunEast Flat Creek Solar LLC (Applicant) proposes the construction of the SunEast Flat Creek Solar Project (Project) in the Towns of Root and Canajoharie, Montgomery County, New York. The Project as currently proposed consists of an approximately 300-megawatt (MW) photovoltaic (PV) solar energy generation facility (Facility) (Figure 1). The Applicant is assessing available land across approximately 30 parcels on over 2,100 acres of private land owned by multiple landowners (Project Area; Figure 1). Project facilities will include commercial-scale solar arrays, access roads, buried (and possibly overhead) electric collection lines, inverters, electrical interconnection facilities (i.e., a collection substation and point of interconnection (POI) switchyard), and operations and maintenance facilities. The proposed collection substation and POI switchyard will be located on land within the Project Area. The Applicant intends to interconnect to the LS Power Grid New York Corporation's 345 kV transmission line (currently in construction) located directly adjacent to the Project.

TRC has been retained by the Applicant to provide environmental review and licensing services in support of the Project. The purpose of this letter is to initiate formal consultation with New York State Office of Parks, Recreation and Historic Preservation (OPRHP) and the State Historic Preservation Office (SHPO) to determine whether there are any potential impacts to cultural resources that could result from the Project. TRC completed preliminary background research of the Project Area and the vicinity around the Project Area using the National Park Service (NPS), National Register of Historic Places (NRHP), and the OPRHP Cultural Resource Information System (CRIS) websites.

The Project Area resides in the Mohawk Valley, a broad lowland region extending east-west in central New York State, wedged between the Adirondacks to the northeast and the Allegheny Plateau to the southwest along the Mohawk River, which is immediately north of the Project Area and flows east into the Hudson River. Flat Creek, a tributary to the Mohawk River, flows through the Project Area.

The Mohawk Valley region is a broad, irregular valley with significant variation in topography. It is underlain by limestone and shale, rock types much more easily erodible than those of the nearby mountainous regions. When glaciers receded from this area, an overflow from Glacial Lake Iroquois flowed through this area, eroding the valley floor and depositing it to the east in what is now the Hudson Valley. The floodplain of the Mohawk River is very flat, but quite narrow in regions, deeply eroded from the surroundings. The rest of the valley contains rolling hills, river terraces, and low mountains. Soils here are loamy and nutrient-rich, well-suited to agriculture.

Based on the desktop analysis, land use within the Project Area is primarily agriculture consisting of cultivated crops, hay, and pastureland. Some undeveloped wooded areas also occur within the Project Area including non-contiguous forested land, open water, and an electric transmission line which cuts across the southern portion of the

Project Area from east to west and which will be line-tapped to enable interconnection for the completed project (Figure 2).

Approximately 50 soil mapping units occur within the Project Area. The most abundant soil units represented are Darien silt loam, Ilion silt loam, and Lansing silt loam. These soils are derived from glacial till deposits. Lesser amounts of glaciofluvial and glaciolacustrine derived soils are also present, as well as some alluvium (http://websoilsurvey.sc.egov.usda.gov). The Surficial Geological Map of New York, Hudson-Mohawk Sheet (Cadwell 1989) shows the majority of the Project Area within an area mapped as glacial till. The northern most portion and some of the western portion of the Project Area include small areas of bedrock outcrops and larger areas of lacustrine deposits. A small kame terrace is mapped in south central portion of the Project Area. These deposits are underlain by Lorraine, Trenton, and Black River Groups of Canajoharie shale that dates to the Upper and Middle Ordovician except for the northmost area near the Mohawk River that is underlain by Beekmantown Group, Mohawk Valley: Chuctanunda Creek Dolostone; Tribes Hill Formation – limestone, dolostone: Gailor Dolostone that date to the Lower Ordovician (Fisher et al. 1970).

A review of the New York Cultural Resource Information System (CRIS) lists nine cultural resource management (CRM) studies completed within 1 mile of the Project Area (Table 1). Survey 20SR00435, a Phase IA/IB archaeological investigation of a 93-mile long electric transmission corridor performed by Tetra Tech, Inc. in 2020 bisects the Project Area. Fifty-six archaeological sites exist within 1 mile of the Project Area including 11 Historic period sites, 26 Precontact period sites, four sites labeled both Historic and Precontact, and 15 sites with unknown temporal affiliation (Table 2). Six of the documented archaeological sites are not eligible for National Register of Historic Places (NRHP) listing, the remaining sites have undetermined eligibility. Additionally, 85 historic structures (Table 3), and seven NRHP listed properties (Table 4) occur within 1 mile of the Project Area. None of the NRHP listed properties fall within the Project Area. Two of the historic structures occur within the Project Area including the W Devendorf Barn (05709.000090) which has been demolished and the house at 142 Flat Creek Road (05709.000091), its eligibility for listing on the NRHP has not been determined (Table 3).

Four of the seven NRHP-listed properties located within 1-mile of the Project Area relate to the Montgomery County Poor Farm (90NR01534). The original Montgomery County Farm (05708.000091) belonged to the Schenck family for at least two generations and included a spring-fed reservoir, creek, and cemetery as well as houses on both sides of the creek. The farm was sold to the county to care for the poor in 1899. The Schenk Dutch Barn - Country Farm Barn (05708.000092) was built prior to 1853 and was part of the farm sale. The Montgomery County Poor Farm Workshop (05708.000243) is the other property associated with the Montgomery County Poor Farm. Two NRHP-listed properties are associated with the Van Wie Farmstead. Structure 05708.000233 is one of two similar "Spencer houses" that were built close together by relatives prior to 1853. Spencer Barn (05708.000021), a large Dutch barn, was built by A. Van Wie before 1853 and is associated with the farmstead.

The final NRHP-listed property, the New York State Barge Canal (14PR03692), includes 155 contributing buildings and 397 contributing structures dating primarily between 1905 and 1963. The New York State Barge Canal is a state-owned, 20th century network of canals, canalized rivers, and lakes built to allow large commercial and pleasure vessels to pass from the Atlantic Ocean to the Great Lakes. Originally constructed between 1905-1918, this waterway is a direct descendant of the canals first built in New York State during the 1820s. The Barge Canal was designed for self-propelled vessels, barges towed by tugboats, or motorized canal boats, and, therefore, did not require the towpaths of earlier canals. The Canal has 57 locks ranging from 6 to 40 feet allowing passage of vessels up to 300-feet long with a 12-foot draft. The system remains in operation with most of its original early 20th century structures and machinery in service. The New York State Barge Canal is a nationally significant work of early 20th century engineering and construction that impacted transportation and maritime business across the eastern third of the US for almost half a century. The Canal's period of significance is defined as beginning with the initiation of canal construction in 1905 and extending through its last large-scale improvements in 1963 (*information taken from NRHP inventory form)*.

Eleven archaeological sites are shown in the Project Area (Figure 2) (Table 2). Four Precontact period sites, IGTS 145-1-1 (05709.000119), IGTS 145-5-2 (05709.000120), IGTS 147-1-1 (05709.0001121) and IGTS 147A-3-1 (05709.000124), are not eligible for the NRHP. Two Precontact period sites, IGTS 147-2-1 (05709.000122) and IGTS 147A-1-1 (05709.000123), have an undetermined NRHP status. These six sites were found during the 1989-1990 Iroquois Gas Pipeline archaeological survey. IGTS 147-2-1 (05709.000122) is identified as a lithic scatter located on an actively eroding bluff north of Flat Creek. Artifacts were found on the surface (2 chert core fragments, 3 chert flakes, and 1 chert chunk) and in one STP (3 chert flakes) at the site. IGTS 147A-1-1 (05709.000123) consisted of 61 pieces of chert debitage located on the surface of a cultivated field in the floodplain southwest of Flat Creek. The Rumrill-Naylor Site (NYSM 5698, 05709.000075) dates to the Precontact period and contains human remains. No information is available for the Precontact period Janie Site (05709.000078, NYSM 5808). Three New York State Museum Areas (NYSM) are located within the Project Area (Figure 2). NYSM Area 4019, NYSM Area 9215, were documented by A.C. Parker in 1922. NYSM Area 4019 is described as a village or earthworks with some Historic period occupation, but primarily exhibiting Native American cultural expressions. NYSM Area 9215 is identified as a trail. No information is available for NYSM Area 9267.

Forty-five additional archaeological sites lie within 1-mile of the Project Area. These sites are located primarily north of the Project Area along the Mohawk River. Eleven sites are associated with the Historic period. Four are related to the Historic and Precontact periods; 23 are Precontact period and 7 have unknown temporal affiliation. Many of these sites were described by A.C. Parker in 1922 as villages.

Table 1. Previous Cultural Resource Studies Conducted within 1-mile of the Project Area.

OPRHP #	Title	Authors
	Within Project Area	
20SR00397	Historic Architecture Investigation, Marcy to New Scotland Upgrade Project, Oneida, Herkimer, Montgomery, Schenectady and Albany Counties, New York	Tetra Tech, Inc.
18SR56193	Western Montgomery County Historic Resources Survey	Jessie A. Ravage
20SR00435	Phase IA/IB Archaeological Investigations, Marcy to New Scotland Upgrade Project, Oneida, Herkimer, Montgomery, Schenectady, and Albany Counties, New York	Tetra Tech, Inc.
	Within 1-Mile of Project Area	
00SR50864	Stage 1 Cultural Resource Survey, Lottman Wetland Restoration Project, Towns of Canajoharie, Root, Montgomery County, New York	Public Archaeology Facility
99SR61969	Cultural Resources Reconnaissance Survey Report, PIN 2029.50.121 / BIN 1-00285-0, NYS 5S over Flat Creek, Sprakers, Town of Root, Montgomery County, New York	New York State Museum
13SR62371	Phase IA/IB Cultural Resource Survey Esh EQIP Project, Town of Root, Montgomery County, New York	Birchwood Archaeological Services
15SR00323	Phase 1 Archaeological Survey, The University at Albany Mesonet Project (Batch #1, Part 2) (#8/Mead Farm)	Public Archaeology Facility
16SR00438	Phase 1 Cultural Resources Investigation for The Proposed Samuel B. Esh Drainage System Environmental Quality Incentives Program (EQIP) Project, Town of Root, Montgomery County, New York 15PR05602	Panamerican Consultants, Inc.
09SR59117	Cultural Resources Archaeological Monitoring Report, Erie Canal-Sprakers Site. NYSM #10809, Pin 2029.50, Bridge Replacement and Widening of Rte. 5S over Flat Creek, Town of Root, Village of Sprakers, Montgomery County, BIN 1002850 (99PR0378 associated)	NYSM

Table 2. Previously Recorded Archaeological Sites within 1-mile of the Project Area.

Site Number	Site Name	Site Type	National Register Eligibility Status	Distance and Direction (Approximate)
Within Project Area				
05709.000075	Rumrill-Naylor Site (NYSM 5698)	Precontact^	Undetermined	Within Project Area
05709.000078	Janie Site (NYSM 5808)	Precontact	Undetermined	Within Project Area
05709.000119	IGTS 145-1-1	Precontact	Not Eligible	Within Project Area
05709.000120	IGTS 145-5-2	Historic	Not Eligible	Within Project Area
05709.000121	IGTS 147-1-1	Historic	Not Eligible	Within Project Area
05709.000122	IGTS 147-2-1	Precontact	Undetermined	Within Project Area
05709.000123	IGTS 147A-1-1	Precontact	Undetermined	Within Project Area
05709.000124	IGTS 147A-3-1	Precontact	Not Eligible	Within Project Area
NYSM Area 4019	n/a	Precontact and Historic	Undetermined	Within Project Area
NYSM Area 9215	n/a	n/a	Undetermined	Within Project Area
NYSM Area 9267	n/a	n/a	Undetermined	Within Project Area
Within 1-Mile of Project Area				
05702.000105	Horatio Nellis Site	Precontact	Undetermined	0.87 miles north
05702.000106	Unnamed Site (NYSM 1230)	Precontact	Undetermined	1.00 miles west
05702.000107	Klinkhart Site (NYSM 1231)	Precontact	Undetermined	0.81 miles west
05702.000108	Van Evera-Mckinney Site (NYSM 1232)	Precontact and Historic	Undetermined	0.43 miles west
05709.000076	Quarry Site (NYSM 1147)	Precontact	Undetermined	0.88 miles northeast
05709.000079	Unnamed Site	Precontact^	Undetermined	0.5 miles in between two parcels, northern area
05702.000109	Ford Site (NYSM 1233)	Precontact^	Undetermined	0.34 miles west
05702.000110	Kelley's Flats Site (NYSM 1247)	Precontact	Undetermined	0.76 northwest
05702.000126	Site PCA-10	Precontact	Not Eligible	0.66 miles west
05708.000014	SCHENCK (FDA 14-1)	Form Missing	Undetermined	0.51 miles north
05708.000198	Spraker Flats #1 Site (NYSM 1244)	Precontact and Historic	Undetermined	0.89 miles northwest
05708.000199	Schenck Falls Site (NYSM 1245)	Precontact	Undetermined	0.24 miles north
05708.000202	Barb #2 Site (NYSM 5770)	Precontact	Undetermined	0.66 miles northwest
05708.000203	Curtis #1 Site (NYSM 5771)	Precontact	Undetermined	0.62 miles northwest
05708.000204	Barb #1 Site (NYSM 5772)	Precontact	Undetermined	0.69 miles northwest

Table 2. Previously Recorded Archaeological Sites within 1-mile of the Project Area.

Site Number	**Site Name**	**Site Type**	**National Register Eligibility Status**	**Distance and Direction (Approximate)**
05708.000205	Curtis #2 Site (NYSM 5773)	Precontact	Undetermined	0.50 miles north
05708.000206	Curtis #3 Site (NYSM 5774)	Precontact	Undetermined	0.43 miles north
05708.000207	Schenck Site (NYSM 1123)	Precontact^	Undetermined	0.49 miles north
05708.000219	Durham Project 208	Historic	Undetermined	0.73 miles northeast
05708.000220	Durham Project 128	Historic	Undetermined	0.95 miles northeast
05708.000221	Durham Project 196	Historic	Undetermined	1.00 miles north
05708.000222	Durham Project 39	Historic	Undetermined	0.28 miles north
05708.000228	Durham Project 130	Historic	Undetermined	0.45 miles north
05709.000006	Lasher (NYSM 1128)	Precontact	Undetermined	0.98 miles east
05709.000072	Unnamed Site (Tionontoguen 2 - NYSM 1234)	Precontact	Undetermined	0.21 miles west
05709.000073	Little Nose Flats #2 (NYSM 1246)	Precontact	Undetermined	0.18 miles north
05709.000074	Mitchell Site (NYSM 1248)	Precontact and Historic	Undetermined	0.22 miles northwest
05709.000077	Little Nose Quarry Site (NYSM 1148)	Precontact	Undetermined	0.35 miles east
05709.000125	IGTS 148-1-1 Prehistoric	Precontact and Historic	Not Eligible	0.58 miles east
05709.000129	IGTS 145A-3-1	Precontact	Undetermined	0.09 miles west
05709.000131	Durham Project 131	Historic	Undetermined	0.87 miles east
05709.000132	Durham Project 31	Historic	Undetermined	0.24 miles north
05709.000133	Durham Project 19	Historic	Undetermined	0.21 miles north
05709.000138	Erie Canal-Sprakers Site (NYSM 10809)	Historic	Undetermined	0.10 miles north
NYSM Site 3961	SCHENCK?	Historic Native American	Undetermined	0.50 miles north
NYSM Area 3973	n/a	Precontact	Undetermined	0.92 miles northwest
NYSM Site 3980	n/a	n/a	Undetermined	0.81 miles north
NYSM Site 3984	Tionontoguen	Historic Native American	Undetermined	0.24 miles northwest
NYSM Site 5570	Conscience Bay	n/a	Undetermined	0.51 miles north
NYSM Area 7653	n/a	n/a	Undetermined	0.24 miles north
NYSM Area 8219	n/a	n/a	Undetermined	1.00 miles west
NYSM Area 8221	n/a	n/a	Undetermined	0.34 miles northwest
NYSM Site 8965	n/a	Precontact	Undetermined	0.22 miles southwest
NYSM Site 8985	n/a	Precontact	Undetermined	0.4 miles southwest
NYSM Area 9267	n/a	n/a	Undetermined	0.25 miles north

Table 3. Historic Structures located within 1-mile of the Project Area.

OPRHP #	Address	Name	Distance and Direction (Approximate)	NR Status
Within Project Area				
05709.000090	Flat Creek Rd, Root NY	W Devendorf Barn	Within Project Area	Not Eligible - Demolished
05709.000091	142 Flat Creek Rd, Root NY	142 Flat Creek Rd	Within Project Area	Undetermined
Within 1-Mile of the Project Area				
05709.000104	158 Monk Rd, Root, NY	158 Monk Rd	.05 miles northwest	Undetermined
05709.000105	212 Monk Rd, Root, NY	212 Monk Rd	.01 miles north	Not Eligible
05709.000106	130 Indian Dr, Root NY	130 Indian Drive	.19 miles west	Undetermined
05709.000149	206 Monk Rd, Sprakers, NY	206 Monk Rd	.01 miles north	Not Eligible
05709.000152	Rappa Road, Canajoharie NY	Rappa Road Cemetery	Adjacent to project	Eligible
05702.000020	641 Mapletown Rd, Canajoharie NY	641 Mapletown Rd	0.85 miles south	Undetermined
05702.000052	Mapletown Rd & Blaine Rd, Canajoharie	Mapletown Cemetery	0.99 miles northeast	Eligible
05702.000053	Blaine Rd, Canajoharie, NY	Demolished- Dutch Reformed Church	1 mile west	Not Eligible
05702.000054	563 Mapletown Rd, Canajoharie NY	563 Mapletown Rd	0.95 miles west	Undetermined
05702.000055	611 Mapletown Rd, Canajoharie NY	611 Mapletown Rd	0.85 miles south	Undetermined
05702.000059	141 Flannigan Rd, Canajoharie NY	141 Flannigan Rd	0.69 miles west	Not Eligible
05702.000094	279 Carlisle Rd, Canajoharie NY	279 Carlisle Rd	0.70 miles north	Not Eligible
05702.000095	261 Blaine Rd, Canajoharie NY	261 Blaine Rd	0.18 miles west	Not Eligible
05702.000114	434 Sprakers Rd, Canajoharie NY	434 Sprakers Rd	0.64 miles north	Undetermined
05702.000115	376 Sprakers Rd, Canajoharie NY	376 Sprakers Rd	0.78 miles north	Undetermined
05702.000116	140 Jump Rd, Canajoharie NY	140 Jump Rd	0.74 miles north	Undetermined
05702.000118	534 Sprakers Rd, Canajoharie NY	534 Sprakers Rd	0.45 miles west	Undetermined
05702.000129	194 Carlisle Rd, Canajoharie NY	194 Carlisle Rd	0.43 miles west	Not Eligible
05702.000143	386 Sprakers Rd, Canajoharie NY	386 Sprakers Rd	0.75 miles north	Not Eligible
05702.000165	518 Sprakers Rd, Canajoharie NY	518 Sprakers Rd	0.52 miles west	Undetermined

Table 3. Historic Structures located within 1-mile of the Project Area.

OPRHP #	**Address**	**Name**	**Distance and Direction (Approximate)**	**NR Status**
05702.000205	416 Sprakers Rd, Canajoharie NY 13317	Norman W. Countryman Barn	0.70 miles north	Undetermined
05708.000004	Route 5, Palatine NY	Spraker Inn - Demolished	0.47 miles north	Not Eligible - Demolished
05708.000234	NYS Route 5, Fonda NY	BIN 1002530	0.34 miles north	Not Eligible
05709.000016	824 Carlisle Rd, Root NY	824 Carlisle Rd	0.01 miles south	Not Eligible
05709.000018	336 Darrow Road, Root NY	336 Darrow Road	0.33 miles west	Not Eligible
05709.000021	108 Lynk Street, Root, NY	108 Lynk Street	0,37 miles west	Undetermined
05709.000024	Kings Rd, Root NY	Van Buren Residence	0.28 miles west	Not Eligible - Demolished
05709.000028	Carlisle Rd, Root NY	Folmsbee's Hotel & Store Flat Creek	0.04 miles east	Not Eligible - Demolished
05709.000030	1067 Carlisle Rd, Root NY	Root Town Hall	0.01 miles east	Undetermined
05709.000032	555 Darrow Road, Root NY	555 Darrow Road	0.52 miles southeast	Undetermined
05709.000033	602 Darrow Road, Root NY	602 Darrow Road	0.54 miles southeast	Not Eligible
05709.000035	181 Becker Rd, Root NY	Wessel Hill School	0.98 miles south	Not Eligible - Demolished
05709.000036	393 Darrow Road, Root NY	393 Darrow Road	0.08 miles south	Not Eligible
05709.000037	Mapletown Rd, Root NY	Folmsbee (Kromhout Res)	0.47 miles west	Not Eligible - Demolished
05709.000038	835 Mapletown Rd, Root NY	835 Mapletown Rd	0.53 miles south	Undetermined
05709.000039	Mapletown Rd, Root NY	J. Folmsbee Barn	0.47 miles west	Not Eligible - Demolished
05709.000040	Carlisle Rd, Root NY	Burns (Weakley Res.)	0.06 miles east	Not Eligible - Demolished
05709.000043	Carlisle Rd, Root NY	Flomsbee Storage Barn	0.08 miles east	Not Eligible - Demolished
05709.000049	713 Mapletown Rd, Root NY	713 Mapletown Rd	0.64 miles southwest	Undetermined
05709.000053	446 Rappa Rd, Root NY	446 Rappa Rd	.02 miles west	Undetermined
05709.000055	797 Mapletown Rd, Root NY	797 Mapletown Rd	0.65 miles south	Undetermined
05709.000060	1021 Carlisle Rd, Root NY	1021 Carlisle Rd	0.02 miles north	Undetermined
05709.000071	829 NY 162, Root, NY	Currytown Reformed Church	0.04 miles north	Undetermined
05709.000081	Carlisle Rd, Root NY	True Dutch Church	0.02 miles south	Undetermined

Table 3. Historic Structures located within 1-mile of the Project Area.

OPRHP #	Address	Name	Distance and Direction (Approximate)	NR Status
05709.000082	Carlisle Rd, Root NY	Link's Tavern	0.08 miles west	Undetermined
05709.000083	486 Flat Creek Rd, Root NY	486 Flat Creek Rd	0.03 miles east	Undetermined
05709.000084	1084 Carlisle Rd, Root NY	1084 Carlisle Rd	0,09 miles north	Undetermined
05709.000085	499 Flat Creek Rd, Root NY	499 Flat Creek Rd	0.06 miles east	Undetermined
05709.000086	498 Flat Creek Rd, Root NY	498 Flat Creek Rd	0.04 miles east	Eligible
05709.000087	1165 Mapletown Rd, Root NY	1165 Mapletown Rd	0.02 miles north	Eligible
05709.000088	1226 Carlisle Rd, Root NY	1226 Carlisle Rd.	0.02 miles west	Not Eligible
05709.000089	1209 Carlisle Rd, Root NY	1209 Carlisle Rd	0.01 miles south	Not Eligible
05709.000092	119 Fish and Game Club Rd, Root NY	119 Fish and Game Club Rd	0.10 miles east	Undetermined
05709.000093	588 NY 162, Root NY	588 NY 162	0.14 miles north	Undetermined
05709.000094	244 Hilltop Rd, Root, NY	244 Hilltop Rd	0.67 miles southwest	Not Eligible
05709.000097	410 Hilltop Rd, Root NY	410 Hilltop Rd	0.14 miles north	Undetermined
05709.000098	110 Sprakers Hill Rd, Root NY	110 Sprakers Hill Rd	0.10 miles northwest	Not Eligible
05709.000099	116 Sprakers Hill Rd, Root NY	116 Sprakers Hill Rd	0.03 miles northwest	Undetermined
05709.000100	104 Monk Rd, Root NY	104 Monk Rd	0.03 miles northwest	Not Eligible
05709.000101	108 Monk Rd, Root NY	108 Monk Rd	0.03 miles northwest	Undetermined
05709.000103	114 Monk Rd, Root NY	114 Monk Rd	0.03 miles northwest	Not Eligible
05709.000107	129 Mohawk St, Root NY	129 Mohawk St	0.22 miles northwest	Undetermined
05709.000108	119 Clinton St, Root NY	119 Clinton St	0.22 miles north	Not Eligible
05709.000109	117 Clinton St, Root NY	117 Clinton St	0.22 miles north	Not Eligible
05709.000110	109 Clinton St, Root NY	109 Clinton St	0.22 miles north	Not Eligible
05709.000111	112 Clinton St, Root NY	112 Clinton St	0.22 miles north	Not Eligible
05709.000112	5060 NY-5s, Root NY	5060 NY-5s	0.22 miles north	Undetermined
05709.000113	565 Sprakers Rd, Root NY	565 Sprakers Rd	0.17 miles northwest	Undetermined
05709.000114	571 Sprakers Rd, Root NY	571 Sprakers Rd	0.17 miles northwest	Undetermined

Table 3. Historic Structures located within 1-mile of the Project Area.

OPRHP #	Address	Name	Distance and Direction (Approximate)	NR Status
05709.000115	5057 NY 5S, Root NY	5057 NY 5S	0.22 miles northwest	Not Eligible
05709.000116	5070 NY 5S, Root NY	5070 NY 5S	0.22 miles north	Undetermined
05709.000117	112 Sprakers Hill, Root NY	Reformed Church	0.0 miles northwest	Undetermined
05709.000118	558 Sprakers Rd, Root NY	558 Sprakers Rd	0.20 miles northwest	Undetermined
05709.000134	NY 5S, Root NY	BIN 1-00285-0	0.22 miles northwest	Undetermined
05709.000140	Carlisle Road, Root NY	BIN 3309910	0.01 miles east	Undetermined
05709.000147	110 Clinton St, Root NY	110 Clinton St	0.22 miles north	Not Eligible
05709.000150	181 Lynk Street, Sprakers NY 12166	Carr Farmhouse	0.38 miles east	Eligible
05709.000151	181 Lynk Street, Sprakers NY 12166	Carr Farm Hay Barn	0.37 miles east	Eligible
05709.000158	181 Rural Grove Road, Root NY	181 Rural Grove Road	0.87 miles east	Not Eligible
05709.000159	159 Rural Grove Road, Root NY	159 Rural Grove Road	0.90 miles east	Not Eligible
05709.000160	1123 Brand Road, Root NY	1123 Brand Road	0.95 miles east	Not Eligible
05709.000161	1125 Brand Road, Root NY	1125 Brand Road	0.94 miles east	Not Eligible
05709.000163	C2500040 - Route 5S, Root, NY	Route 5S	0.04 miles north	Not Eligible

Table 4. NRHP-listed Historic Properties within 1-mile of the Project Area.

NRHP # or OPRHP #	Structure(s)	Date	Name	Address
14NR03692	563 contributing	1905-1963	New York State Barge Canal Historic District	Waterford to Tonawanda, Whitehall, Oswego, and Waterloo
90NR01534		ca. 1826	Montgomery County Poor Farm	4934 State Route 5, Fonda NY
05708.000091		ca. 1899	Montgomery County Farm	4934 State Route 5, Fonda NY 12068
05708.000092	1	Prior to 1853	Schenk Dutch Barn - Country Farm Barn	4934 State Route 5, Fonda NY 12068
05708.000233	1	Prior to 1853	Van Wie Farmstead	269 Brower Rd, Palatine NY
05708.000242			Montgomery County Poor Farm Cemetery	State Route 5, Fonda NY
05708.000243	1		Montgomery County Poor Farm Workshop	4934 State Route 5, Fonda NY

Summary

The Project is located on over 2,100 acres in the Towns of Root and Canajoharie in Montgomery County on primarily agricultural land. One previous cultural resource management study bisects the Project Area. Two inventoried historic structures occur within the Project Area; however one has been demolished. Eleven previously recorded archaeological sites are also located within the Project Area. No listed NRHP properties are located within the Project Area. There are five of cemeteries located adjacent to or near the Project Area (Figure 2)

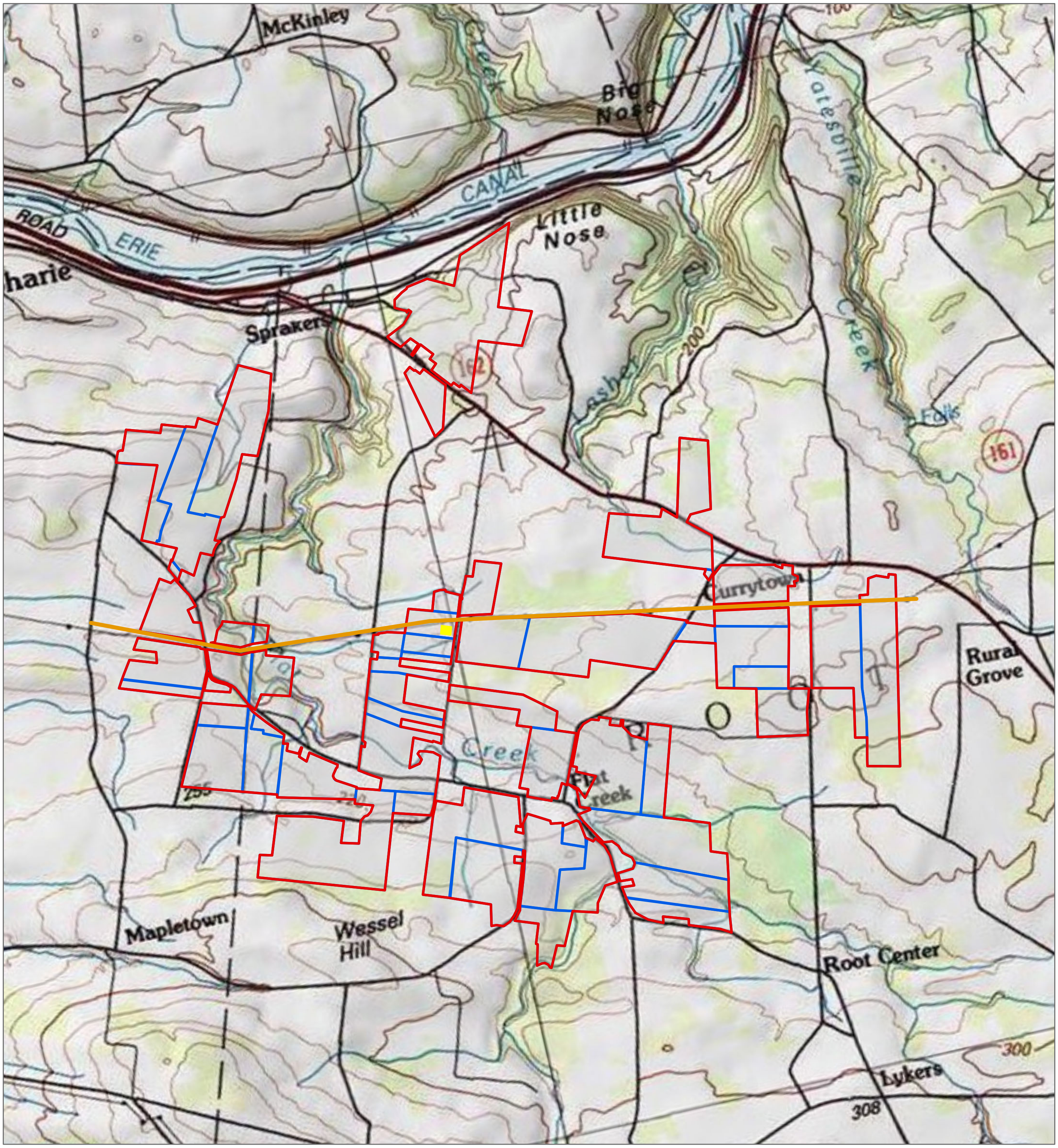
TRC looks forward to receiving your review of this information to determine if additional consultation or further study of potential Project effects is warranted. Should you have any questions or require additional information, please do not hesitate to contact me at (207) 215-2872, or kemack@trccompanies.com.

Sincerely yours,

KEMack

Karen E. Mack,
Operations Manager, Cultural Resources

cc: R. Jason Dickey, TRC



🟥 PROJECT BOUNDARY

🟦 PARCEL BOUNDARY

— TRANSMISSION LINE

🟨 SUBSTATION

BASE MAP: USGS COLOR ORTHO IMAGERY
DATA SOURCES: TRC

N

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MILES

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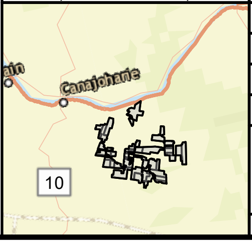

PROJECT:

SUNEAST
FLAT CREEK SOLAR PROJECT

TITLE:

PROJECT LOCATION

DRAWN BY:	ABBIE YOUNG	PROJ. NO.:	427281
CHECKED BY:	KAREN MACK	**FIGURE 1**	
APPROVED BY:	KAREN MACK		
DATE:	MARCH 2022		

TRC

1356 WASHINGTON STREET
SUITE A
BATH, ME 04530

FILE: FLAT CREEK SOLAR

COORDINATE SYSTEM: NAD 1983 ALBERS; MAP ROTATION: 0
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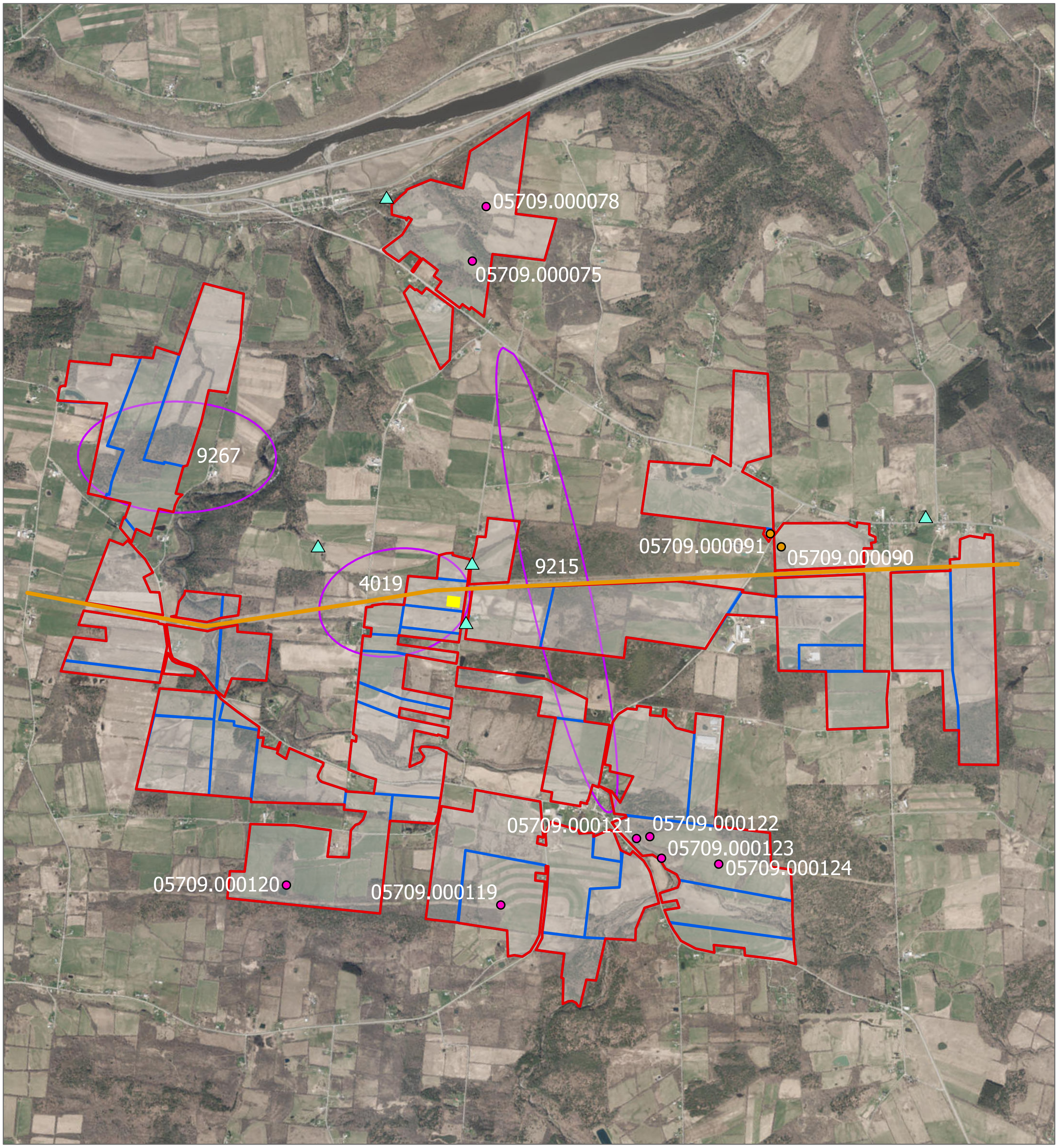

▲	CEMETERY
●	APPROXIMATE INVENTORIED HISTORIC STRUCTURE LOCATIONS
●	APPROXIMATE SITE LOCATIONS
☐	NYSM AREAS
☐	PROJECT BOUNDARY
▨	PARCEL BOUNDARY
—	TRANSMISSION LINE
■	SUBSTATION

BASE MAP: USGS COLOR ORTHO IMAGERY
DATA SOURCES: TRC

N

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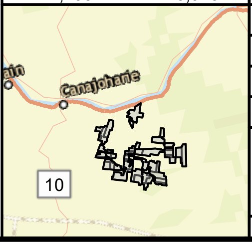


PROJECT:

SUNEAST
FLAT CREEK SOLAR PROJECT

TITLE:

CRIS RESOURCE LOCATIONS

DRAWN BY:	ABBIE YOUNG	PROJ. NO.:	427281
CHECKED BY:	KAREN MACK	**FIGURE 2**	
APPROVED BY:	KAREN MACK		
DATE:	MARCH 2022		

TRC

1356 WASHINGTON STREET
SUITE A
BATH, ME 04530

FILE: FLAT CREEK SOLAR

COORDINATE SYSTEM: NAD 1983 ALBERS; MAP ROTATION: 0
-- SAVED BY: AYOUNG ON 3/2/2022, 12:58:26 PM; FILE PATH: C:\USERS\AYOUNG\ONEDRIVE - TRC\DOCUMENTS\ARCGIS\PROJECTS\FLAT CREEK SOLAR\FLAT CREEK SOLAR.APRX; LAYOUT NAME: 8.5X11P_INSET

New York State
Parks, Recreation and
Historic Preservation

KATHY HOCHUL
Governor

ERIK KULLESEID
Commissioner

August 14, 2023

Karen E Mack
Principal Investigator - Operations Manager
TRC
1356 Washington St, Suite A
Bath, ME 04530

Re: ORES
SunEast Flat Creek Solar Project, LLC/300 MW/2100 Acres
Towns of Canajoharie and Root, Montgomery County, NY
22PR01523

Dear Karen E Mack:

Thank you for requesting the comments of the Division for Historic Preservation of the Office of Parks, Recreation and Historic Preservation (OPRHP). We have reviewed the submitted materials 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 Division for Historic Preservation 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. Such impacts must be considered as part of the environmental review of the project pursuant to Executive Law Section 94-c and its implementing regulations (19 NYCRR Part 900).

We note that there are twelve State and National Register listed or eligible buildings within or adjacent to the project area. These include the following:

05709.000104	05709.000071	05709.000167	05709.000152	05702.000052	05702.000116
Building	Building	Building	Building	Building	Building
Major Andrew Mitchell House	CURRYTOWN REFORMED CHURCH	residence	Rappa Road Cemetery	Mapletown Cemetery	Van Evera House
158 MONK RD, ROOT NY	829 State Highway 162 ROOT, NY	788 State Highway 162 Sprakers NY	Rappa Road, Canajoharie NY	Mapletown Road & Blaine Road , Canajoharie NY	140 JUMP RD, CANAJOHARIE NY
Eligible	Eligible	Eligible	Eligible	Eligible	Eligible

05709.000150	05709.000151	05708.000255	00104.000641	05709.000038	05709.000092
Building	Building	Building District	Building District	Building	Building
Carr Farmhouse	Carr Farm Hay Barn	Montgomery County Poor Farm	New York State Barge Canal Historic District	835 Mapletown Rd.	119 Fish and Game Club Rd
181 Lynk Street, Sprakers NY 12166	118 Lynk Street, Sprakers NY			835 MAPLETOWN RD, ROOT NY	119 FISH & GAME CLUB RD, ROOT NY
Eligible	Eligible	Listed	Listed	Eligible	Eligible

In order for our office to continue this review and evaluate potential impacts to these historic resources, please provide a Visual Impact Assessment document (VIA). The VIA should, at minimum, include the following documentation and information:

1. Site plans including all solar array locations and all surveyed NR/ NRE resources clearly marked and keyed to the plan. Site plans may include the ZVI information both with and without vegetation. Site plans should include elevation drawings of the solar panels indicating maximum panel height and direction of rotation.
2. Distance between each historic resource and the nearest the solar arrays.
3. Photographs of the identified resources taken toward the resource and toward the proposed solar facility.
4. Assessment of potential visibility and any additional information to assist with evaluating historic significance and potential visual impacts.

Please note that additional detailed information may be required depending upon the results the VIA. Assessment of potential impact is dependent upon the significance of the resource, integrity and importance of the setting to the resource, distance from solar arrays, and other factors such as intervening vegetation, structures, and topography. Additional detailed information typically includes the following:

1. Detailed site plans showing solar panels, access roads, and other features, as well as any existing or proposed vegetative or topographic buffers, in the immediate vicinity of specific historic resources. (It is useful for these plans to be superimposed with satellite or orthographic images.)
2. Visual simulations of proposed solar arrays.
3. landscape plans illustrating planting schemes, berms, fencing, and other visual elements.

Documentation requested in this letter should be provided via our Cultural Resource Information System (CRIS) at https://cris.parks.ny.gov/. Once on the CRIS site, you can log in as a guest and choose "submit" at the very top menu. Go to “Consultation” and choose "submit new information for an existing project". You will need this project number and your e-mail address.

If you have any questions, you can call or e-mail me at the contact information below.

Sincerely,

Weston Davey
Historic Site Restoration Coordinator
518-268-2164 | Weston.Davey@parks.ny.gov

New York State
Parks, Recreation and
Historic Preservation

KATHY HOCHUL
Governor

ERIK KULLESEID
Commissioner

August 15, 2023

Karen E Mack
Principal Investigator - Operations Manager
TRC
1356 Washington St
Suite A
Bath, ME 04530

Re: ORES
SunEast Flat Creek Solar Project, LLC/300 MW/2100 Acres
Towns of Canajoharie and Root, Montgomery County, NY
22PR01523

Dear Karen E Mack:

Thank you for requesting the comments of the Division for Historic Preservation of the Office of Parks, Recreation and Historic Preservation (OPRHP). We have reviewed the submitted materials 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 Division for Historic Preservation and relate only to Historic/Cultural resources. They do not include potential environmental impact to New York State Parkland that may be involved in or near your project. Such impact must be considered as part of the environmental review of the project pursuant to the National Environmental Policy Act (New York Environmental Conservation Law Article 8).

The OPRHP has received the Phase IA archaeological survey report entitled “Phase IA Archaeological Assessment of the SunEast Flat Creek Solar Project, Towns of Root and Canajoharie, Montgomery County, New York” prepared by TRC (June 2023, 23SR00382). We offer the following comments in response to the submitted Phase IA archaeological survey report:

1) We recommend that all permanent bodies of water should have a 100-meter buffer around them.

2) Map documented structures should be represented in the mapping with a point feature.

3) The black outline on the mapping indicates Project Boundaries, yet areas within it do not contain indications of archaeological sensitivity. Please either explain on the mapping why sensitivity did not continue into those areas or extend the sensitivity into all portions of the project area.

4) Please add slope to all the map keys in which slope are indicated.

5) OPRHP does not recommend making entire historic roadways historically sensitive. Our guidance does not recommend testing along historic roads unless MDS’s are noted and then testing would occur around those locations.

An example of a figure showing these requested changes will follow in an email.

The revised report should be submitted to the OPRHP for review. If you have any questions, I can be reached at Jessica.Vavrasek@parks.ny.gov.

Sincerely,

Jessica Vavrasek

Jessica Vavrasek
Historic Preservation Specialist – Archaeology/NAGPRA

Appendix E – Geotechnical Engineering Report

Preliminary Geotechnical Engineering Report

Flat Creek Solar Site
Town of Root, Montgomery County, New York
November 17, 2021
Terracon Project No. J5215096

Prepared for:
SED NY Holdings LLC
Old Lyme, CT

Prepared by:
Terracon Consultants-NY, Inc.
Rochester, New York

November 17, 2021

SED NY Holdings LLC
5-2 Davis Road East
Old Lyme, CT 06371

Attn: Mr. Reed Wills
P: (302) 540-2696
E: reed.wills@suneastpower.com

Re: Preliminary Geotechnical Engineering Report
Flat Creek Solar Site
Town of Root, Montgomery County, New York
Terracon Project No. J5215096

Dear Mr. Wills:

We have completed the Preliminary Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. PJ5215096 dated May 3, 2021. This report presents the findings of the subsurface exploration and provides preliminary geotechnical recommendations concerning driven steel piles for support of solar panel foundations, earthwork, unpaved access roads, and shallow foundations for support of ancillary structures for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants-NY, Inc.

Blake J. Pilarski, E.I.T.
Staff Engineer

Michele A. Fiorillo, P.E.(NY)
Geotechnical Department Manager

SME Review By: James M. Jackson, P.E. (FL)

REPORT TOPICS

Note: This report was originally delivered in a web-based format. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

Note: Refer to each individual Attachment for a listing of contents.

REPORT SUMMARY

Topic [1]	Overview Statement [2]
Project Description	The approximately 1,230-acre site (fenced areas) is to be developed with a solar facility.
Subsurface Conditions	The site can be broken into three zones, with Zone 1 consisting of silty and clayey soils overlaying hard/dense to very dense soil or bedrock. The borings in Zone 2 generally consisted of silty and sandy soils. The borings in Zone 3 generally consisted of silty and clayey soils overlaying clayey soils. Groundwater was observed in FC-5, FC-9, FC-13 and FC-15 at depths ranging from 3 to 8 feet below grade. Groundwater was generally not observed in the remainder of the borings.
Pile Load Testing	Pile load testing was not part of the scope in this preliminary study.
PV Array	Preliminary parameters for driven steel piles for the support of solar panel racking systems and other miscellaneous structures are provided in this section. Shallow or mat foundations also appear suitable, based on the preliminary data, for support of miscellaneous structures utilizing the bearing capacity values provided in this section.
General Comments	This section contains important information about the limitations of this geotechnical engineering report.

1. If the reader is reviewing this report as a pdf, the topics above can be used to access the appropriate section of the report by simply clicking on the topic itself.
2. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Preliminary Geotechnical Engineering Report

Flat Creek Solar Site
Town of Root, Montgomery County, New York

Terracon Project No. J5215096
November 17, 2021

INTRODUCTION

This report presents the results of our subsurface exploration and preliminary geotechnical engineering services performed for the proposed 200 MW (AC) photovoltaic (PV) solar power facility to be located in the Town of Root, Montgomery County, New York. The purpose of these services is to provide information and preliminary geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- L-Pile parameters
- Pile skin friction and end bearing
- Seismic site classification
- Mat/slab foundations
- Laboratory test results
- Seismic site classification per IBC
- Unpaved access roads
- Adfreeze stress and frost depth
- Estimated settlement (shallow foundations)

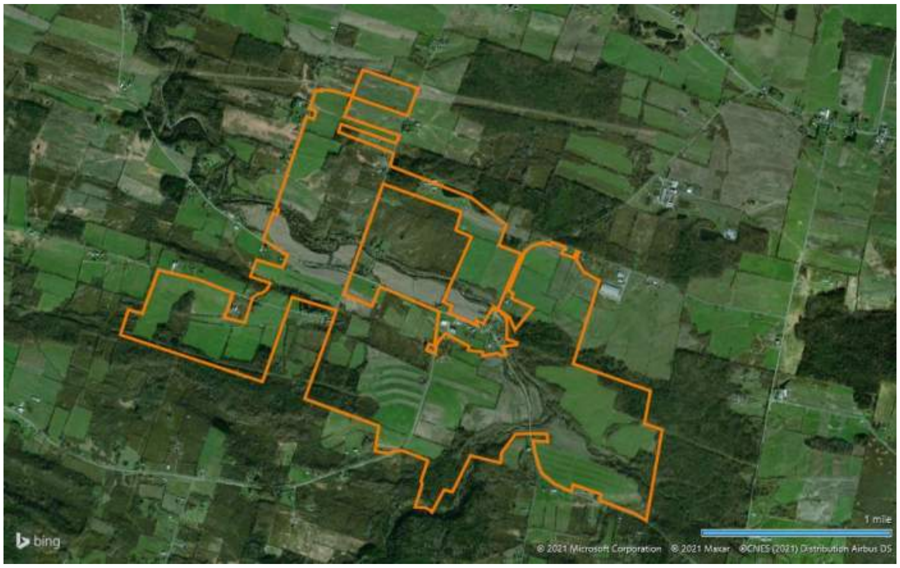
The preliminary geotechnical engineering Scope of Services for this project included the following:

- Soil borings at sixteen locations (FC-Series) to depths ranging from approximately 13 to 20 feet;
- Geotechnical laboratory testing of soil samples consisting of Grain-Size Distributions, Atterberg limits and standard Proctors;
- Field electrical resistivity testing at eight locations (FC-1, FC-3, FC-6, FC-9, FC-11, FC-12, FC-14 and FC-16);
- Laboratory thermal resistivity test on soil samples collected from FC-6, FC-9, FC-12 and FC-16 at depths of 1 to 4 feet;
- Corrosivity suite testing on eight soil samples collected from borings FC-1, FC-3, FC-6, FC-9, FC-11, FC-12, FC-14 and FC-16 at depths of 1 to 4 feet;
- Geotechnical engineering analysis and preparation of this report.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and as separate graphs in the **Exploration Results** section.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of the site plans provided by SunEast Development LLC and publicly available topographic maps.

Item	Description
Parcel Information	The project is located in the Town of Root, Montgomery County, New York. The site is approximately 1,230 acres (fenced areas). The approximate center of the parcel is located at about Latitude 42.8449° N and Longitude 74.5113° W. The approximate site boundary is marked in orange on the below aerial.  © 2021 Microsoft Corporation © 2021 Maxar ©CNES (2021) Distribution Airbus DS
Existing Improvements	The proposed solar power facility consists of vacant agricultural parcels with scattered wooded areas. Flat Creek flows through the center of the site.
Current Ground Cover	Agricultural land with scattered wooded areas.
Existing Topography (USGS)	Ground surface elevations (EL.) within the proposed solar array appear to vary greatly throughout the proposed site with elevations ranging from about El. 680 feet along the center portion of the site in proximity to Flat Creek to El. 900 feet in the hilltops. .

PROJECT DESCRIPTION

Our final understanding of the project conditions is as follows:

Item	Description
Information Provided	The following documents were provided to Terracon ■ Flat Creek Solar Conceptual Site Layout Plan dated September 30, 2020. ■ SunEast Development RFP dated March 2021.
Project Description	The site development consists of an approximately 200 MW (AC) (PV) solar power facility on about 1,230 acres of land (fenced areas). The power facility will also include transformers, switchgear, and buried and/or overhead collector system. A substation is assumed to be planned for the site but the location is currently unknown.
Proposed Construction	The PV array field will be comprised of PV modules attached to a fixed tilt racking system supported on driven steel piles. Electrical equipment will be supported on concrete slabs-on-grade / mat foundations.
Typical Loads for Racking Structures (estimated)	Structural loads were not provided, but have been estimated based on our experience on projects using single axis tracking rack systems: ■ Compression: 1½ to 4 kips ■ Lateral: 1 to 3½ kips ■ Uplift: 1.5 kips exclusive of frost heave loads ■ Ancillary Equipment Slabs: 1,500 pounds per square foot (psf)
Grading/Slopes	We anticipate that minimal grading will take place across the solar arrays and proposed grades will follow existing grades. We anticipate less than 2 feet of cut/fill.
Access Roadways	We understand that 15 feet wide access road cross sections used for construction of the project will be the responsibility of the EPC, and that only post construction traffic with an allowable rut depth of 3 inches are what we are to design for in this report. We anticipate low-volume, aggregate-surfaced and native soil access roads will have a maximum HS-20 vehicle load and will travel over the access roads only once per week.

GEOTECHNICAL CHARACTERIZATION

Geology

The project is located within the Appalachian Plateaus physiographic province. Geological maps indicate surficial deposits at the project site to consist of Lacustrine Beach, Lacustrine Sand, Kame Deposits and Glacial Till underlain by shale bedrock of the Utica Shale formation (Middle Ordovician) or dolostone of the Beekmantown Group (Lower Ordovician).

Subsurface Profile

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of site preparation and foundation options. Conditions encountered at each exploration point are indicated on the individual boring logs. The individual logs and GeoModel can be found in the **Exploration Results** section of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description [1,2]
1	**Surface**	Topsoil
2	**Native Soil - 1**	Mixtures of Silt, Sand, Clay and Gravel (CL-ML, ML, SM, CL); trace rock fragments; brown, gray; soft to hard or loose to medium dense to dense (SPT N values range from 3 to 41)
3	**Native Soils -2**	Mixtures of Silt, Sand, Clay and Gravel (ML, SM, CL-ML, SP); contains rock, cobble and boulder fragments; brown, gray; very stiff to hard or dense to very dense (SPT N values range from 35 to >50)
4	**Bedrock**	Shale; highly to moderately weathered; gray; weak rock

1. The sampling equipment utilized may preclude sampling particles larger than 2-inch in dimension. Cobble-sized fragments were encountered in most soil borings, as also indicated by the sample spoon penetration refusals encountered in most of the borings within the depths explored.
2. Bedrock was encountered in borings FC-6 and FC-7 at depths of approximately 10 to 13 feet, respectively. At FC-6 the drillers were able to advance the auger within the weathered bedrock to a depth of about 18 feet below existing grade. In FC-7 auger refusal was encountered at the surface of the shale bedrock, at a depth of about 13.1 feet. .

Specific conditions encountered at each SPT boring are indicated on the individual logs included in the **Exploration Results** of this report. Stratification boundaries on the logs and profiles represent the approximate location of changes in soil/rock types; in-situ, the transition between materials may be more gradual.

Groundwater Conditions

Groundwater generally appears as either a permanent or temporary water source. Permanent groundwater is generally present year-round, which may or may not be influenced by seasonal and climatic changes. Temporary groundwater water is also referred to as a “perched” water source, which generally develops because of seasonal and climatic conditions.

We observed the boreholes for the presence of groundwater during and at completion of drilling or excavation. The groundwater levels at each exploration location can be found on the boring logs of the **Exploration Results** section of this report. A summary of the groundwater at the exploration locations are presented below:

Boring Number	Approximate Depth to Groundwater[1] (feet)
FC-5	3
FC-9	6
FC-13	6
FC-15	8

1. Below ground surface (bgs)

Groundwater was generally not encountered in the remainder of the borings. Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Water may also become temporarily perched over low permeability layers or bedrock, especially after rainfall. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

CONTRIBUTORY RISK COMPONENTS

ITEM	DESCRIPTION
Supplementary Exploration and Services	Additional soil test borings should be performed to adequately explore the site as part of a design-level study. Additionally, a full-scale pile load testing (PLT) program should be considered as the project design progresses.
Suitability Statement	The proposed site appears suitable for the use of driven steel W-Section steel piles for the support of the proposed solar arrays. We anticipate pile installation could require predrilling at several locations across the proposed solar development. However, further tests are necessary to confirm this.
Soil Conditions	The subsurface conditions in Zone 1 (FC-1, FC-2, FC-4, FC-6, FC-7, FC-8, FC-10, FC-11, FC-13, FC-15, and FC-16) generally consist of medium stiff to hard (SPT-N values ranging from 5 to 26) silty and clayey soils to depths ranging from about 4 to 10 feet. Below these depths the borings generally encountered a significant amount of large cobbles and boulders, and the soils are generally stiff to very hard to dense to very dense. Borings FC-6 and FC-7 also encountered highly to moderately weathered shale at depths of 7 and 13 feet, respectively. The borings were generally terminated at depths ranging from about 13 to 19 feet. The subsurface conditions in Zone 2 (FC-3, FC-5, and FC-9) generally consist of medium stiff to very stiff or medium dense (SPT-N values ranging from 6 to 21) silty and sandy soils to depths of about 6 to 10 feet underlain by hard or dense

ITEM	DESCRIPTION
	(SPT-N values ranging from 21 to >50) silty and sandy soils to a depth of approximately 20 feet below grade. The subsurface conditions in Zone 3 (FC-12 and FC-14) generally consist of medium stiff to hard (SPT-N values ranging from 6 to 41) silty and clayey soils to depths of about 8 to 10 feet underlain by soft to very stiff (SPT-N values ranging from 3 to 17) clayey soils to a depth of approximately 18 to 20 feet below grade. In boring FC-14, hard Sandy Silt with rock fragments was encountered at a depth of about 18 feet below grade.
Access	Wet and loose/soft surface conditions due to rainwater will create access issues for vehicles. The site will generally be more accessible in the summer and early fall due to the improved drying conditions.
Grading	We anticipate very little grading will be required. On-site materials that are used as fill or backfill will likely require moisture conditioning prior to re-compaction. Alternatively, these materials could be replaced with imported soils containing an appropriate moisture content and plasticity index. Site soils that are mostly clay are not suitable for use as engineered fill. Stabilization measures, such as over-excavation and replacement, should be expected.
Groundwater	Groundwater was observed in FC-5, FC-9, FC-13 and FC-15 at depths ranging from 3 to 8 feet below ground surface. Groundwater was generally not encountered in the borings. Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project. Excavations, such as trenches for electrical cable and conduit, may encounter groundwater and require dewatering. Excavations for shallow foundations could also encounter groundwater, especially if construction is performed during periods of seasonally high groundwater. While precipitation is relatively constant throughout the year, groundwater levels are expected to be deepest during the late summer due to increased evaporation rates.
Site Drainage	It is likely that the site may have ditches/canals which may have been installed to facilitate farming activities and site access. If encountered, filling the drainage canals or destruction of other site drainage systems will result in increased groundwater levels, softer soils, and generally undesirable subsurface conditions.
Corrosion Hazard	The results of our laboratory testing of soil chemical properties are expected to assist a qualified engineer design corrosion protection for the production piles and other project elements.
Excavation Hazards	Based on the results of our borings and our experience with the geology of the project site, we do not expect that difficult excavation conditions will be encountered during construction. However, excavations advanced within the very dense soils may be difficult as a result of encountering large cobbles and/or boulders.

ITEM	DESCRIPTION
Anticipated Pile Drivability	We have separated the site into zones based on the results of the subsurface conditions encountered in the test borings. Zones 1 through 3 were based on the penetration resistance (SPT-N values) as well the indication of large cobbles and boulders (as indicated by the sampler refusal) encountered within the native soils and shale bedrock. In general, piles installed in Zone 1 and Zone 2 could encounter penetration refusal prior reaching the design embedment depth and therefore we would expect pre-drilling to be required. Piles installed in Zone 1 have a higher probability of encountering penetration refusal than pies installed in Zone 2. The pre-drilling could negatively affect the axial and lateral capacity. Piles installed in Zone 3 are likely able to be installed to the design embedment depths, and predrilling is likely not required within Zone 3 Additional soil test borings should be performed to adequately explore the site as part of a design-level study. Additionally, a full-scale pile load testing (PLT) program should be considered as the project design progresses. We also recommend that the PLT program includes piles installed in pre-drilled holes in Zone 1 and Zone 2.
General Construction Considerations	The near-surface soils are moderately moisture sensitive and subject to degradation with exposure to moisture. To the extent practical, earthwork should be performed during warmer and drier periods of weather to reduce the amount of necessary subgrade remedial measures for soft and unsuitable conditions beneath access roadways, equipment pads, etc.

PRELIMINARY RECOMMENDATIONS FOR DRIVEN PILE FOUNDATIONS

We have performed preliminary geotechnical analyses for driven pile foundations to support the typical PV panel racking system. Subsequent analyses will be required once design level geotechnical information is available and once other design considerations are more fully defined. **THEREFORE, THE RESULTS OF THE ANALYSES DESCRIBED BELOW ARE NOT SUITABLE FOR FINAL DESIGN.** Instead, this analysis is intended to assist you in roughly evaluating construction costs and development viability for the proposed project. It should also be noted that our analyses are based on short-term conditions based on boring information. For this type of foundation system, provisions for flexible or adjustable connection between the posts and the array superstructure are recommended.

FROST CONSIDERATIONS

Based on the provided information, the solar arrays for this project are anticipated to be supported by driven piles. The driven piles should be designed to resist design loads including compression, uplift, frost heave action and lateral forces. The soils at this site are frost susceptible. Frost heave effects on pile foundations can be significant. If the anchorage of the foundations and the deadweight of the structure are not sufficient to resist these forces, it can cause uplift to structures. Based on our review of soil samples and published soil maps of the area, we recommend that an adfreeze stress (frost heave) of 1,500 pounds per square foot (psf) acting along the pile perimeter to a depth of 2.5 feet below the ground surface should be considered for calculating the potential frost induced heave force along with a load factor of 1.0. This depth is referred to as the “adfreeze” depth in the following design parameter tables.

GEOTECHNICAL AXIAL CAPACITY

The following preliminary geotechnical parameters can be used to estimate the capacity of driven W-section pile foundations. These values should also be suitable to prepare a full-scale pile load testing program which is recommended as part of the overall project design. Final design values will vary from the preliminary estimates below. The upper 2.5 feet of soil should be neglected when calculating the ultimate capacity from skin friction.

Zone 1: Pre-Drilling Likely Required[1]

Minimum Pile Embedment Depth Below Ground Surface (feet)	Ultimate Skin Friction (psf)	Ultimate End Bearing Capacity (psf)
0 to 2.5	Neglect	Neglect
3 to 8	240	44,000
8 to 13	820	120,000
13 to Varies[2,3]	N/A	180,000

1. Borings located in Zone 1: FC-1, FC-2, FC-4, FC-6, FC-7, FC-8, FC-10, FC-11, FC-13. FC-15, and FC-16.
2. Refer to the individual boring logs for the depth to bedrock.
3. Ultimate skin friction values for bedrock are not applicable for driven piles which refuse on bedrock. For piles that must be pre-drilled and grouted, refer to the **Pre-Drilled Pile Considerations** section for the bond strength between grout and bedrock.

Zone 2: Pre-Drilling Potentially Required[1]

Minimum Pile Embedment Depth Below Ground Surface (feet)	Ultimate Skin Friction (psf)	Ultimate End Bearing Capacity (psf)
0 to 2.5	Neglect	Neglect
3 to 8	200	36,000
8 to 13	500	76,000
13 to 20	600	88,000

1. Borings located in Zone 2: FC-3, FC-5, and FC-9.

Zone 3: Pre-Drilling Likely Not Required[1]		
Minimum Pile Embedment Depth Below Ground Surface (feet)	**Ultimate Skin Friction (psf)**	**Ultimate End Bearing Capacity (psf)**
0 to 2.5	Neglect	Neglect
3 to 6	800	12,000
6 to 10	1,000	18,000
10 to 15	800	12,000
15 to 20	500	3,000

1. Borings located in Zone 3: FC-12 and FC-14.

The above values are to be used in the following equations to obtain the ultimate uplift or compression load capacity of a pile:

$$Q_{ult\ (compressive)} = q_t \text{ x } A + H \text{ x } P \text{ x } q_s$$
$$Q_{ult\ (uplift)} = H \text{ x } P \text{ x } q_s$$

Q_{ult} = Ultimate uplift or compression capacity of post (lbs.)
$Q_{ult\ (end)}$ = Ultimate end bearing capacity per table above (lbs.)
H = Depth of embedment of pile (ft.)
P = Perimeter area/ft. of pile. (i.e. W6x9 = 1.64 sf/ft.)
q_s = Skin friction per depth per table above (psf)
q_t = unit toe-bearing resistance per table above (psf)
A = cross sectional area of pile (i.e. W6x9 = 0.019 sf).

The skin friction is appropriate for uplift and compressive loading and represents ultimate values. A factor of safety of 2 should be applied to the skin friction values. The end bearing is also an ultimate value and should have a factor of safety of 2 applied for design.

Piles should have a minimum center-to-center spacing of at least 3 times their largest cross-sectional dimension to prevent reduction in the axial capacities due to group effects. If the piles are designed using the above parameters, settlements are not anticipated to exceed 1 inch.

GEOTECHNICAL LATERAL CAPACITY

The parameters in the following table can be used for a preliminary analysis of the lateral capacity of driven steel piles in support of solar panel arrays:

LPile Parameters – Zone 1: Pre-Drilling Likely Required[1]

Soil Type	Depth (feet)	LPile (P-y) Curve Soil Model[3]	Effective Unit Weight, γ (pcf)	Undrained Cohesion (psf)	Friction Angle, Φ (degree)	P-Multiplier [2]
Clayey Soils	0 to 2.5	Stiff Clay w/o Free Water (Reese)	105	500	--	0.7
	3 to 8		110	1,500	--	1.0
Sandy Soils	8 to 13	Sand (Reese)	125	--	34	1.0
	13 to varies[4]		125	--	36	1.0

1. Borings located in Zone 1: FC-1, FC-2, FC-4, FC-6, FC-7, FC-8, FC-10, FC-11, FC-13. FC-15, and FC-16.
2. Reduced in the upper 2.5 feet to account for freeze/thaw effects.
3. Use the LPile default values for Soil Modulus, k and Strain Factor, E_{50}
4. The weathered shale bedrock was assumed to behave like a cohesionless soil..

LPile Parameters – Zone 2: Pre-Drilling Potentially Required[1]

Soil Type	Depth (feet)	LPile (P-y) Curve Soil Model[4]	Effective Unit Weight, γ (pcf) [2]	Friction Angle, Φ (degree)	P-Multiplier [3]
Sandy and Silty Soils	0 to 2.5	Sand (Reese)	105	27	0.7
	2.5 to 8		48	28	1.0
	8 to 14		58	30	1.0
	14 to 20		53	33	1.0

1. Borings located in Zone 2: FC-3, FC-5, and FC-9.
2. Buoyant unit weight used below groundwater (assumed to be at 3 feet bgs).
3. Reduced in the upper 3.0 feet to account for freeze/thaw effects.
4. Use a default value of Soil Modulus, k.

LPile Parameters – Zone 3: Pre-Drilling Likely Not Required[1]

Soil Type	Depth (feet)	LPile (P-y) Curve Soil Model[3]	Effective Unit Weight, γ (pcf)	Undrained Cohesion (psf)	P-Multiplier [2]
Clayey Soils	0 to 2.5	Stiff Clay w/o Free Water (Reese)	105	750	0.7
	2.5 to 6		120	1,200	1.0
	6 to 10		115	2,000	1.0
	10 to 15		120	1,200	1.0

LPile Parameters – Zone 3: Pre-Drilling Likely Not Required[1]

Soil Type	Depth (feet)	LPile (P-y) Curve Soil Model[3]	Effective Unit Weight, γ (pcf)	Undrained Cohesion (psf)	P-Multiplier [2]
	15 to 20	Soft Clay (Matlock)	110	500	1.0

1. Borings located in Zone 3: FC-12 and FC-14
2. Reduced in the upper 2.5 feet to account for freeze/thaw effects.
3. Use the LPile default values for Soil Modulus, k and Strain Factor, E_{50}

The above indicated effective unit weight, effective friction angle, and cohesion values have no factor of safety and may be used to analyze suitability of the proposed section and serviceability requirements. These parameters are based on correlations with SPT results, published values, and our experience with similar soil types. Existing p-y models typically under-predict the lateral capacity of shallow driven piles in clay soils. Therefore, the P-multiplier is most likely higher but would need to be confirmed based on results of site-specific load test results.

DRIVEN PILE CONSTRUCTION CONSIDERATIONS

Based on the field exploration, it is our opinion that the soils on the site are suitable for pile installation. However, difficult pile-driving conditions should be expected in Zone 1 and Zone 2 and especially where SPT N-Values greater than 40 were encountered during our field exploration. We anticipate pile installation could require predrilling in these areas.

PRE-DRILLED PILE CONSIDERATIONS

There are two pre-drilling applications which can be utilized to improve pile installation in areas with difficult pile driving conditions. Where very dense soil or highly weathered rock are encountered, pre-drilling under-sized holes (approximately 80% to 90% of the largest pile dimension) before pile installation can help to facilitate pile driving. Where bedrock would cause pile refusal conditions, over-sized holes (minimum 2-inches greater than the largest pile dimension) can be drilled before placing and grouting the pile in place. A load testing program should be completed to determine the feasibility of using either pre-drilled option. The pre-drilled under-sized holes should not extend the entire design embedment depth and should instead be terminated about 3 to 6 inches less than the desired embedment depth. Actual pre-drilled depths should be documented in the installation records for each pile location. The skin friction, end bearing, and LPile parameters provided in the previous sections may be used to estimate preliminary capacities of piles installed in pre-drilled under-sized holes. Additionally, an ultimate skin friction value of 1,000 psf may be used for the drilled bedrock zone. However, full-scale load testing should be completed on piles installed in under-sized holes since capacity can be significantly impacted by this construction method.

PRELIMINARY RECOMMENDATIONS FOR ISOLATED SLAB FOUNDATIONS

We understand that some equipment may be supported on mat/slab foundations while other structures and O&M building may be supported on shallow foundations. Based on the anticipated types of structures and the expected magnitude of loading, surface soil replacement that is provided in the **PRELIMINARY EARTHWORK RECOMENDATIONS** sections of this report will be needed. We would expect an allowable bearing capacity of 2,000 psf with total and differential settlements of about 1 inch and ¾ inch, respectively, depending on minimum foundation width and embedment.

PRELIMINARY EARTHWORK RECOMMENDATIONS

The site work conditions will be largely dependent on the weather conditions and the contractor’s means and methods in controlling surface drainage and protecting the subgrade. The clayey and silty soils encountered in the borings may provide poor surface water drainage at the site for construction. Site preparation where inverter mat foundations will be installed should include clearing and grubbing, installation of a site drainage system (where necessary), subgrade preparation, proof rolling and vibratory densification as necessary. Site preparation is not necessary in the PV Array field or where inverters will be supported on driven piles except to improve site drainage where necessary.

We would expect typical earthmoving equipment (bulldozers, excavators, steel drum vibratory rollers) to be suitable for completion of earthwork activities on the site. The most challenging obstacle for earthwork construction will be the control of surface water, especially during the typical wet season. The site should be graded to prevent ponding of surface water.

Typical unpaved access roads in the lightly loaded array areas consisting of about 6 to 9 inches of aggregate base on compacted stable native soil should be suitable. The substation access road will likely require 6 to 9 inches of aggregate base over 12 inches of stabilized subgrade or native soils reinforced with a geogrid.

CORROSIVITY

Corrosivity test results performed on samples collected from bulk samples throughout the site. These values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction. Location of the samples and the test result are included in our results of corrosion analysis included in the appendix of this report.

These test results are provided to assist in determining the type and degree of corrosion protection that may be required. We recommend that a certified corrosion engineer be retained to analyze the need for corrosion protection and to design appropriate protective measures, if required.

As discussed in Section 10.7.5 of the AASHTO LRFD Bridge Manual, 8th Edition, 2017, the following soil or site conditions should be considered as indicative of potential deterioration or corrosion situation for steel piles:

- Soil electrical resistivity less than 2,000 ohm-cm
- pH less than 5.5
- pH between 5.5 and 8.5 with high organic content
- Sulfate concentration greater than 1,000 ppm (mg/kg)

FIELD RESISTIVITY TEST RESULTS

Field measurements of soil electrical resistivity were performed by Terracon on September 16, 2021. The soil resistivity testing was performed at the locations identified in the **Exploration Plan**. The Wenner arrangement (equal electrode spacing) was used with "a" spacings of 2.5, 5, 10, 15, 20 and 50 feet at eight locations within the solar array area and at one location within the proposed substation. The "a" spacing is generally considered to be the depth of influence of the test. The testing was performed in both a north-south and an east-west orientation at each location. Results of the soil resistivity measurements are presented in the **Exploration Results** section.

SEISMIC CONSIDERATIONS

Description	Value
2018 International Building Code Site Classification (IBC) [1]	C or D [2]

1/ The site class definition was determined using SPT N-values in conjunction with section 1613.3.2 in the 2018 IBC and Table 20.3-1 in the 2010 ASCE-7.

2/ Borings extended to a maximum depth of 20 feet, and this seismic site class definition considers that similar conditions continue below the maximum depth of the subsurface exploration.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Prior to construction of the project, Terracon should be retained as the Geotechnical Engineer to provide design level geotechnical engineering services.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

ATTACHMENTS

FIELD EXPLORATION

Contents:

Note: All attachments are one page unless noted above.

FIELD EXPLORATION PROCEDURES

Number of Explorations	Type of Exploration	Approximate Depth or Description	Planned Location
16 locations (FC-1 through FC-16)	SPT Boring	13 to 20 feet bgs	Array Areas
8 locations (FC-1, FC-3, FC-6, FC-9, FC-11, FC-12, FC-14 and FC-16)	Field Electrical Resistivity	‘a’ spacing: 2.5, 5, 10, 15, 20, and 50 feet.	Array Areas
4 locations (FC-6, FC-9, FC-12 and FC-16)	Bulk Sample for Thermal Resistivity	1 to 4 feet bgs	Array Areas
8 locations (FC-1, FC-3, FC-6, FC-9, FC-11, FC-12, FC-14 and FC-16)	Bulk Samples for Corrosion Testing	1 to 4 feet bgs	Array Areas

Boring Layout and Elevations: The exploration locations were selected by Terracon personnel based on the site and access conditions and the planned footprint of the PV arrays locations provided by SunEast Development, LLC. The GPS coordinates of the boring locations were obtained with a handheld GPS unit with estimated horizontal accuracy of about ±15 feet. Elevations were estimated from USGS. The boring locations and elevations should be considered accurate only to the degrees implied by the methods used to determine them. If elevations and a more precise boring layout are desired, we recommend borings be surveyed following completion of fieldwork.

SPT Borings: The SPT soil borings utilized a track-mounted, rotary drilling rig equipped with an automatic hammer. Soil samples were obtained by the split spoon sampling procedure in general accordance with the Standard Penetration Test (SPT) procedure. In the split spoon sampling procedure, the number of blows required to advance the sampling spoon the last 12 inches of an 18-inch penetration or the middle 12 inches of a 24-inch penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration resistance value (N). This value is used to estimate the in-situ relative density of cohesionless soils and the consistency of cohesive soils. The sampling depths and penetration distance, plus the standard penetration resistance values, are shown on the boring logs.

Portions of the samples from the borings were sealed in jars to reduce moisture loss, and then the jars were taken to our laboratory for further observation and classification. Upon completion, the boreholes were backfilled with soil cuttings.

Field logs of each boring were prepared by a field geologist. These logs included visual classifications of the materials encountered during drilling as well as the geologist's interpretation of the subsurface conditions between samples.

Soil Electrical Resistivity Testing: Soil electrical resistivity data was obtained in accordance with ASTM G57 Standard Test Method for Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method. For testing, we performed two mutually perpendicular lines with electrode “a” spacing of 2.5, 5, 10, 15, 20 and 50 feet at two locations within the solar array area

SITE LOCATION

Flat Creek Solar Site ■ Town of Root, NY

Terracon Project No. J5215096

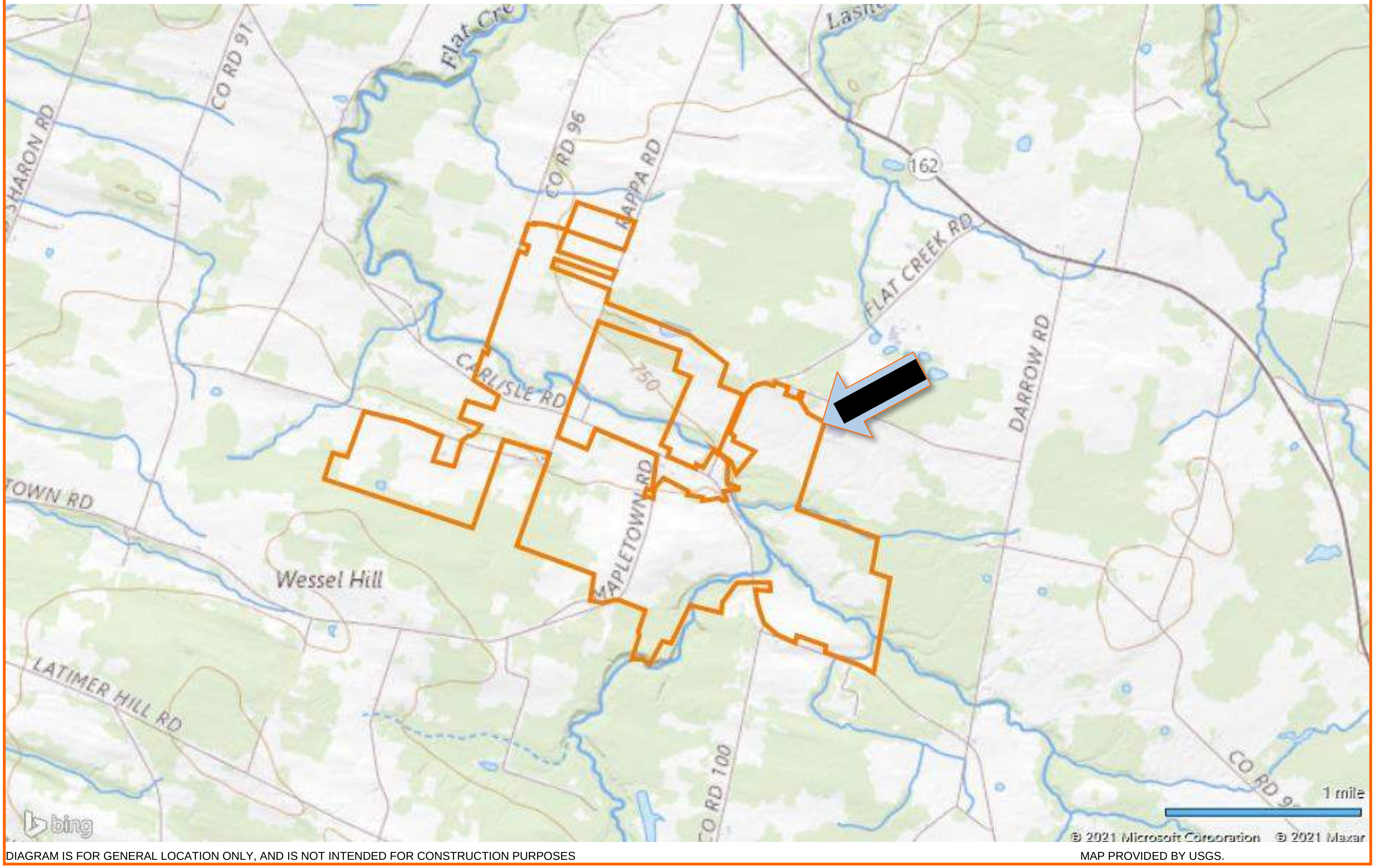


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY USGS.

EXPLORATION PLAN WITH AERIAL IMAGE

Flat Creek Solar Site ■ Town of Root, NY

Terracon Project No. J5215096

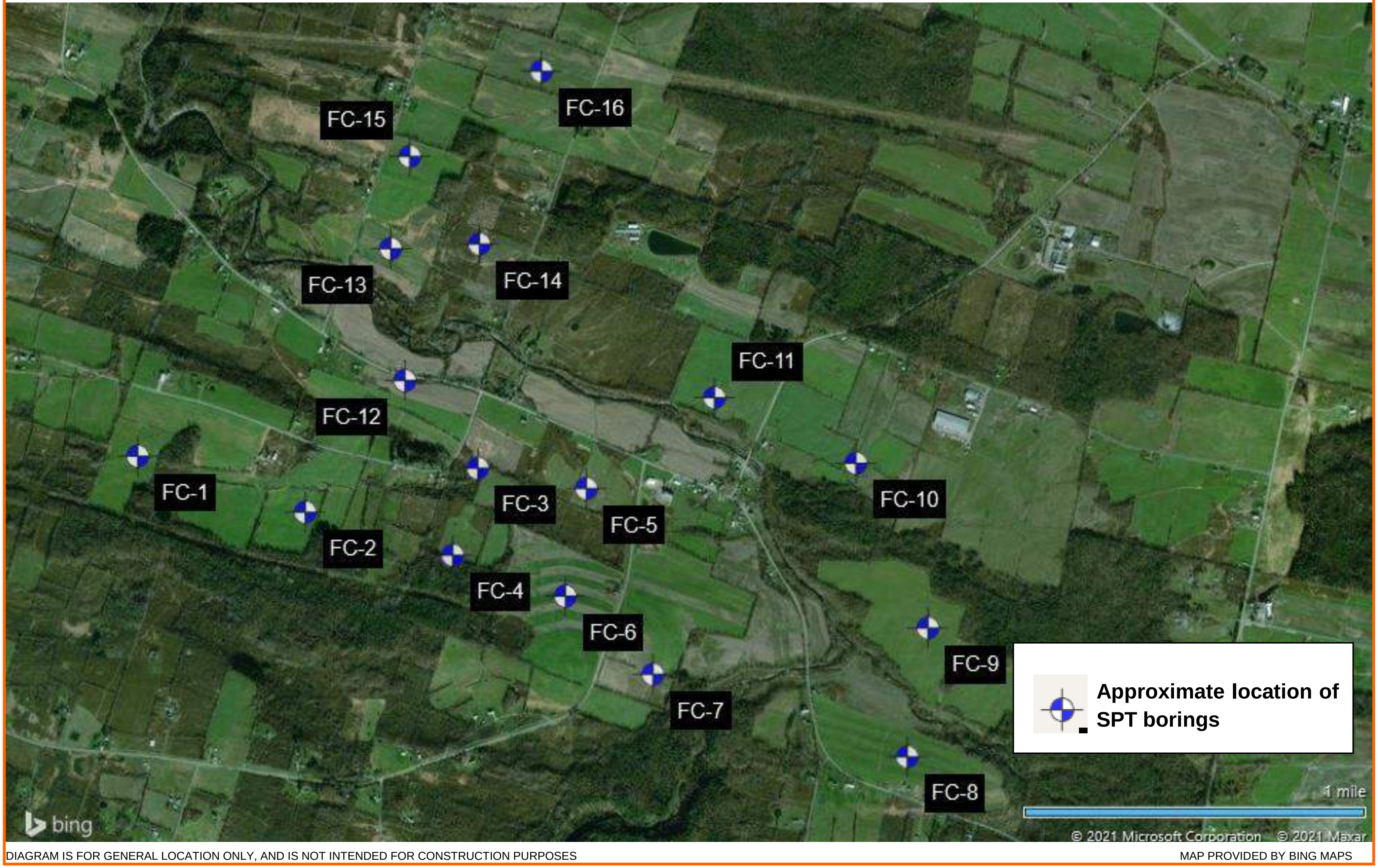


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY BING MAPS

EXPLORATION PLAN WITH PROJECT OVERLAY

Flat Creek Solar Site ■ Town of Root, NY
Terracon Project No. J5215096

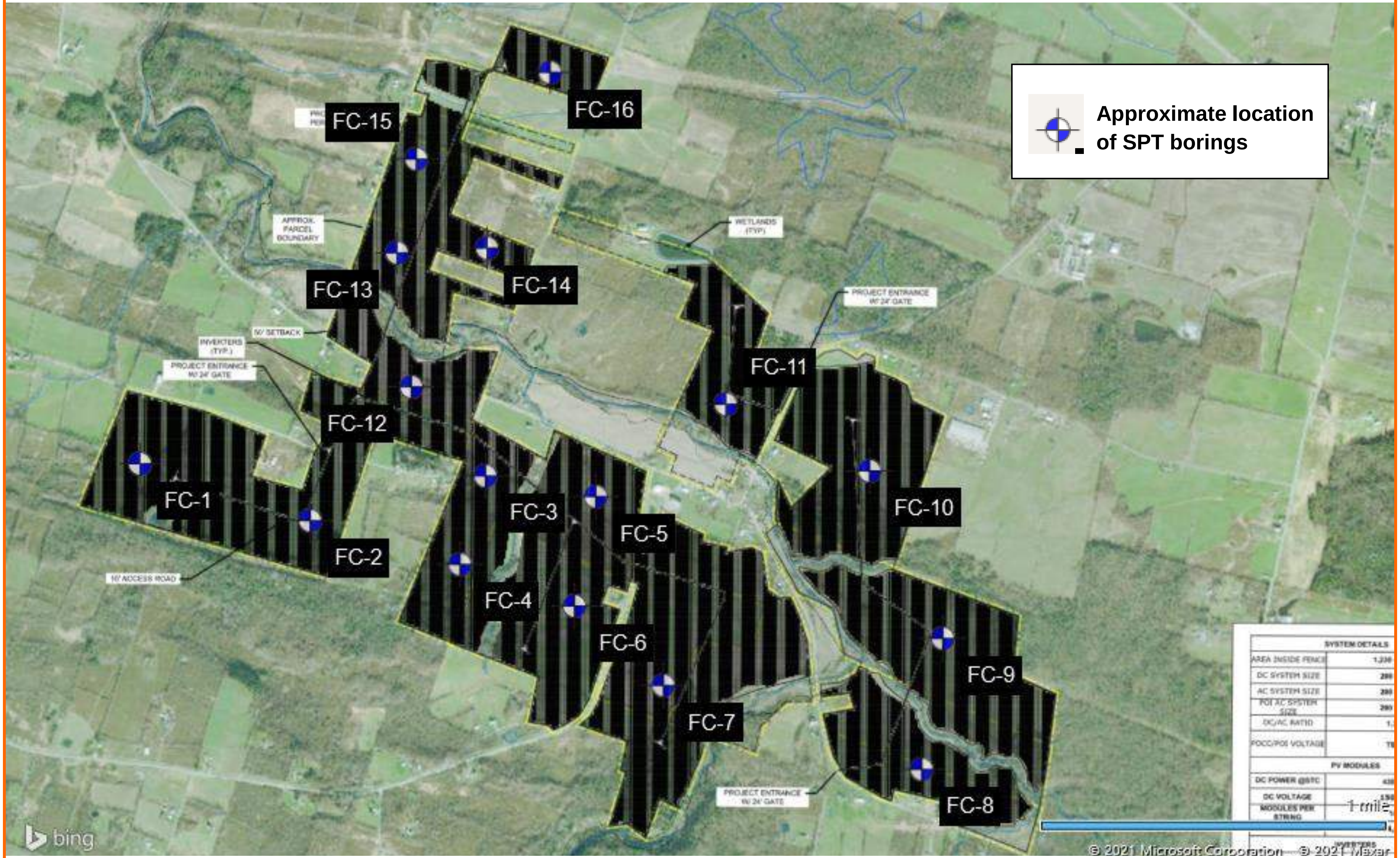


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY SUNEAST DEVELOPMENT, LLC.

EXPLORATION PLAN WITH ANALYSIS ZONES

Flat Creek Solar Site ■ Town of Root, NY
Terracon Project No. J5215096

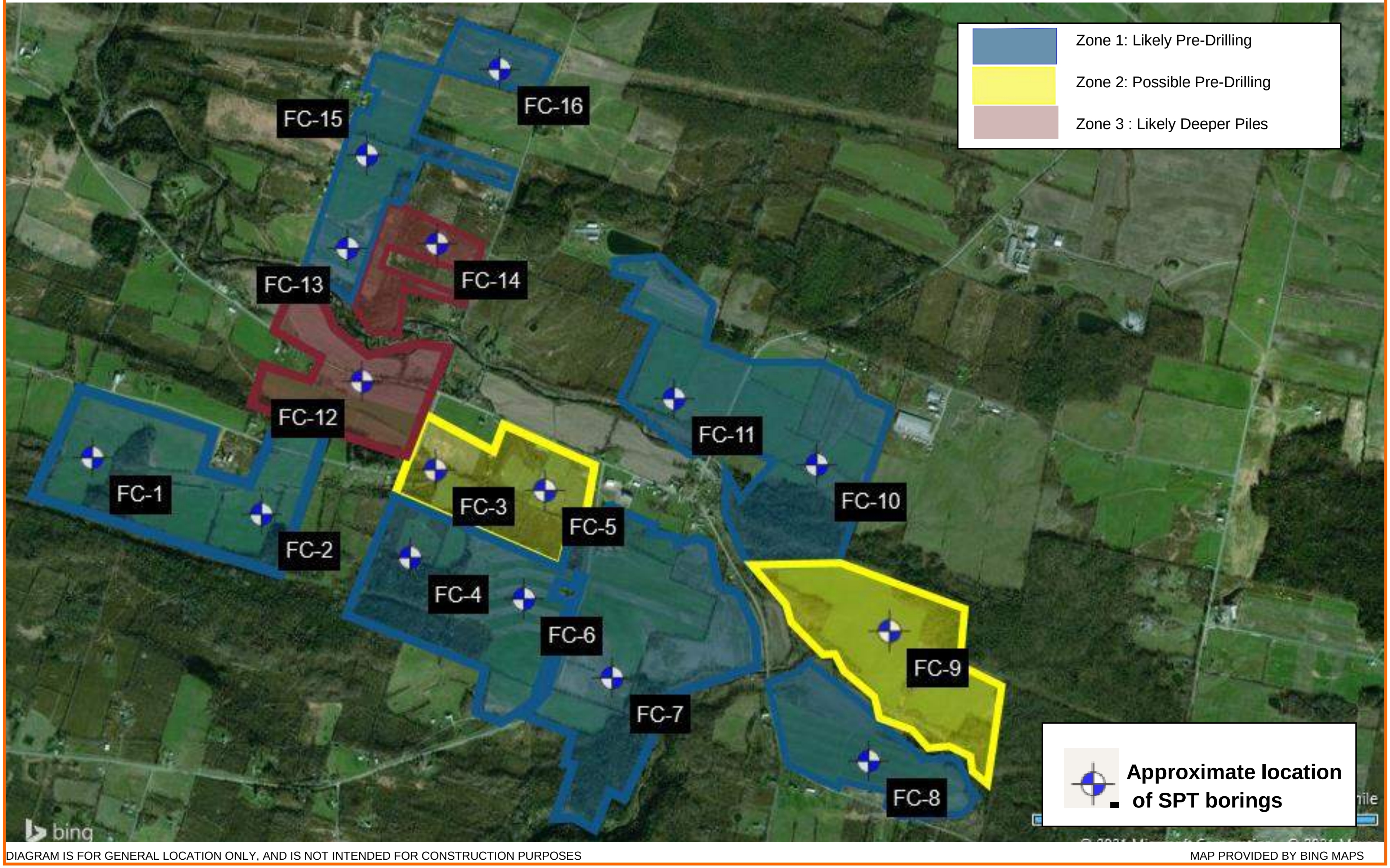


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY BING MAPS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SunEast Solar PV NY Sites ■ Town of Root, NY

Terracon Project No. J5215096

SAMPLING

▮ Rock Core

✋ Grab Sample

☒ Standard Penetration Test

WATER LEVEL

▽ **Water Initially Encountered**

▽ **Water Level After a Specified Period of Time**

▼ **Water Level After a Specified Period of Time**

▨ **Cave In Encountered**

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

N	**Standard Penetration Test Resistance (Blows/Ft.)**
(HP)	**Hand Penetrometer**
(T)	**Torvane**
(DCP)	**Dynamic Cone Penetrometer**
UC	**Unconfined Compressive Strength**
(PID)	**Photo-Ionization Detector**
(OVA)	**Organic Vapor Analyzer**

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

LOCATION AND ELEVATION NOTES

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		**CONSISTENCY OF FINE-GRAINED SOILS** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (tsf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					**Soil Classification**	
					Group Symbol	**Group Name** [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu ≥ 4 and 1 ≤ Cc ≤ 3 [E]		GW	Well-graded gravel [F]
			Cu < 4 and/or [Cc<1 or Cc>3.0] [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu ≥ 6 and 1 ≤ Cc ≤ 3 [E]		SW	Well-graded sand [I]
			Cu < 6 and/or [Cc<1 or Cc>3.0] [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G, H, I]
			Fines classify as CL or CH		SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above “A”		CL	Lean clay [K, L, M]
			PI < 4 or plots below “A” line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K, L, M, N]
			Liquid limit - not dried			Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above “A” line		CH	Fat clay [K, L, M]
			PI plots below “A” line		MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K, L, M, P]
			Liquid limit - not dried			Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add “with cobbles or boulders, or both” to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10} \qquad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add “with sand” to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add “with organic fines” to group name.

[I] If soil contains ≥ 15% gravel, add “with gravel” to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add “with sand” or “with gravel,” whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add “sandy” to group name.

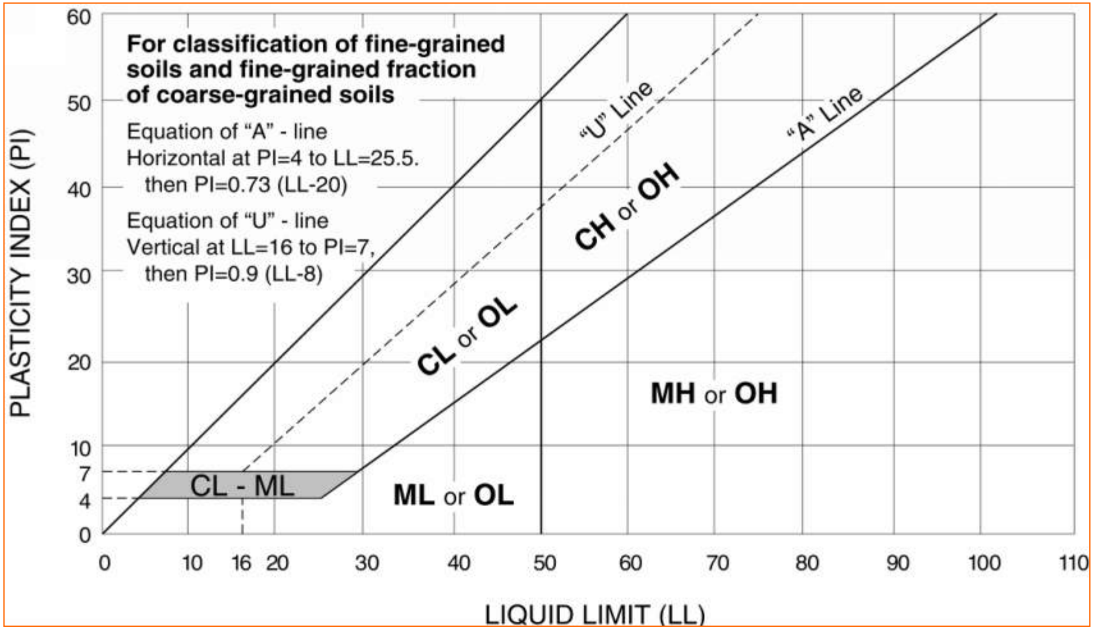
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add “gravelly” to group name.

[N] PI ≥ 4 and plots on or above “A” line.

[O] PI < 4 or plots below “A” line.

[P] PI plots on or above “A” line.

[Q] PI plots below “A” line.



DESCRIPTION OF ROCK PROPERTIES

WEATHERING

Term	Description
Unweathered	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.
Slightly weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition.
Moderately weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
Highly weathered	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.
Completely weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.
Residual soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

STRENGTH OR HARDNESS

Description	Field Identification	Uniaxial Compressive Strength, psi (MPa)
Extremely weak	Indented by thumbnail	40-150 (0.3-1)
Very weak	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife	150-700 (1-5)
Weak rock	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer	700-4,000 (5-30)
Medium strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer	4,000-7,000 (30-50)
Strong rock	Specimen requires more than one blow of geological hammer to fracture it	7,000-15,000 (50-100)
Very strong	Specimen requires many blows of geological hammer to fracture it	15,000-36,000 (100-250)
Extremely strong	Specimen can only be chipped with geological hammer	>36,000 (>250)

DISCONTINUITY DESCRIPTION

Fracture Spacing (Joints, Faults, Other Fractures)		Bedding Spacing (May Include Foliation or Banding)	
Description	**Spacing**	**Description**	**Spacing**
Extremely close	< ¾ in (<19 mm)	**Laminated**	< ½ in (<12 mm)
Very close	¾ in – 2-1/2 in (19 - 60 mm)	**Very thin**	½ in – 2 in (12 – 50 mm)
Close	2-1/2 in – 8 in (60 – 200 mm)	**Thin**	2 in – 1 ft. (50 – 300 mm)
Moderate	8 in – 2 ft. (200 – 600 mm)	**Medium**	1 ft. – 3 ft. (300 – 900 mm)
Wide	2 ft. – 6 ft. (600 mm – 2.0 m)	**Thick**	3 ft. – 10 ft. (900 mm – 3 m)
Very Wide	6 ft. – 20 ft. (2.0 – 6 m)	**Massive**	> 10 ft. (3 m)

Discontinuity Orientation (Angle): Measure the angle of discontinuity relative to a plane perpendicular to the longitudinal axis of the core. (For most cases, the core axis is vertical; therefore, the plane perpendicular to the core axis is horizontal.) For example, a horizontal bedding plane would have a 0-degree angle.

ROCK QUALITY DESIGNATION (RQD) [1]

Description	RQD Value (%)
Very Poor	0 - 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 - 100

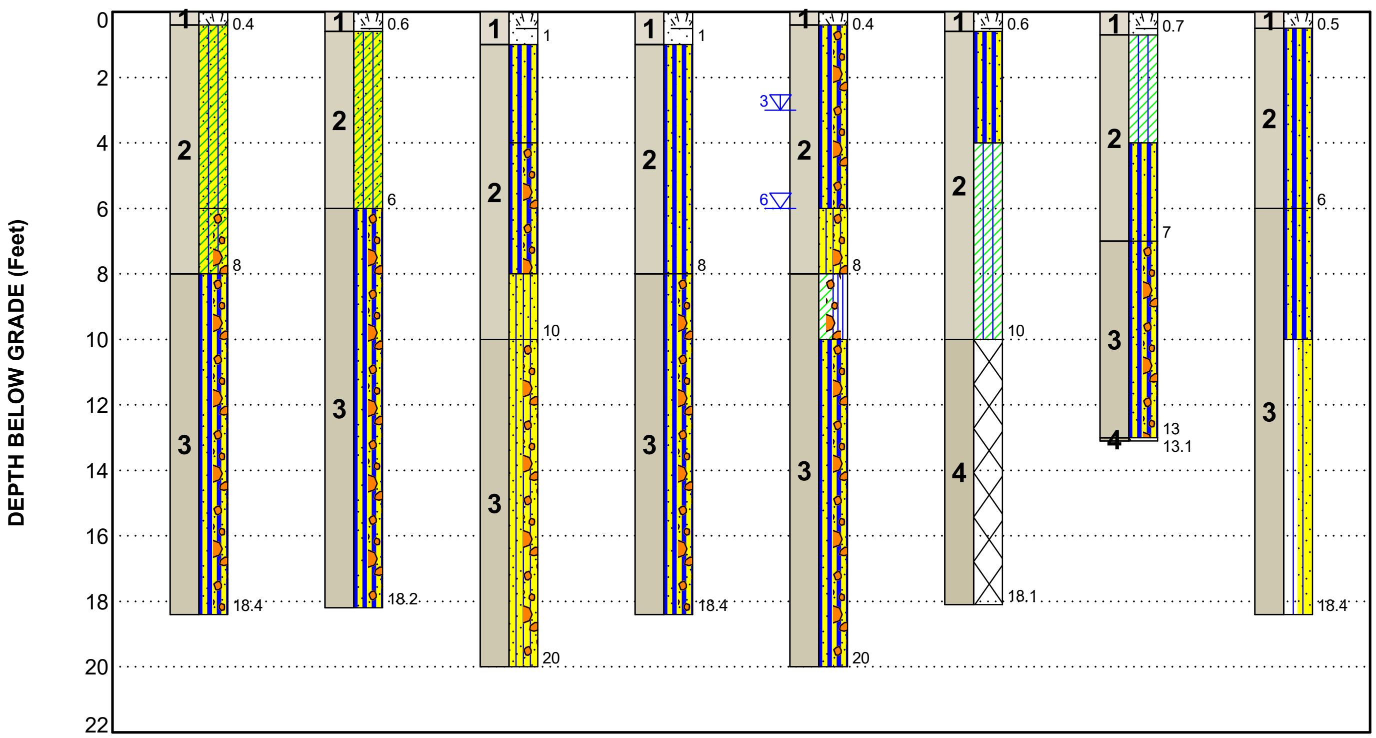
1. The combined length of all sound and intact core segments equal to or greater than 4 inches in length, expressed as a percentage of the total core run length.

Reference: U.S. Department of Transportation, Federal Highway Administration, Publication No FHWA-NHI-10-034, December 2009 Technical Manual for Design and Construction of Road Tunnels – Civil Elements

GEOMODEL

SunEast Solar PV NY Sites ■ Town of Root, NY
Terracon Project No. J5215096

Terracon GeoReport



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Surface	Topsoil
2	Native Soil 1	Mixtures of Silt, Sand, Clay and Gravel (CL-ML, ML, SM, CL); trace rock fragments; brown, gray; soft to hard or loose to medium dense to dense (SPT N values range from 3 to 41)
3	Native Soil 2	Mixtures of Silt, Sand, Clay and Gravel (ML, SM, CL-ML, SP); contains rock, cobble and boulder fragments; brown, gray; very stiff to hard or dense to very dense (SPT N values range from 35 to >50)
4	Bedrock	Shale; highly to moderately weathered; gray; weak rock

LEGEND

- ▨ Topsoil
- ▨ Sandy Silty Clay
- ▨ Sandy Silty Clay with Gravel
- ▨ Sandy Silt with Gravel
- ▨ Sandy Silt
- ▨ Silty Sand
- ▨ Silty Sand with Gravel
- ▨ Silty Clay with Gravel
- ▨ Silty Clay
- ☒ Weathered Rock
- ▨ Silt with Sand

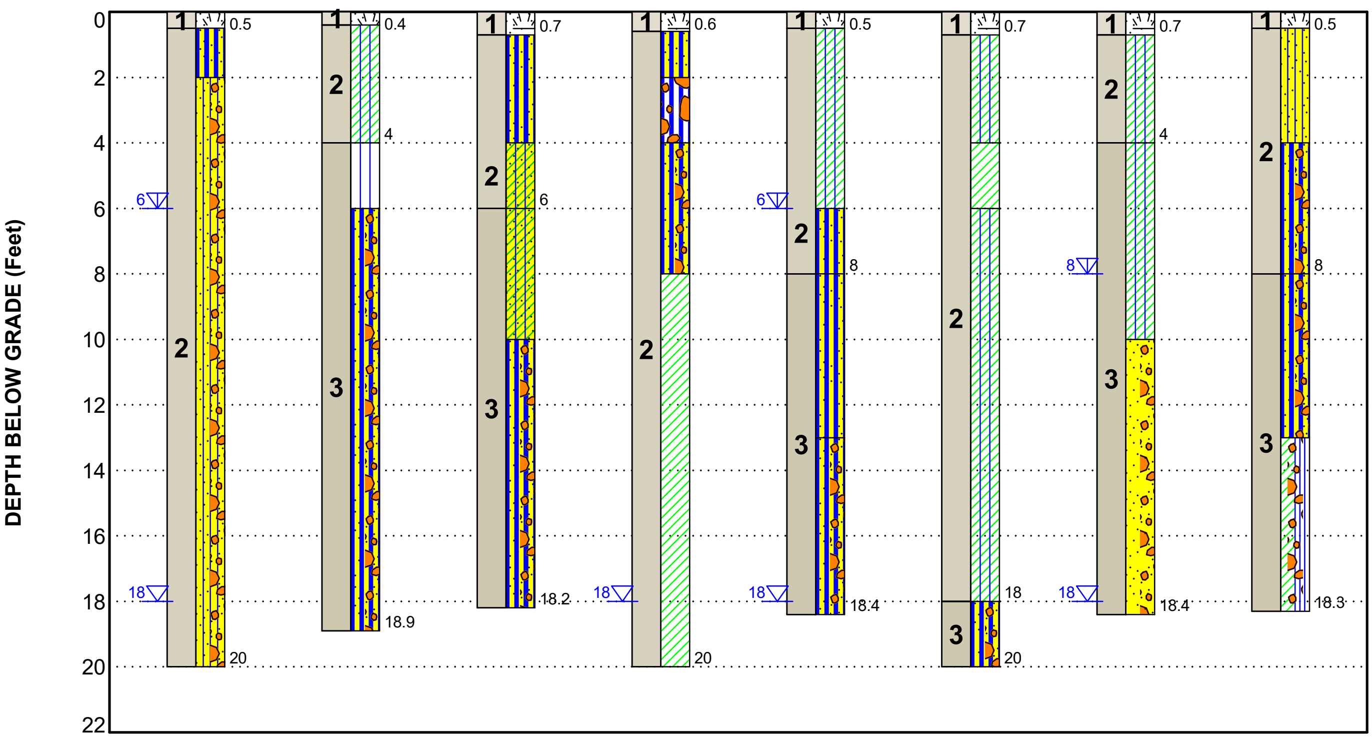
▽ First Water Observation
▽ Second Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

GEOMODEL

SunEast Solar PV NY Sites ■ Town of Root, NY
Terracon Project No. J5215096



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	**Surface**	Topsoil
2	**Native Soil 1**	Mixtures of Silt, Sand, Clay and Gravel (CL-ML, ML, SM, CL); trace rock fragments; brown, gray; soft to hard or loose to medium dense to dense (SPT N values range from 3 to 41)
3	**Native Soil 2**	Mixtures of Silt, Sand, Clay and Gravel (ML, SM, CL-ML, SP); contains rock, cobble and boulder fragments; brown, gray; very stiff to hard or dense to very dense (SPT N values range from 35 to >50)
4	**Bedrock**	Shale; highly to moderately weathered; gray; weak rock

LEGEND

- ▨ Topsoil
- ▨ Sandy Silt
- ▨ Silty Sand with Gravel
- ▨ Silty Clay
- ▨ Silt
- ▨ Sandy Silt with Gravel
- ▨ Sandy Silty Clay
- ▨ Gravelly Silt
- ▨ Lean Clay
- ▨ Poorly-graded Sand with Gravel
- ▨ Silty Sand
- ▨ Silty Clay with Gravel

▽ First Water Observation
▽ Second Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

BORING LOG NO. FC-1

Page 1 of 1

PROJECT: SunEast Solar PV NY Sites

CLIENT: SunEast Development, LLC
Old Lyme, CT

SITE: **Flat Creek**
Town of Root, NY

LOCATION See Exploration Plan

Latitude: 42.8443° Longitude: -74.5358°

Approximate Surface Elev.: 810 (Ft.) +/-

MODEL LAYER	DEPTH		ELEVATION (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	ATTERBERG LIMITS LL-PL-PI
1	0.4	**TOPSOIL**	809.5+/-				
2		**SANDY SILTY CLAY (CL-ML)**, trace gravel, brown, medium stiff to very stiff		☒	2	2-4-4-6 N=8	31-21-10
				☒	20	4-4-7-8 N=11	
				☒	24	4-7-9-9 N=16	
	6.0		804+/-				
		SANDY SILTY CLAY WITH GRAVEL (CL-ML), brown, very stiff, contains rock fragments		☒	20	8-10-16-18 N=26	
	8.0		802+/-				
3		**SANDY SILT WITH GRAVEL (ML)**, dark grayish brown, hard		☒	13	21-36-50/5"	
				☒	20	19-36-40-35 N=76	
		Becomes dark gray		☒	18	15-18-21-25 N=39	
	18.4		791.5+/-	☒	5	50/5"	
		Boring Terminated at 18.4 Feet					

DEPTH (Ft.): 5, 10, 15

WATER LEVEL OBSERVATIONS

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 inch ID Hollow Stem Augers and 2 inch OD Split Barrel Sampler

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from USGS topographic site maps.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

15 Marway Cir, Ste 2B
Rochester, NY

Boring Started: 08-02-2021	Boring Completed: 08-02-2021
Drill Rig: CME-550	Driller: M. Powell
Project No.: J5215096	

BORING LOG NO. FC-2

PROJECT: SunEast Solar PV NY Sites

CLIENT: SunEast Development, LLC
Old Lyme, CT

SITE: Flat Creek
Town of Root, NY

LOCATION See Exploration Plan

Latitude: 42.8419° Longitude: -74.5261°

Approximate Surface Elev.: 807 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH		ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS
1		0.6	**TOPSOIL**	806.5+/-					
2			**SANDY SILTY CLAY (CL-ML)**, trace gravel, brown to dark brown, medium stiff to very stiff				☒	19	2-3-3-5 N=6
							☒	22	4-5-5-6 N=10
		6.0		801+/-	5		☒	22	5-13-13-15 N=26
3			**SANDY SILT WITH GRAVEL (ML)**, brown, hard, contains cobbles and boulders				☒	24	21-24-25-23 N=49
							☒	1	50/2"
			Becomes dark gray		10		☒	24	24-30-34-50/5" N=64
							☒	0	50/2"
					15				
		18.2		789+/-			☒	0	50/2"
			Boring Terminated at 18.2 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 inch ID Hollow Stem Augers and 2 inch OD Split Barrel Sampler

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from USGS topographic site maps.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
15 Marway Cir, Ste 2B
Rochester, NY

Boring Started: 08-03-2021	Boring Completed: 08-03-2021
Drill Rig: CME-550	Driller: M. Powell
Project No.: J5215096	

BORING LOG NO. FC-3

Page 1 of 1

PROJECT: SunEast Solar PV NY Sites

CLIENT: SunEast Development, LLC
Old Lyme, CT

SITE: Flat Creek
Town of Root, NY

LOCATION See Exploration Plan

Latitude: 42.8438° Longitude: -74.5161°

Approximate Surface Elev.: 730 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	ATTERBERG LIMITS LL-PL-PI
1		**TOPSOIL** 1.0	729+/-				19	2-3-3-4 N=6	NP
2		**SANDY SILT (ML)**, trace gravel, brown, medium stiff					14	3-3-4-3 N=7	
		4.0	726+/-						
		SANDY SILT WITH GRAVEL (ML), brown, medium stiff to stiff		5			2	3-3-3-4 N=6	
							24	5-6-6-7 N=12	
		8.0	722+/-						
3		**SILTY SAND (SM)**, dark brown, medium dense					14	5-5-10-12 N=15	
		10.0	720+/-	10					
		SILTY SAND WITH GRAVEL (SM), dark brown, dense					13	8-19-27-32 N=46	
							13	9-16-20-23 N=36	
				15					
		Contains rock fragments					14	10-16-14-13 N=30	
		20.0	710+/-	20					
		Boring Terminated at 20 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 inch ID Hollow Stem Augers and 2 inch OD Split Barrel Sampler

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from USGS topographic site maps.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
15 Marway Cir, Ste 2B
Rochester, NY

Boring Started: 08-03-2021	Boring Completed: 08-03-2021
Drill Rig: CME-550	Driller: M. Powell
Project No.: J5215096	

BORING LOG NO. FC-4

PROJECT: **SunEast Solar PV NY Sites**

CLIENT: **SunEast Development, LLC**
Old Lyme, CT

SITE: **Flat Creek**
Town of Root, NY

LOCATION See Exploration Plan

Latitude: 42.8401° Longitude: -74.5175°

Approximate Surface Elev.: 818 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH		ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS
1		1.0	**TOPSOIL**	817+/-			☒	19	2-2-3-3 N=5
2			**SANDY SILT (ML)**, trace gravel, brown, medium stiff to very stiff				☒	12	3-3-3-4 N=6
					5		☒	19	3-4-4-10 N=8
		8.0		810+/-			☒	12	8-8-9-9 N=17
3			**SANDY SILT WITH GRAVEL (ML)**, brown to dark brown, hard, contains cobbles and boulders				☒		30-50/2"
			Becomes dark gray		10		☒	20	17-30-36-35 N=66
							☒	11	10-17-19-20 N=36
					15				
		18.4		799.5+/-			☒	5	50/5"
			Boring Terminated at 18.4 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 inch ID Hollow Stem Augers and 2 inch OD Split Barrel Sampler

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from USGS topographic site maps.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
15 Marway Cir, Ste 2B
Rochester, NY

Boring Started: 08-03-2021	Boring Completed: 08-03-2021
Drill Rig: CME-550	Driller: M. Powell
Project No.: J5215096	

BORING LOG NO. FC-5

PROJECT: **SunEast Solar PV NY Sites**

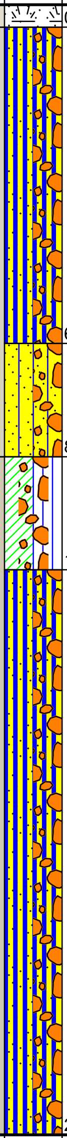
CLIENT: **SunEast Development, LLC**
Old Lyme, CT

SITE: **Flat Creek**
Town of Root, NY

LOCATION See Exploration Plan

Latitude: 42.8429° Longitude: -74.5098°

Approximate Surface Elev.: 733 (Ft.) +/-



MODEL LAYER	DEPTH		ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS
1	0.4	**TOPSOIL**	732.5+/-					
2		**SANDY SILT WITH GRAVEL (ML)**, dark brown, medium stiff to very stiff				☒	11	3-3-3-4 N=6
					▽	☒	12	4-5-5-10 N=10
				5		☒	16	10-8-8-8 N=16
	6.0		727+/-		▽			
		SILTY SAND WITH GRAVEL (SM), brown, medium dense				☒	12	8-9-12-10 N=21
	8.0		725+/-					
		SILTY CLAY WITH GRAVEL (CL-ML), brown, hard				☒	28	16-18-24 N=42
	10.0		723+/-	10				
3		**SANDY SILT WITH GRAVEL (ML)**, brown, hard				☒	13	15-18-21-26 N=39
		Becomes dark gray				☒	14	13-16-21-19 N=37
				15				
		Becomes very stiff				☒	13	10-9-12-12 N=21
	20.0		713+/-	20				
		Boring Terminated at 20 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 inch ID Hollow Stem Augers and 2 inch OD Split Barrel Sampler

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from USGS topographic site maps.

Notes:

WATER LEVEL OBSERVATIONS

▽ *6' While drilling*

▽ *3' At completion*

Terracon
15 Marway Cir, Ste 2B
Rochester, NY

Boring Started: 08-03-2021	Boring Completed: 08-03-2021
Drill Rig: CME-550	Driller: M. Powell
Project No.: J5215096	

BORING LOG NO. FC-6

PROJECT: SunEast Solar PV NY Sites

CLIENT: SunEast Development, LLC
Old Lyme, CT

SITE: Flat Creek
Town of Root, NY

LOCATION See Exploration Plan

Latitude: 42.8384° Longitude: -74.5110°

Approximate Surface Elev.: 848 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)
1	0.6	**TOPSOIL**	847.5+/-
2	4.0	**SANDY SILT (ML)**, trace gravel, dark brown, medium stiff to stiff	844+/-
2	10.0	**SILTY CLAY (CL-ML)**, dark brown, medium stiff to very stiff	838+/-
4	18.1	**WEATHERED SHALE**, gray, highly to moderately weathered with depth, weak rock	830+/-

Boring Terminated at 18.1 Feet

RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
17	3-4-4-5 N=8	33.5	NP
22	5-5-5-6 N=10		
17	4-4-4-5 N=8		
23	6-6-7-9 N=13		
23	6-8-11-16 N=19		
12	24-50/5"		
6	50/5"		
1	50/1"		

DEPTH (Ft.): 5, 10, 15

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 inch ID Hollow Stem Augers and 2 inch OD Split Barrel Sampler

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from USGS topographic site maps.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
15 Marway Cir, Ste 2B
Rochester, NY

Boring Started: 08-04-2021	Boring Completed: 08-04-2021
Drill Rig: CME-550	Driller: M. Powell
Project No.: J5215096	

BORING LOG NO. FC-7

Page 1 of 1

PROJECT: SunEast Solar PV NY Sites

CLIENT: SunEast Development, LLC
Old Lyme, CT

SITE: Flat Creek
Town of Root, NY

LOCATION See Exploration Plan

Latitude: 42.8350° Longitude: -74.5060°

Approximate Surface Elev.: 862 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)
1	0.7	**TOPSOIL**	861.5+/-
2	4.0	**SILTY CLAY (CL-ML)**, brown, medium stiff	858+/-
2	7.0	**SANDY SILT (ML)**, brown, stiff to hard, contains clay seams	855+/-
3	13.0	**SANDY SILT WITH GRAVEL (ML)**, brown, hard	849+/-
4	13.1	**WEATHERED SHALE**, dark gray, moderately weathered, weak rock	849+/-

Sample Spoon penetration refusal encountered at 13.1' BGS. Auger penetration refusal encountered at 13.1 Feet

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS
		☒	24	2-2-3-5 N=5
		☒	11	4-4-4-5 N=8
5		☒	24	5-6-6-8 N=12
		☒	18	13-27-50/5"
		☒	24	12-14-19-17 N=33
10		☒	5	50/5"
		☒	1	50/1"

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 inch ID Hollow Stem Augers and 2 inch OD Split Barrel Sampler

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from USGS topographic site maps.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
15 Marway Cir, Ste 2B
Rochester, NY

Boring Started: 08-04-2021	Boring Completed: 08-04-2021
Drill Rig: CME-550	Driller: M. Powell
Project No.: J5215096	

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL J5215096 SUNEAST SOLAR PV.GPJ TERRACON_DATATEMPLATE.GDT 11/17/21

BORING LOG NO. FC-8

Page 1 of 1

PROJECT: SunEast Solar PV NY Sites

CLIENT: SunEast Development, LLC
Old Lyme, CT

SITE: Flat Creek
Town of Root, NY

LOCATION See Exploration Plan

Latitude: 42.8316° Longitude: -74.4913°

Approximate Surface Elev.: 821 (Ft.) +/-

MODEL LAYER	DEPTH		ELEVATION (Ft.)
1	0.5	**TOPSOIL**	820.5+/-
2	6.0	**SANDY SILT (ML)**, trace gravel, brown, stiff to very stiff	815+/-
3	10.0	**SANDY SILT (ML)**, trace gravel, brown, hard, Contains rock fragments	811+/-
3	18.4	**SILT WITH SAND (ML)**, gray, hard, contains rock fragments	802.5+/-

Boring Terminated at 18.4 Feet

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS
		☒	20	3-4-4-5 N=8
		☒	22	7-7-7-7 N=14
5		☒	10	6-5-5-11 N=10
		☒	16	26-21-27-30 N=48
		☒	0.42	50/5"
10		☒	17	2-27-50/5"
		☒	5	50/5"
15				
		☒		50/5"

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 inch ID Hollow Stem Augers and 2 inch OD Split Barrel Sampler

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from USGS topographic site maps.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

15 Marway Cir, Ste 2B
Rochester, NY

Boring Started: 08-04-2021	Boring Completed: 08-04-2021
Drill Rig: CME-550	Driller: M. Powell
Project No.: J5215096	

BORING LOG NO. FC-9

PROJECT: SunEast Solar PV NY Sites

CLIENT: SunEast Development, LLC
Old Lyme, CT

SITE: **Flat Creek**
Town of Root, NY

LOCATION See Exploration Plan

Latitude: 42.8370° Longitude: -74.4901°

Approximate Surface Elev.: 825 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1	0.5	**TOPSOIL**	824.5+/-							
	2.0	**SANDY SILT (ML)**, trace gravel, contains wood fragments, brown, stiff	823+/-			☒	16	4-5-5-5 N=10		
		SILTY SAND WITH GRAVEL (SM), brown, medium dense to dense				☒	12	9-10-10-12 N=20	15.1	NP
				5		☒	24	5-6-8-12 N=14		
					▽	☒	24	12-18-17-22 N=35		
		Becomes dark gray				☒	24	24-18-22-17 N=40		
2				10		☒	16	12-13-17-19 N=30		
		Becomes medium dense				☒	16	5-9-13-13 N=22		
				15						
					▽					
	20.0		805+/-	20		☒	13	6-8-12-17 N=20		
		Boring Terminated at 20 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 inch ID Hollow Stem Augers and 2 inch OD Split Barrel Sampler

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from USGS topographic site maps.

Notes:

WATER LEVEL OBSERVATIONS
▽ *18' While drilling*
▽ *6' At completion*

Terracon
15 Marway Cir, Ste 2B
Rochester, NY

Boring Started: 08-04-2021	Boring Completed: 08-04-2021
Drill Rig: CME-550	Driller: M. Powell
Project No.: J5215096	

BORING LOG NO. FC-10

Page 1 of 1

PROJECT: SunEast Solar PV NY Sites

CLIENT: SunEast Development, LLC
Old Lyme, CT

SITE: Flat Creek
Town of Root, NY

LOCATION See Exploration Plan

Latitude: 42.8440° Longitude: -74.4943°

Approximate Surface Elev.: 814 (Ft.) +/-

MODEL LAYER	DEPTH		ELEVATION (Ft.)
1	0.4	**TOPSOIL**	813.5+/-
2	4.0	**SILTY CLAY (CL-ML)**, trace gravel, brown, stiff	810+/-
3	6.0	**SILT (ML)**, trace gravel, brown, hard	808+/-
3	18.9	**SANDY SILT WITH GRAVEL (ML)**, dark brown, hard Contains cobbles and boulders	795+/-
		Boring Terminated at 18.9 Feet	

DEPTH (Ft.): 5, 10, 15

RECOVERY (In.)	FIELD TEST RESULTS
22	5-4-4-5 N=8
17	5-5-10-10 N=15
16	22-35-50/5"
16	19-20-50/5"
23	8-17-20-20 N=37
10	29-50/5"
10	25-22-29-17 N=51
10	27-50/5"

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 inch ID Hollow Stem Augers and 2 inch OD Split Barrel Sampler

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from USGS topographic site maps.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
15 Marway Cir, Ste 2B
Rochester, NY

Boring Started: 08-05-2021	Boring Completed: 08-05-2021
Drill Rig: CME-550	Driller: M. Powell
Project No.: J5215096	

BORING LOG NO. FC-11

Page 1 of 1

PROJECT: SunEast Solar PV NY Sites

CLIENT: SunEast Development, LLC
Old Lyme, CT

SITE: Flat Creek
Town of Root, NY

LOCATION See Exploration Plan

Latitude: 42.8468° Longitude: -74.5024°

Approximate Surface Elev.: 760 (Ft.) +/-

MODEL LAYER	DEPTH		ELEVATION (Ft.)
1	0.7	**TOPSOIL**	759.5+/-
2	4.0	**SANDY SILT (ML)**, trace gravel, brown, medium stiff to hard	756+/-
2	6.0	**SANDY SILTY CLAY (CL-ML)**, trace gravel, dark brown, hard	754+/-
3	10.0	**SANDY SILTY CLAY (CL-ML)**, trace gravel, dark brown, hard	750+/-
3	18.2	**SANDY SILT WITH GRAVEL (ML)**, brown, hard	742+/-
		Boring Terminated at 18.2 Feet	

WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	ATTERBERG LIMITS LL-PL-PI
	☒	17	2-2-2-2 N=4	NP
	☒	11	7-19-18-21 N=37	
	☒	17	8-14-19-21 N=33	
	☒	10	35-50/5"	
	☒	10	33-50/5"	
	☒	4	50/5"	
	☒	10	22-25-50/5"	
	☒	2	50/2"	

DEPTH (Ft.): 5, 10, 15

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 inch ID Hollow Stem Augers and 2 inch OD Split Barrel Sampler

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from USGS topographic site maps.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
15 Marway Cir, Ste 2B
Rochester, NY

Boring Started: 08-05-2021	Boring Completed: 08-05-2021
Drill Rig: CME-550	Driller: M. Powell
Project No.: J5215096	

BORING LOG NO. FC-12

PROJECT: SunEast Solar PV NY Sites

CLIENT: SunEast Development, LLC
Old Lyme, CT

SITE: Flat Creek
Town of Root, NY

LOCATION See Exploration Plan

Latitude: 42.8475° Longitude: -74.5203°

Approximate Surface Elev.: 702 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)
1	0.6	**TOPSOIL**	701.5+/-
2	2.0	**SANDY SILT (ML)**, trace gravel, dark brown, medium stiff	700+/-
	4.0	**GRAVELLY SILT (ML)**, dark gray, hard	698+/-
	8.0	**SANDY SILT WITH GRAVEL (ML)**, brown, stiff to hard	694+/-
	20.0	**LEAN CLAY (CL)**, gray, very stiff to soft	682+/-
		Boring Terminated at 20 Feet	

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
0-2		☒	13	2-2-3-3 N=5		
2-3.5		☒	8	17-17-50/5"	19.6	NP
4-6		☒	15	4-6-8-12 N=14		
6-8		☒	15	37-23-18-21 N=41		
8-10		☒	18	6-8-9-10 N=17		
10-12		☒	18	8-7-4-4 N=11		
13-15		☒	18	3-2-3-2 N=5		
18-20	▽	☒		2-2-1-8 N=3		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 inch ID Hollow Stem Augers and 2 inch OD Split Barrel Sampler

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from USGS topographic site maps.

Notes:

WATER LEVEL OBSERVATIONS

▽ *18' While drilling*

Dry at completion

Terracon
15 Marway Cir, Ste 2B
Rochester, NY

Boring Started: 08-05-2021	Boring Completed: 08-05-2021
Drill Rig: CME-550	Driller: M. Powell
Project No.: J5215096	

BORING LOG NO. FC-13

Page 1 of 1

PROJECT: SunEast Solar PV NY Sites

CLIENT: SunEast Development, LLC
Old Lyme, CT

SITE: **Flat Creek**
Town of Root, NY

LOCATION See Exploration Plan

Latitude: 42.8531° Longitude: -74.5211°

Approximate Surface Elev.: 717 (Ft.) +/-

MODEL LAYER	DEPTH		ELEVATION (Ft.)
1	0.5	**TOPSOIL**	716.5+/-
		SILTY CLAY (CL-ML), brown, medium stiff to stiff	
2	6.0	**SANDY SILT (ML)**, trace gravel, brown, very stiff	711+/-
	8.0	**SANDY SILT (ML)**, trace gravel, brown, hard Cored boulder from 10.2' to 13.0'	709+/-
3	13.0	**SANDY SILT WITH GRAVEL (ML)**, gray, hard	704+/-
	18.4	***Boring Terminated at 18.4 Feet***	698.5+/-

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	RECOVERY (In.)	FIELD TEST RESULTS
0.5–2.5		12	2-3-3-3 N=6
2.5–4.5		24	3-4-7-7 N=11
4.5–6.5	▽ (6)	10	5-5-7-8 N=12
6.5–8.5		24	10-10-11-14 N=21
8.5			50/5"
10			50/2"
18	▽ (18)	4	50/5"
13.0–15.0		16	18-21-22-20 N=43

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 inch ID Hollow Stem Augers and 2 inch OD Split Barrel Sampler

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from USGS topographic site maps.

Notes:

WATER LEVEL OBSERVATIONS

▽ *18' While drilling*

▽ *6' At completion*

Terracon
15 Marway Cir, Ste 2B
Rochester, NY

Boring Started: 08-05-2021	Boring Completed: 08-05-2021
Drill Rig: CME-550	Driller: M. Powell
Project No.: J5215096	

BORING LOG NO. FC-14

Page 1 of 1

PROJECT: SunEast Solar PV NY Sites

CLIENT: SunEast Development, LLC
Old Lyme, CT

SITE: Flat Creek
Town of Root, NY

LOCATION See Exploration Plan

Latitude: 42.8533° Longitude: -74.5160°

Approximate Surface Elev.: 719 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH		ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.7	**TOPSOIL**	718.5+/-			☒	18	2-3-3-4 N=6		
		4.0	**SILTY CLAY (CL-ML)**, brown, medium stiff to stiff	715+/-			☒	24	5-6-7-8 N=13	42.7	63-35-28
		6.0	**LEAN CLAY (CL)**, brown, very stiff	713+/-	5		☒	22	5-8-9-13 N=17		
			SILTY CLAY (CL), brown, hard to stiff				☒	24	20-19-21-12 N=40		
2							☒	18	8-12-11-10 N=23		
			Becomes dark gray		10		☒	22	10-9-7-8 N=16		
					15		☒	16	3-4-5-6 N=9		
		18.0		701+/-							
3		20.0	**SANDY SILT WITH GRAVEL (ML)**, dark gray, hard, contains rock fragments	699+/-	20		☒	14	10-25-25-25 N=50		
			Boring Terminated at 20 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 inch ID Hollow Stem Augers and 2 inch OD Split Barrel Sampler

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from USGS topographic site maps.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
15 Marway Cir, Ste 2B
Rochester, NY

Boring Started: 08-06-2021	Boring Completed: 08-06-2021
Drill Rig: CME-550	Driller: M. Powell
Project No.: J5215096	

BORING LOG NO. FC-15

Page 1 of 1

PROJECT: SunEast Solar PV NY Sites

CLIENT: SunEast Development, LLC
Old Lyme, CT

SITE: Flat Creek
Town of Root, NY

LOCATION See Exploration Plan

Latitude: 42.8570° Longitude: -74.5200°

Approximate Surface Elev.: 738 (Ft.) +/-

MODEL LAYER	DEPTH		ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS
1	0.7	**TOPSOIL**	737.5+/-					
2		**SILTY CLAY (CL-ML)**, brown, medium stiff to very stiff				☒	10	2-3-3-4 N=6
						☒	18	5-7-10-13 N=17
	4.0		734+/-					
3		**SILTY CLAY (CL-ML)**, brown, hard		5		☒	16	5-10-33-16 N=43
		Contains cobble and boulders				☒	11	22-40-47-35 N=87
					▽	☒	15	30-25-32-34 N=57
	10.0		728+/-	10				
		POORLY GRADED SAND WITH GRAVEL (SP), trace silt, gray, dense to very dense				☒	15	8-12-23-12 N=35
				15		☒	10	10-25-10-7 N=35
	18.4	Contains rock fragments	719.5+/-		▽	☒	3	50/5"
		Boring Terminated at 18.4 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 inch ID Hollow Stem Augers and 2 inch OD Split Barrel Sampler

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from USGS topographic site maps.

Notes:

WATER LEVEL OBSERVATIONS

▽ *18' While drilling*

▽ *8' At completion*

Terracon
15 Marway Cir, Ste 2B
Rochester, NY

Boring Started: 08-06-2021	Boring Completed: 08-06-2021
Drill Rig: CME-550	Driller: M. Powell
Project No.: J5215096	

BORING LOG NO. FC-16

PROJECT: SunEast Solar PV NY Sites

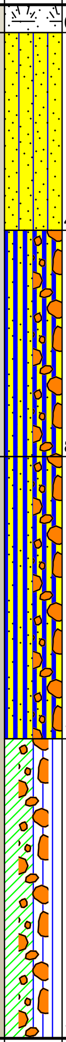
CLIENT: SunEast Development, LLC
Old Lyme, CT

SITE: Flat Creek
Town of Root, NY

LOCATION See Exploration Plan

Latitude: 42.8606° Longitude: -74.5124°

Approximate Surface Elev.: 770 (Ft.) +/-



MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1	0.5	**TOPSOIL**	769.5+/-							
		SILTY SAND (SM), dark brown, loose to medium dense				X	17	1-2-2-3 N=4		
	4.0		766+/-			X	17	5-12-7-11 N=19	37.6	NP
2		**SANDY SILT WITH GRAVEL (ML)**, dark brown, very stiff to hard		5		X	18	3-7-9-14 N=16		
	8.0		762+/-			X	23	12-22-17-14 N=39		
		SANDY SILT WITH GRAVEL (ML), gray, hard, contains cobbles and boulders				X	1	50/1"		
	13.0		757+/-	10		X	24	29-38-28-22 N=66		
3		**SILTY CLAY WITH GRAVEL (CL-ML)**, dark brown, hard, contains cobbles and boulders				X	16	14-19-50/5"		
	18.3		751.5+/-	15		X	4	50/4"		
		Boring Terminated at 18.3 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 inch ID Hollow Stem Augers and 2 inch OD Split Barrel Sampler

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from USGS topographic site maps.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
15 Marway Cir, Ste 2B
Rochester, NY

Boring Started: 08-06-2021	Boring Completed: 08-06-2021
Drill Rig: CME-550	Driller: M. Powell
Project No.: J5215096	

FIELD SOIL RESISTIVITY TEST LOCATIONS

Flat Creek Solar Site ■ Town of Root, NY

Terracon Project No. J5215096

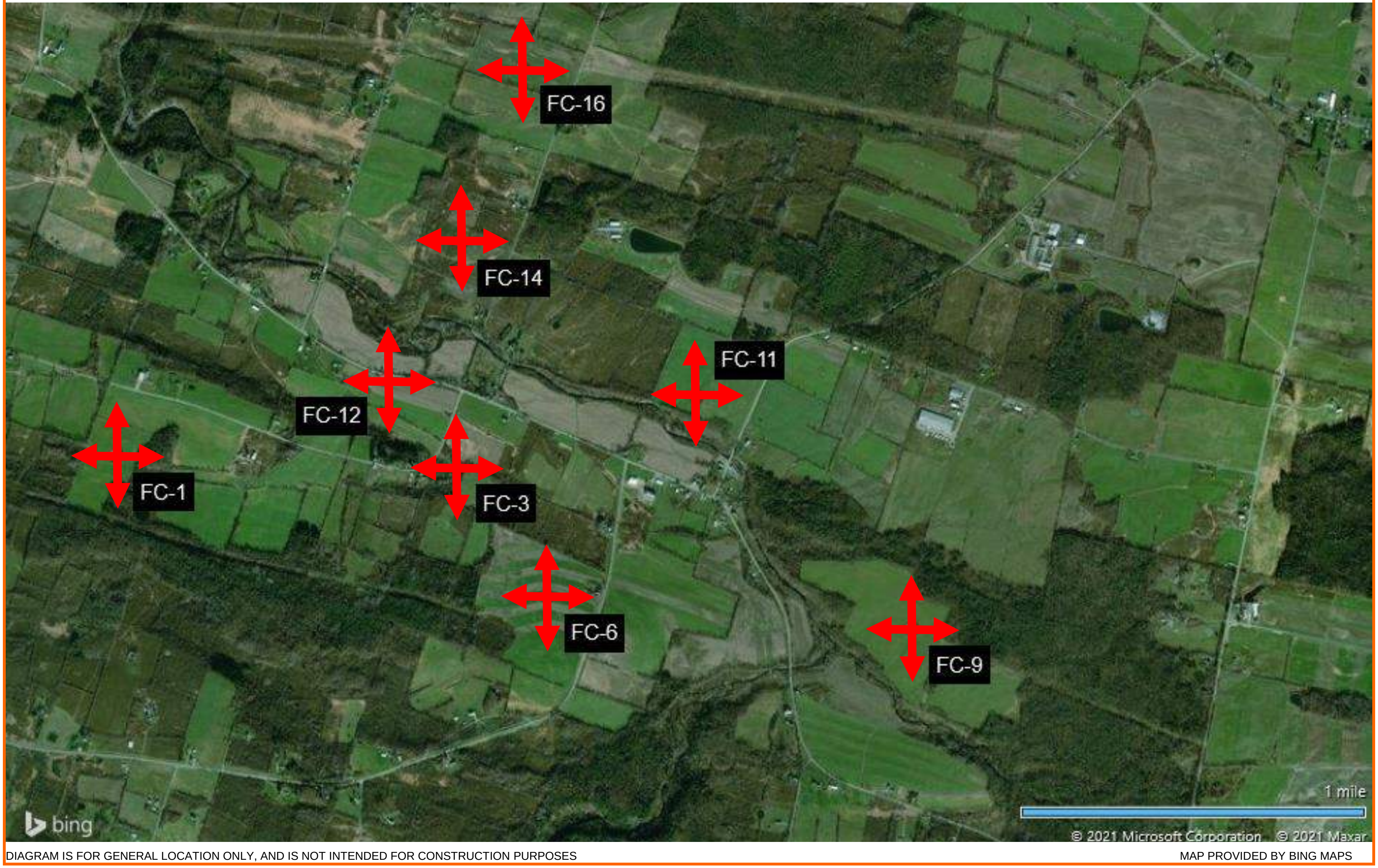


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY BING MAPS

FIELD ELECTRICAL RESISTIVITY TEST DATA (SUNEAST SOLAR - 7 SITES)

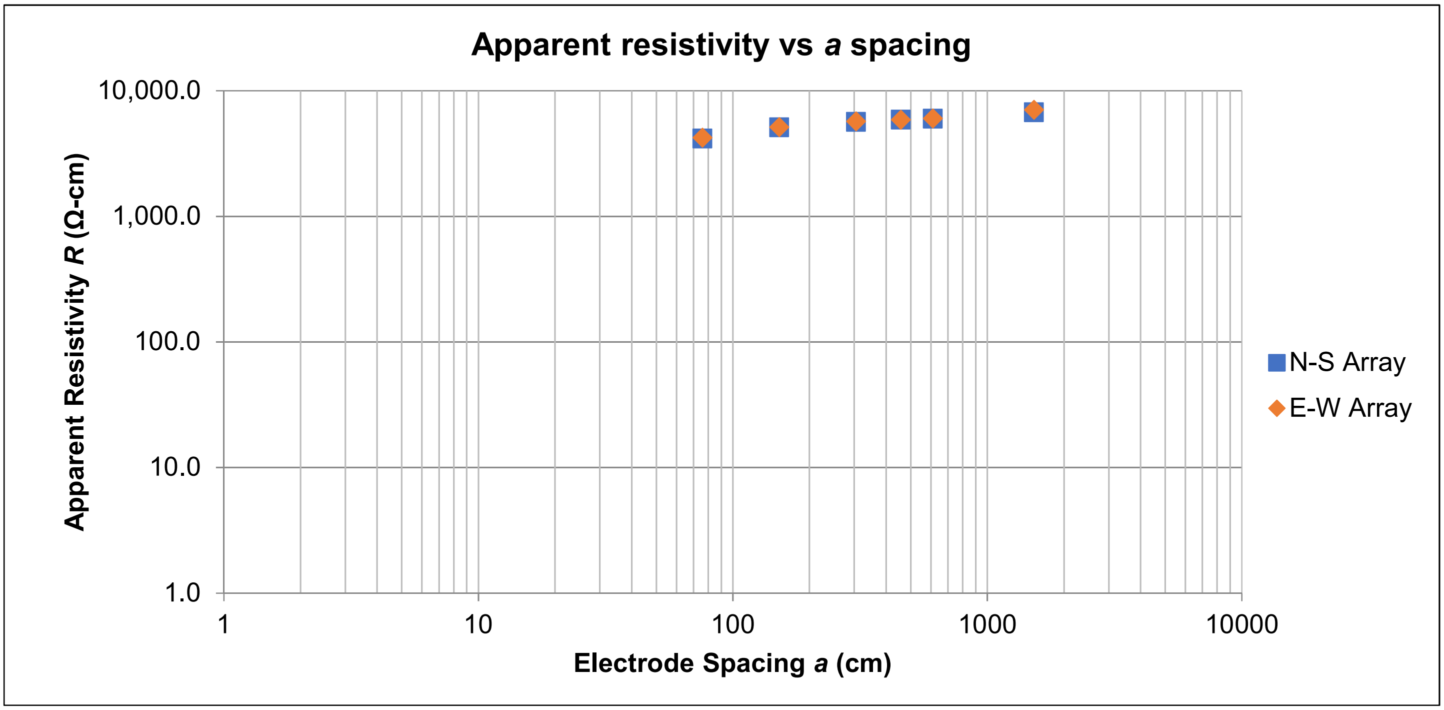
Flat Creek Solar ■ Root, NY

Terracon Project No. J5215096

Array Loc.	FC-1		
Instrument	Mini-Res Resistivity Meter	**Weather**	Partly Cloudy, 64°F
Serial #	SN-306	**Ground Cond.**	Wet, 68°F Ground Temperature
Cal. Check	8/18/2021	**Tested By**	Brandon Luther
Test Date	9/16//2021	**Method**	Wenner 4-pin (ASTM G57-06 (2020); IEEE 81-2012)
Notes & Conflicts	Corn Field, Wet Surface		

Apparent resistivity ρ is calculated as : $\rho = \dfrac{4\pi aR}{1 + \dfrac{2a}{\sqrt{a^2+4b^2}} - \dfrac{a}{\sqrt{a^2+b^2}}}$

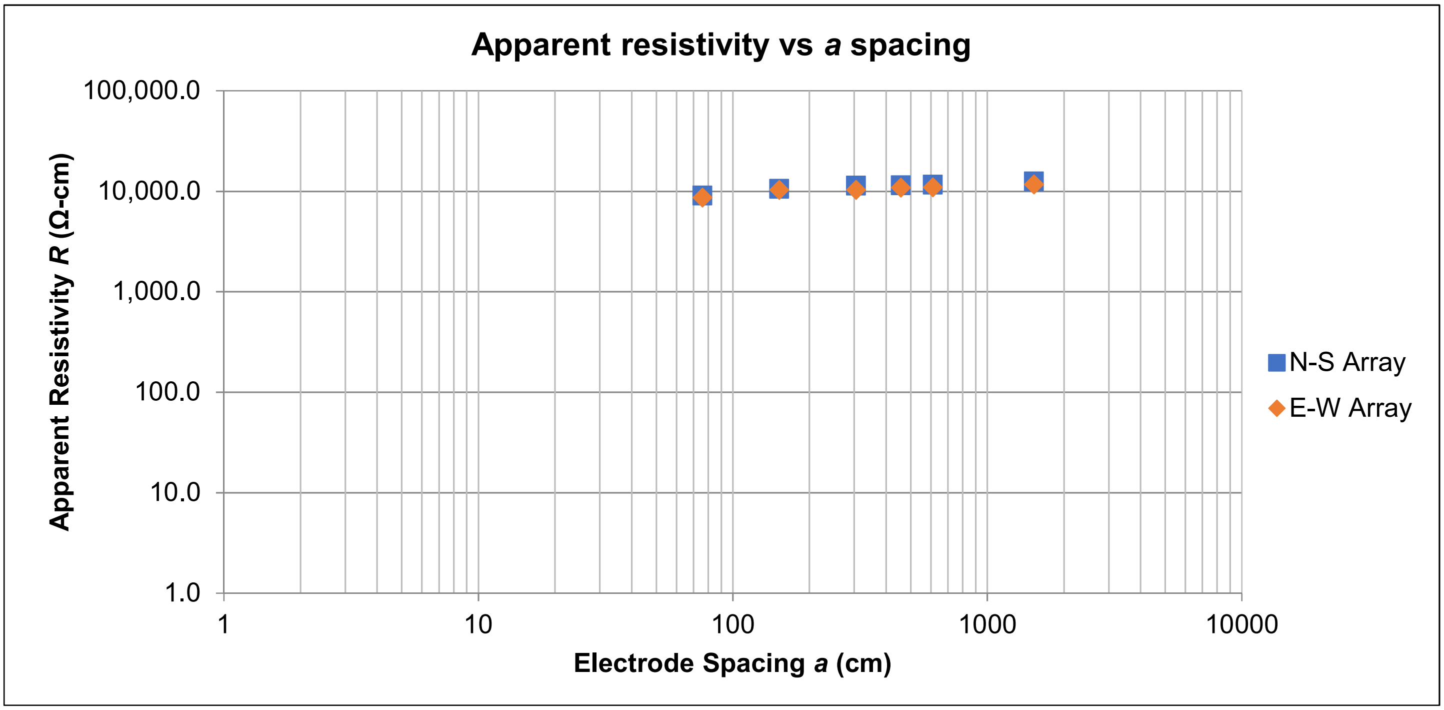
Electrode Spacing *a*		**Electrode Depth *b***		**N-S Test**		**E-W Test**	
(feet)	(centimeters)	(inches)	(centimeters)	Measured Resistance *R* Ω	Apparent Resistivity ρ (Ω-cm)	Measured Resistance *R* Ω	Apparent Resistivity ρ (Ω-cm)
2.5	76	6	15	8.24	4190	8.36	4250
5	152	6	15	5.30	5140	5.31	5160
10	305	12	30	2.91	5680	2.93	5710
15	457	12	30	2.06	5940	2.04	5900
20	610	12	30	1.57	6040	1.57	6050
50	1524	12	30	0.71	6790	0.74	7070



Array Loc.	FC-3		
Instrument	Mini-Res Resistivity Meter	**Weather**	Partly Cloudy, 65°F
Serial #	SN-306	**Ground Cond.**	Moist, 68°F Ground Temperature
Cal. Check	8/18/2021	**Tested By**	Brandon Luther
Test Date	9/16//2021	**Method**	Wenner 4-pin (ASTM G57-06 (2020); IEEE 81-2012)
Notes & Conflicts	Crop Field, Moist Surface, Clay/sand		

Apparent resistivity ρ is calculated as : $\rho = \dfrac{4\pi aR}{1 + \dfrac{2a}{\sqrt{a^2+4b^2}} - \dfrac{a}{\sqrt{a^2+b^2}}}$

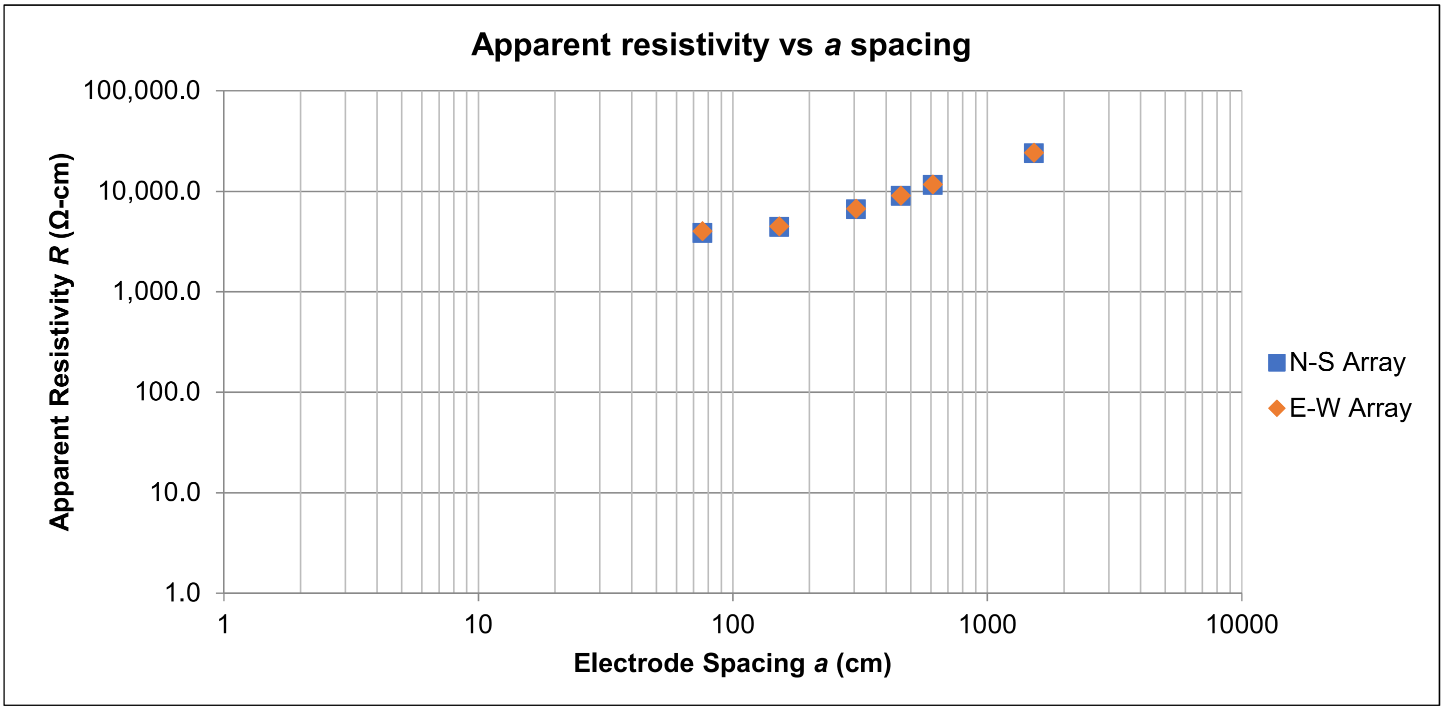
Electrode Spacing *a*		**Electrode Depth *b***		**N-S Test**		**E-W Test**	
(feet)	(centimeters)	(inches)	(centimeters)	Measured Resistance *R* Ω	Apparent Resistivity *ρ* (Ω-cm)	Measured Resistance *R* Ω	Apparent Resistivity *ρ* (Ω-cm)
2.5	76	6	15	17.95	9120	17.06	8670
5	152	6	15	10.94	10620	10.63	10320
10	305	12	30	5.90	11500	5.30	10330
15	457	12	30	3.99	11550	3.77	10900
20	610	12	30	3.05	11730	2.85	10970
50	1524	12	30	1.31	12590	1.22	11690



Array Loc.	FC-6		
Instrument	Mini-Res Resistivity Meter	**Weather**	Partly Cloudy, 69°F
Serial #	SN-306	**Ground Cond.**	Moist, 69°F Ground Temperature
Cal. Check	8/18/2021	**Tested By**	Brandon Luther
Test Date	9/16//2021	**Method**	Wenner 4-pin (ASTM G57-06 (2020); IEEE 81-2012)
Notes & Conflicts	Crop Field, Moist Surface		

Apparent resistivity ρ is calculated as :
$$\rho = \frac{4\pi aR}{1+\frac{2a}{\sqrt{a^2+4b^2}}-\frac{a}{\sqrt{a^2+b^2}}}$$

Electrode Spacing *a*		**Electrode Depth *b***		**N-S Test**		**E-W Test**	
(feet)	(centimeters)	(inches)	(centimeters)	Measured Resistance *R* Ω	Apparent Resistivity *ρ* (Ω-cm)	Measured Resistance *R* Ω	Apparent Resistivity *ρ* (Ω-cm)
2.5	76	6	15	7.64	3880	7.89	4010
5	152	6	15	4.58	4450	4.62	4490
10	305	12	30	3.42	6660	3.44	6700
15	457	12	30	3.14	9090	3.13	9060
20	610	12	30	3.03	11670	3.05	11720
50	1524	12	30	2.52	24140	2.52	24190



FIELD ELECTRICAL RESISTIVITY TEST DATA (SUNEAST SOLAR - 7 SITES)

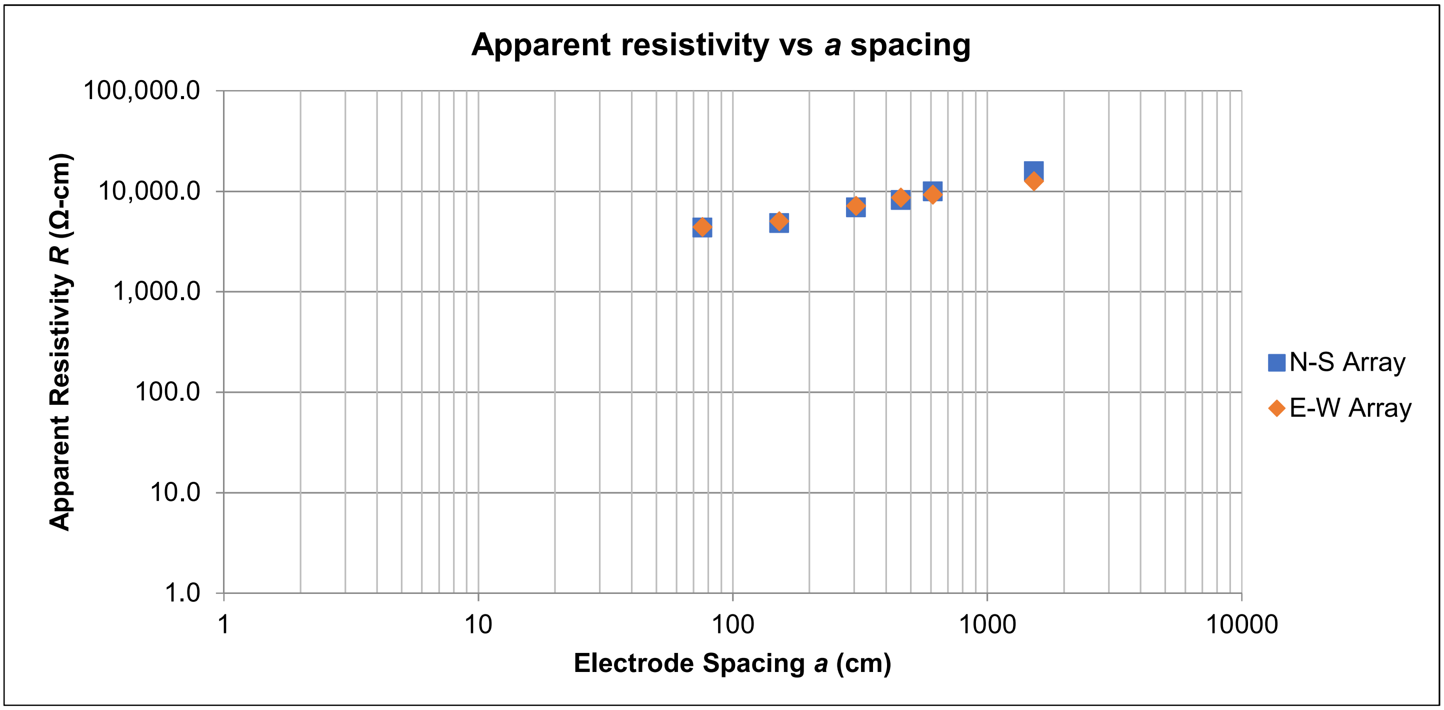
Flat Creek Solar ■ Root, NY

Terracon Project No. J5215096

Array Loc.	FC-9		
Instrument	Mini-Res Resistivity Meter	**Weather**	Partly Cloudy, 70°F
Serial #	SN-306	**Ground Cond.**	Moist, 67°F Ground Temperature
Cal. Check	8/18/2021	**Tested By**	Brandon Luther
Test Date	9/16//2021	**Method**	Wenner 4-pin (ASTM G57-06 (2020); IEEE 81-2012)
Notes & Conflicts	Crop Field, Moist Surface		

Apparent resistivity ρ is calculated as : $$\rho = \frac{4\pi a R}{1 + \frac{2a}{\sqrt{a^2 + 4b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$

Electrode Spacing *a*		**Electrode Depth *b***		**N-S Test**		**E-W Test**	
(feet)	(centimeters)	(inches)	(centimeters)	Measured Resistance *R* Ω	Apparent Resistivity *ρ* (Ω-cm)	Measured Resistance *R* Ω	Apparent Resistivity *ρ* (Ω-cm)
2.5	76	6	15	8.65	4390	8.72	4430
5	152	6	15	5.01	4870	5.18	5030
10	305	12	30	3.58	6980	3.68	7180
15	457	12	30	2.86	8260	2.99	8650
20	610	12	30	2.62	10080	2.41	9290
50	1524	12	30	1.67	16010	1.31	12590



FIELD ELECTRICAL RESISTIVITY TEST DATA (SUNEAST SOLAR - 7 SITES)

Flat Creek Solar ■ Root, NY
Terracon Project No. J5215096

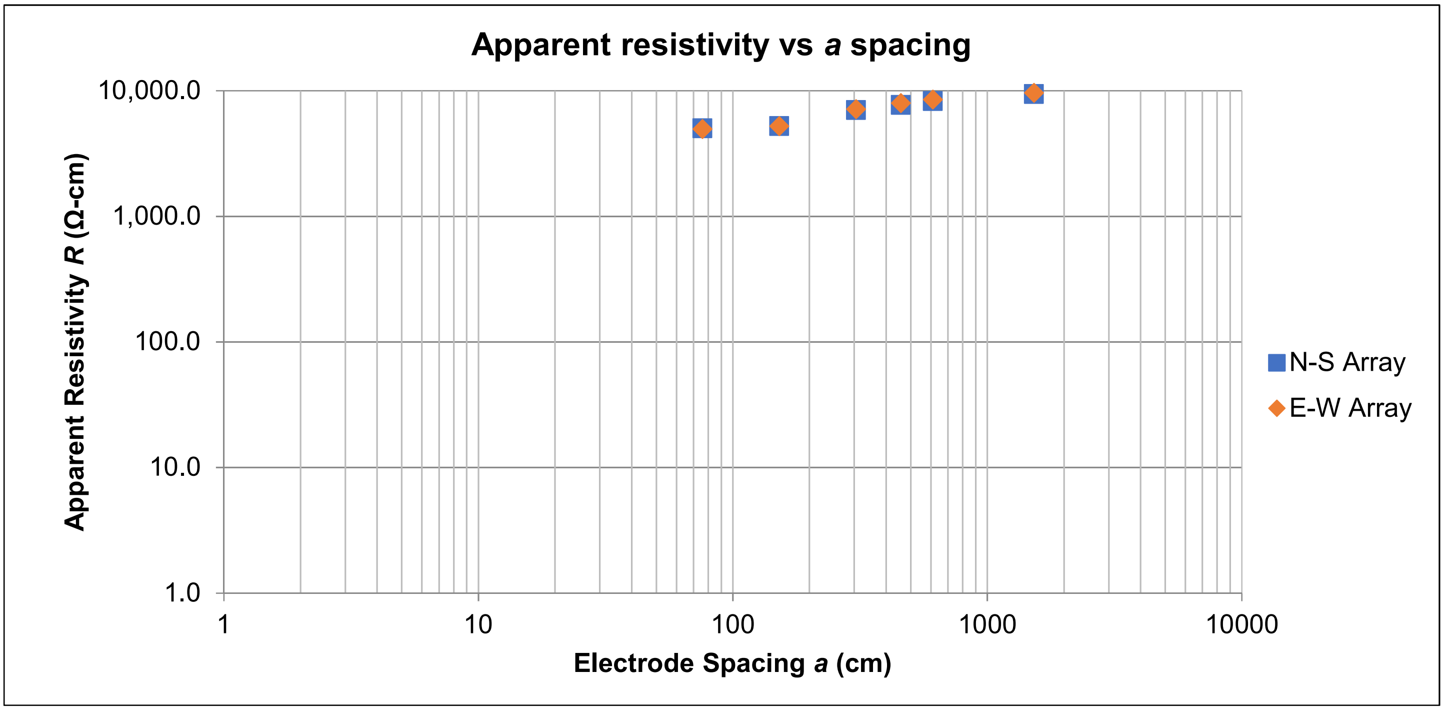
Terracon GeoReport

Array Loc.	FC-11		
Instrument	Mini-Res Resistivity Meter	**Weather**	Partly Cloudy, 69°F
Serial #	SN-306	**Ground Cond.**	Moist, 70°F Ground Temperature
Cal. Check	8/18/2021	**Tested By**	Brandon Luther
Test Date	9/16//2021	**Method**	Wenner 4-pin (ASTM G57-06 (2020); IEEE 81-2012)
Notes & Conflicts	Crop Field, Moist Surface		

Apparent resistivity ρ is calculated as :

$$\rho = \frac{4\pi a R}{1 + \frac{2a}{\sqrt{a^2 + 4b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$

Electrode Spacing *a*		**Electrode Depth *b***		**N-S Test**		**E-W Test**	
(feet)	(centimeters)	(inches)	(centimeters)	Measured Resistance *R* Ω	Apparent Resistivity *ρ* (Ω-cm)	Measured Resistance *R* Ω	Apparent Resistivity *ρ* (Ω-cm)
2.5	76	6	15	9.94	5050	9.79	4980
5	152	6	15	5.44	5280	5.38	5230
10	305	12	30	3.64	7090	3.67	7150
15	457	12	30	2.68	7760	2.76	7980
20	610	12	30	2.16	8320	2.22	8550
50	1524	12	30	0.99	9470	1.01	9660



FIELD ELECTRICAL RESISTIVITY TEST DATA (SUNEAST SOLAR - 7 SITES)

Flat Creek Solar ■ Root, NY

Terracon Project No. J5215096

Array Loc. FC-12

Instrument Mini-Res Resistivity Meter

Weather Partly Cloudy, 70°F

Serial # SN-306

Ground Cond. Moist, 71°F Ground Temperature

Cal. Check 8/18/2021

Tested By Brandon Luther

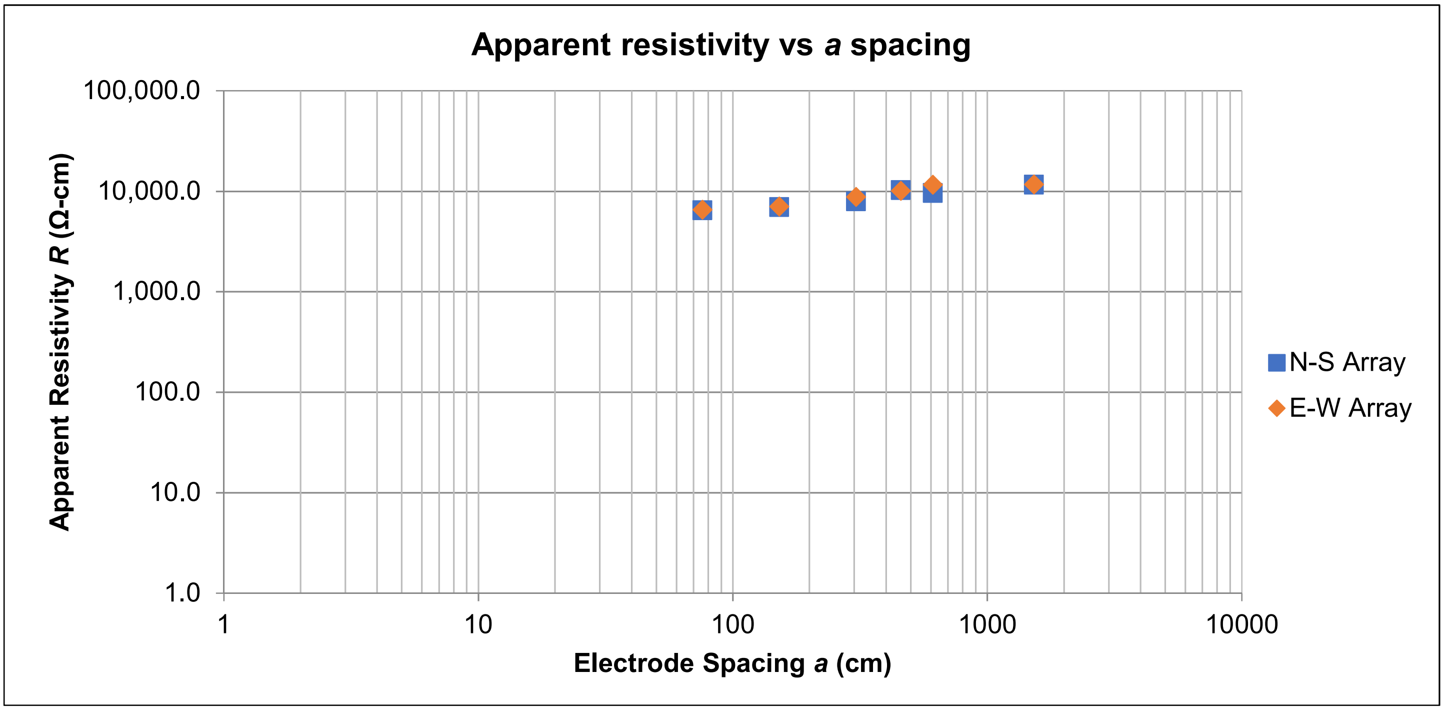
Test Date 9/16//2021

Method Wenner 4-pin (ASTM G57-06 (2020); IEEE 81-2012)

Notes & Conflicts Crop Field, Moist Surface

Apparent resistivity ρ is calculated as : $\rho = \dfrac{4\pi aR}{1 + \dfrac{2a}{\sqrt{a^2+4b^2}} - \dfrac{a}{\sqrt{a^2+b^2}}}$

Electrode Spacing *a*		**Electrode Depth *b***		**N-S Test**		**E-W Test**	
(feet)	(centimeters)	(inches)	(centimeters)	Measured Resistance *R* Ω	Apparent Resistivity ρ (Ω-cm)	Measured Resistance *R* Ω	Apparent Resistivity ρ (Ω-cm)
2.5	76	6	15	12.80	6510	12.90	6560
5	152	6	15	7.20	6990	7.29	7080
10	305	12	30	4.10	7990	4.53	8830
15	457	12	30	3.57	10330	3.49	10100
20	610	12	30	2.51	9670	3.01	11600
50	1524	12	30	1.22	11690	1.22	11690



FIELD ELECTRICAL RESISTIVITY TEST DATA (SUNEAST SOLAR - 7 SITES)

Flat Creek Solar ■ Root, NY

Terracon Project No. J5215096

Array Loc. FC-14

Instrument Mini-Res Resistivity Meter

Serial # SN-306

Cal. Check 8/18/2021

Test Date 9/16//2021

Weather Partly Cloudy, 69°F

Ground Cond. Saturated, 70°F Ground Temperature

Tested By Brandon Luther

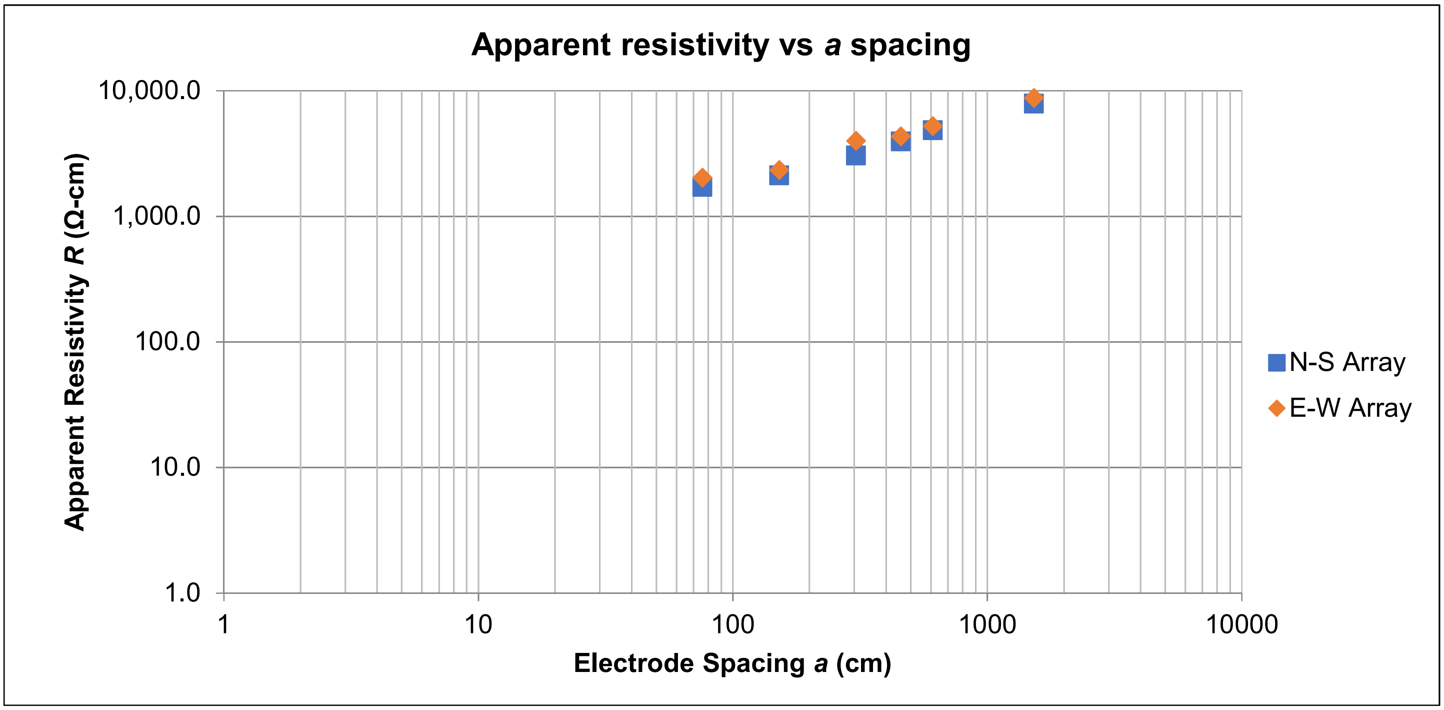
Method Wenner 4-pin (ASTM G57-06 (2020); IEEE 81-2012)

Notes & Conflicts Goldenrod Field, Wet Surface

Apparent resistivity ρ is calculated as :

$$\rho = \frac{4\pi a R}{1+\frac{2a}{\sqrt{a^2+4b^2}}-\frac{a}{\sqrt{a^2+b^2}}}$$

Electrode Spacing *a*		Electrode Depth *b*		N-S Test		E-W Test	
(feet)	(centimeters)	(inches)	(centimeters)	Measured Resistance *R*	Apparent Resistivity *ρ*	Measured Resistance *R*	Apparent Resistivity *ρ*
				Ω	(Ω-cm)	Ω	(Ω-cm)
2.5	76	6	15	3.41	1730	4.01	2040
5	152	6	15	2.20	2140	2.41	2340
10	305	12	30	1.58	3070	2.06	4010
15	457	12	30	1.37	3970	1.50	4340
20	610	12	30	1.26	4870	1.36	5230
50	1524	12	30	0.83	7960	0.92	8800



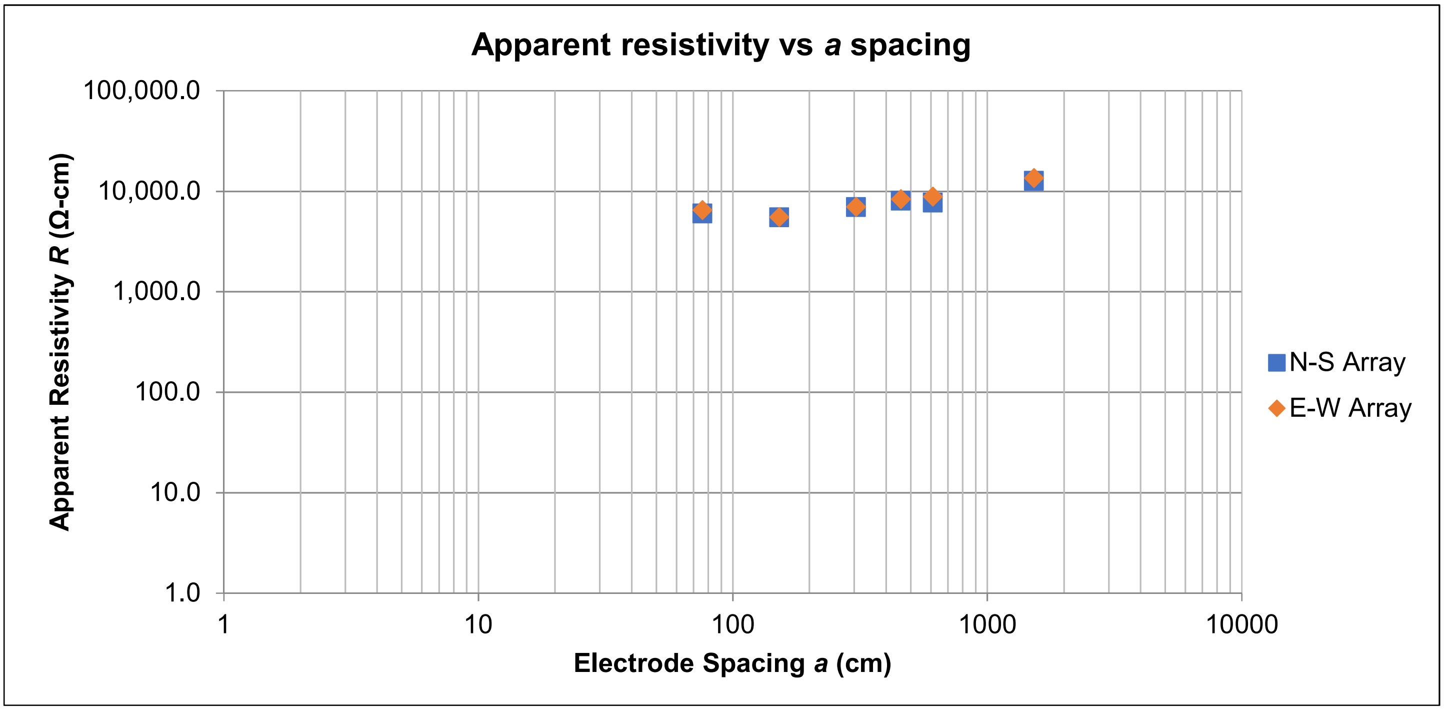
FIELD ELECTRICAL RESISTIVITY TEST DATA (SUNEAST SOLAR - 7 SITES)

Flat Creek Solar ■ Root, NY
Terracon Project No. J5215096

Array Loc.	FC-16		
Instrument	Mini-Res Resistivity Meter	**Weather**	Partly Cloudy, 72°F
Serial #	SN-306	**Ground Cond.**	Moist, 67°F Ground Temperature
Cal. Check	8/18/2021	**Tested By**	Brandon Luther
Test Date	9/16//2021	**Method**	Wenner 4-pin (ASTM G57-06 (2020); IEEE 81-2012)
Notes & Conflicts	Cut Crop Field, Moist Surface		

Apparent resistivity ρ is calculated as :
$$\rho = \frac{4\pi a R}{1 + \frac{2a}{\sqrt{a^2 + 4b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$

Electrode Spacing *a*		**Electrode Depth *b***		**N-S Test**		**E-W Test**	
(feet)	(centimeters)	(inches)	(centimeters)	Measured Resistance *R* Ω	Apparent Resistivity *ρ* (Ω-cm)	Measured Resistance *R* Ω	Apparent Resistivity *ρ* (Ω-cm)
2.5	76	6	15	11.90	6050	12.80	6510
5	152	6	15	5.70	5540	5.70	5540
10	305	12	30	3.60	7010	3.60	7010
15	457	12	30	2.80	8100	2.90	8390
20	610	12	30	2.01	7750	2.31	8900
50	1524	12	30	1.34	12850	1.41	13540



LABORATORY TESTING

Contents:

Note: All attachments are one page unless noted above.

LABORATORY TEST PROCEDURES

Geotechnical Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- Moisture Contest Test
- Atterberg Limit Test
- Grain Size Distribution Test

Our laboratory testing program also included examination of soil samples by an engineer. Based on observation and test data, the engineer classified the soil samples in accordance with the Unified Soil Classification System (ASTM D2487). Additional laboratory testing was also completed as described below:

Corrosion Test Samples

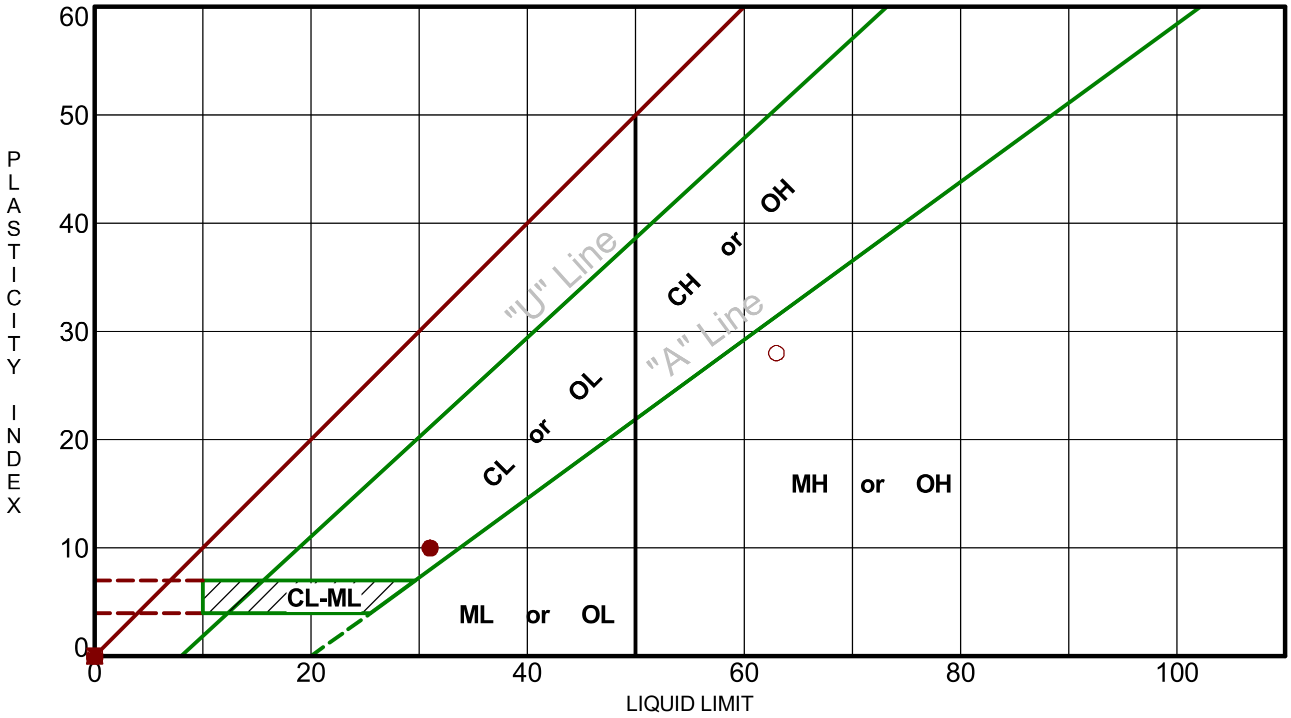
Eight soil samples were collected from a depth of 1 to 4 feet bgs for laboratory corrosion testing. The corrosion testing consisted of water-soluble sulfate ion content (ASTM C1580), water-soluble chloride ion content (ASTM D512), pH (ASTM D4972), Sulfides (ASTM D4658), Oxidation Reduction Potential (ASTM G200), and electrical resistivity using the “soil box” method (ASTM G187). Eight tests were run as part of our study.

Laboratory Thermal Resistivity Testing

Laboratory thermal resistivity testing was performed by Geotherm USA on a soil sample obtained during our field exploration from depths ranging from approximately 1 to 4 feet below the existing ground surface. The thermal resistivity testing was performed in general accordance with the IEEE standard. The dry-out curve was developed from the soil specimen compacted to 90 percent of the standard Proctor criteria (ASTM D698) at the optimum moisture content.

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth	LL	PL	PI	Fines	USCS	Description
●	FC-1	1 - 4	31	21	10			SANDY SILTY CLAY
⊠	FC-3	1 - 4	NP	NP	NP			SANDY SILT
▲	FC-6	1 - 4	NP	NP	NP	69.5	ML	SANDY SILT
★	FC-9	1 - 4	NP	NP	NP	28.7	SM	SILTY SAND with GRAVEL
⦿	FC-11	1 - 4	NP	NP	NP			SANDY SILT
✿	FC-12	1 - 4	NP	NP	NP	67.1	ML	GRAVELLY SILT
○	FC-14	1 - 4	63	35	28			SILTY CLAY
△	FC-16	1 - 4	NP	NP	NP	49.7	SM	SILTY SAND

PROJECT: SunEast Solar PV NY Sites

SITE: Flat Creek
Town of Root, NY

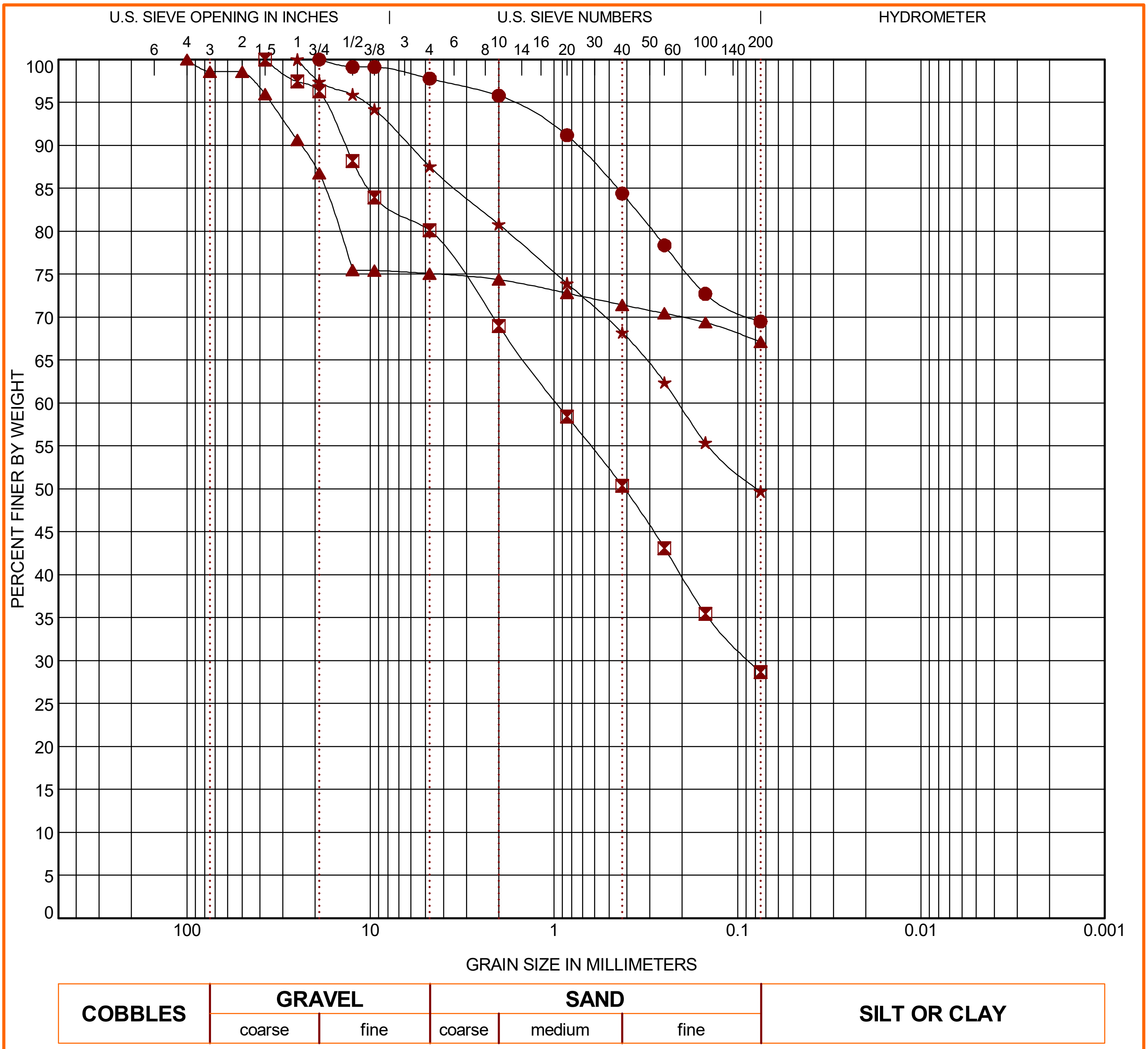
Terracon
15 Marway Cir, Ste 2B
Rochester, NY

PROJECT NUMBER: J5215096

CLIENT: SunEast Development, LLC
Malvern, PA

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



Boring ID		Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	FC-6	1 - 4	SANDY SILT (ML)	33.5	NP	NP	NP		
☒	FC-9	1 - 4	SILTY SAND with GRAVEL (SM)	15.1	NP	NP	NP		
▲	FC-12	1 - 4	GRAVELLY SILT (ML)	19.6	NP	NP	NP		
★	FC-16	1 - 4	SILTY SAND (SM)	37.6	NP	NP	NP		

Boring ID		Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	FC-6	1 - 4	19				0.0	2.2	28.3		69.5	
☒	FC-9	1 - 4	37.5	0.964	0.086		0.0	19.9	51.4		28.7	
▲	FC-12	1 - 4	100				1.4	23.5	8.0		67.1	
★	FC-16	1 - 4	25	0.21			0.0	12.4	37.8		49.7	

PROJECT: SunEast Solar PV NY Sites

SITE: Flat Creek
Town of Root, NY

Terracon
15 Marway Cir, Ste 2B
Rochester, NY

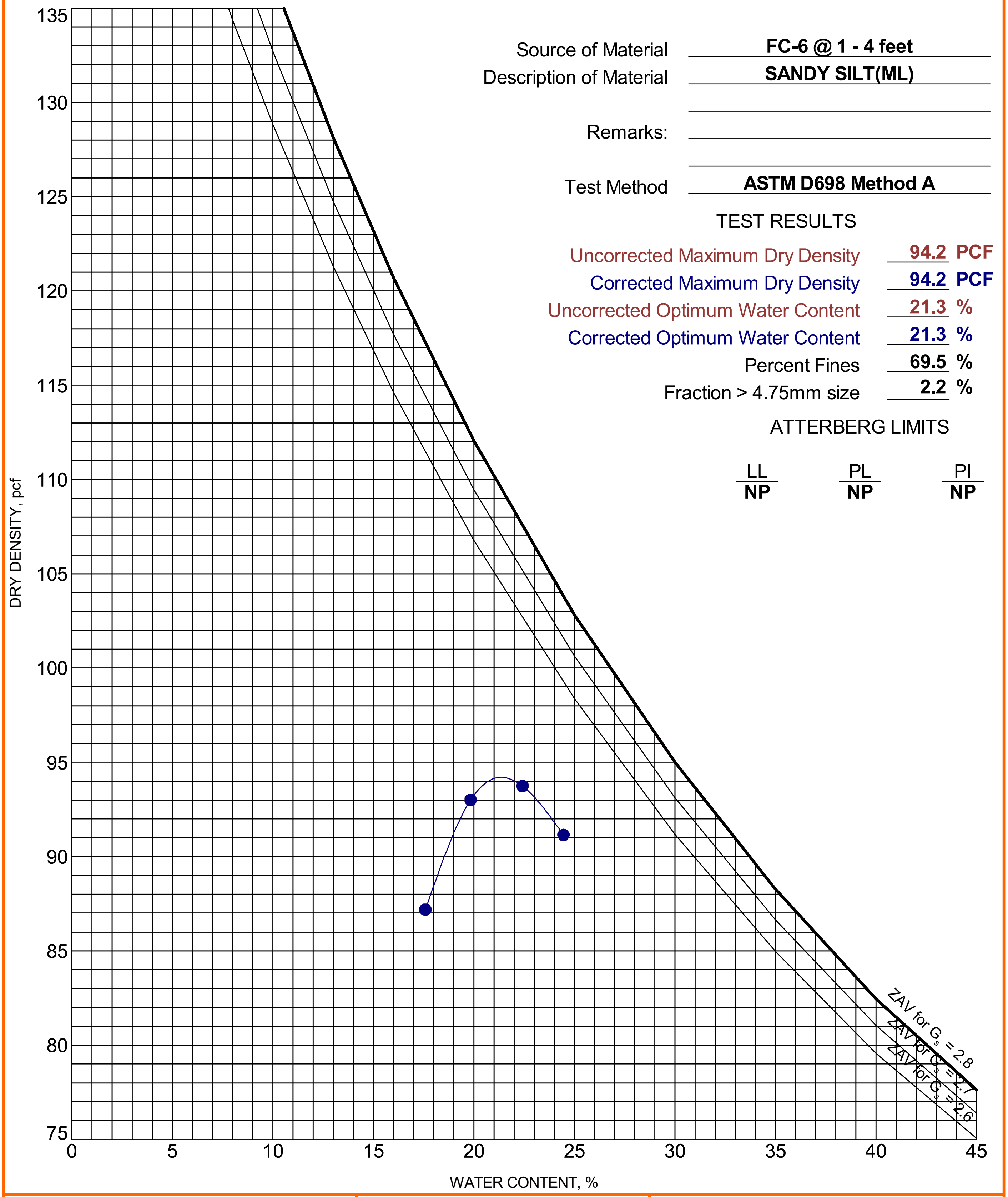
PROJECT NUMBER: J5215096

CLIENT: SunEast Development, LLC
Malvern, PA

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 J5215096 SUNEAST SOLAR PV .GPJ TERRACON_DATATEMPLATE.GDT 10/14/21

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material **FC-6 @ 1 - 4 feet**

Description of Material **SANDY SILT(ML)**

Remarks:

Test Method **ASTM D698 Method A**

TEST RESULTS

Uncorrected Maximum Dry Density	**94.2**	**PCF**
Corrected Maximum Dry Density	**94.2**	**PCF**
Uncorrected Optimum Water Content	**21.3**	**%**
Corrected Optimum Water Content	**21.3**	**%**
Percent Fines	**69.5**	**%**
Fraction > 4.75mm size	**2.2**	**%**

ATTERBERG LIMITS

LL	PL	PI
NP	**NP**	**NP**

PROJECT: SunEast Solar PV NY Sites

SITE: Flat Creek
Town of Root, NY

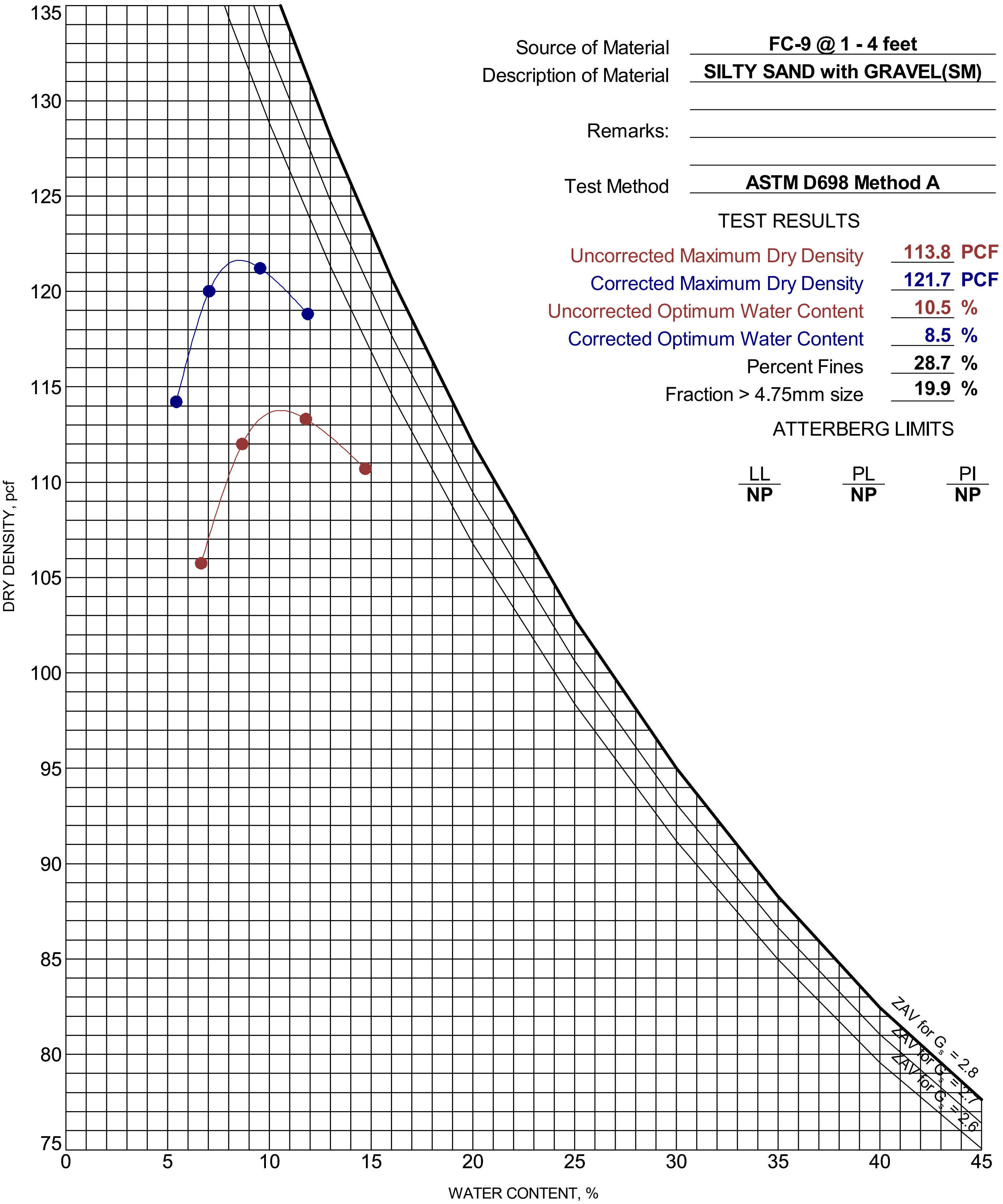
Terracon
15 Marway Cir, Ste 2B
Rochester, NY

PROJECT NUMBER: J5215096

CLIENT: SunEast Development, LLC
Malvern, PA

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material **FC-9 @ 1 - 4 feet**

Description of Material **SILTY SAND with GRAVEL(SM)**

Remarks:

Test Method **ASTM D698 Method A**

TEST RESULTS

Uncorrected Maximum Dry Density	**113.8**	**PCF**
Corrected Maximum Dry Density	**121.7**	**PCF**
Uncorrected Optimum Water Content	**10.5**	**%**
Corrected Optimum Water Content	**8.5**	**%**
Percent Fines	**28.7**	**%**
Fraction > 4.75mm size	**19.9**	**%**

ATTERBERG LIMITS

LL	PL	PI
NP	**NP**	**NP**

PROJECT: SunEast Solar PV NY Sites

SITE: Flat Creek
Town of Root, NY

15 Marway Cir, Ste 2B
Rochester, NY

PROJECT NUMBER: J5215096

CLIENT: SunEast Development, LLC
Malvern, PA

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557

Source of Material: **FC-12 @ 1 - 4 feet**

Description of Material: **GRAVELLY SILT(ML)**

Remarks:

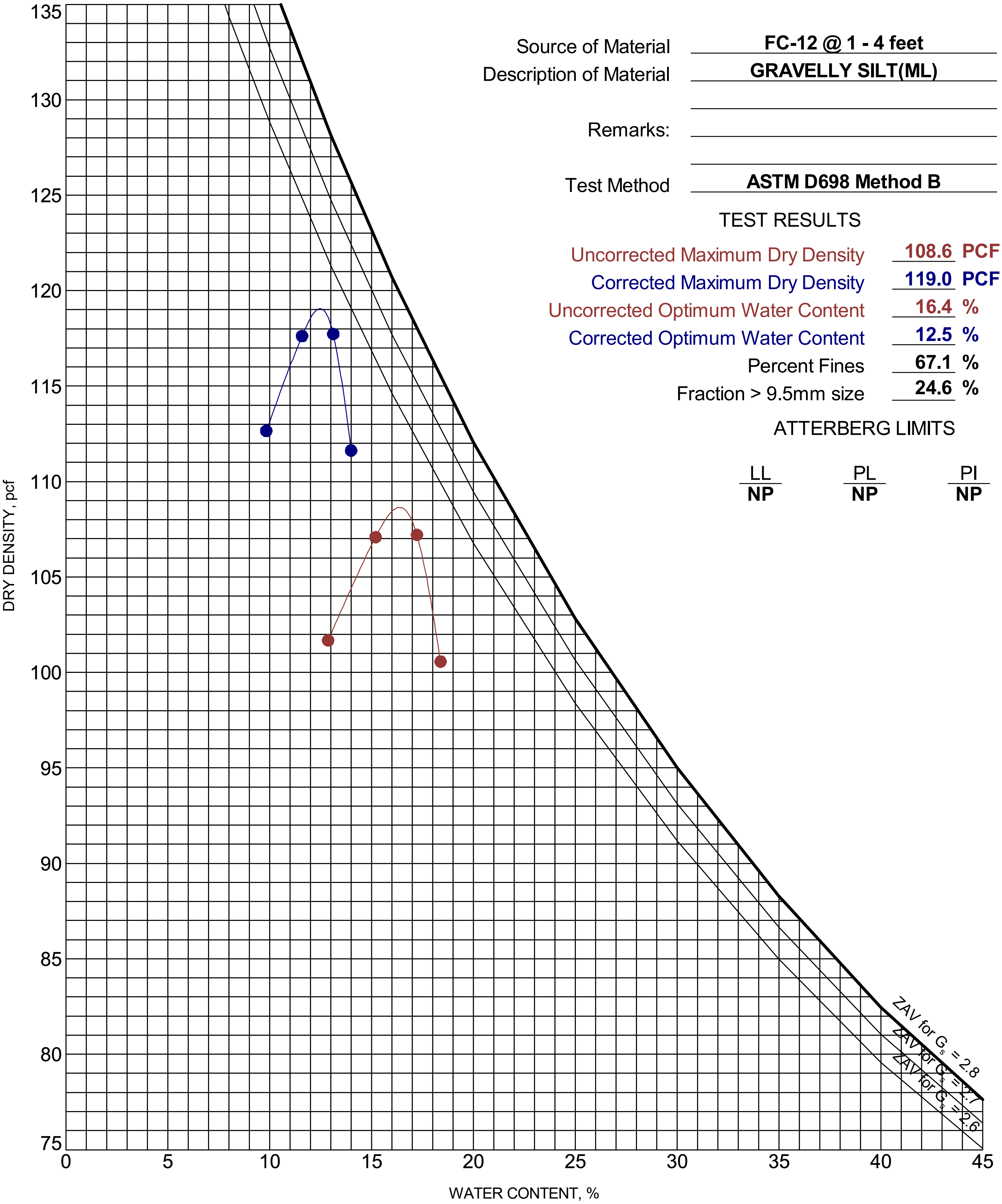
Test Method: **ASTM D698 Method B**

TEST RESULTS

Uncorrected Maximum Dry Density	**108.6**	**PCF**
Corrected Maximum Dry Density	**119.0**	**PCF**
Uncorrected Optimum Water Content	**16.4**	**%**
Corrected Optimum Water Content	**12.5**	**%**
Percent Fines	**67.1**	**%**
Fraction > 9.5mm size	**24.6**	**%**

ATTERBERG LIMITS

LL	PL	PI
NP	**NP**	**NP**

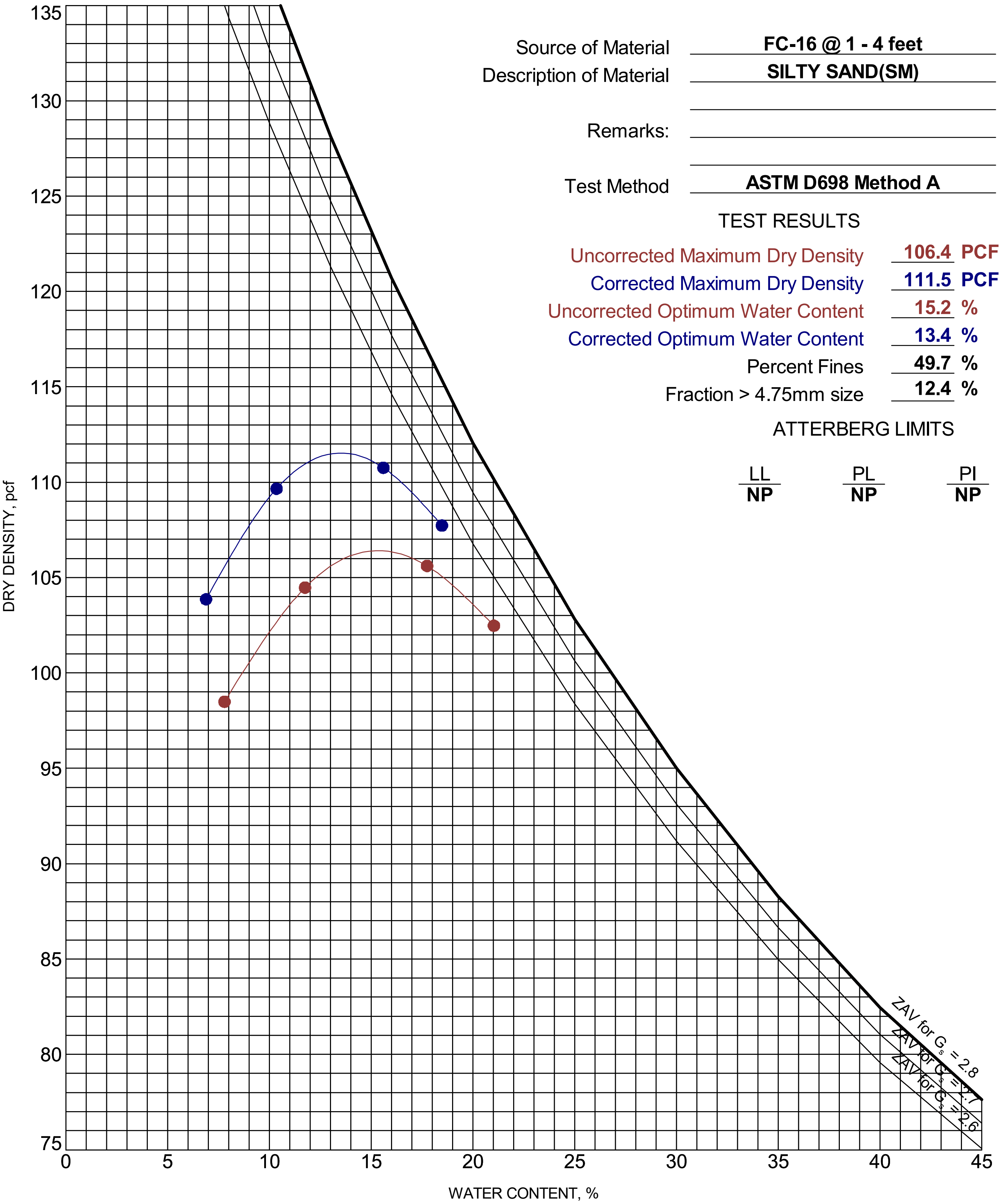


PROJECT: SunEast Solar PV NY Sites	PROJECT NUMBER: J5215096
SITE: Flat Creek Town of Root, NY	CLIENT: SunEast Development, LLC Malvern, PA

Terracon
15 Marway Cir, Ste 2B
Rochester, NY

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material: **FC-16 @ 1 - 4 feet**
Description of Material: **SILTY SAND(SM)**
Remarks:
Test Method: **ASTM D698 Method A**

TEST RESULTS

Uncorrected Maximum Dry Density	**106.4**	**PCF**
Corrected Maximum Dry Density	**111.5**	**PCF**
Uncorrected Optimum Water Content	**15.2**	**%**
Corrected Optimum Water Content	**13.4**	**%**
Percent Fines	**49.7**	**%**
Fraction > 4.75mm size	**12.4**	**%**

ATTERBERG LIMITS

LL	PL	PI
NP	**NP**	**NP**

PROJECT: SunEast Solar PV NY Sites

SITE: Flat Creek
Town of Root, NY

Terracon
15 Marway Cir, Ste 2B
Rochester, NY

PROJECT NUMBER: J5215096

CLIENT: SunEast Development, LLC
Malvern, PA

15 Marway Cir Ste 2B
Rochester, NY 14624
(585) 247-3471

Client	**Project**
SED NY Holdings LLC	SunEast Solar
Old Lyme, CT	J5215096

Date Received: 9/15/2021

Results from Corrosion Testing

Sample Location	FC-1	FC-3	FC-6	FC-9
Sample Depth (ft.)	1'-4'	1'-4'	1'-4'	1'-4'
pH Analysis, ASTM G 51	9.00	8.67	8.48	8.47
Water Soluble Sulfate (SO4), ASTM C 1580 (ppm)	11	10	11	13
Sulfides, AWWA 4500-S D, (mg/kg)	Nil	Nil	Nil	Nil
Chlorides, ASTM D 512, (ppm)	31	51	42	39
Red-Ox, ASTM G 200, (mV)	+570	+453	+461	+472
Total Salts, AWWA 2520 B, (mg/kg)	36	191	180	270
Resistivity (Saturated), ASTM G 187, (ohm-cm)	7240	3520	5320	8580

Analyzed By: ____________________

Robert Castronovo
Environmental Lab Technician

The tests were performed in general accordance with applicable ASTM and AWWA test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

15 Marway Cir Ste 2B
Rochester, NY 14624
(585) 247-3471

Client	**Project**
SED NY Holdings LLC	SunEast Solar
Old Lyme, CT	J5215096

Date Received: 9/15/2021

Results from Corrosion Testing

Sample Location	FC-11	FC-12	FC-14	FC-16
Sample Depth (ft.)	1'-4'	1'-4'	1'-4'	1'-4'
pH Analysis, ASTM G 51	8.94	8.53	8.84	8.95
Water Soluble Sulfate (SO4), ASTM C 1580 (ppm)	23	16	6	12
Sulfides, AWWA 4500-S D, (mg/kg)	Nil	Nil	Nil	Nil
Chlorides, ASTM D 512, (ppm)	41	45	52	38
Red-Ox, ASTM G 200, (mV)	+570	+462	+460	+461
Total Salts, AWWA 2520 B, (mg/kg)	36	315	213	343
Resistivity (Saturated), ASTM G 187, (ohm-cm)	16570	>20000	17530	19220

Analyzed By: ______________________

Robert Castronovo
Environmental Lab Technician

The tests were performed in general accordance with applicable ASTM and AWWA test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

Geotherm USA

21239 FM529 Rd., Bldg. F
Cypress, TX 77433
Tel: 281-985-9344
Fax: 832-427-1752
info@geothermusa.com
http://www.geothermusa.com

September 14, 2021

Terracon Consultants, Inc.
15 Marway Circle, Suite 2B
Rochester, NY 14624
Attn: Travis Wooden, E.I.T.

Re: Thermal Analysis of Native Soil Samples
Flat Creek – Rochester, NY (Project No. J5215096)

The following is the report of thermal dryout characterization tests conducted on four (4) native soil samples from the referenced project sent to our laboratory.

Thermal Resistivity Tests: The samples were reconstituted at the 'as received' or 'optimum' moisture content (greater of the two) and at 90% of standard Proctor dry density **provided by Terracon**. The tests were conducted in accordance with the IEEE standard 442-2017. The results are tabulated below and the thermal dryout curves are presented in **Figures 1 to 4.**

Sample ID, Description, Thermal Resistivity, Moisture Content and Density

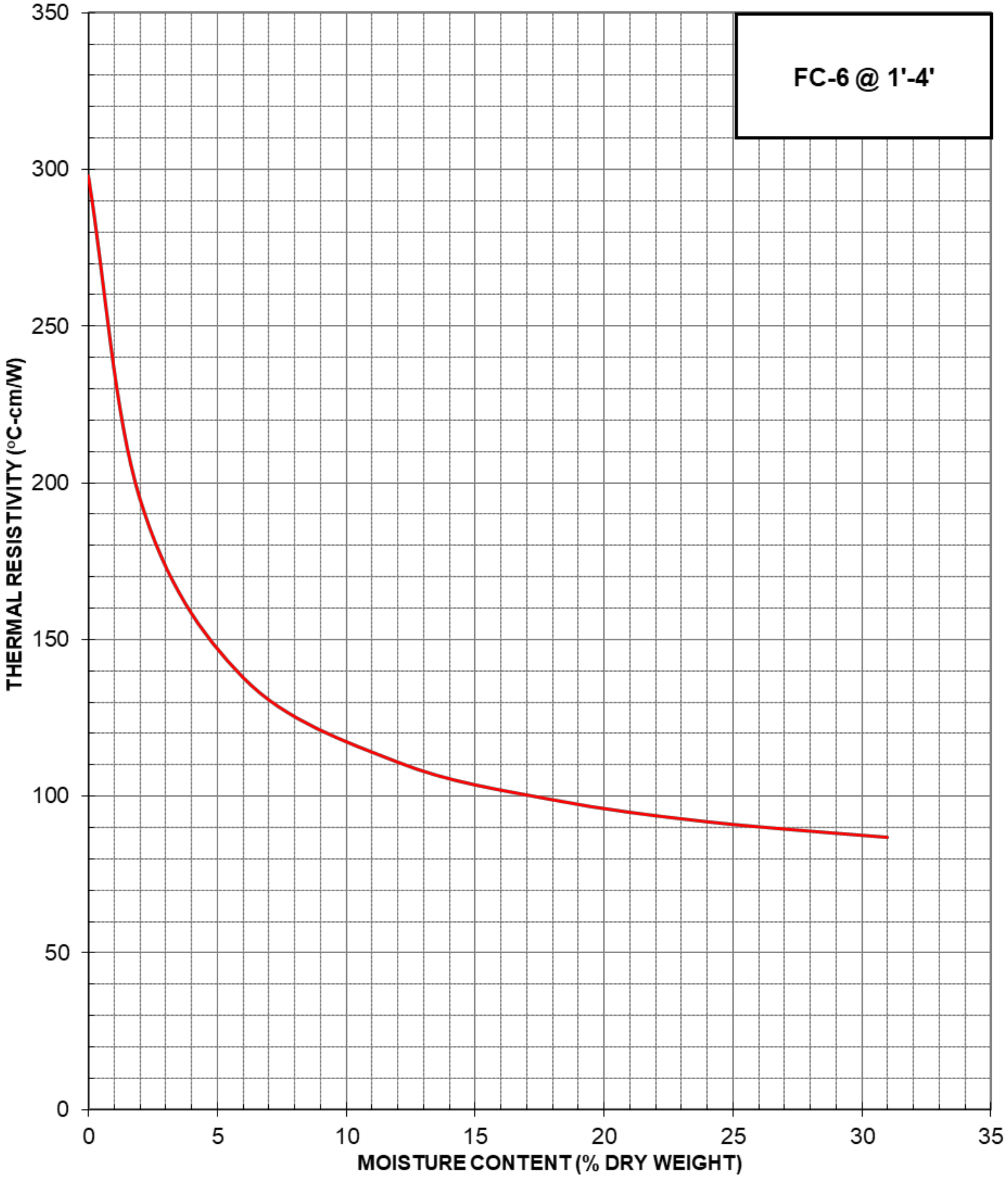
Sample ID @ 1' – 4'	Description (Terracon)	Thermal Resistivity (°C-cm/W)		Moisture Content (%)	Dry Density (lb/ft^3)
		Wet	Dry		
FC-6	Sandy silt (ML)	87	298	31	85
FC-9	Silty sand with gravel (SM)	58	174	15	110
FC-12	Gravelly silt (ML)	66	182	18	107
FC-16	Silty sand (SM)	64	219	21	100

Please contact us if you have any questions or if we can be of further assistance.

Geotherm USA

Deepak Parmar

THERMAL DRYOUT CURVE



Terracon Consultants, Inc. (Project No. J5215096)

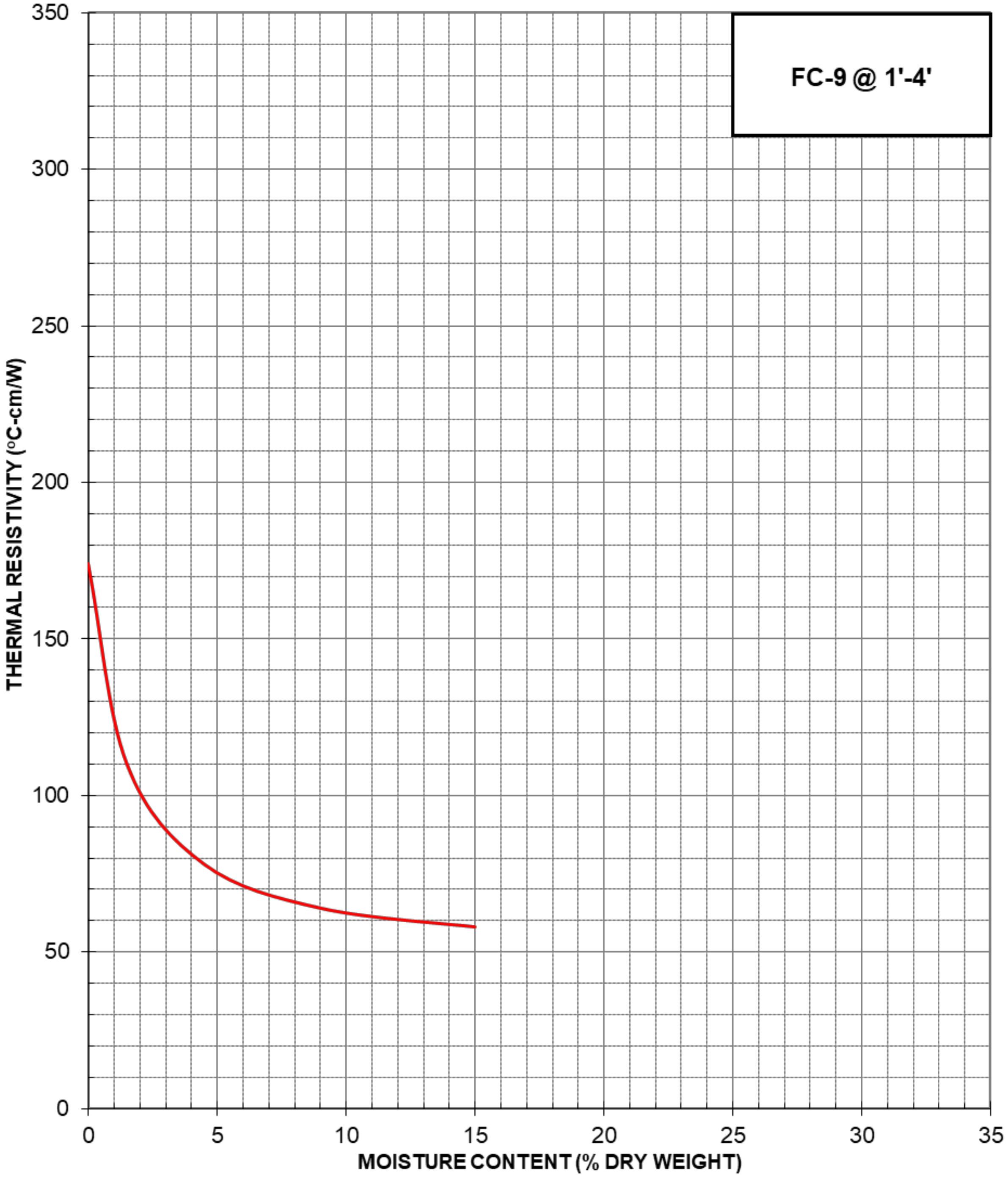
SunEast Solar PV NY Sites – Flat Creek

Thermal Analysis of Native Soil Samples

September 2021

Figure 1

THERMAL DRYOUT CURVE



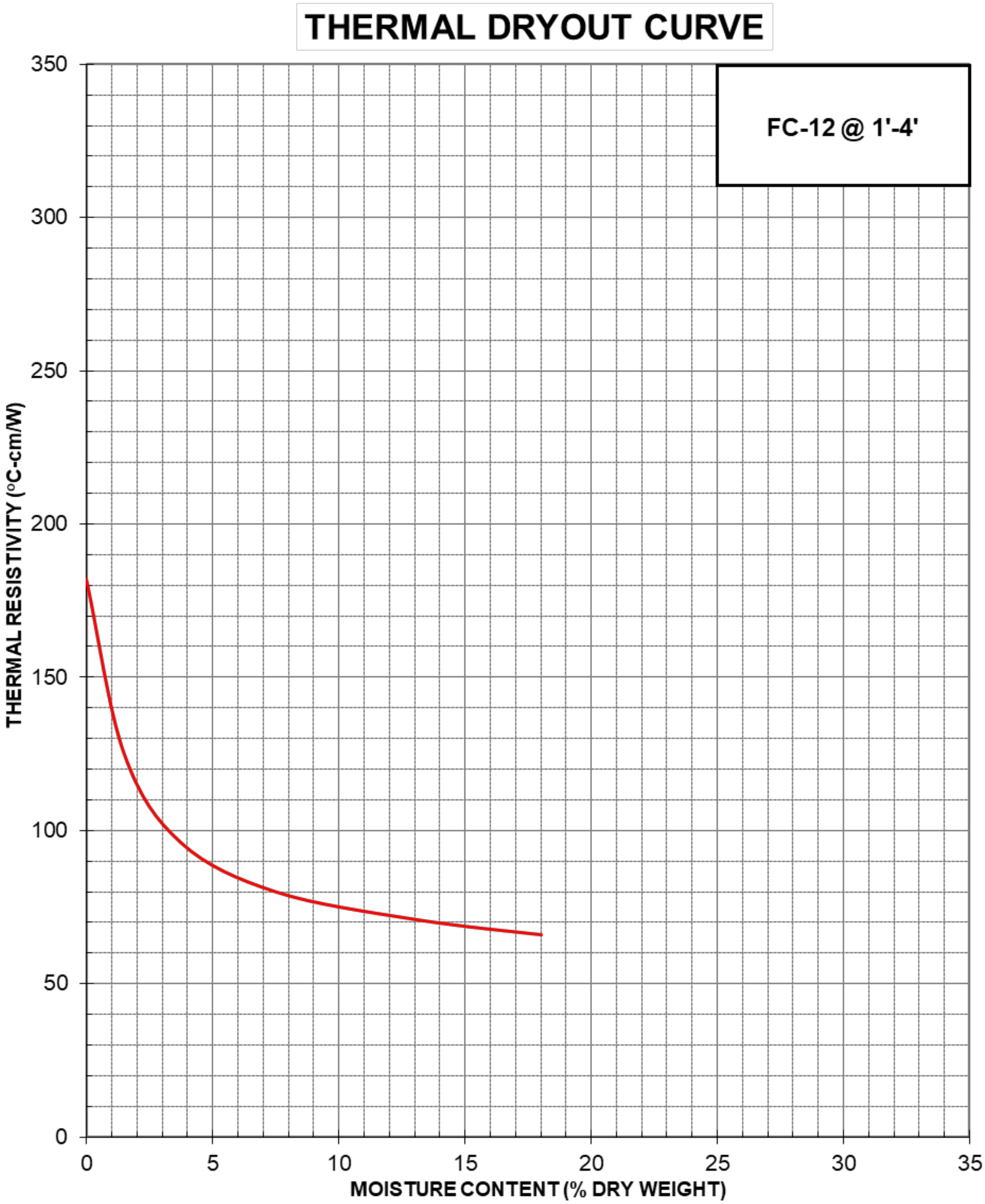
Terracon Consultants, Inc. (Project No. J5215096)

SunEast Solar PV NY Sites – Flat Creek

Thermal Analysis of Native Soil Samples

September 2021

Figure 2



Terracon Consultants, Inc. (Project No. J5215096)

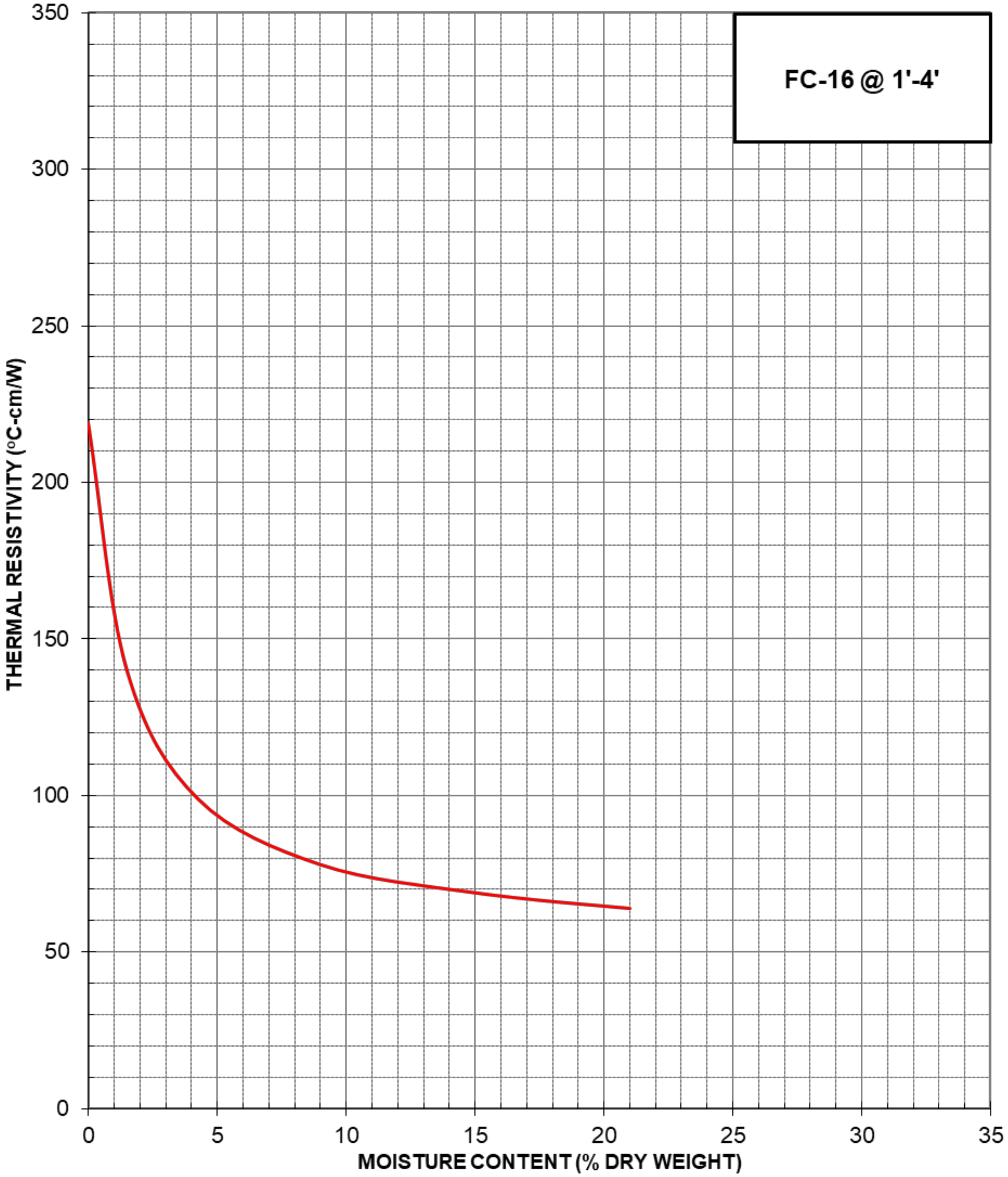
SunEast Solar PV NY Sites – Flat Creek

Thermal Analysis of Native Soil Samples

September 2021

Figure 3

THERMAL DRYOUT CURVE



Terracon Consultants, Inc. (Project No. J5215096)

SunEast Solar PV NY Sites – Flat Creek

Thermal Analysis of Native Soil Samples

September 2021

Figure 4

TRC
16000 Commerce Pkwy.
Suite B
Mount Laurel, NJ 08054
T 856.273.1224
TRCcompanies.com

September 8, 2022

Mr. Greg Elko
SED NY Holdings LLC
110 Phoenixville Pike, Suite 100
Malvern, PA 19355

Re: Geotechnical Engineering Report
Proposed Flat Creek Solar Project
Town of Root, Montgomery County, NY
TRC Project #: 427281.2022.GEOT

Dear Mr. Elko:

TRC Engineers, Inc. (TRC) is pleased to present our Geotechnical Engineering Report for the referenced project. Our work was initiated in accordance with Cordelio Services LLC Work Order #04, dated April 8, 2022 and completed in general accordance with the agreed scope of work presented in TRC's revised proposal, submitted April 6, 2022. A summary of our geotechnical exploration activities, including the laboratory test results, findings and recommendations related to the proposed Flat Creek Solar Project is summarized below.

1.0 INTRODUCTION

This report presents the results of the geotechnical exploration for the proposed photovoltaic (PV) solar array structures to be constructed at the Flat Creek Solar project site located in the Town of Root, Montgomery County, New York (Site). The purpose of our exploration was to evaluate the geologic and subsurface conditions at additional parcel areas leased to the Site since completion of a Preliminary Geotechnical Engineering Report prepared by Terracon Consultants (dated November 21, 2021) to reduce uncertainty with respect to anticipated foundation and site construction, and to provide geotechnical recommendations for design by others of the proposed project.

1.1 Project Description

The Site is located in the Town of Root, Montgomery County, New York along the southwest side of Route 162 and north of Route 92. The Site is primarily vacant agricultural land, which was mostly clear of crops at the time of the field exploration along with scattered wooded areas. Several existing structures, including houses and barns, are currently located on or adjacent to portion of the proposed lease area parcel. Up to approximately 300 MW of PV array capacity will be developed across nearly 3,000 acres. Based on our experience with similar projects, we assume that the proposed photovoltaic array designers would prefer to have the arrays mounted on posts driven into the ground. The anticipated post loads or types have not been provided to TRC but are assumed to be driven approximately 7-10 feet below existing ground surface (bgs) typical for such construction. It is assumed that significant earthwork (cuts and fills) is not required for the project development and that existing grades will remain relatively unchanged.

1.2 Scope of Services

Our geotechnical scope of services was presented in TRC's revised Proposal for Geotechnical Engineering Services dated April 6, 2022. To accomplish this work, we have provided the following services:

- Review of Terracon's Preliminary Geotechnical Engineering Report (dated November 21, 2021) to develop a supplement exploration program.
- Exploration of subsurface conditions by drilling fifteen (15) borings onsite within proposed solar array and substation areas and retrieving soil samples for classification and laboratory testing.
- Evaluation of the physical and engineering properties of the subsurface soils at the boring locations based on visually classifying the samples by a member of our geotechnical staff.
- Engineering analysis to evaluate the proposed foundation systems for the support of the ground-mounted PV solar array.
- Preparation of this report to summarize our findings and to present our conclusions and recommendations regarding the following:

    - Foundation support for the proposed solar array structures assuming post foundations, or alternative system, as applicable based on subsurface conditions.
    - Bearing capacity and other parameters for use in preliminary foundation design by others.
    - Anticipated excavation conditions and presence of potential rock or other refusal conditions, if applicable.
    - Suitability of on-site soils for reuse in backfills and requirements for imported fills.
    - Recommendations for placement, compaction, and testing of fills, if applicable.
    - Soil parameters (both above and below ground water table) for active, at rest, and passive conditions and L-Pile soil parameters for use in foundation design by others.
    - Anticipated ground water conditions and impacts on the design and construction.
    - Frost penetration depth.
    - Corrosivity potential on buried steel and concrete.
    - Field electrical resistivity.
    - Thermal resistivity laboratory test results
    - Preliminary Seismic Site Class parameters in accordance with ASCE 7-16.
    - Other construction-related concerns, as applicable based on available site subsurface conditions, details of the proposed construction and any available preliminary design information.

2.0 SITE CONDITIONS

2.1 Site Reconnaissance, Boring Stakeout, and Investigation

A member of TRC's local professional staff performed a site reconnaissance in conjunction with test boring stakeout and field electrical resistivity testing. Test boring locations were staked in the field using a cellphone-based GPS app at the approximate locations recommended by TRC and approved by SED as shown on the attached Figure 1, *Approximate Test Boring Location Plan*. The 15 test borings were spatially distributed within accessible areas of the solar array area of the additional parcel areas with boring B-116 located within the proposed substation footprint. Prior to drilling, the Dig Safely New York (DSNY) One-Call notification system was contacted to notify owners of public utilities in the area of the proposed testing borings for utility mark out and clearance of test boring activities.

The test boring field activities were performed between June 27, 2022 and June 30, 2022 by TRC's drilling subcontractor, CME Associates, using an ATV-mounted drill rig. Split spoon sampling was performed continuously through the upper 10 ft bgs and at 5 ft intervals thereafter to the completion depths using the Standard Penetration Test (SPT) Method (American Society of Testing and Materials [ASTM] D1586). The soil samples were obtained by driving the split spoon sampler 24 inches into the soil with a 140-pound automatic hammer free-falling 30 inches. The number of blows required for each 6 inches of penetration was recorded separately. The SPT blow count ("N-value") of the soil was calculated as the number of blows required for the middle 12 inches (6-inch to 18-inch interval) of penetration or fraction thereof. The SPT N-value serves as an indicator of relative consistency for cohesive soils and relative density of granular soils. Borings were terminated at the borings' target depths or auger refusal, whichever was encountered first, ranging from approximately 4.6 ft to 35 ft bgs. Upon completion, all test borings were backfilled to the approximate existing ground surface with the auger cuttings. Copies of the test boring logs are attached along with a copy of the approximate test boring location site plan.

2.2 Regional Geology

According to available public geological data, the surficial geology at the project site consists of residual soil deposits weathered in place from the underlying parent rock. Locally the site is underlain predominantly by mudstone and shale of the Utica Shale Formation from the Middle Ordovician Age. The northern parcels sit near a contact with carbonate limestone of the undivided Trenton and Black River Groups and the Beekmantown Group of the Middle and Lower Ordovician Age, respectively.

2.3 Subsurface Conditions

Below a surficial cultivated topsoil layer, the test borings revealed that the surficial soils generally consist mostly of LEAN CLAY and SILTY CLAY with varying quantities of sand and rock fragments extending to depths ranging from approximately 2.5 ft to 22 ft bgs. SPT N-values indicate that the consistency of these soils ranges from "medium stiff" to "hard". Laboratory test results indicate that the materials tested are relatively low plastic and can be described as a silty clay and lean clay with plastic limits ranging from 11% to 21%, liquid limits ranging from 17% to 36%, and plasticity indexes ranging from 4% to 18%. Natural moisture contents as received by the laboratory range from approximately 8% to 18%. Maximum laboratory compacted dry densities of the representative bulk samples of the clay as determined by ASTM D 698 ranged from 104.4 to 117.3 pounds per cubic foot (pcf) at optimum moisture contents ranging from 13.2% to 18.3%.

Occasional cobble inclusions were noted in various borings ranging from the depth of 3 ft to 15 ft bgs. The presence of these oversized materials may pose difficult driving conditions for driven post type foundation during installation.

Below the surficial clayey soil stratum, test borings B-106 and B-116 encountered a stratum consisting of silty, clayey sand with varying quantities of gravel-sized rock fragments. SPT N-values indicate the relative density of this stratum is “medium dense”. Laboratory test results indicate that the fine-grained (silt and clay) content of this layer is approximately 41% to 46%. Natural moisture content as received by the laboratory ranged from approximately 7% to 8%.

Auger refusal, which typically represents the apparent top of weathered rock, was encountered in test borings B-103, B-104, B-111 to B-113, and B-115 at depths ranging from approximately 4.6 ft to 13.1 ft bgs. Difficult drilling conditions, which are typically indicative of hard or very dense soil conditions, presence of rock fragments, and/or decomposed rock, were also encountered at 12 of the 15 test boring locations. The depths and locations where difficult drilling and auger refusal were encountered are summarized in Table 1, below.

Table 1: Summary of Difficult Drilling and Auger Refusal Depths

Test Boring Location	**Depth to Hard or Very Dense Soils/Difficult Drilling (ft, bgs[1])**	**Depth to Auger Refusal (ft, bgs[1])**
B-101	>15	>15
B-102	8	>15
B-103	11	13.1
B-104	2.5	5.5
B-105	6	>15
B-106	8.5	>15
B-107	7	>15
B-108	8	>15
B-109	7.5	>15
B-111	2.5	4.6
B-112	4.5	5.2
B-113	3.5	5.2
B-114	>15	>15
B-115	4	5.2

Test Boring Location	Depth to Hard or Very Dense Soils/Difficult Drilling (ft, bgs[1])	Depth to Auger Refusal (ft, bgs[1])
B-116[2]	>15	>15

1. *ft, bgs = feet below existing ground surface*
2. *Boring located in area of proposed substation footprint.*

2.4 Groundwater

Groundwater, when encountered, was present at depths ranging from 4 ft to 8.5 ft bgs in test borings B-101, B-103, B-107 and B-115 within the array fields and at a depth of 22.5 ft bgs in test boring B-116 within the proposed substation footprint, respectively, during drilling at the time of the field exploration. However, the development of perched water conditions may be encountered within standard excavation depths for foundations or utilities during wet periods. The groundwater conditions are representative of the conditions at the date and time of this study and are not representative of daily, seasonal, long-term fluctuations, development of perched conditions, or ponding of water in low lying areas during wet periods.

3.0 CORROSION EVALUATION AND THERMAL RESTIVITY

3.1 Corrosion Evaluation

To evaluate the corrosion potential of the subsurface soils at the site, we submitted three (3) representative bulk soil samples at depths of approximately 1-5 ft bgs, composited from test boring locations during our subsurface exploration to an analytical laboratory for pH, chloride, soluble sulfate, and sulfate content, resistivity and oxidation reduction testing. The results are summarized in Table 2, below.

Table 2: Results of Corrosivity Testing

Sample	Boring No.	pH in (H20)	pH in (CaCl2)	Chlorides (mg/kg)*	Sulfates (mg/kg)*	Sulfides (mg/kg)*	Oxidation Reduction	Resistivity (ohm-cm)**
Bulk 1	B-101 to B-104	7.6	6.8	50	85	Nil	+662	2,500
Bulk 2	B-106 to B-108	7.5	6.7	60	93	Nil	+670	2,200
Bulk 3	B-111 to B-115	7.4	6.8	40	65	Nil	+658	3,485

* *mg/kg = milligrams per kilogram*
*** ohm-cm = ohm-centimeter*

TRC also conducted field resistivity testing using the Wenner Four-Pin method in general accordance with ASTM G57. Testing was centered at boring locations B-106 and B-109 with the test lines oriented in perpendicular to one another at each test location. Measurements were taken along each test line corresponding to electrode spacings of 2.5 ft, 5 ft, 10 ft, 20 ft, and 40 ft. Field resistivity test results are attached, and the results are discussed further in this section.

Many factors can affect the corrosion potential of soil including soil moisture content, resistivity, permeability, and pH, as well as chloride and sulfate concentration. In general, soil resistivity, which is a measure of how easily electrical current flows through soils, is the most influential factor. Based on classification developed by William J. Ellis (1978), the approximate relationship between soil corrosiveness was developed as shown in Table 3 below.

Table 3: Relationship Between Soil Resistivity and Soil Corrosivity

Soil Resistivity (ohm-cm)*	**Classification of Soil Corrosiveness**
0 to 900	Very Severely Corrosive
900 to 2,300	Severely Corrosive
2,300 to 5,000	Moderately Corrosive
5,000 to 10,000	Mildly Corrosive
10,000 to >100,000	Very Mildly Corrosive

** ohm-cm = ohm-centimeter*

Chloride and sulfate ion concentrations and pH appear to play secondary roles in affecting corrosion potential. High chloride levels tend to reduce soil resistivity and break down otherwise protective surface deposits, which can result in corrosion of buried metallic improvements or reinforced concrete structures. Sulfate ions in the soil can lower the soil resistivity and can be highly aggressive to Portland cement concrete (PCC) by combining chemically with certain constituents of the concrete, principally tricalcium aluminate. This reaction is accompanied by expansion and eventual disruption of the concrete matrix. Soils containing high sulfate content could also cause corrosion of the reinforcing steel in concrete. Table 4.2.1 of the American Concrete Institute (ACI, 2008) provides requirements for concrete exposed to sulfate-containing solutions as summarized in Table 4 below.

Table 4: Relationship Between Sulfate Concentration and Sulfate Exposure (Table 4.2.1 of ACI)

Water-Soluble Sulfate (SO4) in soil (ppm)*	**Sulfate Exposure**
0 to 1,000	Negligible
1,000 to 2,000	Moderate
2,000 to 20,000	Severe
over 20,000	Very Severe

**ppm = parts per million*

Acidity is an important factor of soil corrosivity. The lower the pH (the more acidic the environment), the higher will the soil corrosivity be with respect to buried metallic structures. As soil pH increases above 7 (the neutral value), the soil is increasingly more alkaline and less corrosive to buried steel structures due to protective surface films which form on steel in high pH environments. A pH between 5 and 8.5 is generally considered relatively passive from a corrosion standpoint.

The laboratory electrical resistivity test completed on the samples of surficial soils indicates values ranging from 2,200 to 3,485 ohm-centimeters, which would be indicative of moderately to severely corrosive potential to buried metallic improvements. Based on the field resistivity testing results the electrical resistivity values for the existing subsoils range from approximately 153 to 2,561 ohm-centimeters, which would be indicative of moderately to very severely corrosive potential. Based on this result and the resistivity correlations presented in Table 3, the corrosion potential to buried metallic improvements may be characterized as ranging from moderately to very severely corrosive.

Based on our previous experience and Table 4.2.1 of the ACI, it is our opinion that sulfate exposure to PCC may be considered negligible for the native subsurface materials tested.

3.2 Thermal Resistivity

Laboratory thermal resistivity test results with the thermal dryout curves, are attached to this report. Thermal Resistivity testing was performed in general accordance with ASTM 5334 on three (3) representative composite samples compacted to density equivalent to approximately 90% of the maximum dry density and at the optimum moisture content as established by ASTM D 698 for each composite test sample. The samples were then oven dried, and multiple thermal resistivity readings were obtained at various moisture contents. The thermal resistivities decrease with increasing moisture content and varies from 98.8 to 171.2 ^{o}C-cm/W when fully dry and from 55.5 to 62.7 ^{o}C-cm/W at optimum moisture.

4.0 FOUNDATIONS AND EARTHWORK

4.1 Site Seismic Coefficients

According to the ASCE 7-16, the site class is within “Site Class C or D” based on the soil profiles. The maximum considered earthquake ground motions in this area for 0.2 sec. and 1.0 sec. spectral responses are approximately 20.6% g and 6.1% g, respectively. The use of Site Class D is recommended for seismic design of critical equipment, such as within the proposed substation. For Site Class D, the corresponding 0.2 and 1.0 sec. design spectral response acceleration parameters S_{DS} and S_{D1} are 22.0 % g and 9.7 % g, respectively.

4.2 Foundations

Based on the results of this investigation and our experience with similar structures, a foundation system consisting of driven posts is assumed as generally preferred by the designer for support of the proposed ground-mounted photovoltaic arrays. Based on the results of the test borings, the use of driven posts are feasible and could be supported in the natural soils encountered at this project, but could potentially be problematic due to shallow refusal conditions.

It is our understanding that shallow foundations will be needed to support the proposed relatively light equipment, as well as more heavily loaded equipment such as the transformers and dead-end structures at the Site substation location. A combination of shallow foundations and mats could be utilized for support of various structures or equipment bearing on newly placed, compacted load bearing fill or the existing natural soils after proper subgrade preparation as described below. Drilled piers could also be utilized.

As noted in Table 1, six (6) test borings encountered refusal to earth drilling equipment at depths ranging from 4.6 to 13.1 feet bgs. The remaining borings did not encounter auger refusal prior to reaching the planned boring depth. Additionally, difficult drilling conditions and/or hard or very dense soil conditions including cobble inclusions were encountered in 12 of the 15 test borings at depths ranging from 2.5 ft to 11 ft bgs. The remaining borings did not encounter difficult drilling conditions prior to reaching the planned boring depth. Therefore, shallow refusal conditions may be encountered within these areas and other portions of the proposed solar array area when attempting to drive posts and depending on the required minimum embedment depths.

Where the use of a driven post system is limited for use on this project where refusal to drilling and sampling tools is encountered, the designer and contractor should be prepared to implement alternative installation methods (or alternative foundation support systems) for achieving sufficient foundation embedment to provide sufficient resistance for uplift and lateral loading conditions, as necessary. The following alternatives will need to be considered at the Site as subsurface obstructions due to hard or very dense soils, highly decomposed rock, or possible cobbles are likely to be encountered at relatively shallow depths (i.e., less than 10 ft bgs) as observed at most of the test boring locations:

- The use of predrilling to break up the dense highly decomposed rock or other obstructions to increase post embedment for vertical and lateral support.
- The use of larger sized, heavier grade posts that will accommodate harder driving conditions and could provide increased embedment and sufficient lateral capacity and uplift.
- The use of helical screw piles to achieve uplift and lateral capacities at shallower depths.
- The use of shallow spread footings or ballast foundations where adequate embedment with other foundation or installation methods cannot be achieved.

4.2.1 Driven Post Support System

As mentioned above, driving post beyond depths where hard or very dense soils and highly decomposed rock were encountered will be difficult and pre-drilling will likely become necessary to achieve sufficient post depth to resist the required lateral and uplift loads wherever similar conditions are encountered. All posts should be driven to bear at sufficient depths required to provide adequate axial, uplift, and lateral resistances.

4.2.2 Helical Screw Support System

A helical pile system, such as that manufactured by IDEAL Manufacturing, AB Chance, Magnum Piering, or similar, having a minimum 3-inch diameter or low-displacement ground screws, such as those manufactured by TerraSmart, or similar, could be considered as an alternative to driven posts in areas where driving restrictions as previously discussed are less than 8 ft bgs for support of the proposed arrays. Lateral and uplift capacities of helical piles, as well as the ability of the shaft to withstand anticipated installation torque based on subsurface conditions, should be verified by the pile manufacturer or installer. Generally speaking, additional capacities can be developed using larger diameters and helix combinations. Because these piles offer little lateral resistance due to their relatively small cross section, these piles can be installed by grouting on the exterior of the pile during the installation to provide increased lateral and uplift capacity, if required. Installation of helical piles below the auger refusal depths, where encountered, is typically not be feasible. Embedment into the very dense/difficult augering material may be possible, but as stated previously, will be dependent on the ability of the central shaft to withstand installation torque required to advance helices. Depths of hard, very dense soils and auger refusal are as presented in Table 1 above and piles will not be able to penetrate below these depths. Alternative to a conventional small shaft helical pile, the use of a 2-inch to 3-inch diameter continuous flight helical pile, could be considered that generally can be drilled deeper into very dense soil conditions as compared to a conventional helical pile with larger diameter helices.

The final design should be verified by the helical pile manufacturer prior to implementation at the Site. Also, the type and diameter of helix plates to be used, as well as the central bar or round pipe characteristics or that of a continuous flight helical pile should be verified by the product manufacturer based on this design capacity and anticipated torque value required for installation of the helical piles. If subsurface obstructions are encountered during installation, pre-drilling or pre-excavation will be required. If predrilling or pre-excavating, then all piles should be backfilled or grouted to ensure intimate contact with surrounding soils and so not to negatively impact lateral stability.

4.2.3 Recommended Geotechnical Parameters for Pile Design

Allowable design end-bearing capacities (for driven posts) and recommended geotechnical parameters for use in design analysis, included in Tables 5 and 6 below, can be utilized for evaluation of posts or piles for support of the PV solar array, or other design analysis, as required. ***We recommend that lateral and uplift resistance of soils be reduced by 50% above a depth of 4 ft below the ground surface to account for disturbance resulting from construction as well as to account for the negative impacts due to frost and thaw action.*** Allowable capacities assume a factor of safety of 2 for compression loads; a factor of safety equal to 3 was used for determining allowable uplift capacity of piles; a factor of safety equal to 1.5 should be used for transient (wind/seismic) loading conditions. The factor of safety for uplift capacity can be reduced to 2 in conjunction with pile load testing. The use of lower factors of safety is at the sole discretion and risk tolerance of the designing engineer.

Table 5. Summary of Allowable Soil Bearing Capacities

Soil Description[1]	**Relative Density/ Consistency**	**Cohesion (psf)**	**Downward Skin Friction (psf/ft) for steel/soil**	**Upward Skin Friction (psf/ft) for steel/soil**	**Allowable Bearing Capacity (ksf***)**
CLAY/SILTY CLAY	"Medium" to "Stiff"	1,000	200*	100*	2
CLAY/SILTY CLAY	"Very Stiff"	2,000	300*	150*	3
CLAY/SILTY CLAY	"Hard"	4,000	400*	200*	5
SAND/GRAVEL/ Decomposed Rock	"Dense" to "Very Dense"	NA	150**	75**	5

1. See the attached Subsurface Condition Summary Table for additional details
* *psf/ft – pounds per square foot per foot (over pile length)*
** *psf/ft – pounds per square foot per foot (triangular distribution over pile length)*
*** *ksf – kips per square foot*

Table 6. Summary of Unfactored Soil Parameters for Design

Soil Description[1]	**LPILE Soil Type**	**Consistency / Relative Density**	**Total (Submerged) Unit Weight (pcf*)**	**Friction Angle (degrees)**	**E_{50}**	**Cohesion (psf**)**	**Soil Modulus Above/Below Water Table, k (pci**)**
CLAY/SILTY CLAY	Clay	"Medium" to "Stiff"	115 (52.6)	-	0.01	1,000	-
CLAY/SILTY CLAY	Clay	"Very Stiff"	120 (57.6)		0.007	2,000	-
CLAY/SILTY CLAY	Clay	"Hard"	125 (62.6)		0.005	4,000	-
SAND/GRAVEL/ Decomposed Rock	Sand	"Dense" to "Very Dense"	130 (67.6)	34	-	-	225/125

1. See the attached Subsurface Condition Summary Table for additional details
* *pcf – pounds per cubic foot*
** *psf – pounds per square foot*
*** *pci – pounds per cubic inch*

Prior to or during construction, we recommend that tension and lateral load tests be conducted on a minimum of three piles for each size, system, or soil consistency/relative density to verify the adequacy of the design. Testing should be performed in general accordance with ASTM 3689 and ASTM 3966 or in accordance with current standard practice in the industry. The test locations should coincide with the test boring locations based on the variability of the subsurface conditions. The test piles should be installed with the same means and methods used to install production piles. In the event that the means and methods or embedment depths of pile installation are revised following initial pile testing, additional pile tests should be performed to verify that sufficient resistance can be achieved with the revised means, methods, and embedment. The results should be reviewed and approved by a qualified geotechnical engineer.

4.2.4 Shallow Foundations

Shallow foundation systems such as rigid mats can be considered for support of electrical equipment or other ancillary equipment. Additionally, ballasted foundations may need to be considered for support of the proposed solar arrays where installation of helical or driven post foundations cannot achieve sufficient embedment due to shallow refusal conditions due to the presence of weathered rock or cobbles and boulders. ***Ballast foundations for solar array support and mats supporting light equipment can be designed for an allowable bearing capacity of 2,000 psf*** when constructed in accordance with the general recommendations presented in the *Earthwork* section of this report. A vertical subgrade modulus of 80 pci may be used in foundation mat design. A typical allowable interface friction coefficient of 0.35 be used for design of cast in place concrete foundations assuming that they are constructed on grade overlying the natural soils.

Transformers, dead-end structures and similar heavily loaded structure foundations or mats bearing on the existing natural soils or newly placed and compacted fill can be designed for an allowable bearing capacity of 3,000 psf, after proper subgrade preparation as follows:

1. Over-excavate the natural soils for a minimum depth of 2.0 feet below bottom of the footing depth. Over-excavation shall extend beyond the perimeter of the foundation 1 foot horizontally for each foot of depth below existing grade.
2. The exposed subgrade shall be densified in the presence of a qualified geotechnical professional to confirm suitability of exposed grade and identify any soft, loose, unstable or unsuitable (biodegradable material or waste) materials that shall be removed.

Foundation subgrades for supporting electrical equipment or other ancillary structures subjected to freezing temperatures during construction and/or the life of the structure should be established at least 4 ft below adjacent grades or otherwise protected against frost action. Alternatively, to resist frost heave, light loaded mat slabs constructed at grade should be provided a coarse aggregate similar to AASHTO #57 aggregate layer (minimum 24 inches thick) below the mat foundation to reduce frost impacts. To guard against a punching type shear failure, minimum widths of continuous footings should be 24 in.

Shallow excavations for foundation slabs and construction of utilities may encounter perched groundwater in low lying areas or during wet periods. If perched groundwater or surface runoff are encountered, sumps and pumps will be sufficient to control groundwater and provide stable working conditions.

4.2.5 Drilled Shafts

Axial Capacity

Alternately, based on the subsurface conditions encountered and on our experience with similar construction, drilled shafts may be considered, particularly for support of the heavier equipment. The bottom of drilled shafts are anticipated to bear within the very stiff to hard clay or dense decomposed rock. The foundation designer should verify that the overall shaft diameter and length are sufficient to provide the vertical and necessary lateral support based on recommendations presented herein. It is our experience that the required length and diameter of drilled shafts, if used to support structures subjected to high lateral loads (such as the proposed dead end structures) will be controlled by anticipated lateral loading conditions.

Drilled shafts can be designed to derive their load-carrying capacities from shaft sidewall resistance (i.e., "skin friction"), end-bearing, or a combination of the two. The following are noted with respect to axial capacity of drilled shafts:

- Where the shaft length is entirely in soil and the length of the shaft is at least twice the shaft diameter, the embedment length can be checked for adequate axial compression capacity based on the sum of the allowable load in end bearing and side friction.

- Where the shaft length is less than twice the shaft diameter, or where methods of construction preclude consideration for shaft resistance (i.e., permanent casing installed in an oversized hole) the drilled shaft should be sized based on end bearing alone.

- Shaft resistance should not be included in soil within the upper 4 ft from the ground surface to account for disturbance during construction as well as negative impacts from frost action.

- For large diameter shafts, the weight of concrete (including consideration for the effects of buoyancy) might be adequate to resist anticipated uplift (or tension) loads, where applicable. If shaft resistance must be considered in addition to the weight of the shaft, a factor of safety of 3 is recommended for use in estimating allowable uplift capacity.

- Allowable design unit resistances against axial loads are provided in Table 5 above.

Lateral Capacity

Recommended geotechnical parameters for use in LPILE analysis are included in Table 6 above. If drilled shafts are to be constructed within a distance of 3B to 5B, where B is the shaft diameter, reduction factors should be applied as appropriate to account for group effects. We recommend that lateral resistance of soils within 4 ft of the ground surface be neglected to account for disturbance resulting from both drilled shaft construction and the negative impacts due to frost action.

Construction Related Concerns

Temporary casing may be required during shaft construction to maintain sidewall stability through the soft natural soils, where cobble inclusions are present, or in excavations where groundwater and/or perched water zones are encountered.

Intimate contact between the drilled shaft and surrounding soil will be critical to achieve the lateral load resistance predicted by the LPILE models. As such, use of permanent casing in the design and installation of drilled shafts should be avoided. If use of permanent casing is required, the permanent casing should be in intimate contact with the surrounding soil. Permanent casing should not be placed in an oversized hole unless grouting of the exterior annular space is performed to create intimate contact between the casing and soil. If intimate contact is not maintained, lateral deflections will significantly exceed those estimated in the LPILE evaluations. These deflections will be very highly variable and difficult to predict as they will be dependent on the method of construction and the amount of sidewall relaxation and annular space resulting from the construction process.

If the shaft is cased so that the excavation remains stable and free of water infiltration, freefall placement of concrete could be considered, provided the contractor can direct concrete discharge through the center of the shaft and avoid contact with the reinforcement cage during freefall, which could result in unacceptable aggregate separation. In the event of water infiltration into the shaft, the reinforcement cage should be installed followed by installation of a tremie tube to the bottom of the shaft so that the shaft can be concreted using bottom-up tremie techniques. Care will need to be taken to ensure that the tremie remains inserted at the bottom of the shaft during concrete placement.

Final length and diameter of the drilled shafts will be a function of the vertical loads as well as the lateral load and deflection requirements, where applicable. Preferably, shafts should extend into the natural alluvial soils to limit settlements and maximize end bearing capacity.

4.3 Earthwork

Based on our understanding of the proposed construction, significant grading and earthwork operations are not anticipated unless material removal and replacement would be considered for support of equipment foundations. The following recommendations are provided based on the site soils encountered.

Any existing subsurface utilities, which conflict with the proposed development should be removed or relocated, where applicable. In areas of backfill placement and/or construction of shallow foundations, all topsoil and organic or otherwise deleterious material should be removed before foundation construction or new fill placement. Any obstructions that would interfere with new foundation construction must be removed in their entirety from a foundation location. After stripping residual topsoil and excavation to the proposed bearing elevations for shallow mat foundations, the exposed subgrade areas should be vigorously densified with as large a compactor as is practical to improve overall performance and reduce impacts of settlements within the disturbed surficial soil. Soft, loose, or unstable areas identified during the course of excavation should be densified in-place or excavated and replaced with compacted load bearing fill.

The natural surficial soils contain predominant fine-grained (lean clay and/or silty clay) content and will be sensitive to moisture and disturbance. Therefore, they may lose considerable strength when wet or disturbed by construction equipment and could be difficult to work with during cold or wet weather. The presence of low lying areas will be highly sensitive to disturbance when wet. Some moisture conditioning (wetting or drying) of these soils should be anticipated before reuse in compacted backfills, particularly during wet seasons. Existing surficial soils with organic inclusions should be excluded from reuse as load-bearing fill. Once a subgrade has been prepared, construction traffic should be controlled in such a fashion as to minimize subgrade disturbance.

Imported load-bearing fill, if required, should consist of well-graded granular material similar to SW, GW, SM or GM as identified by the Unified Soil Classification System (USCS) which is not excessively moist and is free from ice and snow, roots, surface coatings, sod, loam, clay, rubbish, other deleterious or organic matter, and any particles larger than 4 inches in diameter. Alternatively, an AASHTO No. 57 or NYSDOT Type 2 coarse aggregate layer (minimum 24 inches thick) could be considered below mat foundations supporting electrical equipment to reduce frost impacts.

All backfills fills should be placed in horizontal layers not exceeding 8 inch loose thickness. The lift thickness criterion may be modified in the field depending on the conditions present at the time of construction and on the compaction equipment used. Load-bearing fills for the support of foundations should be compacted to not less than 98% of maximum dry density (ASTM D 698). All newly placed fills and backfills, if utilized for areas of the solar array posts or piles, should be compacted to not less the 95% of maximum dry density (ASTM D698). Fills in paved areas, if planned, or areas supporting access roads should be compacted to not less than 95% of maximum dry density (ASTM D698). Fills in landscaped areas should be compacted to at least 90% of maximum dry density (ASTM D698).

The sidewalls of any confined excavations deeper than 4 ft must be sloped, benched, or adequately shored per OSHA 29 CFR 1926 regulations. Trench boxes and/or sheeting could be used in conjunction with open cut slopes to permit access to confined excavations. The onsite predominantly clayey soils are classified as Type B soils according to OSHA 29 CFR 1926. Open excavations in the natural clay or silt soils should not be steeper than 1H: 1V if dry and 1.5H: 1V if submerged or where wet conditions are observed, such as perched water or significant surface runoff.

If site grading will include cuts, especially near or beyond the depths listed in Table 1, then heavy duty excavators or dozers with ripper attachments will be required to remove the decomposed rock materials.

4.4 Trench Backfill

Bedding and pipe embedment materials to be used around underground utility or electrical conduit pipes should be well graded sand or gravel conforming to the pipe manufacturer's recommendations and should be placed and compacted in accordance with project specifications, local requirements, or governing jurisdiction. General fill to be used above pipe embedment materials should be placed and compacted in accordance with the recommendations contained in this section.

Depended on site grading and depth of trenches, it is noted that cobbles and or refusal to excavation equipment may be encountered during excavation of trenches. Shallow rock if encountered during utility excavation, must be removed entirely from within the bedding zone of all trenches prior to utility construction. Excavation of rock will require the use of larger equipment, including, but not limited to large heavy-duty excavators, hydraulic rams, and dozers with ripper blade attachments. Trench excavations should be over-excavated to provide at least 3 to 4 inches of bedding material to provide a uniform support for utilities and electrical conduits. Where direct bury of utilities will occur, a layer of clean sand, or similar material free of rock fragments should be placed immediately over the cables to prevent damage during compaction of backfill.

Utility trenches located adjacent to footings or foundations should not extend below an imaginary 1:1 (horizontal:vertical) plane projected downward from the foundation bearing surface to the bottom edge of the trench. Where utility trenches will cross beneath footing bearing planes, the footing concrete should be deepened to encase the pipe, or the utility trench should be backfilled with sand/cement slurry or lean concrete within the foundation-bearing plane.

4.5 Gravel Access Roadways

After stripping of the existing topsoil proposed access roads should be proof-rolled with a heavily loaded pneumatic-tired vehicle such as a loaded water truck or tri-axle dump truck. Soft, loose or unstable areas, identified by significant pumping, rutting or similar deformation under wheel loads must be removed and replaced with compacted fill or aggregate material to achieve stable subgrade prior to placing common fill for site grading, if required, or fill aggregate surfacing. A layer of a geogrid should be installed directly over the subgrade with adjacent rolls lapped in accordance with manufacturer's recommendations in general accordance with NYSDEC standard for limited Use Pervious Haul Roads. A layer of aggregate similar in gradation to NYSDOT Item 703-02, Size Designation 3-5 of Table 703-4 material should be placed directly over the geogrid in a single 8-inch thick layer and spread with tracked equipment in accordance with NYSDEC standards. During construction, the access road may need to be occasionally re-graded and re-densified. Any electric cables crossing below the roadway should be installed in heavy duty rigid steel conduits or installed a minimum 3 ft below finished grade to prevent damage to the cables.

4.6 Surface Drainage

Positive surface water drainage gradients at least 2 percent should be provided to direct surface water away from foundations and mat slabs towards suitable discharge facilities. Ponding of surface water should not be allowed on or adjacent to structures, slabs-on-grade, or pavements. Any rain runoff should be directed away from foundation and slabs-on-grade such as equipment pads, as applicable.

In addition, a sufficiently thick velocity dissipater, such as layer of coarse drainage aggregate of at least 3 to 4 inches in size, should be placed along water flow paths to dissipate concentrated flow of runoff water in order to minimize surface erosion.

4.7 Plans, Specifications, and Construction Review

We recommend that TRC perform a plan review of the geotechnical aspects of the project design for general conformance with our recommendations. In addition, subsurface materials encountered in the relatively small diameter, widely spaced borings may vary significantly from other subsurface materials on the site. Therefore, we also recommend that a representative of our firm observe and confirm the geotechnical specifications of the project construction. This will allow us to form an opinion about the general conformance of the project plans and construction with our recommendations. In addition, our observations during construction will enable us to note subsurface conditions that may vary from the conditions encountered during our investigation and, if needed, provide supplemental recommendations. For the above reasons, the recommendations provided in this report are based on the assumption that TRC will be retained to provide observation and testing services during construction to confirm that conditions are similar to that assumed for design and to form an opinion as to whether the work has been performed in general accordance with the project plans and specifications. If we are not retained for these services, TRC cannot assume any responsibility for any potential claims that may arise during or after construction as a result of misuse or misinterpretation of TRC's report by others. These services are not included as part of TRC's current scope of work.

4.8 Construction Observation

TRC recommends that a qualified geotechnical professional should observe the geotechnical aspects of the earthwork for general conformance with our recommendations including site preparation, selection of fill materials, pile installation, and the placement and compaction of fill. To facilitate your construction schedule and if you wish TRC to perform these services, we request sufficient notification (72 hours) for site visits. The project plans and specifications should incorporate all recommendations contained in the text of this report. These services are not included as part of TRC's current scope of work.

5.0 LIMITATIONS

This report has been prepared for SED NY Holdings LLC, specifically for design of the proposed solar array and associated development to be constructed at the Flat Creek Solar project site located in the Town of Root, Montgomery County, NY as identified herein. Transfer of this report or included information is at the sole discretion of SED NY Holdings LLC. TRC's contractual relationship remains with SED NY Holdings LLC and limitations stated herein remain applicable regardless of end user. The opinions, conclusions, and recommendations presented in this report have been formulated in accordance with accepted geotechnical engineering practices that exist in the area at the time this report was written. No other warranty, expressed or implied, is made or should be inferred.

The opinions, conclusions and recommendations contained in this report are based upon the information obtained from our investigation, which includes data from a limited number of widely separated discrete locations, visual observations from our site reconnaissance, and review of other geotechnical data provided to us, along with local experience and engineering judgment. An attempt has been made to provide for normal contingencies; however, the possibility remains that differing or unexpected conditions may be encountered during construction. If this should occur, or if additional or contradictory data are revealed in the future, TRC should be notified so that modifications to this report can be made, if necessary. TRC is not responsible for any conclusions or opinions drawn from the data included herein, other than those specifically stated, nor are the recommendations presented in this report intended for direct use as construction specifications.

TRC should be retained to review the geotechnical aspects of the final plans and specifications for conformance with our recommendations. The recommendations provided in this report are based on the assumption that TRC will be retained to provide observation and testing services during construction to confirm that conditions are similar to that assumed for design and to form an opinion as to whether the work has been performed in accordance with the project plans and specifications. If we are not retained for these services, TRC cannot assume any responsibility for any potential claims that may arise during or after construction as a result of misuse or misinterpretation of TRC's report by others. Furthermore, TRC will cease to be the Geotechnical Engineer-of-Record at the time another consultant is retained for follow up service to this report, if applicable.

The opinions presented in this report are valid as of the present date for the property evaluated. Changes in the condition of the property will likely occur with the passage of time due to natural processes and/or the works of man. In addition, changes in applicable standards of practice can occur as a result of legislation and/or the broadening of knowledge. Furthermore, geotechnical issues may arise that were not apparent at the time of our investigation. Accordingly, the opinions presented in this report may be invalidated, wholly or partially, by changes outside of our control. Therefore, this report is subject to review and should not be relied upon after a period of three years. Similarly, this report should not be used, nor are its recommendation applicable, for any other properties or alternate developments.

We trust this report contains the information you require and thank you for the opportunity to work on this project. Please consider our firm for future geotechnical services as needed.

Sincerely,

TRC Engineers, Inc.

James P. Benjamin

James P. Benjamin, PE*
Geotechnical Project Manager
*NJ, PA

almhd

Izzaldin Al Mohd, PhD, PE
Chief Geotechnical Engineer
NY License No.: 105780

cc: S. McGee, TRC
J. Dickey, TRC

FIGURES

Project No. 427281.2022.GEOT

Date: August 30,2022

For: SED NY Holdings LLC

TRC

16000 Commerce Parkway, Mt. Laurel, New Jersey 08054

PH. (856) 273-1224 FAX. (856) 273-9244

APPROXIMATE TEST BORING LOCATIONS

Flat Creek Solar

Town of Root, Montgomery County, New York

FIGURE

1

SunEast - Flat Creek Solar Project
Town of Root, Montgomery County, NY

Boring Number	Depth to Groundwater	CLAY/SILTY CLAY									SILTY/CLAYEY SAND & GRAVEL						Decomposed Rock		
		Medium to Stiff			Very Stiff			Hard			Medium Dense to Dense			Very Dense			Very Dense		
B-101	8.5	0	to	6	6	to	15	--	to	--	--	to	--	--	to	--	--	to	--
B-102	>15	0	to	6	6	to	8	8	to	15	--	to	--	--	to	--	--	to	--
B-103	6	0	to	6	6	to	8	8	to	11	--	to	--	--	to	--	11	to	13.1
B-104	>5.5	0	to	1	--	to	--	1	to	3	--	to	--	--	to	--	3	to	5.5
B-105	>15	0	to	2	2	to	5.5	5.5	to	15	--	to	--	--	to	--	--	to	--
B-106	>15	0	to	7	--	to	--	7	to	15	--	to	--	--	to	--	--	to	--
B-107	5.5	0	to	6	10.5	to	15	6	to	10.5	--	to	--	--	to	--	--	to	--
B-108	>15	0	to	2	--	to	--	2	to	13	--	to	--	--	to	--	13	to	15
B-109	>15	0	to	6	--	to	--	6	to	7.5	--	to	--	7.5	to	13.5	13.5	to	15
B-111	7.8	0	to	2.5	--	to	--	2.5	to	3	--	to	--	--	to	--	3	to	4.6
B-112	>5.2	0	to	2	2	to	4.5	--	to	--	--	to	--	--	to	--	4.5	to	5.2
B-113	>5.2	0	to	2	--	to	--	2	to	3.5	--	to	--	--	to	--	3.5	to	5.2
B-114	>15	0	to	4	4	to	15	--	to	--	--	to	--	--	to	--	--	to	--
B-115	4	0	to	3	--	to	--	--	to	--	--	to	--	--	to	--	3	to	5.2
B-116	22.5	0	to	8	18	to	22	8	to	18	22	to	35	--	to	--	--	to	--

FIELD DATA

TEST BORING LOGS

TRC

TEST BORING LOG

BORING	**B-101**
G.S. ELEV.	
FILE	427281.2022.GEOT
SHEET	1 OF 1

PROJECT: FLAT CREEK SOLAR

LOCATION: MONTGOMERY COUNTY, NY

GROUNDWATER DATA

FIRST ENCOUNTERED N/A ▽

DEPTH	HOUR	DATE	ELAPSED TIME	
8.5'	10:30	6/27	0 HR	▼
				▽

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER RYAN
INSPECTOR R. DEPOLO
DATE STARTED 06/27/2022
DATE COMPLETED 06/27/2022

DEPTH		A	B	C	DESCRIPTION	REC	REMARKS
		S-1	1 4 7 8	▨	*LT BROWN CLAY (TILL), SM F/M/C SAND, TR TO SM F/M GRAVEL*		
		S-2	7 8 10 10	▨	4.0		
5				▨			
		S-3	3 4 3 3	▨	*LT BROWN/ORANGE-BROWN CLAY, SM F/M/C SAND, TR GRAVEL-SIZED ROCK FRAGMENTS*		
▽ ▼		S-4	5 10 8 8	▨			
10		S-5	6 8 10 11	▨	10.0		
				▨	*BLACK CLAY, SM SAND, TR GRAVEL-SIZED SHALE FRAGMENTS*		
15		S-6	3 5 7 12	▨	15.0		
					END OF BORING AT 15'		
20							
25							
30							
35							

DRN. CC
CKD. JPB

TEST BORING LOG

BORING **B-102**
G.S. ELEV.
FILE 427281.2022.GEOT
SHEET 1 OF 1

PROJECT: FLAT CREEK SOLAR
LOCATION: MONTGOMERY COUNTY, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED NE			
DEPTH	HOUR	DATE	ELAPSED TIME

▽

▼

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER RYAN
INSPECTOR R. DEPOLO
DATE STARTED 06/27/2022
DATE COMPLETED 06/27/2022

DEPTH	A	B	C	DESCRIPTION	REC	REMARKS
	S-1	2 6 6 8	▨			
	S-2	10 10 9 10	▨	***LT BROWN CLAY, TR SAND, TR GRAVEL, TR ROOTS***		
5	S-3	5 6 9 12	▨	6.0		
	S-4	9 11 13 15	▨	***LT BROWN/BLACK CLAY, SM SAND, TR GRAVEL-SIZED SHALE FRAGMENTS***		SHALE FRAGMENTS FROM 8 FT
10	S-5	4 7 39 27	▨	10.0		
			▨	***BLACK/GRAY CLAY, SM GRAVEL-SIZED SHALE FRAGMENTS***		
15	S-6	7 15 20 23	▨	15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

DRN. CC
CKD. JPB

TEST BORING LOG

PROJECT: FLAT CREEK SOLAR
LOCATION: MONTGOMERY COUNTY, NY

BORING	**B-103**
G.S. ELEV.	
FILE	427281.2022.GEOT
SHEET	1 OF 1

GROUNDWATER DATA				
FIRST ENCOUNTERED N/A				▽
DEPTH	HOUR	DATE	ELAPSED TIME	
6.0'	12:00	6/30	0 HR	▼
				▽

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	13.1 '

DRILLER B. FLETCHER
HELPER RYAN
INSPECTOR R. DEPOLO
DATE STARTED 06/30/2022
DATE COMPLETED 06/30/2022

DEPTH	A	B	C	DESCRIPTION	REC	REMARKS
	S-1	2 6 9 10				
	S-2	6 7 16 11		***LT BROWN CLAY, TR TO SM SAND, TR GRAVEL-SIZED SHALE FRAGMENTS***		
5						
▼	S-3	3 4 5 5		6.0		
	S-4	4 8 13 23		***LT BROWN SILTY CLAY, SM GRAVEL-SIZED ROCK FRAGMENTS, TR SAND***		
10	S-5	15 15 15 24				
				11.0		
				GRAVEL-SIZED SHALE FRAGMENTS (DECOMPOSED ROCK)		
	S-6	100/3"		13.1		AUGER REFUSAL AT 13.1 FT
				END OF BORING AT 13.25'		
15						
20						
25						
30						
35						

DRN. CC
CKD. JPB

TEST BORING LOG

PROJECT: FLAT CREEK SOLAR
LOCATION: MONTGOMERY COUNTY, NY

BORING **B-104**
G.S. ELEV.
FILE 427281.2022.GEOT
SHEET 1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NE			
DEPTH	HOUR	DATE	ELAPSED TIME

▽
▼

METHOD OF ADVANCING BOREHOLE					
a	FROM	0.0 '	TO	2.7 '	
d	FROM	2.7 '	TO	5.5 '	

DRILLER B. FLETCHER
HELPER RYAN
INSPECTOR R. DEPOLO
DATE STARTED 06/30/2022
DATE COMPLETED 06/30/2022

DEPTH	A	B	C	DESCRIPTION	REC	REMARKS
	S-1	2 3 22 17	▨	***LT BROWN SILTY CLAY, SM GRAVEL-SIZED ROCK FRAGMENTS, SM SAND***		
	S-2	26 100/2"	▨ 3.0			
	S-3	100/5"	▨	***SHALE FRAGMENTS, TR LIMESTONE (DECOMPOSED ROCK)***		
5			5.5			
				END OF BORING AT 5.5'		AUGER REFUSAL AT 5.5 FT; BORING OFFSET ~15 FT AWAY CONFIRMED REFUSAL
10						
15						
20						
25						
30						
35						

DRN. CC
CKD. JPB

TEST BORING LOG

PROJECT: FLAT CREEK SOLAR
LOCATION: MONTGOMERY COUNTY, NY

BORING	**B-105**
G.S. ELEV.	
FILE	427281.2022.GEOT
SHEET	1 OF 1

GROUNDWATER DATA

FIRST ENCOUNTERED NE ▽

DEPTH	HOUR	DATE	ELAPSED TIME

▼

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER RYAN
INSPECTOR R. DEPOLO
DATE STARTED 06/27/2022
DATE COMPLETED 06/27/2022

DEPTH	A	B	C	DESCRIPTION	REC	REMARKS
	S-1	2 3 4 6				
	S-2	6 12 14 22		***LT BROWN CLAY, TR SAND, TR GRAVEL-SIZED ROCK FRAGMENTS WITH COBBLES***		
5						
	S-3	14 16 21 20		5.5		
	S-4	26 30 26 31				
10	S-5	11 26 59 56		***GRAY-BLACK SILTY CLAY, SM GRAVEL-SIZED ROCK FRAGMENTS, TR SAND***		
15				15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

DRN. CC
CKD. JPB

TEST BORING LOG

BORING	**B-106**
G.S. ELEV.	
FILE	427281.2022.GEOT
SHEET	1 OF 1

PROJECT: FLAT CREEK SOLAR

LOCATION: MONTGOMERY COUNTY, NY

GROUNDWATER DATA

FIRST ENCOUNTERED NE

DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER RYAN
INSPECTOR R. DEPOLO
DATE STARTED 06/27/2022
DATE COMPLETED 06/27/2022

DEPTH	A	B	C	DESCRIPTION	REC	REMARKS
	S-1	2 5 6 6		***ORANGE-BROWN SILT, TR ROOTS*** 2.0		
	S-2	5 7 12 12		***LT BROWN CLAY, TR TO SM F/M/C SAND, TR GRAVEL-SIZED ROCK FRAGMENTS***		
5	S-3	5 7 5 7		7.0		
	S-4	8 14 16 18				
10	S-5	12 41 32 48		***BROWN/WHITE CLAY, TR SAND, TR GRAVEL-SIZED SHALE FRAGMENTS*** 12.5		
15	S-6	4 15 12 16		***GRAY-BLACK SILTY CLAYEY F/M/C SAND, SM GRAVEL-SIZED SHALE FRAGMENTS*** 15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

DRN. CC
CKD. JPB

TEST BORING LOG

BORING **B-107**
G.S. ELEV.
FILE 427281.2022.GEOT
SHEET 1 OF 1

PROJECT: FLAT CREEK SOLAR
LOCATION: MONTGOMERY COUNTY, NY

GROUNDWATER DATA

FIRST ENCOUNTERED 5.5 ' ▽

DEPTH	HOUR	DATE	ELAPSED TIME

▼

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER RYAN
INSPECTOR R. DEPOLO
DATE STARTED 06/29/2022
DATE COMPLETED 06/29/2022

DEPTH	A	B	C	DESCRIPTION	REC	REMARKS
	S-1	3 5 6 7		***LT BROWN SILT, SM F/M/C SAND, TR GRAVEL-SIZED ROCK FRAGMENTS, TR CLAY***		
	S-2	6 6 7 7				
5 ▽	S-3	3 3 5 9		6.0		
	S-4	10 13 100/1"		***LT BROWN F/M/C SANDY SILTY CLAY, TR TO SM GRAVEL-SIZED ROCK FRAGMENTS WITH COBBLES***		
10	S-5	10 20 24 31		10.5		
				BLACK CLAY, SM GRAVEL-SIZED ROCK FRAGMENTS WITH COBBLES		
15	S-6	7 7 22 20		15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

DRN. CC
CKD. JPB

TEST BORING LOG

PROJECT: FLAT CREEK SOLAR
LOCATION: MONTGOMERY COUNTY, NY

BORING	**B-108**
G.S. ELEV.	
FILE	427281.2022.GEOT
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NE			
DEPTH	HOUR	DATE	ELAPSED TIME

▽ ▼

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER RYAN
INSPECTOR R. DEPOLO
DATE STARTED 06/27/2022
DATE COMPLETED 06/27/2022

DEPTH	A	B	C	DESCRIPTION	REC	REMARKS
	S-1	2 4 8 7	▨	*LT BROWN SILTY CLAY, TR TO SM SAND, TR GRAVEL-SIZED ROCK FRAGMENTS* 2.0		
	S-2	13 14 25 33	▨	*LT BROWN CLAY, SM GRAVEL-SIZED ROCK FRAGMENTS*		
5	S-3	8 9 10 15	▨			
	S-4	18 16 24 16	▨	8.0		
10	S-5	18 27 56 57	▨	*LT BROWN-ORANGE SILTY CLAY, SM GRAVEL-SIZED ROCK FRAGMENTS WITH POSSIBLE COBBLES*		
			▨	13.0		
15	S-6	10 33 33 33	▨	*GRAY-BLACK CLAY, SM GRAVEL-SIZED SHALE FRAGMENTS (DECOMPOSED ROCK)* 15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

DRN. CC
CKD. JPB

TEST BORING LOG

PROJECT: FLAT CREEK SOLAR

LOCATION: MONTGOMERY COUNTY, NY

BORING	**B-109**
G.S. ELEV.	
FILE	427281.2022.GEOT
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NE			
DEPTH	HOUR	DATE	ELAPSED TIME

▽

▼

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER RYAN
INSPECTOR R. DEPOLO
DATE STARTED 06/27/2022
DATE COMPLETED 06/27/2022

DEPTH	A	B	C	DESCRIPTION	REC	REMARKS
	S-1	3 6 7 8				
	S-2	7 16 21 12		***LT BROWN SANDY SILTY CLAY, SM F/M/C SAND, TR GRAVEL-SIZED ROCK FRAGMENTS***		
5	S-3	4 5 10 15	6.0			
	S-4	13 21 33 47	7.5	***DARK BROWN-GRAY SILTY CLAY, SM SAND, TR TO SM GRAVEL-SIZED ROCK FRAGMENTS WITH COBBLES***		
10	S-5	10 15 33 27		***BLACK/GRAY SILTY CLAYEY F/M/C SAND, SM GRAVEL-SIZED ROCK FRAGMENTS WITH COBBLES***		
			13.5	***BLACK ROCK FRAGMENTS, SM SILTY CLAY (DECOMPOSED ROCK)***		
15			15.0	***END OF BORING AT 15'***		
20						
25						
30						
35						

DRN. CC
CKD. JPB

TEST BORING LOG

PROJECT: FLAT CREEK SOLAR
LOCATION: MONTGOMERY COUNTY, NY

BORING B-111
G.S. ELEV.
FILE 427281.2022.GEOT
SHEET 1 OF 1

GROUNDWATER DATA

FIRST ENCOUNTERED NE

DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	2.7 '
d	FROM	2.7 '	TO	4.6 '

DRILLER B. FLETCHER
HELPER RYAN
INSPECTOR R. DEPOLO
DATE STARTED 06/27/2022
DATE COMPLETED 06/27/2022

DEPTH	A	B	C	DESCRIPTION	REC	REMARKS
	S-1	4 5 5 6		***LT BROWN F/M/C SANDY CLAY, SM GRAVEL***		
	S-2	6 100/2"	3.0			
	S-3	100/4"	4.6	***BROWN-GRAY SHALE ROCK FRAGMENTS (DECOMPOSED ROCK)***		
5				***END OF BORING AT 4.6'***		AUGER REFUSAL AT 4.6 FT; OFFSET BORING INSTALLED ~15 FT AWAY TO CONFIRM REFUSAL
10						
15						
20						
25						
30						
35						

DRN. CC
CKD. JPB

TEST BORING LOG

PROJECT: FLAT CREEK SOLAR
LOCATION: MONTGOMERY COUNTY, NY

BORING **B-112**
G.S. ELEV.
FILE 427281.2022.GEOT
SHEET 1 OF 1

GROUNDWATER DATA

FIRST ENCOUNTERED NE

DEPTH	HOUR	DATE	ELAPSED TIME

▽
▼

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	5.0 '
d	FROM	5.0 '	TO	5.2 '

DRILLER B. FLETCHER
HELPER RYAN
INSPECTOR R. DEPOLO
DATE STARTED 06/28/2022
DATE COMPLETED 06/28/2022

DEPTH	A	B	C	DESCRIPTION	REC	REMARKS
	S-1	1 3 6 9	▨	***BROWN SILTY CLAY, SM GRAVEL-SIZED ROCK FRAGMENTS, TR SAND***		
	S-2	6 6 12 8	▨			
			4.5			
5	S-3	11 69 100/0"	5.2	***GRAY-BLACK SILTY CLAYEY GRAVEL-SIZED ROCK FRAGMENTS, SM F/M/C SAND***		AUGER REFUSAL AT 5.2 FT; OFFSET BORING INSTALLED ~19-20 FT AWAY TO CONFIRM REFUSAL
				END OF BORING AT 5.2'		
10						
15						
20						
25						
30						
35						

DRN. CC
CKD. JPB

TEST BORING LOG

PROJECT: FLAT CREEK SOLAR
LOCATION: MONTGOMERY COUNTY, NY

BORING **B-113**
G.S. ELEV.
FILE 427281.2022.GEOT
SHEET 1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NE			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM 0.0 '	TO 5.2 '		

DRILLER B. FLETCHER
HELPER RYAN
INSPECTOR R. DEPOLO
DATE STARTED 06/28/2022
DATE COMPLETED 06/28/2022

DEPTH		A	B	C		DESCRIPTION	REC	REMARKS
		S-1	2 4 5 6	▨		***BROWN-BLACK CLAY, TR SAND, TR GRAVEL-SIZED ROCK FRAGMENTS, TR ORGANICS***		
		S-2	14 25 44 34	▨	3.5	***BLACK SILTY GRAVEL-SIZED SHALE FRAGMENTS (DECOMPOSED ROCK)***		
5		S-3	22 66 100/2"	▨	5.2			
						END OF BORING AT 5.2'		AUGER REFUSAL AT 5.2 FT; OFFSET BORING INSTALLED ~15 FT AWAY TO CONFIRM REFUSAL
10								
15								
20								
25								
30								
35								

DRN. CC
CKD. JPB

NEW PROJECTS TEST BORING LOG 427281 FLAT CREEK SOLAR.GPJ SITE BLAUVELT.GDT 9/9/22

TEST BORING LOG

PROJECT: FLAT CREEK SOLAR
LOCATION: MONTGOMERY COUNTY, NY

BORING	**B-114**
G.S. ELEV.	
FILE	427281.2022.GEOT
SHEET	1 OF 1

GROUNDWATER DATA

FIRST ENCOUNTERED NE

DEPTH	HOUR	DATE	ELAPSED TIME

▽ ▼

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER RYAN
INSPECTOR R. DEPOLO
DATE STARTED 06/28/2022
DATE COMPLETED 06/28/2022

DEPTH	A	B				C	DESCRIPTION	REC	REMARKS
	S-1	3	6	5	7		*LT BROWN F/M SANDY SILTY CLAY*		
	S-2	4	8	7	7				
5							5.0		
	S-3	3	6	10	13		*BLACK SILTY CLAY, SM GRAVEL-SIZED ROCK FRAGMENTS, TR SAND*		
	S-4	12	20	21	20				
10	S-5	6	10	17	27				
							12.5		
							BLACK CLAY, SM GRAVEL-SIZED ROCK FRAGMENTS		
15	S-6	9	9	11	11		15.0		
							END OF BORING AT 15'		
20									
25									
30									
35									

DRN. CC
CKD. JPB

NEW PROJECTS TEST BORING LOG 427281 FLAT CREEK SOLAR.GPJ SITE BLAUVELT.GDT 9/9/22

TEST BORING LOG

BORING	**B-115**
G.S. ELEV.	
FILE	427281.2022.GEOT
SHEET	1 OF 1

PROJECT: FLAT CREEK SOLAR

LOCATION: MONTGOMERY COUNTY, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED 4.0 ' ▽			
DEPTH	HOUR	DATE	ELAPSED TIME
▼			

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	4.9 '
d	FROM	4.9 '	TO	5.2 '

DRILLER	B. FLETCHER
HELPER	RYAN
INSPECTOR	R. DEPOLO
DATE STARTED	06/28/2022
DATE COMPLETED	06/28/2022

DEPTH		A	B	C	DESCRIPTION	REC	REMARKS
		S-1	1 5 8 12		***LT BROWN SILTY CLAY, SM SAND, TR GRAVEL-SIZED ROCK FRAGMENTS***		
				3.0			
▽		S-2	7 15 14 12		***BLACK SILTY-CLAY, SM GRAVEL SIZED SHALE FRAGMENTS (DECOMPOSED ROCK)***		
5				5.2			AUGER REFUSAL AT 5.2 FT; OFFSET BORING INSTALLED ~15 FT AWAY TO CONFIRM REFUSAL
		S-3	33 100/5"		***END OF BORING AT 5.2'***		
10							
15							
20							
25							
30							
35							

DRN.	CC
CKD.	JPB

TRC

TEST BORING LOG

PROJECT: FLAT CREEK SOLAR
LOCATION: MONTGOMERY COUNTY, NY

BORING	**B-116**
G.S. ELEV.	
FILE	427281.2022.GEOT
SHEET	1 OF 1

GROUNDWATER DATA

FIRST ENCOUNTERED 22.5 ' ▽

DEPTH	HOUR	DATE	ELAPSED TIME

▼

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	35.0 '

DRILLER B. FLETCHER
HELPER RYAN
INSPECTOR R. DEPOLO
DATE STARTED 06/29/2022
DATE COMPLETED 06/29/2022

DEPTH	A	B	C	DESCRIPTION	REC	REMARKS
	S-1	2 8 8 7		*BROWN SILT, TR SAND, TR GRAVEL-SIZED ROCK FRAGMENTS* 2.0		
	S-2	7 13 15 13				
5	S-3	5 5 7 8		*BROWN SILTY CLAY, TR TO SM SAND, TR GRAVEL-SIZED ROCK FRAGMENTS*		
	S-4	7 8 10 10		8.0		
10	S-5	8 22 24 29		*BROWN-GRAY CLAY, SM GRAVEL-SIZED ROCK FRAGMENTS, SM SAND* 13.0		
15	S-6	21 25 14 15				
20	S-7	8 8 10 11		*GRAY/BLACK CLAY, SM GRAVEL-SIZED ROCK FRAGMENTS, TR SAND* 22.0		
▽						
25	S-8	5 8 12 13		*GRAY SILTY CLAYEY SAND, TR TO SM GRAVEL-SIZED ROCK FRAGMENTS* 28.0		
30	S-9	3 8 7 9		*GRAY/BLACK SANDY CLAY, SM GRAVEL-SIZED ROCK FRAGMENTS* 33.0		
35	S-10	4 10 12 17		*GRAY SILTY CLAYEY SAND, TR TO SM GRAVEL-SIZED ROCK FRAGMENTS* 35.0		

END OF BORING AT 35'

DRN. CC
CKD. JPB

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
▨	Clay with Low Plasticity
▨	Silty Clay
▨	USCS Low Plasticity Sandy Clay
▩	Highly Weathered or Decomposed Rock
▥	Silt with Low Plasticity
▨	Silty, Clayey Sand

Symbol	Description
Misc. Symbols	
▽	Water table first encountered
▼	Water table first reading after drilling
◭	Water table second reading after drilling
◮	Water table third reading after drilling
NR	Not Recorded
MH	Moh's Hardness
Sample Type	
▯	Split Barrel

Lab Symbols

FINES = Fines %

LL = Liquid Limit %

PI = Plasticity Index %

U_c = Unconfined Compressive Strength

W/V = Unit Weight

Notes:

COLUMN A) Soil sample number.

COLUMN B) FOR SOIL SAMPLE (ASTM D 1586): indicates number of blows obtained for each 6 ins. penetration of the standard split-barrel sampler. FOR ROCK CORING (ASTM D2113): indicates percent recovery (REC) per run and rock quality designation (RQD). RQD is the % of rock pieces that are 4 ins. or greater in length in a core run.

COLUMN C) Strata symbol as assigned by the geotechnical engineer.

DESCRIPTION) Description including color, texture and classification of subsurface material as applicable (see Descriptive Terms). Estimated depths to bottom of strata as interpolated from the borings are also shown.

DESCRIPTIVE TERMS: F = fine M = medium C = coarse

RELATIVE PROPORTIONS:

-Descriptive Term-	-Symbol-	-Est. Percentages-
Trace	TR	1-10
Trace to Some	TR to SM	10-15
Some	SM	15-30
Silty, Sandy, Clayey, Gravelly	-	30-40
And	and	40-50

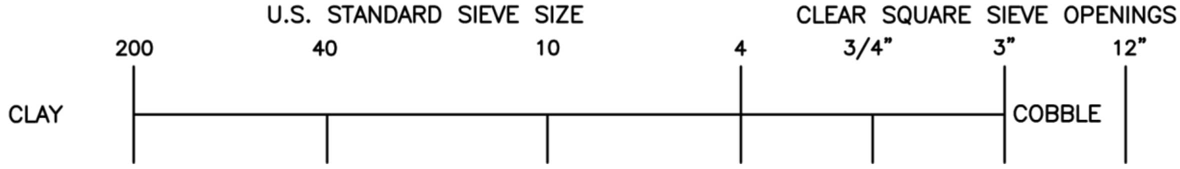
REMARKS) Special conditions or test data as noted during investigation. Note that W.O.P. indicates water observation pipes.

* Free water level as noted may not be indicative of daily, seasonal, tidal, flood, and/or long term fluctuations.

SILTS AND CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

PRIMARY DIVISIONS			SOIL TYPE		SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (Less than 5% Fines)	GW		Well graded gravels, gravel–sand mixtures, little or no fines
			GP		Poorly graded gravels or gravel–sand mixtures, little or no fines
		GRAVEL WITH FINES	GM		Silty gravels, gravel–sand–silt mixtures, plastic fines
			GC		Clayey gravels, gravel–sand–clay mixtures, plastic fines
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (Less than 5% Fines)	SW		Well graded sands, gravelly sands, little or no fines
			SP		Poorly graded sands or gravelly sands, little or no fines
		SANDS WITH FINES	SM		Silty sands, sand–silt–mixtures, non–plastic fines
			SC		Clayey sands, sand–clay mixtures, plastic fines
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50 %		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL		Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50 %		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH		Inorganic clays of high plasticity, fat clays
			OH		Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			PT		Peat and other highly organic soils

DEFINITION OF TERMS



TRC

METHODS AND TOOLS FOR **ADVANCING BOREHOLES**

a - Continuous Sampling

b - Finger type rotary cutter head 6 in. diameter (open hole)

d - Drilled in casing 3 3/8 in. ID; 8 in. OD (hollow-stem auger)

e - Drilled in casing 2 1/2 in. ID; 6 1/4 in. OD (hollow-stem auger)

f - Driven flush joint casing (BW) - 2 3/8 in. ID; 2 7/8 in. OD (300 lb. hammer, 18 in. drop)

g - Driven flush joint casing (NW) - 3 in. ID; 3 1/2 in. OD (300 lb. hammer, 18 in. drop)

h - Tricone Roller Bit - 2 3/8 in. or 2 7/8 in.

i - Drilling Mud (Slurry Method)

c_1 - Double tube diamond core barrel (BX) : core size: 1.6 in.
hole size: 2.36 in.

c_2 - Double tube diamond core barrel (NX) : core size: 2.0 in.
hole size: 2.98 in.

c_3 - 4 in. thin walled diamond bit

c_4 - 6 in. thin walled diamond bit

METHODS AND TOOLS FOR **TESTING AND SAMPLING SOILS AND/OR ROCKS**

Penetration test and split-barrel sampling of soils, ASTM D1586

140 lb. hammer, 30 in. drop. recording number of blows obtained for each 6 in. penetration usually for a total of 18 in. penetration of the standard 2 in. O.D. and 1 3/8 in. I.D. split-barrel sampler. Penetration resistance (N) is the total number of blows required for the second and third 6 in. penetration.

Thin walled tube sampling, ASTM D1587

Samples are obtained by pressing thin-walled steel, brass or aluminum tubes into soil. Standard thin-walled steel tubes:

O.D. in.	2	3
I.D. in.	1.94	2.87

Diamond core drilling, ASTM D2113

Diamond core drilling is used to recover intact samples of rock and some hard soils generally with the use of a:

BWM double tube core barrel
NWM double tube core barrel

FIELD RESISTIVITY DATA

TRC Engineers, Inc.

Field Resistivity Testing

Wenner Method

Project:	Flat Creek Solar	Project No.:	427281
Location:	Montgomery County, NY	Client:	SED NY Holding
Site Conditions:	__ Dry _X_Wet __ Ideal	Date Completed:	6/27/2022
Ambient Temperature:	80 ° F	Operator:	R. DePolo
Rain storms previous day- Yes		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 1	2.5	1.00	479	
	5.0	0.45	431	
	10.0	0.22	421	
	20.0	0.11	421	
	40.0	0.02	153	

Line 1 Direction: ______ N-S

______ NE_SW

__X__ E-W

______ NW-SE

Test Location

B-109

TRC Engineers, Inc.

Field Resistivity Testing

Wenner Method

Project:	Flat Creek Solar	Project No.:	427281
Location:	Montgomery County, NY	Client:	SED NY Holding
Site Conditions:	__ Dry _X_Wet __ Ideal	Date Completed:	6/27/2022
Ambient Temperature:	80° F	Operator:	R. DePolo
Rain storms previous day- Yes		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 2	2.5	1.33	637	
	5.0	0.72	689	
	10.0	0.43	823	
	20.0	0.13	498	
	40.0	0.05	383	

Line 2 Direction: __X__ N-S

______ NE_SW

______ E-W

______ NW-SE

Test Location

B-109

TRC Engineers, Inc.

Field Resistivity Testing

Wenner Method

Project:	Flat Creek Solar	Project No.:	427281
Location:	Montgomery County, NY	Client:	SED NY Holding
Site Conditions:	__ Dry ___Wet _X_ Ideal	Date Completed:	6/29/2022
Ambient Temperature:	85 ° F	Operator:	R. DePolo
Rain storms previous day- No		Helper:	NA

Test	Electrode Spacing (ft)	Resistance Φ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 1	2.5	4.35	2,083	
	5.0	1.75	1,676	
	10.0	0.65	1,245	
	20.0	0.45	1,724	
	40.0	0.14	1,072	

Line 1 Direction:
________ N-S
________ NE_SW
___X___ E-W
________ NW-SE

Test Location

B-106

TRC Engineers, Inc.

Field Resistivity Testing

Wenner Method

Project:	Flat Creek Solar	Project No.:	427281
Location:	Montgomery County, NY	Client:	SED NY Holding
Site Conditions:	__ Dry ___Wet _X_ Ideal	Date Completed:	6/29/2022
Ambient Temperature:	85° F	Operator:	R. DePolo
Rain storms previous day- No		Helper:	NA

Test	Electrode Spacing (ft)	Resistance Φ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 2	2.5	5.35	2,561	
	5.0	2.12	2,030	
	10.0	1.13	2,164	
	20.0	0.65	2,490	
	40.0	0.23	1,762	

Line 2 Direction:
___X___ N-S
________ NE_SW
________ E-W
________ NW-SE

Test Location

B-106

LABORATORY DATA

SUMMARY OF LABORATORY TEST DATA

Project Name: Flat Creek Solar
Montgomery County, NY
Client Name: SED NY Holdings, LLC
TRC Project #: 427281.2022.GEOT

SAMPLE IDENTIFICATION			Soil Group (USCS System)	Moisture Content (%)	GRAIN SIZE DISTRIBUTION				PLASTICITY			
Source #	Sample #	Depth (ft)			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)
B-101	S-3	4.0-6.0	CL*	17.8	-	-	-		22	14	8	0.5
B-101	S-5	8.0-10.0	CL	16.4	2.1	25.0	72.9		30	15	15	0.1
B-101 TO B-104	BULK 1	1.0-5.0	CL	11.1	11.3	28.6	60.1		32	14	18	-0.2
B-102	S-4	6.0-8.0	CL*	15.1	-	-	-		24	13	11	0.2
B-103	S-3	4.0-6.0	CL*	18.1	-	-	-		21	12	9	0.7
B-103	S-4	6.0-8.0	CL-ML*	12.0	-	-	-		19	15	4	-0.8
B-104	S-1	0.0-2.0	CL-ML*	8.9	-	-	-		27	21	6	-2.0
B-105	S-2	2.0-4.0	CL*	11.5	-	-	-		25	17	8	-0.7
B-106	S-2	2.0-4.0	CL*	12.6	-	-	-		20	11	9	0.2

DRAWN BY: TBT 09/08/22

CHECKED BY: JPB 09/08/22

SUMMARY OF LABORATORY TEST DATA

Project Name: Flat Creek Solar
Montgomery County, NY
Client Name: SED NY Holdings, LLC
TRC Project #: 427281.2022.GEOT

SAMPLE IDENTIFICATION			Soil Group (USCS System)	Moisture Content (%)	GRAIN SIZE DISTRIBUTION				PLASTICITY			
Source #	Sample #	Depth (ft)			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)
B-106	S-6	13.0-15.0	SC-SM	7.3	26.5	32.6	40.9		-	-	-	-
B-106 TO B-108	BULK 2	1.0-5.0	CL	16.0	7.7	21.7	70.6		32	15	17	0.1
B-107	S-5	8.0-10.0	CL-ML	11.4	10.6	23.6	65.8		-	-	-	-
B-109	S-3	4.0-6.0	CL-ML	13.3	10.5	33.1	56.4		-	-	-	-
B-109	S-5	8.0-10.0	SC-SM	9.8	18.5	34.8	46.7		-	-	-	-
B-111 TO B-115	BULK 3	1.0-5.0	CL	16.3	20.2	21.9	57.9		36	19	17	-0.2
B-112	S-3	4.0-5.0	GC-GM	15.5	36.7	26.7	36.6		-	-	-	-
B-114	S-4	6.0-8.0	CL-ML*	13.2	-	-	-		22	16	6	-0.5
B-116	S-3	4.0-6.0	CL-ML*	11.6	-	-	-		19	12	7	-0.1
B-116	S-5	8.0-10.0	CL-ML*	9.8	-	-	-		17	11	6	-0.2

DRAWN BY: TBT 09/08/22

CHECKED BY: JPB 09/08/22

SUMMARY OF LABORATORY TEST DATA

Project Name: Flat Creek Solar
Montgomery County, NY
Client Name: SED NY Holdings, LLC
TRC Project #: 427281.2022.GEOT

SAMPLE IDENTIFICATION			Soil Group (USCS System)	Moisture Content (%)	GRAIN SIZE DISTRIBUTION				PLASTICITY			
Source #	Sample #	Depth (ft)			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)
B-116	S-8	23.0-25.0	SC-SM	8.3	15.0	39.0	46.0		14	8	6	0.1

**USCS based on fines only. A gradation analysis was not requested to be completed.*

DRAWN BY: TBT 09/08/22

CHECKED BY: JPB 09/08/22

SUMMARY OF LABORATORY TEST DATA

Project Name: Flat Creek Solar
Montgomery County, NY
Client Name: SED NY Holdings, LLC
TRC Project #: 427281.2022.GEOT

SAMPLE IDENTIFICATION			COMPACTION CHARACTERISTICS			Thermal Resistivity (°C-cm/W)			
Source #	Sample #	Depth (ft)	Type of Test	Maximum Density (PCF)	Optimum Moisture Content (%)	Wet	Dry	Moisture Content (%)	Dry Density (pcf)
B-101 TO B-104	BULK 1	1.0-5.0	D698	117.3	13.2	57.8	129.6	13.2	105.6
B-106 TO B-108	BULK 2	1.0-5.0	D698	104.4	18.3	62.7	171.2	18.3	94.0
B-111 TO B-115	BULK 3	1.0-5.0	D698	112.2	15.2	55.5	98.8	15.2	101.0

DRAWN BY: TBT 09/08/22

CHECKED BY: JPB 09/08/22

SUMMARY OF LABORATORY TEST DATA

Project Name: Flat Creek Solar
Montgomery County, NY
Client Name: SED NY Holdings, LLC
TRC Project #: 427281.2022.GEOT

CORROSION & ELECTRICAL RESISTIVITY

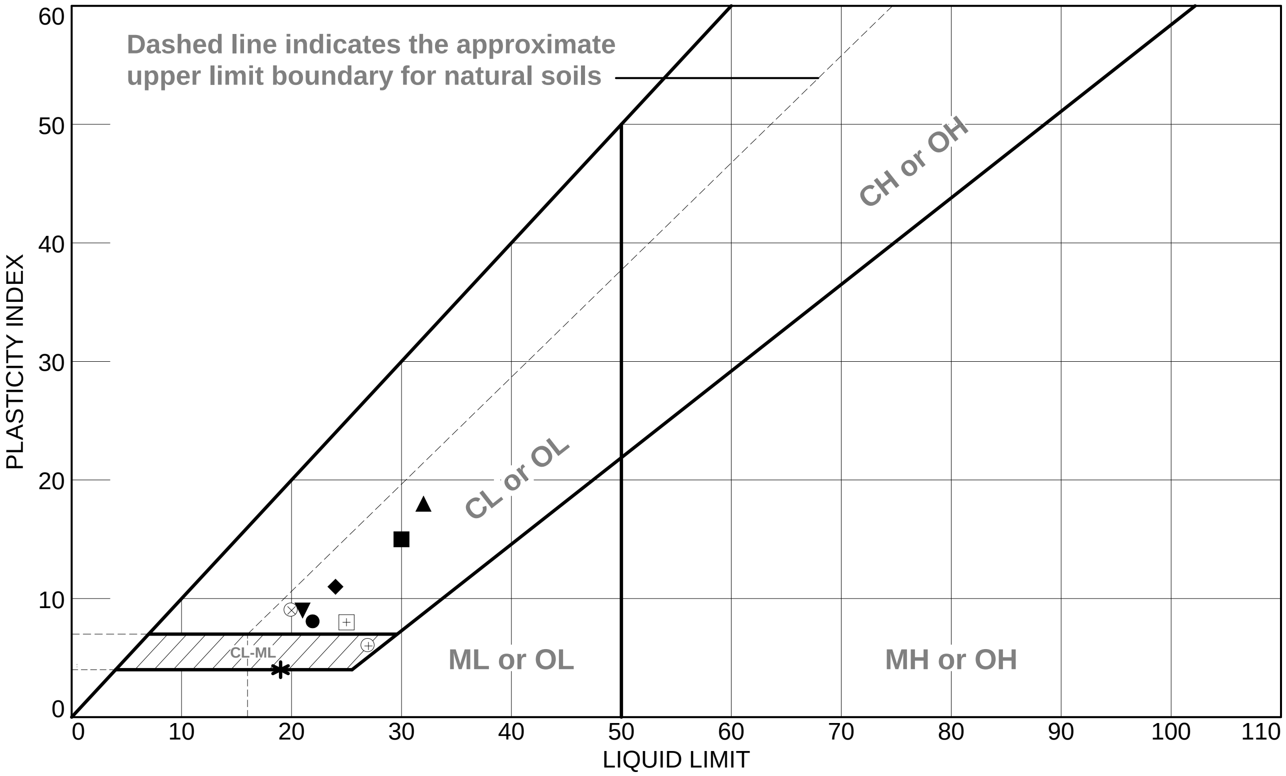
Source #	Sample #	Depth (ft)	pH, ASTM D4972 (in H_20)	pH, ASTM D4972 (in $CaCl_2$)	Water Soluble Sulfates, ASTM D516 (mg/kg)	Chlorides, ASTM D512 (mg/kg)	Sulfides, AWWA 4500-S D (mg/kg)	Oxidation Reduction, ASTM D1498 (mV)	Resistivity, ASTM G187 (ohm-cm)
B-101 TO B-104	BULK 1	1.0-5.0	7.6	6.8	85	50	Nil	+662	2,500
B-106 TO B-108	BULK 2	1.0-5.0	7.5	6.7	93	60	Nil	+670	2,200
B-111 TO B-115	BULK 3	1.0-5.0	7.4	6.8	65	40	Nil	+658	3,485

Nil = <1.0 mg/kg

DRAWN BY: TBT 09/08/22

CHECKED BY: JPB 09/08/22

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

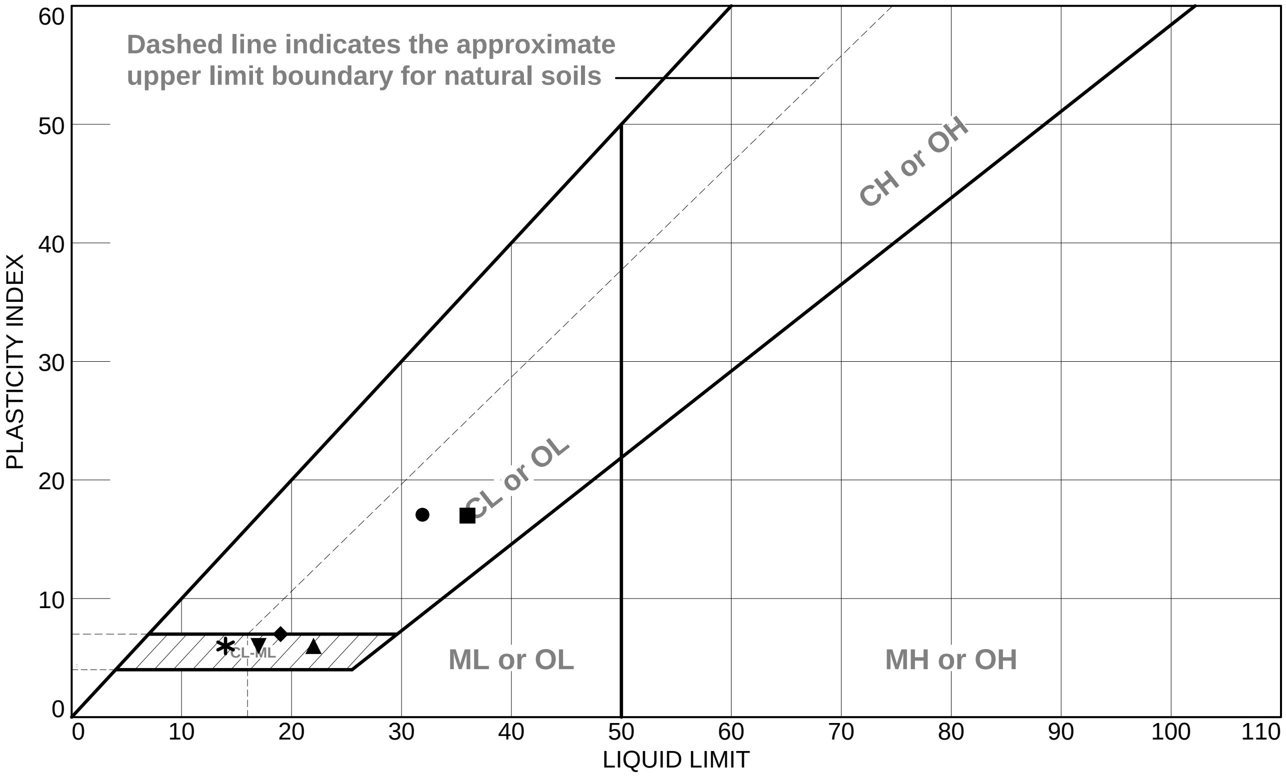
	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	LIQUIDITY INDEX	USCS
●	B-101	S-3	4.0-6.0 FT	17.8	14	22	8	0.5	CL*
■	B-101	S-5	8.0-10.0 FT	16.4	15	30	15	0.1	CL
▲	B-101 TO B-104	BULK 1	1.0-5.0 FT	11.1	14	32	18	-0.2	CL
◆	B-102	S-4	6.0-8.0 FT	15.1	13	24	11	0.2	CL*
▼	B-103	S-3	4.0-6.0 FT	18.1	12	21	9	0.7	CL*
✱	B-103	S-4	6.0-8.0 FT	12.0	15	19	4	-0.8	CL-ML*
⊕	B-104	S-1	0.0-2.0 FT	8.9	21	27	6	-2.0	CL-ML*
⊞	B-105	S-2	2.0-4.0 FT	11.5	17	25	8	-0.7	CL*
⊗	B-106	S-2	2.0-4.0 FT	12.6	11	20	9	0.2	CL*

TRC
Engineers, Inc.
Mt. Laurel, NJ

Client: SUNEAST DEVELOPMENT, LLC
Project: SUNEAST FLAT CREEK SOLAR

Project No.: 427281.2022.GEOT **Figure** 1

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	LIQUIDITY INDEX	USCS
●	B-106 TO B-108	BULK 2	1.0-5.0 FT	16.0	15	32	17	0.1	CL
■	B-111 TO B-115	BULK 3	1.0-5.0 FT	16.3	19	36	17	-0.2	CL
▲	B-114	S-4	6.0-8.0 FT	13.2	16	22	6	-0.5	CL-ML*
◆	B-116	S-3	4.0-6.0 FT	11.6	12	19	7	-0.1	CL-ML*
▼	B-116	S-5	8.0-10.0 FT	9.8	11	17	6	-0.2	CL-ML*
∗	B-116	S-8	23.0-25.0 FT	8.3	8	14	6	0.1	SC-SM

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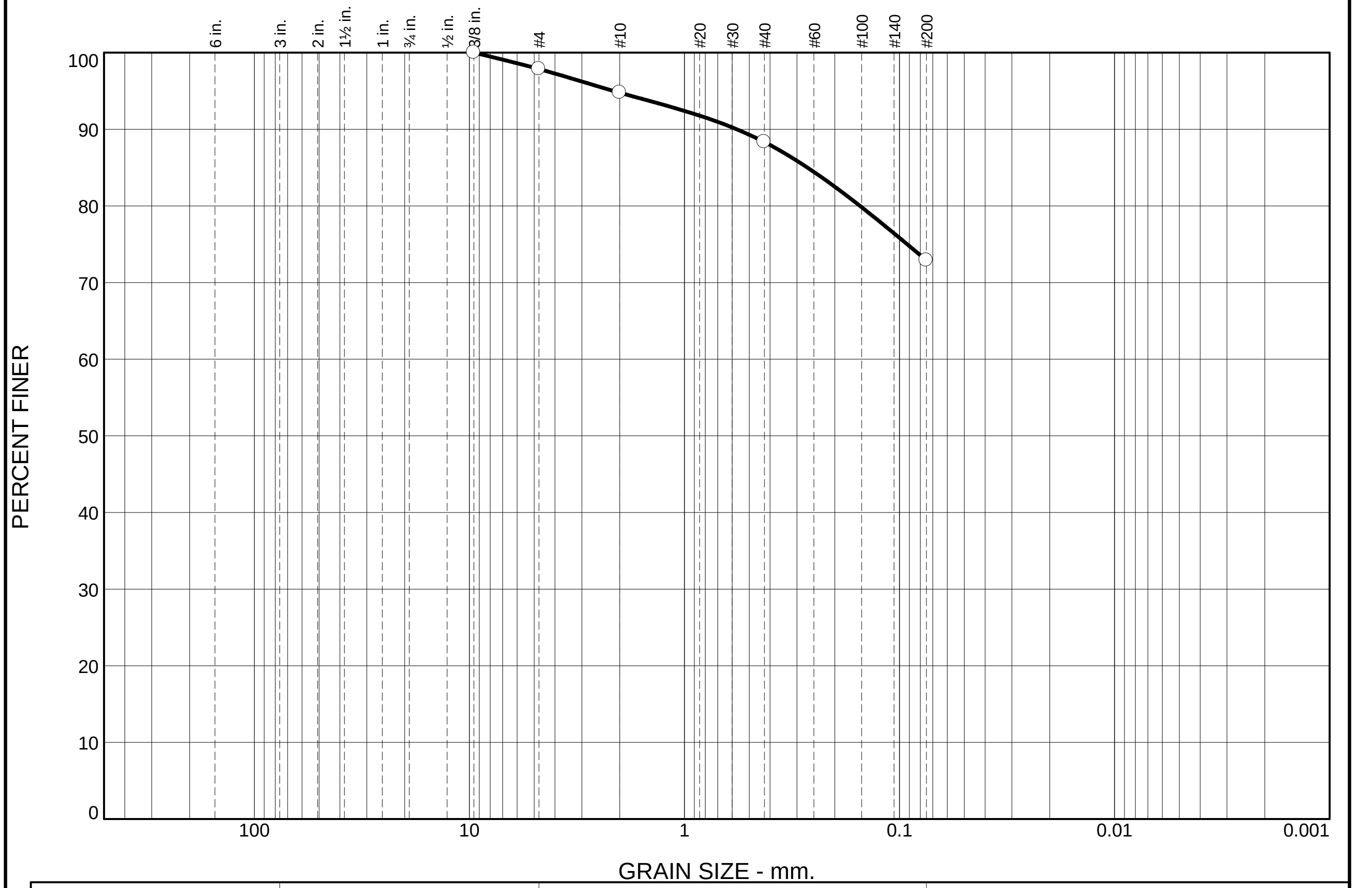
Mt. Laurel, NJ

Client: SUNEAST DEVELOPMENT, LLC
Project: SUNEAST FLAT CREEK SOLAR

Project No.: 427281.2022.GEOT **Figure** 2

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	2.1	3.1	6.5	15.4	72.9	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	30	15	0.2679							

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN LEAN CLAY WITH SAND	08/10/22	CL	16.4

Project No. 427281.2022.GEO **Client:** SUNEAST DEVELOPMENT, LLC

Project: SUNEAST FLAT CREEK SOLAR

○ **Source of Sample:** B-101 **Depth:** 8.0-10.0 FT **Sample Number:** S-5

Remarks:
○SAMPLE DESCRIPTION BASED ON USCS

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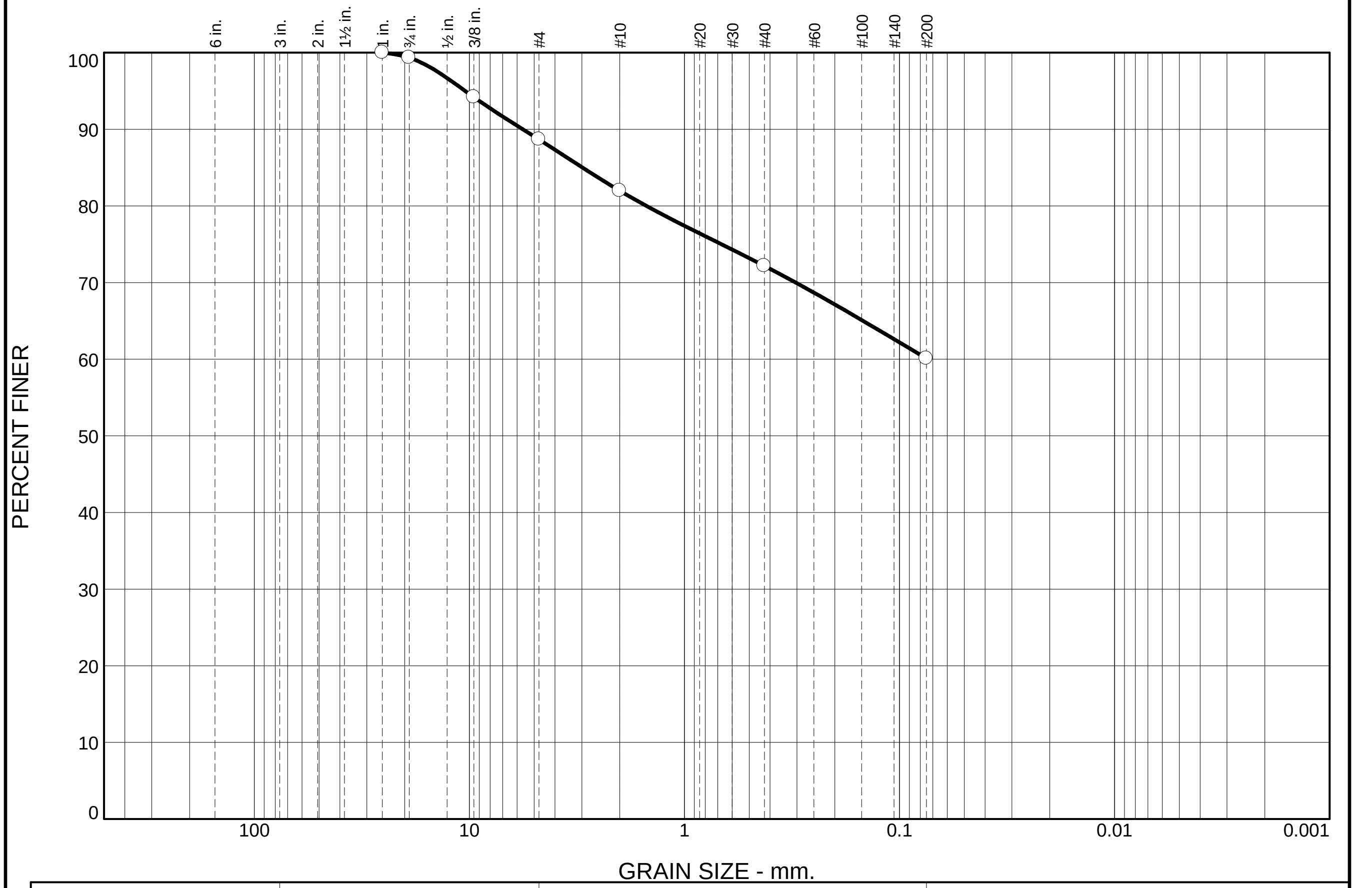
Figure 3

Tested By: EG 08/10/22 **Checked By:** JPB 08/25/22

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.7	10.6	6.7	9.8	12.1	60.1	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	32	14	2.9756							

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SANDY LEAN CLAY	08/09/22	CL	11.1

Project No. 427281.2022.GEO **Client:** SUNEAST DEVELOPMENT, LLC

Project: SUNEAST FLAT CREEK SOLAR

○ **Source:** B-101 TO B-104 **Depth:** 1.0-5.0 FT **Sample No.:** BULK 1

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS

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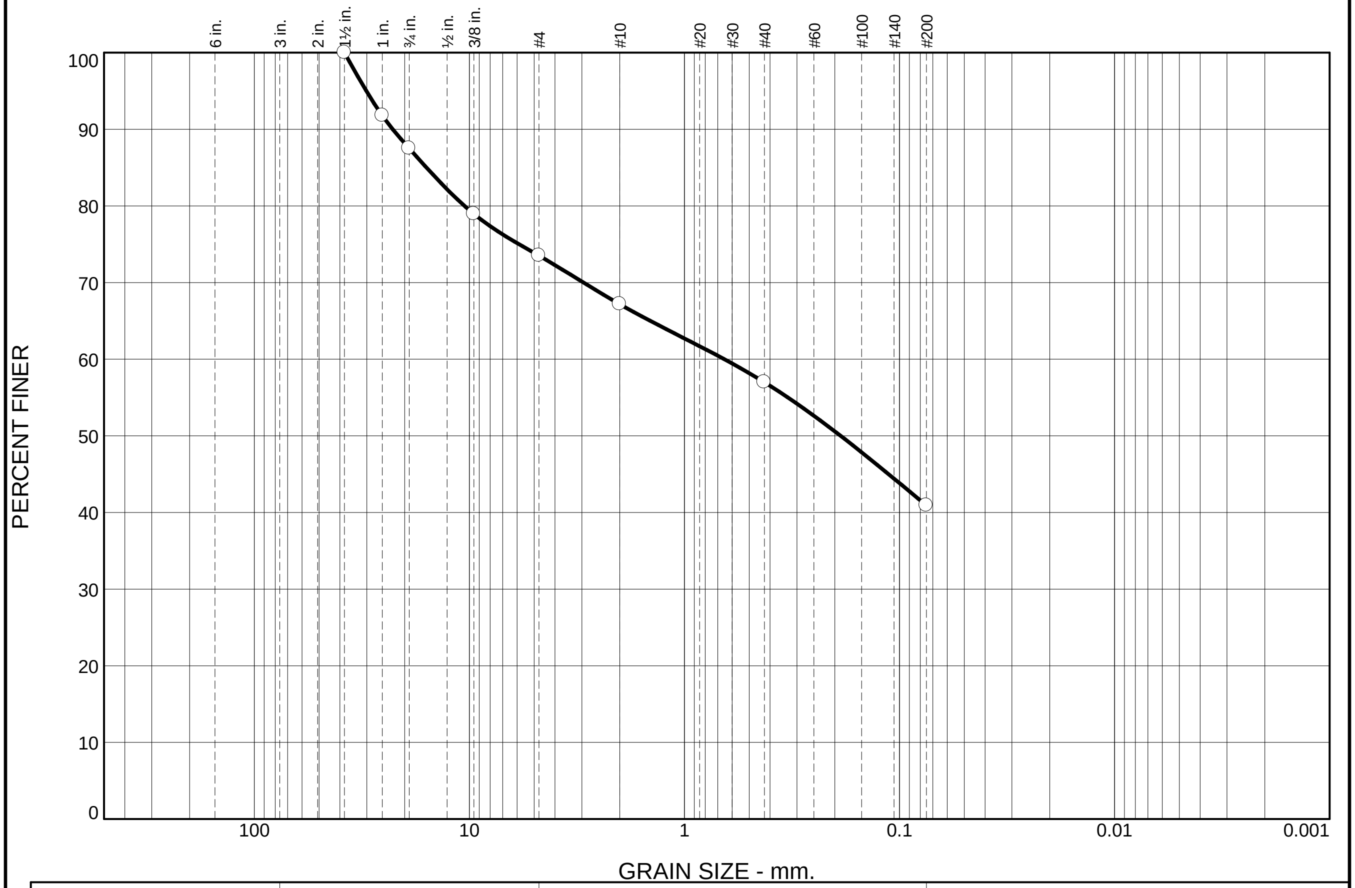
Figure 4

Tested By: JC 08/08/22 **Checked By:** JPB 08/25/22

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	12.5	14.0	6.3	10.2	16.1	40.9	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			15.8202	0.6526	0.1878					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ GRAY-BROWN SILTY, CLAYEY SAND WITH GRAVEL	08/11/22	SC-SM	7.3

Project No. 427281.2022.GEO **Client:** SUNEAST DEVELOPMENT, LLC

Project: SUNEAST FLAT CREEK SOLAR

○ **Source of Sample:** B-106 **Depth:** 13.0-15.0 FT **Sample Number:** S-6

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

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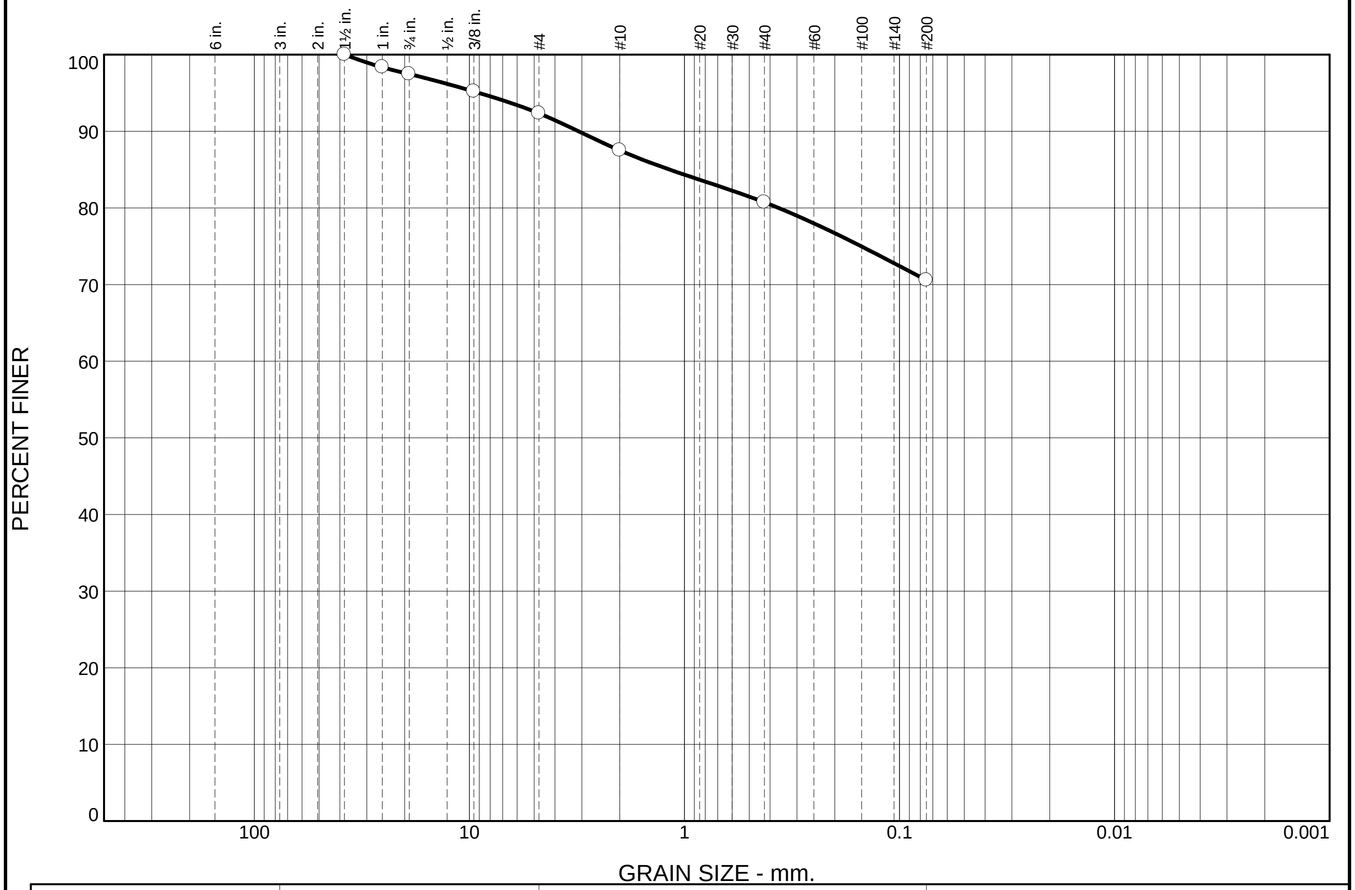
Figure 5

Tested By: JC 08/11/22 **Checked By:** JPB 08/23/22

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	2.5	5.2	4.8	6.8	10.1	70.6	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	32	15	1.1706							

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN LEAN CLAY WITH SAND	08/09/22	CL	16.0

Project No. 427281.2022.GEO **Client:** SUNEAST DEVELOPMENT, LLC

Project: SUNEAST FLAT CREEK SOLAR

○ **Source:** B-106 TO B-108 **Depth:** 1.0-5.0 FT **Sample No.:** BULK 2

Remarks:

○SAMPLE DESCRIPTION
BASED ON USCS

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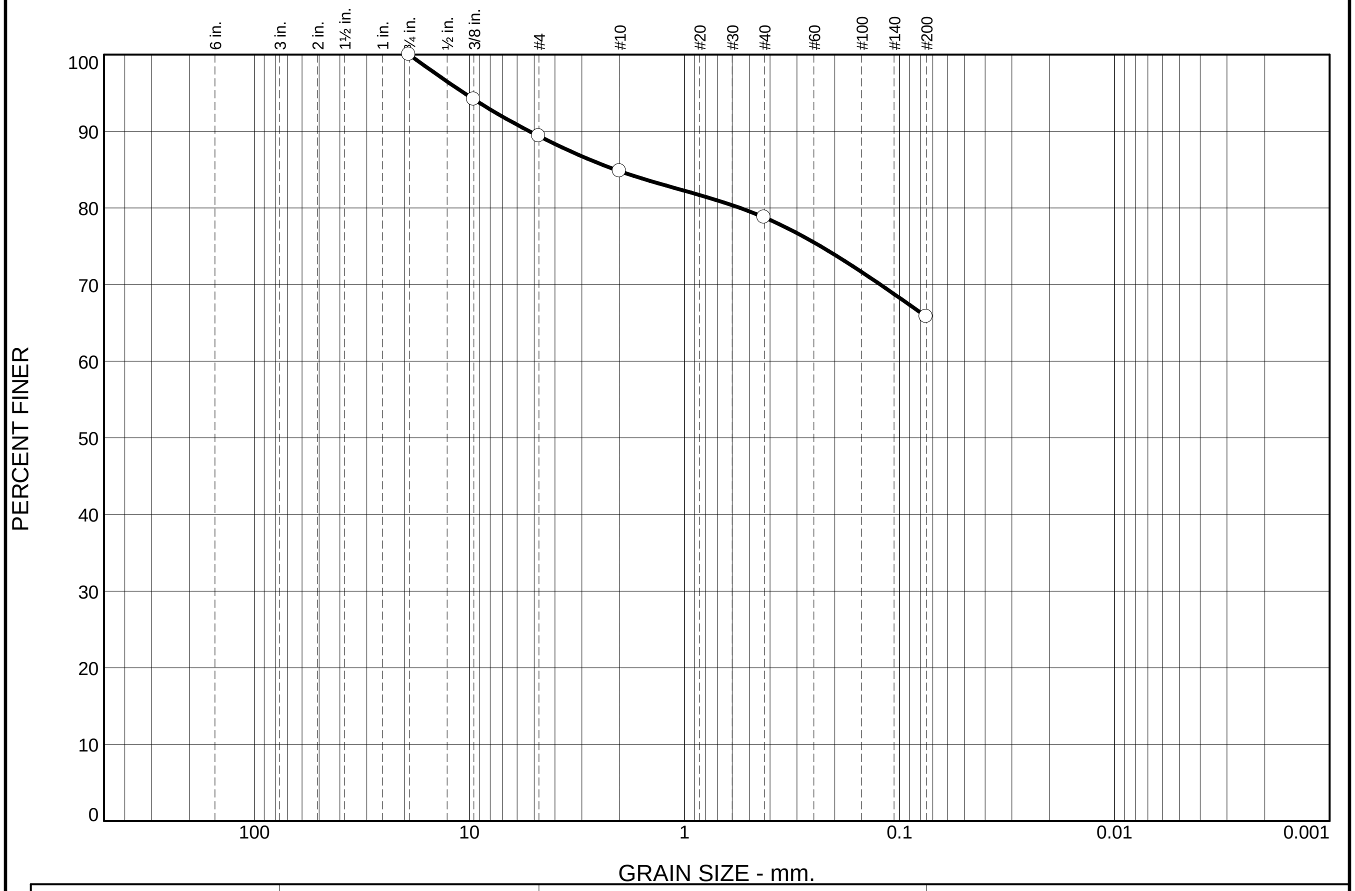
Figure 6

Tested By: JC 08/09/22 **Checked By:** JPB 08/25/22

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	10.6	4.6	6.0	13.0	65.8	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			2.0946							

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SANDY SILTY CLAY	08/11/22	CL-ML	11.4

Project No. 427281.2022.GE **Client:** SUNEAST DEVELOPMENT, LLC

Project: SUNEAST FLAT CREEK SOLAR

○ **Source of Sample:** B-107 **Depth:** 8.0-10.0 FT **Sample Number:** S-5

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

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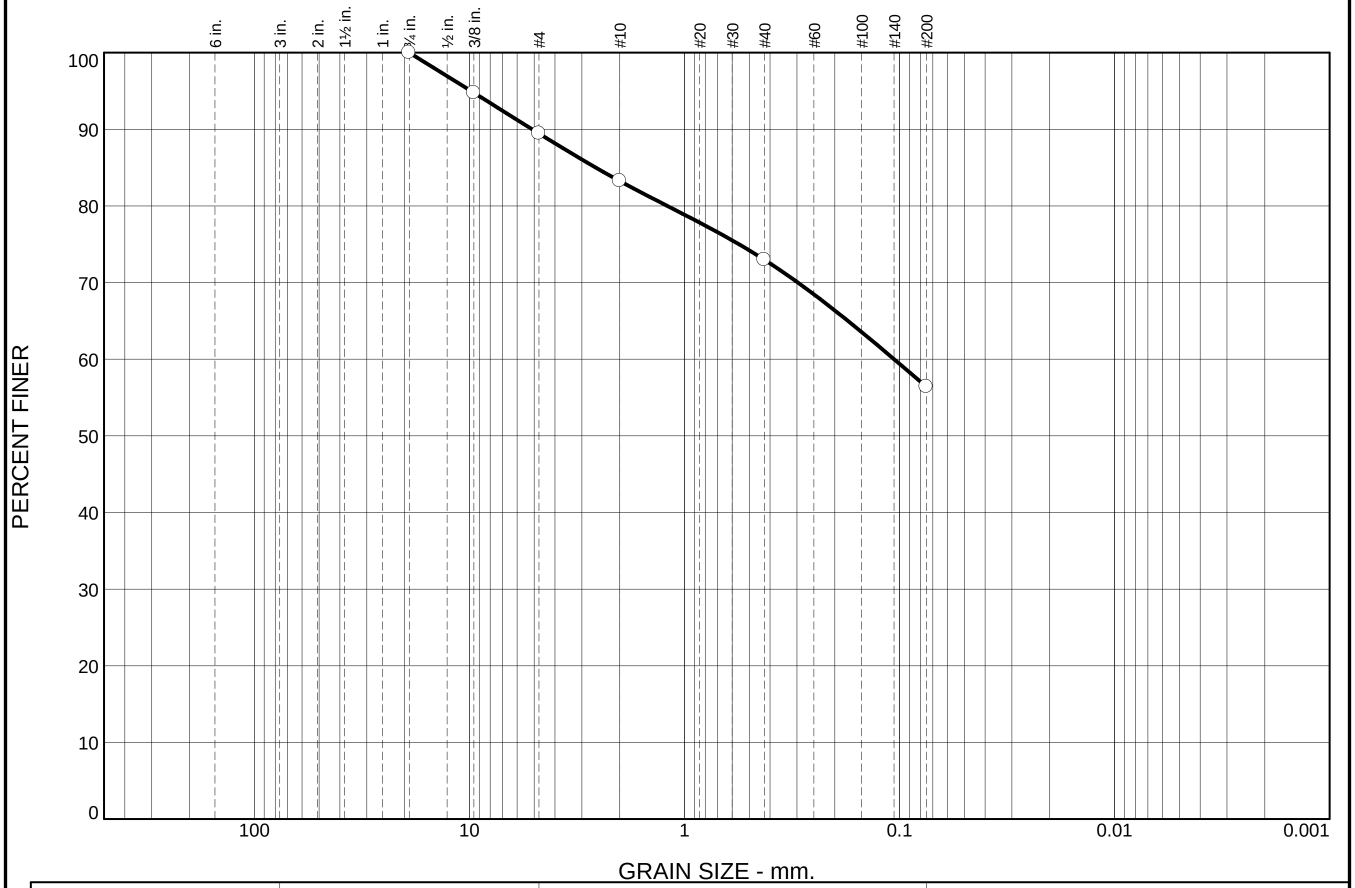
Figure 7

Tested By: JC 08/11/22 **Checked By:** JPB 08/23/22

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	10.5	6.2	10.3	16.6	56.4	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			2.5820	0.1059						

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SANDY SILTY CLAY	08/11/22	CL-ML	13.3

Project No. 427281.2022.GE **Client:** SUNEAST DEVELOPMENT, LLC

Project: SUNEAST FLAT CREEK SOLAR

○ **Source of Sample:** B-109 **Depth:** 4.0-6.0 FT **Sample Number:** S-3

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

TRC Engineers, Inc.

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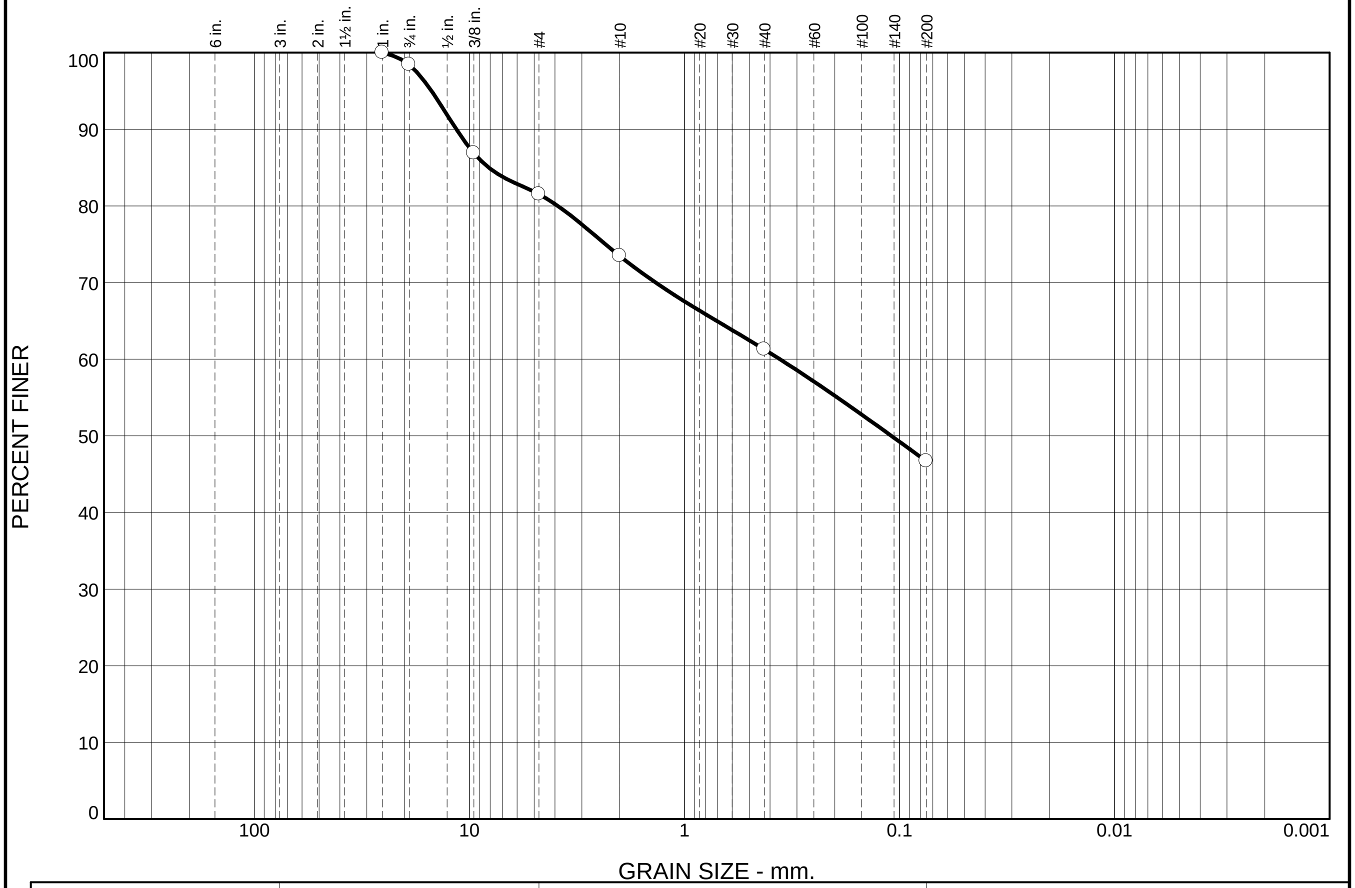
Figure 8

Tested By: JC 08/11/22 **Checked By:** JPB 08/23/22

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	1.6	16.9	8.0	12.2	14.6	46.7	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			8.1223	0.3599	0.1091					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ DARK BROWN SILTY, CLAYEY SAND WITH GRAVEL	08/11/22	SC-SM	9.8

Project No. 427281.2022.GEO **Client:** SUNEAST DEVELOPMENT, LLC

Project: SUNEAST FLAT CREEK SOLAR

○ **Source of Sample:** B-109 **Depth:** 8.0-10.0 FT **Sample Number:** S-5

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

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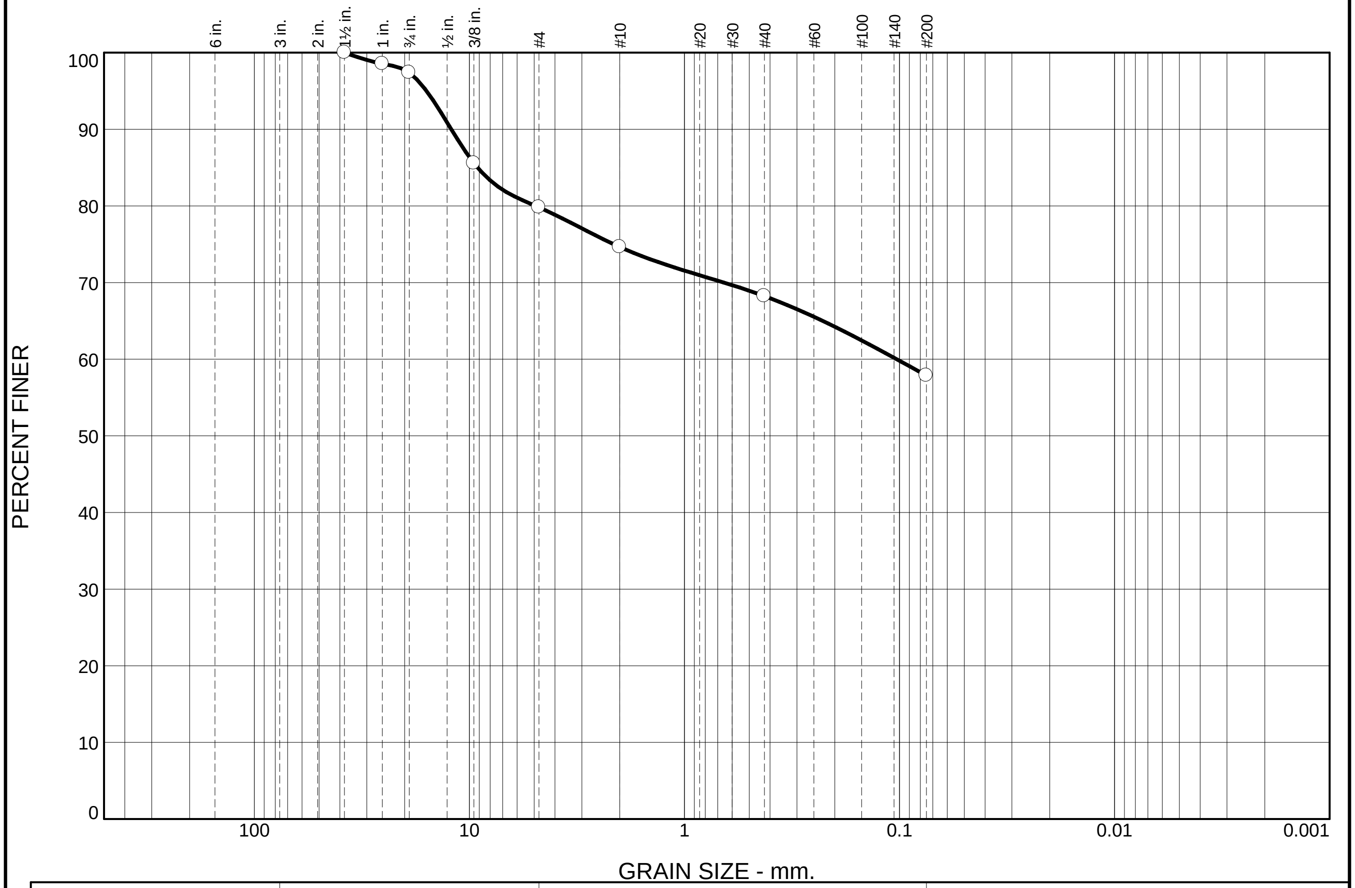
Figure 9

Tested By: JC 08/11/22 **Checked By:** JPB 08/23/22

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	2.6	17.6	5.2	6.4	10.3	57.9	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	36	19	9.1662	0.1031						

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SANDY LEAN CLAY WITH GRAVEL	08/09/22	CL	16.3

Project No. 427281.2022.GEO **Client:** SUNEAST DEVELOPMENT, LLC
Project: SUNEAST FLAT CREEK SOLAR

○ **Source:** B-111 TO B-115 **Depth:** 1.0-5.0 FT **Sample No.:** BULK 3

Remarks:
○SAMPLE DESCRIPTION
BASED ON USCS

TRC Engineers, Inc.

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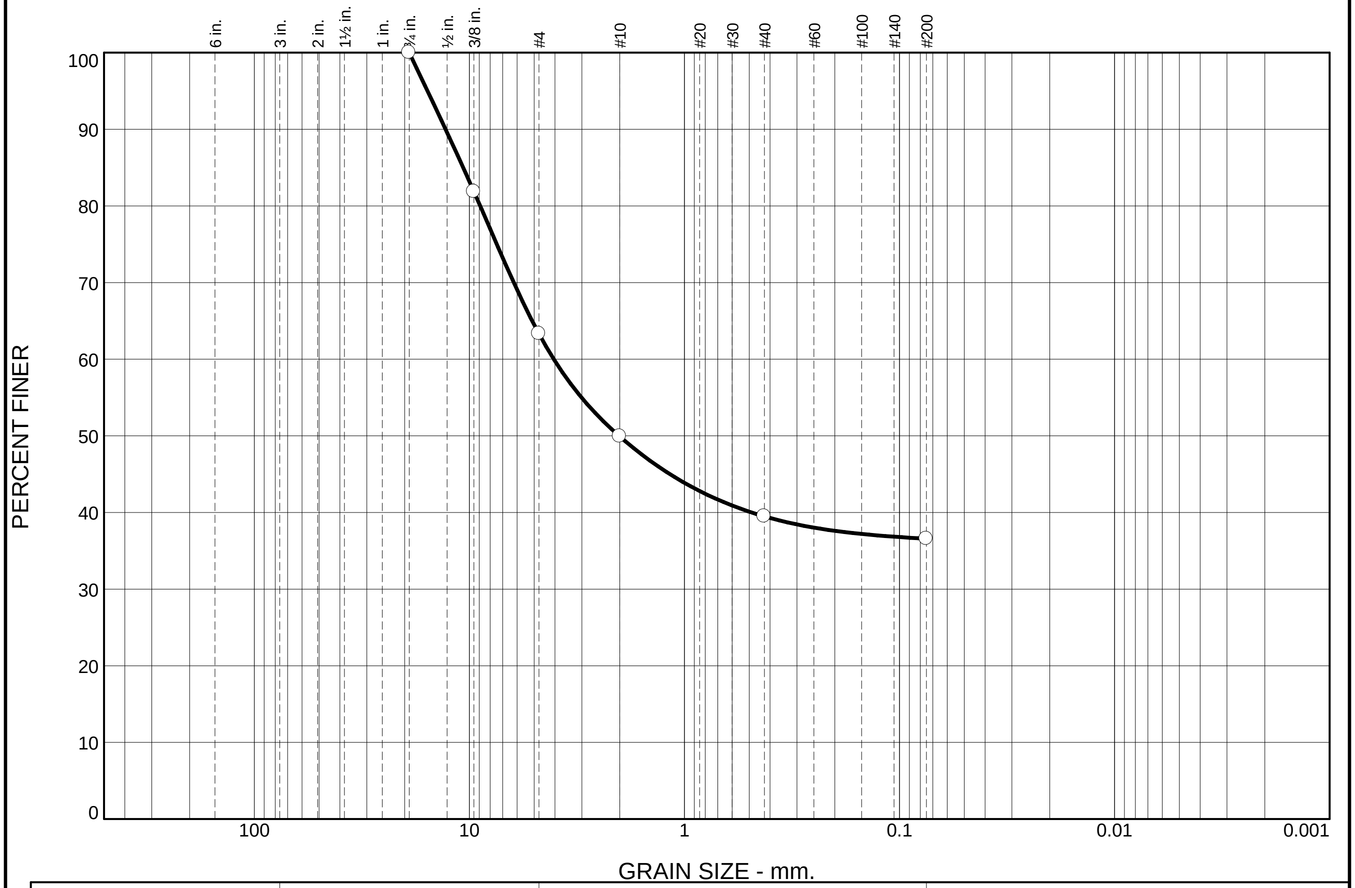
Figure 10

Tested By: JC 08/09/22 **Checked By:** JPB 08/25/22

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	36.7	13.4	10.4	2.9	36.6	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			10.6873	4.0503	2.0144					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ DARK BROWN SILTY CLAYEY GRAVEL WITH SAND	08/12/22	GC-GM	15.5

Project No. 427281.2022.GEO **Client:** SUNEAST DEVELOPMENT, LLC

Project: SUNEAST FLAT CREEK SOLAR

○ **Source of Sample:** B-112 **Depth:** 4.0-5.0 FT **Sample Number:** S-3

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

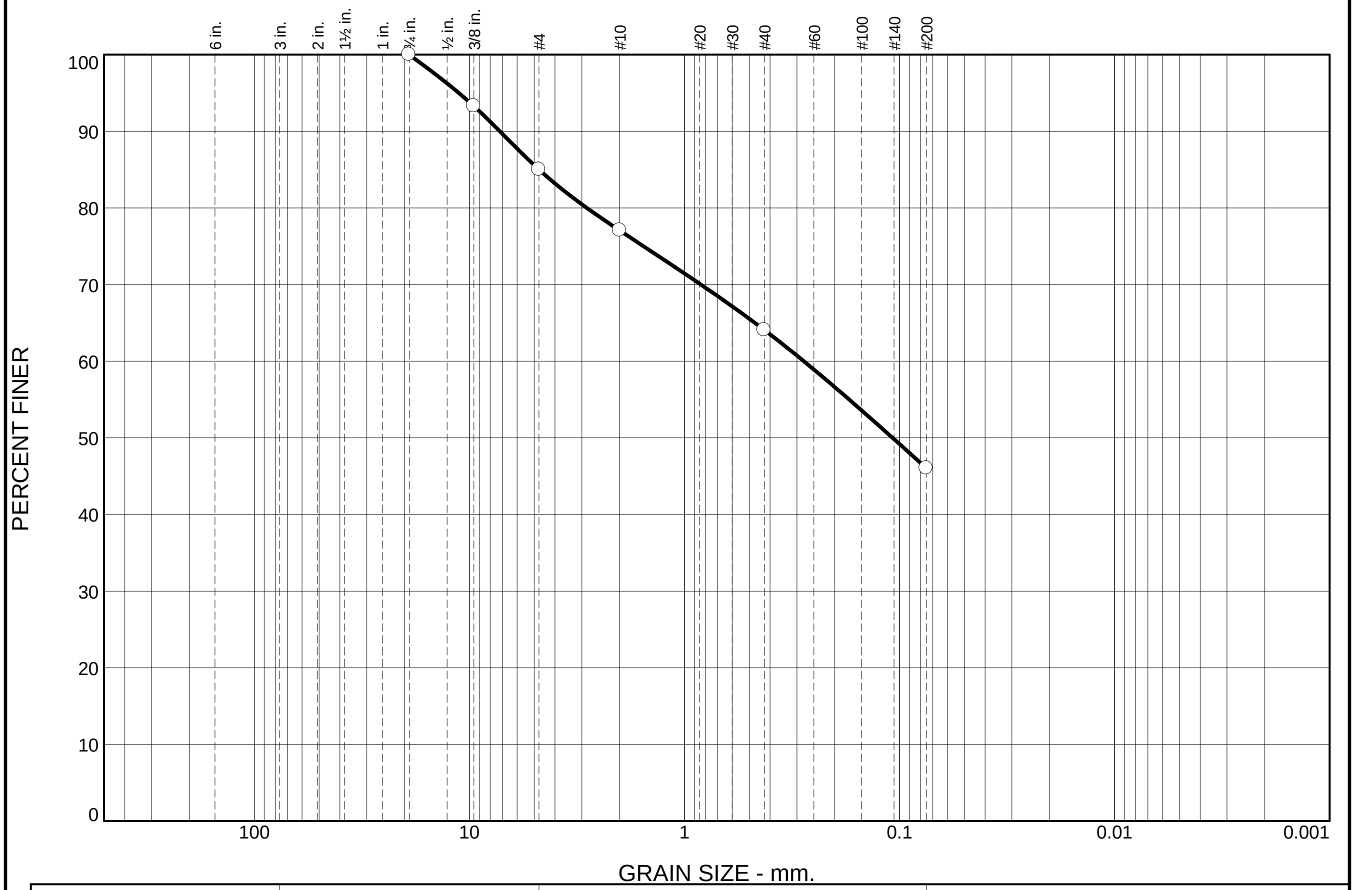
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 11

Tested By: JC 08/12/22 **Checked By:** JPB 08/23/22

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	15.0	7.9	13.0	18.1	46.0	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	14	8	4.7420	0.2785	0.1077					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ DARK BROWN SILTY, CLAYEY SAND WITH GRAVEL	08/10/22	SC-SM	8.3

Project No. 427281.2022.GEO **Client:** SUNEAST DEVELOPMENT, LLC
Project: SUNEAST FLAT CREEK SOLAR

○ **Source of Sample:** B-116 **Depth:** 23.0-25.0 FT **Sample Number:** S-8

Remarks:
○SAMPLE DESCRIPTION
BASED ON USCS

TRC Engineers, Inc.

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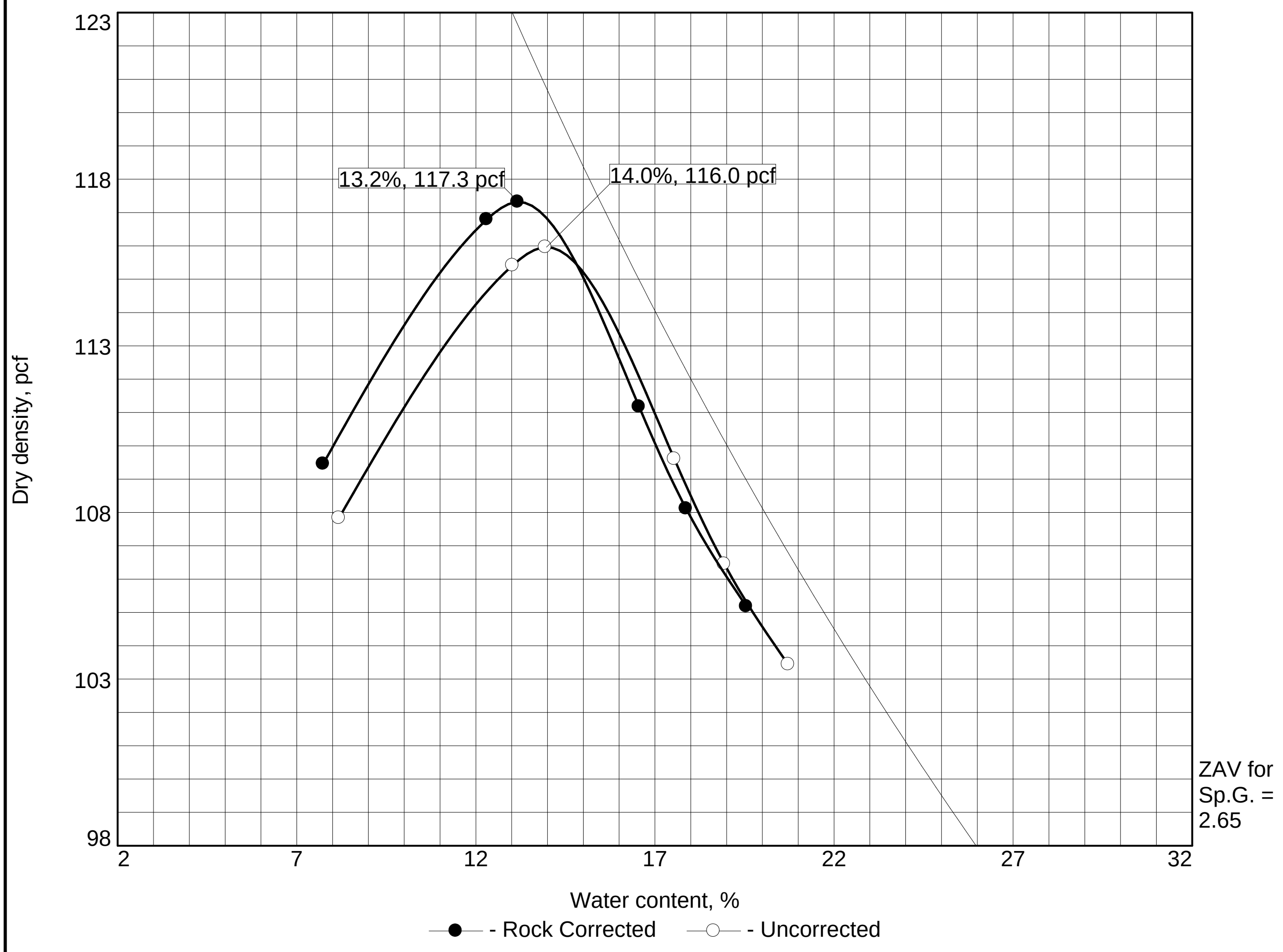
Figure 12

Tested By: JC 08/10/22 **Checked By:** JPB 08/23/22

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
1.0-5.0 FT	CL	A-6(8)	11.1		32	18	5.8	60.1

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 117.3 pcf	116.0 pcf
Optimum moisture = 13.2 %	14.0 %

MATERIAL DESCRIPTION

BROWN SANDY LEAN CLAY

Project No. 427281.2022.GEOT **Client:** SUNEAST DEVELOPMENT, LLC
Project: SUNEAST FLAT CREEK SOLAR

○ **Source of Sample:** B-101 TO B-104 **Sample Number:** BULK 1

Remarks:
SAMPLE DESCRIPTION BASED ON USCS

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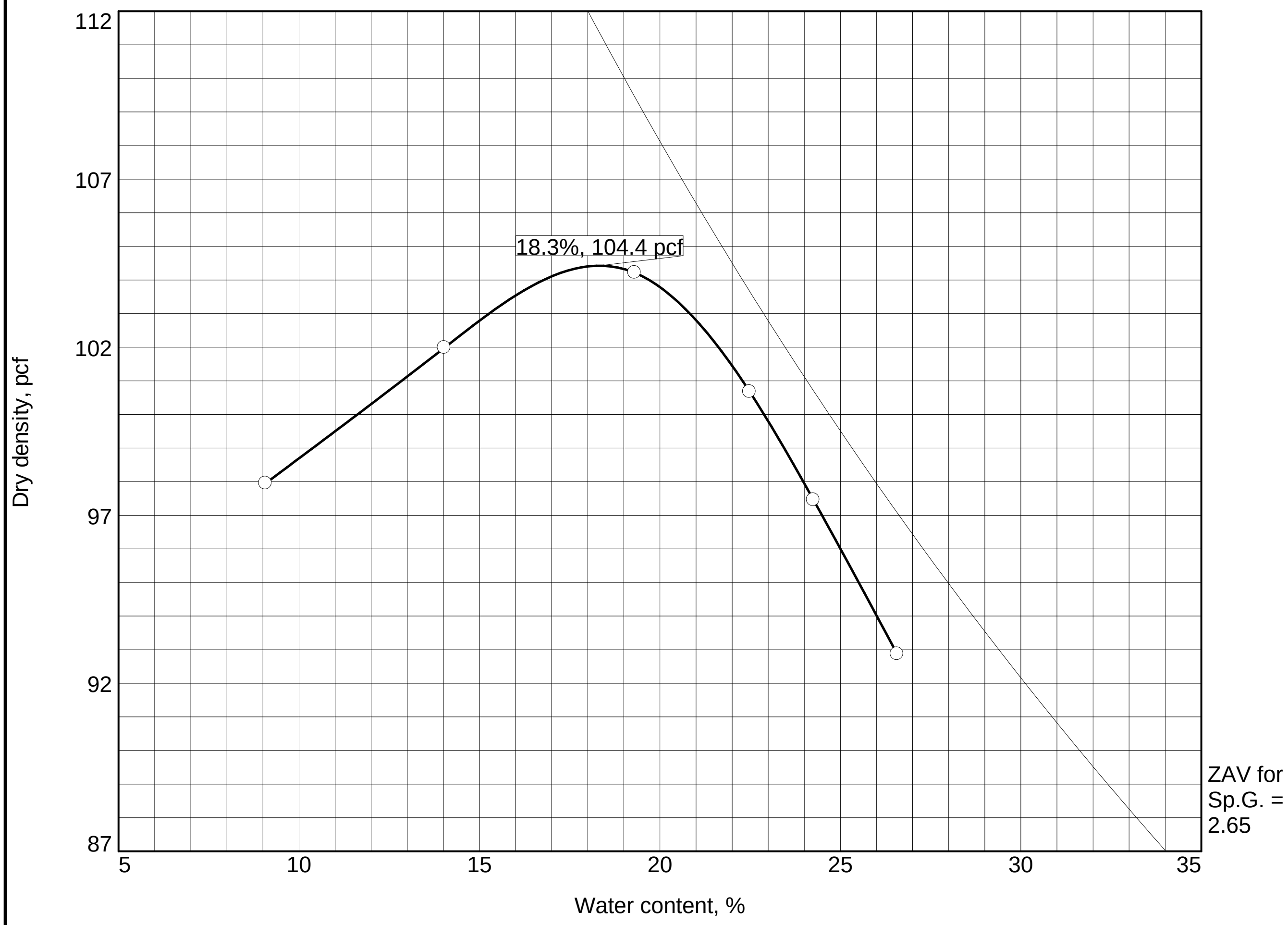
Figure 13

Tested By: JC 07/25/22 **Checked By:** JPB 08/25/22

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
1.0-5.0 FT	CL	A-6(10)	16.0		32	17	4.8	70.6

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 104.4 pcf Optimum moisture = 18.3 %	BROWN LEAN CLAY WITH SAND

Project No. 427281.2022.GEOT **Client:** SUNEAST DEVELOPMENT, LLC

Project: SUNEAST FLAT CREEK SOLAR

○**Source of Sample:** B-106 TO B-108 **Sample Number:** BULK 2

TRC Engineers, Inc.

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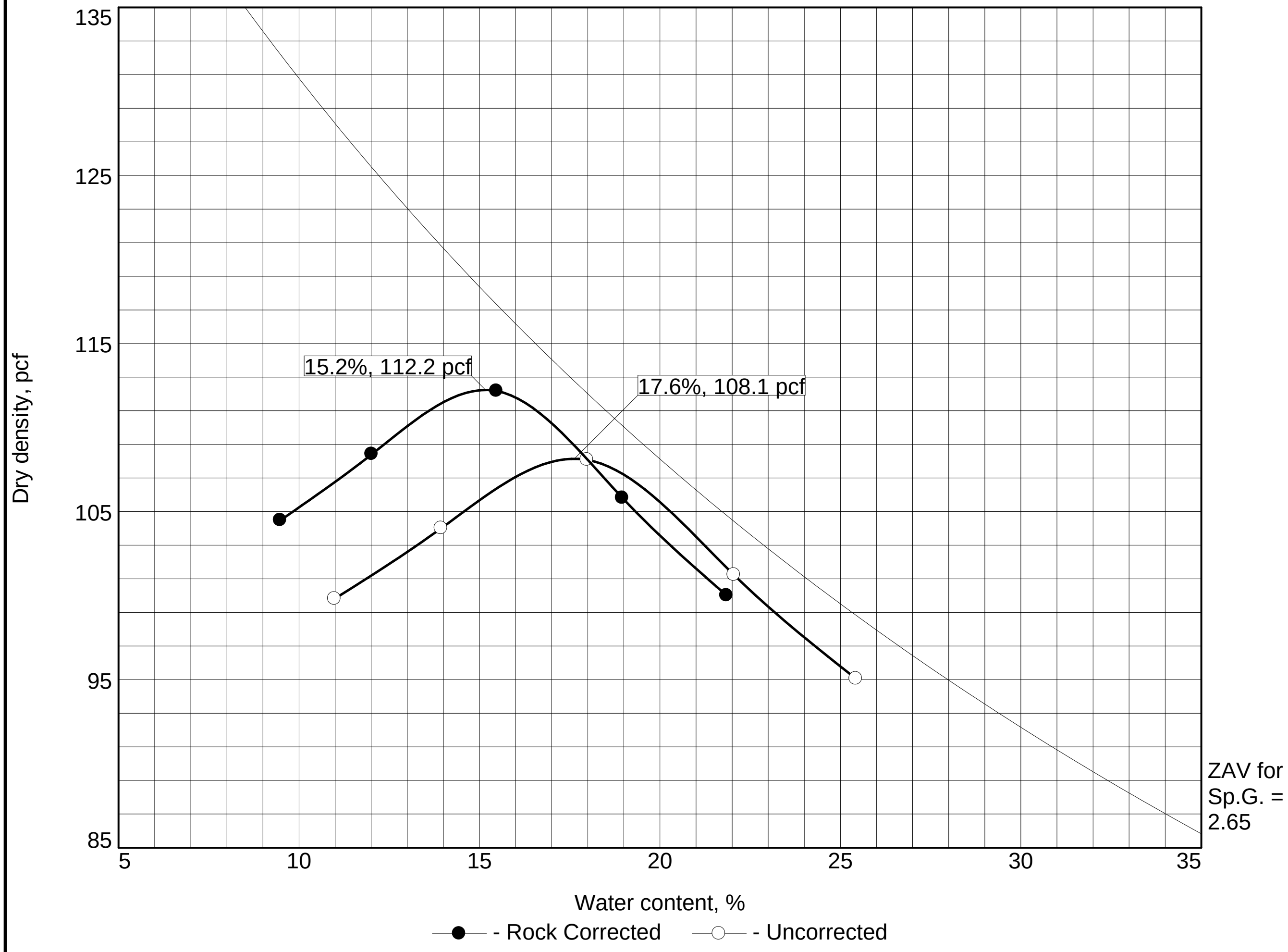
Remarks:

SAMPLE DESCRIPTION BASED ON USCS

Figure 14

Tested By: JC 08/05/22 **Checked By:** JPB 08/25/22

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
1.0-5.0 FT	CL	A-6(7)	16.3		36	17	14.4	57.9

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 112.2 pcf	108.1 pcf
Optimum moisture = 15.2 %	17.6 %

MATERIAL DESCRIPTION

BROWN SANDY LEAN CLAY WITH GRAVEL

Project No. 427281.2022.GEOT **Client:** SUNEAST DEVELOPMENT, LLC
Project: SUNEAST FLAT CREEK SOLAR

○ **Source of Sample:** B-111 TO B-115 **Sample Number:** BULK 3

Remarks:
SAMPLE DESCRIPTION BASED ON USCS

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Mt. Laurel, NJ

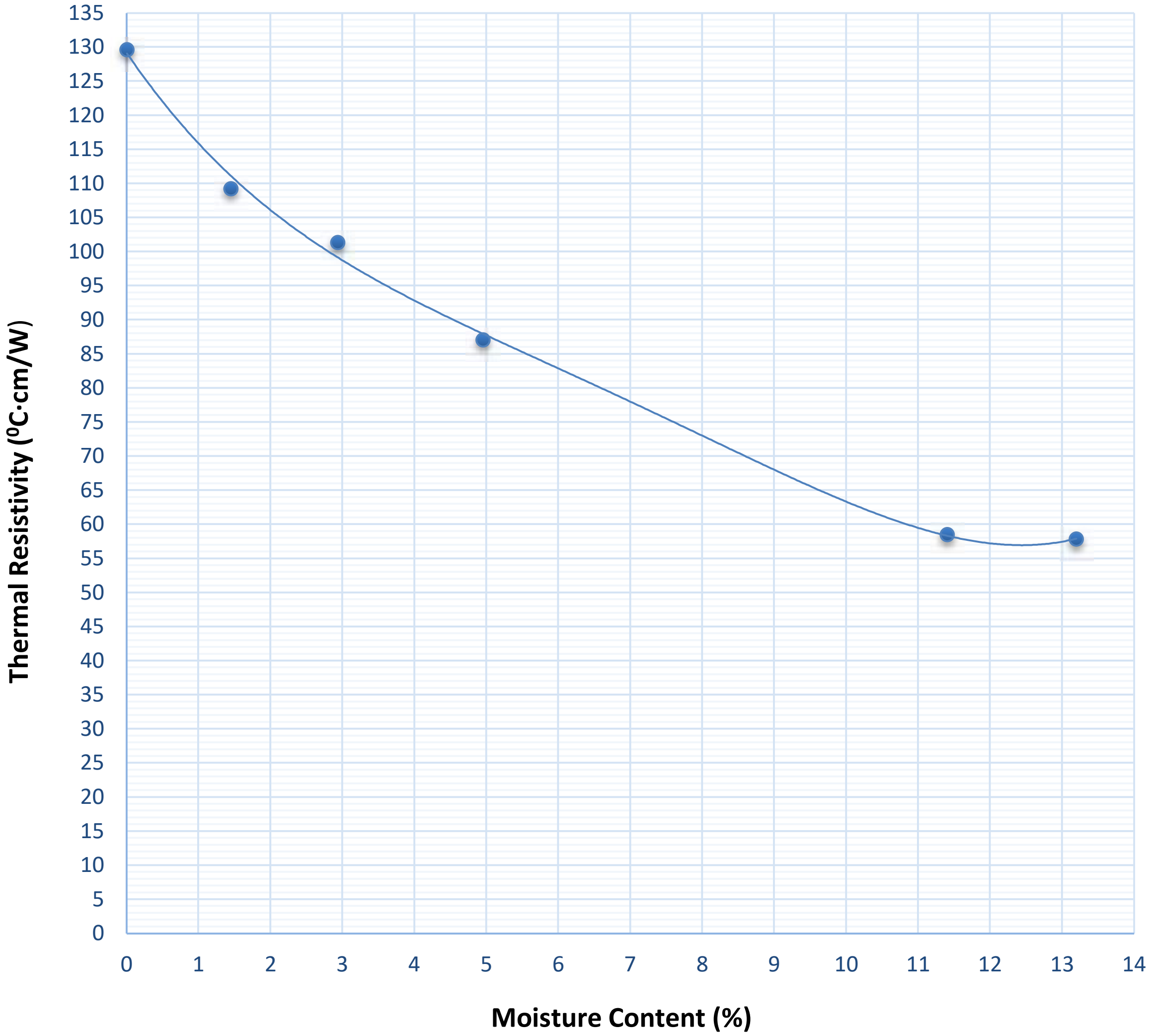
Figure 15

Tested By: JC 07/25/22 **Checked By:** JPB 08/23/22

B-101 to B-104, Bulk 1, 1.0-5.0 ft

THERMAL RESISTIVITY DRY-OUT CURVES (ASTM D5334)

427281.2022.GEOT: Flat Creek Solar

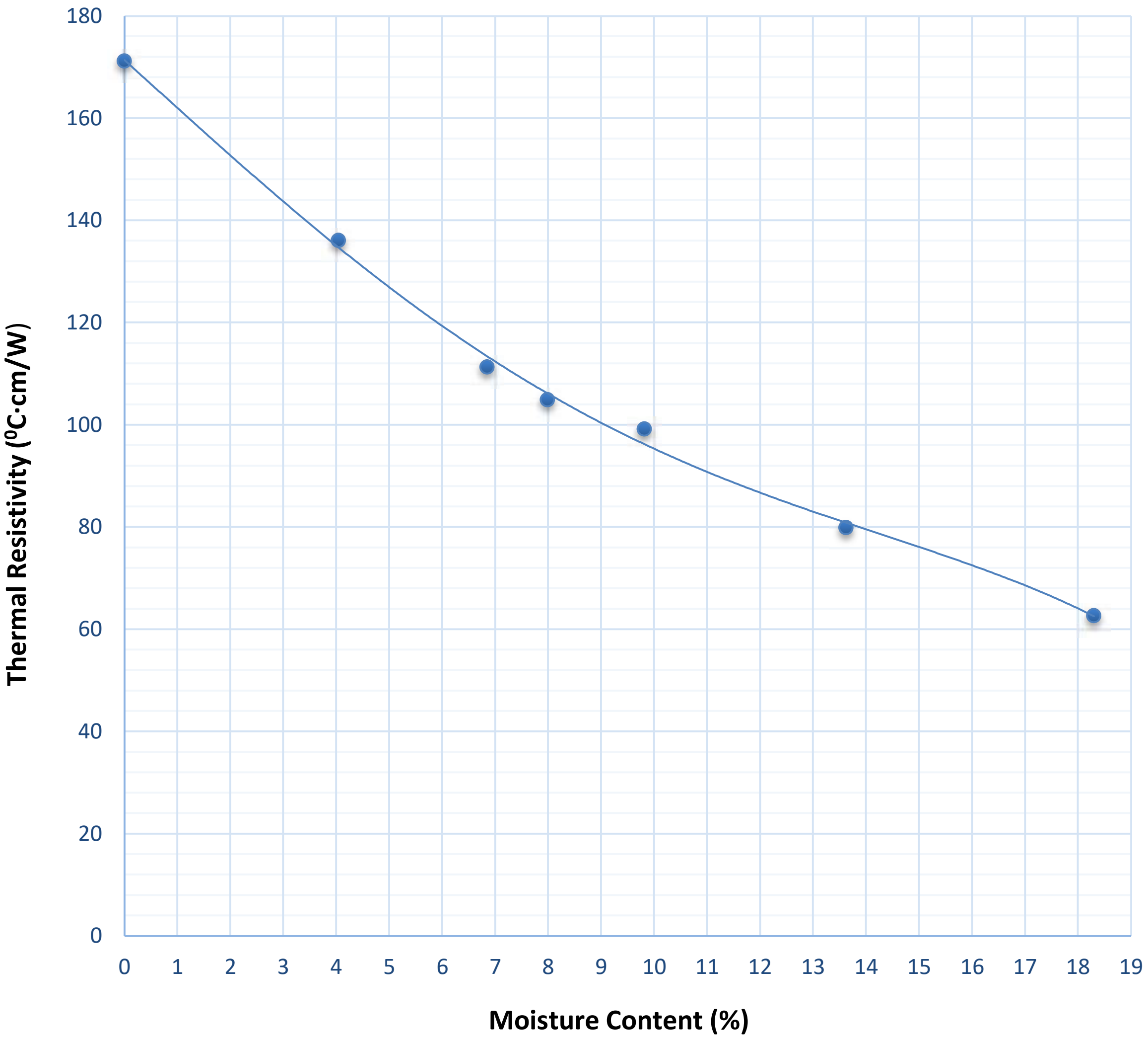


Specimen ID:	B-101 to B-104, BULK 1, 1.0-5.0 FT
USCS:	CL
Received Moisture:	11.1%
LL:	32
PI:	18
P200:	60.1
Max. Dry Dens.:	117.3 pcf
Optimum Moisture:	13.2%

Specimen was prepared at optimum moisture content and at approximately 90% of the maximum dry density as determined by the Standard Proctor test.

B-106 to B-108, Bulk 2, 1.0-5.0 ft

THERMAL RESISTIVITY DRY-OUT CURVES (ASTM D5334)
427281.2022.GEOT: Flat Creek Solar



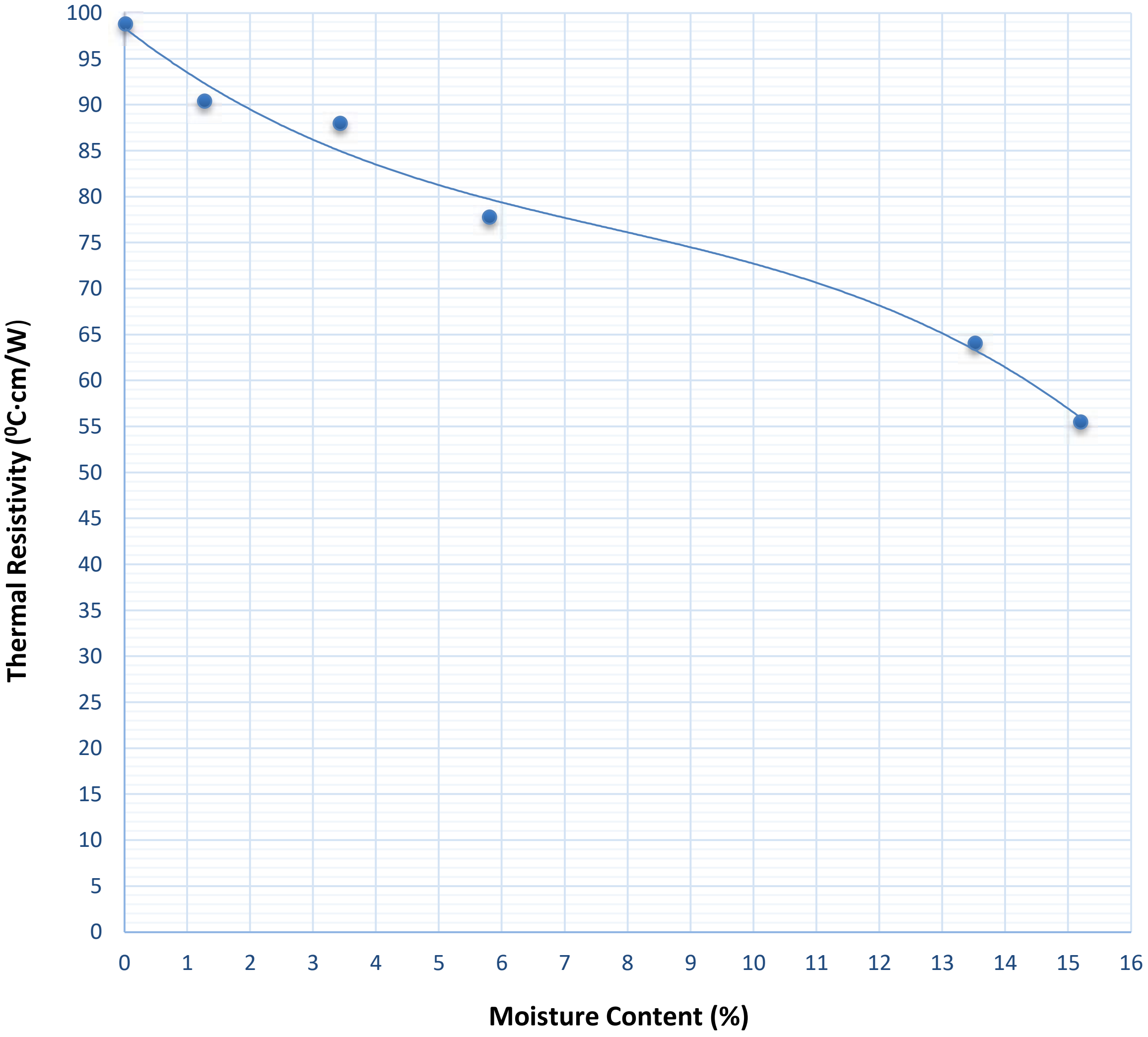
Specimen ID:	B-106 to B-108, BULK 2, 1.0-5.0 FT
USCS:	CL
Received Moisture:	16.0%
LL:	32
PI:	17
P200:	70.6
Max. Dry Dens.:	104.4 pcf
Optimum Moisture:	18.3%

Specimen was prepared at optimum moisture content and at approximately 90% of the maximum dry density as determined by the Standard Proctor test.

B-111 to B-115, Bulk 3, 1.0-5.0 ft

THERMAL RESISTIVITY DRY-OUT CURVES (ASTM D5334)

427281.2022.GEOT: Flat Creek Solar



Specimen ID:	B-111 to B-115, BULK 3, 1.0-5.0 FT
USCS:	CL
Received Moisture:	16.3%
LL:	36
PI:	17
P200:	57.9
Max. Dry Dens.:	112.2 pcf
Optimum Moisture:	15.2%

Specimen was prepared at optimum moisture content and at approximately 90% of the maximum dry density as determined by the Standard Proctor test.

KE CORROSION

3028 ALDON AVE. LAS VEGAS, NV 89121

702-340-1186 KDE@KECORROSION.COM

CLIENT
TRC Solutions, Inc.
16000 Commerce Parkway, Suite B
Mount Laurel, NJ 08054

PROJECT NO: 427281.2002.GEOT
Phase 000Lab

PROJECT
Flat Creek Solar

DATE: July 18, 2022

LAB ID: 22-0088

Sample By: Client

Analyzed By: Kurt D. Ergun

RESULTS FOR CORROSIVITY ANALYSIS OF SOILS

Sample Number:	101-104	106-108	111-115
Sample Location:	Bullk 1	Bulk 2	Bulk 3
Sample Depth:	N/A	N/A	N/A
Laboratory Testing Methods			
pH Analysis, ASTM D4972(in H2O)	7.55	7.51	7.43
PH Analysis, ASTM D4972(in CaCl2)	6.87	6.74	6.76
Water Soluble Sulfates, ASTM D516 (mg/kg)	85	93	65
Clorides, ASTM D512 (mg/kg)	50	60	40
Sulfides, AWWA 4500-S D (mg/kg)	Nil	Nil	Nil
Oxidation-Reduction, AWWA D1498 (mV)	+662	+670	+658
Resistivity, ASTM G187 (ohm-cm)	2500	2200	3485

Nil = <1.0 mg/kg

Kurt D. Ergun
Chemist

Note: The tests were performed in accordance with applicable ASTM, AASHTO, or AWWA methods. Test results submitted are only applicable to samples tested at referenced locations and are not indicative of the results of similar materials.

16000 Commerce Pkwy.
Suite B
Mount Laurel, NJ 08054

T 856.273.1224
TRCcompanies.com

Flat Creek Solar Project Supplemental Geotechnical Engineering Report

TRC Project No. 427281.2022.GEO2

Date: April 2, 2024

Prepared For:

Cordelio Services LLC

16000 Commerce Pkwy.
Suite B
Mount Laurel, NJ 08054

T 856.273.1224
TRCcompanies.com

April 2, 2024

Cordelio Services LLC
c/o Mr. Patrick McCarthy
Vice President, Environmental and Permitting
Flat Creek Solar
Suite 1805 – 55 Fifth Ave.
New York, NY 10003
pmccarthy@cordeliopower.com

Re: Supplemental Geotechnical Engineering Report
Proposed Flat Creek Solar Project
Towns of Root and Canajoharie, Montgomery County, NY
TRC Project #: 427281.2022.GEO2

Dear Mr. McCarthy:

TRC Engineers, Inc. (TRC) is pleased to present Cordelio Services, LLC (Cordelio) our Supplemental Geotechnical Engineering Report for the above referenced project. Our work was initiated in accordance with the signed Work Order, completed in general accordance with the agreed scope of work presented in TRC's revised proposal, submitted to SED Holdings NY LLC (SED) June 7, 2023. A summary of our geotechnical exploration activities, including the laboratory test results, findings and recommendations related to the proposed Flat Creek Solar Project is summarized below.

1.0 INTRODUCTION

This report presents the results of our supplemental geotechnical exploration for the proposed photovoltaic (PV) solar array structures and substation to be constructed at the Flat Creek Solar project site located in the Towns of Root and Canajoharie, Montgomery County, New York (Site). The purpose of our exploration was to evaluate the geologic and subsurface conditions at additional parcel areas added to the Site since completion of the Preliminary Geotechnical Engineering Reports prepared by Terracon Consultants) and TRC, dated November 21, 2021 and September 8, 2022, respectively, to reduce uncertainty with respect to anticipated foundation and site construction, and to provide geotechnical recommendations for design by others of the proposed project.

1.1 Project Description

The additional parcels are located in the northwest corner of the proposed solar development in the Towns of Root and Canajoharie, Montgomery County, New York across approximately 450 additional acres that were not included in previous subsurface explorations for the Site. The Site is primarily an open agricultural land, which was generally clear of crops at the time of the field exploration along with scattered wooded areas. Several existing structures, including houses and barns, are currently located on or adjacent to portions of the proposed lease area parcels. The site is bounded by Route 107 to the North, Carlisle and Cunningham Roads to the West, Route 93 to the South and a combination of partially wooded areas and open agricultural fields to the East. The supplemental substation location identified at the time of the field exploration is located within an open, agricultural fields west of Route 96 south of the existing overhead transmission line right-of-way. Based on our experience with similar projects, we assume that the proposed photovoltaic array would likely be mounted on posts driven into the ground. The anticipated loading conditions for the posts have not been provided to TRC but the posts are anticipated to be driven approximately 7-10 feet below existing ground surface (bgs), which is typical for such construction. Based on site conditions and topography, it is assumed that significant earthwork (cuts and fills) will not be required for the project development and that existing grades will remain relatively unchanged.

1.2 Scope of Services

Based on our geotechnical scope of services as presented in TRC's revised Proposal for Geotechnical Engineering Services dated June 7, 2023, the following services were completed:

- Review of Terracon's Preliminary Geotechnical Engineering Report (dated November 21, 2021) and TRCs' own Geotechnical Report (dated September 8, 2022) for adjacent parcels.
- Exploration of subsurface conditions by drilling and sampling of a total of eight (8) borings: seven (7) supplemental borings onsite spatially distributed across the proposed solar array field development areas and one (1) supplemental boring within the revised substation footprint as shown on Figure 1.
- Evaluation of the physical and geotechnical engineering properties of the subsurface soils within the boring locations based on describing the soils by visual-manual examination by a member of our geotechnical staff.
- Engineering analysis for the proposed foundation systems for the support of the ground-mounted PV solar array and associated development.
- Preparation of this report to summarize our findings, conclusions, and recommendations regarding the following:

    - Foundation support for the proposed solar array structures assuming post foundations, or alternative system as applicable based on subsurface conditions.
    - Bearing capacity parameters for use in foundation design by others.
    - Anticipated excavation conditions and presence of potential rock or other refusal conditions, if applicable.
    - Suitability of on-site soils for reuse in back fills and requirements for imported fills.
    - Recommendations for placement, compaction and testing of fills, if applicable
    - Soil parameters (both above and below ground water table) for active, at rest and passive conditions and L-Pile soil parameters for use in foundation design by others.
    - Anticipated ground water conditions and impacts on the design and construction.
    - Frost penetration depth.
    - Corrosivity potential on buried steel and concrete.
    - Field electrical resistivity results
    - Thermal resistivity laboratory test results
    - Preliminary Seismic Site Class parameters in accordance with ASCE 7-22
    - Other construction-related concerns, as warranted based on site subsurface conditions, details of the proposed construction, and anticipated loading conditions.

2.0 SITE CONDITIONS

2.1 Site Reconnaissance and Boring Stakeout

A limited site reconnaissance was conducted on June 12 and 13, 2023. At the time of the visit, the majority of the Site of the proposed development consisted of open fields with vegetation at the time of the site visit and several tree lines and partially wooded areas. Several dirt access roads and farmers trails were also observed throughout the Site. During the field visit, TRC did not observe any structures, stockpiles or any other man-made obstructions that are likely to interfere with the proposed PV array construction.

During the site visit, TRC also staked out the test boring locations in the field and performed field electrical resistivity testing at the proposed locations. Test boring locations were determined in the field using Google Earth KMZ files and a cellphone-based GPS application at the approximate locations recommended by TRC and approved by SED and Cordelio as shown on the attached Figure 1, *Approximate Test Boring Location Plan*. Prior to drilling, the U-Dig New York One-Call notification system was contacted to notify owners of public utilities in the area of the proposed testing borings for utility mark out and clearance of test boring activities.

2.2 Geotechnical Field Exploration

This investigation is based on a total of Eight (8) borings; Seven (7) borings (Borings B-201 through B-208) across the proposed solar array field development areas and one (1) supplemental boring (Boring B-200) within the revised substation footprint at the locations indicated in Figure 1. The test boring field activities were performed on June 12 and 13, 2023 by TRC's in-house drilling division under the full-time supervision by a member of TRC's geotechnical engineering staff. Drilling and sampling were performed using a track-mounted drill rig. Split spoon sampling was performed continuously through the upper ten (10) ft bgs and at five (5)-ft intervals thereafter to the completion depths in each boring using the Standard Penetration Test (SPT) Method (American Society of Testing and Materials [ASTM] D1586). The samples were obtained by driving the split spoon sampler 24 inches into the soil with a 140-pound automatic hammer free-falling 30 inches. The number of blows required for each 6 inches of penetration was recorded separately. The SPT blow count ("N-value") of the soil was calculated as the number of blows required for the middle 12 inches (6 to 18-inch interval) of penetration or fraction thereof. The SPT N-value serves as an indicator of consistency for cohesive soils and relative density of granular soils. The new substation boring (B-200) extended for 30.0 ft bgs, whereas the borings within the solar array fields were terminated at depths ranging from 6.8 to 15.0 ft bgs after achieving auger refusal or a maximum depth of 15 ft bgs. Upon completion, all test borings were backfilled to the approximate existing ground surface with the auger cuttings. Copies of the test boring logs are attached along with a copy of the approximate test boring location plan.

2.2 Regional Geology

According to available public geological data, the surficial geology at the project site consists of residual soil deposits weathered in place from the underlying parent rock. Locally the majority of the Site is underlain predominantly by carbonate limestone and dolostone of the Beekmantown Gorup from the Lower Ordovician Age. The southwest portion of the supplemental site area and the proposed substation area are underlain predominantly by mudstone and shale of the Utica Shale Formation from the Middle Ordovician Age.

2.3 Subsurface Conditions

Under the 0.7 ft-thick topsoil 1.3 ft-thick silty gravel, Boring B-200, which was drilled within the proposed substation, encountered 11.0 ft of “stiff” to “very stiff” silty clay underlain by 5.0 ft of “medium dense” silt underlain by 12.0 ft of gravel sized rock fragments which extended to the termination depth of the boring.

Below a surficial cultivated topsoil layer, the test borings within the solar array lot revealed that the surficial soils generally consist mostly of low to high plastic combination of silt, clay, clayey silt and silty clay with varying quantities of sand and gravel-sized rock fragments. SPT N-values within the solar array field indicate that the consistency of these soils ranges from “soft” to “stiff” within the upper 6.0 ft followed by “stiff” to “very stiff” layers for the remaining depths.

Laboratory test results performed on representative samples indicate plastic limits ranging from 13% to 23%, liquid limits ranging from 16% to 52%, and plasticity indexes ranging from 3% to 29%. Natural moisture contents as received by the laboratory range from approximately 8% to 19%. Maximum laboratory compacted dry densities of a representative bulk sample of the clay as determined by ASTM D 698 was approximately from 127.5 pounds per cubic foot (pcf) at an optimum moisture content of 8.4%.

Occasional difficult drilling was noted in various borings ranging from the depths of 6 ft to 10 ft bgs. The presence of these dense conditions and possible oversized material inclusions (gravel and or possible cobbles) may pose difficult driving conditions for driven post type foundation during installation.

Below the surficial clayey soil stratum, each test boring with the exception of B-207 encountered a stratum consisting of silty SAND and GRAVEL-SIZED ROCK FRAGMENTS with varying quantities of clay, generally extending to the completion depths. SPT N-values indicate the relative density of this stratum ranges from “medium dense” to “very dense”. Laboratory test results indicate that the fine-grained (silt and clay) content of this layer ranges from approximately 35% to 48%. Natural moisture content as received by the laboratory ranged from approximately 6% to 19%.

Auger refusal, which typically represents the apparent top of weathered rock, was encountered in test borings B-205 and B-206 at approximate depths 10.5 ft and 6.8 ft bgs, respectively. Difficult drilling conditions, which are typically indicative of hard or very dense soil conditions and/or the potential presence of oversized rock fragments, were also encountered at 6 of the 8 test boring locations. The depths and locations where difficult drilling and auger refusal were encountered are summarized in Table 1, below.

Table 1. Summary of Difficult Drilling and Auger Refusal Depths

Test Boring Location	**Boring Termination Depth, ft**	**Depth to Hard or Very Dense Soils/Difficult Drilling (ft, bgs[1])**	**Depth to Auger Refusal (ft, bgs[1])**
B-200	30.0	9.5	>30
B-201	15.0	>15	>15
B-202	15.0	9	>15
B-204	13.8	8	>15
B-205	10.5	9.5	10.5
B-206	6.8	5.5	6.0

Test Boring Location	Boring Termination Depth, ft	Depth to Hard or Very Dense Soils/Difficult Drilling (ft, bgs[1])	Depth to Auger Refusal (ft, bgs[1])
B-207	15.0	>15	>15
B-208	15.0	9	>15

ft, bgs = feet below existing ground surface

2.4 Groundwater

Observations for groundwater were attempted during drilling and shortly after completion in each test boring. Free water was not observed on the drilling rods or split-spoon sampler during drilling. Groundwater was only encountered in test boring B-206 at a depth of approximately 5.8 ft bgs after completion of drilling at the time of the field exploration. The water readings recorded on the logs represent the conditions at the time the measurements were taken and do not reflect daily, seasonal, or long-term fluctuations in the groundwater level or development of perched water. Hydrostatic groundwater levels and upper (perched) saturation zones should be expected to fluctuate seasonally due to variations in rainfall, runoff, evapotranspiration, irrigation methods, and other factors, especially within the layers of sand and gravel-sized rock fragment. Consequently, any measured groundwater levels or absence thereof shown on the boring logs only represent conditions at the time the readings were collected and may thus be different at the time of construction. Furthermore, the actual groundwater levels, seepage, and localized saturated conditions may be observed at shallower depths during periods of heavy precipitation. Static daily and seasonal groundwater levels and upper (perched) saturation zones would need to be determined through the installation and monitoring of piezometers, especially in fine-grained soil stratums. This was outside of TRC's scope of work. The boreholes were subsequently backfilled with soil cuttings following water level measurements upon completion of drilling activities.

3.0 CORROSION EVALUATION AND THERMAL RESTIVITY

3.1 Corrosion Evaluation

To evaluate the corrosion potential of the near surface soils at the site, we submitted two (2) representative bulk soil samples from depths of approximately 1 ft to 5 ft bgs, composited from test boring locations during our subsurface exploration to an analytical laboratory for pH, chloride, soluble sulfate, and sulfate content, resistivity and oxidation reduction testing. The results are summarized in Table 2, below.

Table 2. Results of Corrosivity Testing

Sample	Boring No.	pH in (H20)	pH in (CaCl2)	Chlorides (mg/kg)*	Sulfates (mg/kg)*	Sulfides (mg/kg)*	Oxidation Reduction	Resistivity (ohm-cm)**
Bulk 1	B-200 & B-207	6.80	6.11	75	84	Nil	+690	2,645
Bulk 2 & 3	B-201, B-202, B-205, & B-208	6.69	6.06	50	68	Nil	+695	4,510

* *mg/kg = milligrams per kilogram*
** *ohm-cm = ohm-centimeter*

TRC also conducted field resistivity testing using the Wenner Four-Pin method in general accordance with ASTM G57. Testing was centered at boring locations B-200 and B-202 with the test lines oriented in perpendicular to one another at each test location. Measurements were taken along each test line corresponding to electrode spacings of 2.5 ft, 5 ft, 10 ft, 20 ft, and 25 ft. Field resistivity test results are attached, and the results are discussed further in this section.

Many factors can affect the corrosion potential of soil including soil moisture content, resistivity, permeability, and pH, as well as chloride and sulfate concentration. In general, soil resistivity, which is a measure of how easily electrical current flows through soils, is the most influential factor. Based on classification developed by William J. Ellis (1978), the approximate relationship between soil corrosiveness was developed as shown in Table 3 below.

Table 3. Relationship Between Soil Resistivity and Soil Corrosivity

Soil Resistivity (ohm-cm)*	**Classification of Soil Corrosiveness**
0 to 900	Very Severely Corrosive
900 to 2,300	Severely Corrosive
2,300 to 5,000	Moderately Corrosive
5,000 to 10,000	Mildly Corrosive
10,000 to >100,000	Very Mildly Corrosive

** ohm-cm = ohm-centimeter*

Chloride and sulfate ion concentrations and pH appear to play secondary roles in affecting corrosion potential. High chloride levels tend to reduce soil resistivity and break down otherwise protective surface deposits, which can result in corrosion of buried metallic improvements or reinforced concrete structures. Sulfate ions in the soil can lower the soil resistivity and can be highly aggressive to Portland cement concrete (PCC) by combining chemically with certain constituents of the concrete, principally tricalcium aluminate. This reaction is accompanied by expansion and eventual disruption of the concrete matrix. Soils containing high sulfate content could also cause corrosion of the reinforcing steel in concrete. Table 4.2.1 of the American Concrete Institute (ACI, 2008) provides requirements for concrete exposed to sulfate-containing solutions as summarized in Table 4 below.

Table 4. Relationship Between Sulfate Concentration and Sulfate Exposure (Table 4.2.1 of ACI)

Water-Soluble Sulfate (SO4) in soil (ppm)*	**Sulfate Exposure**
0 to 1,000	Negligible
1,000 to 2,000	Moderate
2,000 to 20,000	Severe
over 20,000	Very Severe

**ppm = parts per million*

Acidity is an important factor of soil corrosivity. The lower the pH (the more acidic the environment), the higher will the soil corrosivity be with respect to buried metallic structures. As soil pH increases above 7 (the neutral value), the soil is increasingly more alkaline and less corrosive to buried steel structures due to protective surface films which form on steel in high pH environments. A pH between 5 and 8.5 is generally considered relatively passive from a corrosion standpoint.

The laboratory electrical resistivity test completed on the samples of surficial soils indicates values ranging from 2,645 to 4,510 ohm-centimeters, which would be indicative of moderately corrosive potential to buried metallic improvements. Based on the field resistivity testing results the electrical resistivity values for the existing subsoils range from approximately 3,916 to 10,293 ohm-centimeters. Based on these results and the resistivity correlations presented in Table 3, the corrosion potential to buried metallic improvements may be characterized as ranging from moderately to very mildly corrosive.

Based on our previous experience and Table 4.2.1 of the ACI, it is our opinion that sulfate exposure to PCC may be considered negligible for the native subsurface materials tested.

3.2 Thermal Resistivity

Laboratory thermal resistivity test results with the thermal dryout curves, are attached to this report. Thermal Resistivity testing was performed in general accordance with ASTM 5334 on one (1) representative composite sample compacted to density equivalent to approximately 90% of the maximum dry density and at 2% greater than the optimum moisture content as established by ASTM D 698. The sample was then oven dried, and multiple thermal resistivity readings were obtained at various moisture contents. The thermal resistivities decrease with increasing moisture content and ranged from 127.8 °C-cm/W when fully dry to 46.4 °C-cm/W at 2% above optimum moisture.

4.0 FOUNDATIONS AND EARTHWORK

4.1 Site Seismic Coefficients

According to the ASCE 7-22, the site class is within “Site Class D” based on the soil profiles the maximum considered earthquake ground motions in this area for 0.2 second and 1.0 second spectral responses are approximately 22% g and 5.3% g, respectively. For Site Class D, the corresponding 0.2 and 1.0 sec. design spectral response acceleration parameters S_{DS} and S_{D1} are 18% g and 7.4 % g, respectively.

4.2 Foundations

Based on the results of this investigation and our experience with similar structures, a foundation system consisting of driven posts is assumed as generally preferable by the designer for support of the proposed ground-mounted photovoltaic arrays. Based on the results of the test borings, driven posts are mostly feasible and could be supported in the natural soils encountered at this site. However, occasional problematic driving could be encountered based on observed zones of very dense soils, the presence of gravel-sized rock fragments, and occasional refusal to earth drilling equipment in several of the boring locations.

It is our understanding that shallow foundations will be needed to support the proposed relatively light equipment, as well as more heavily loaded equipment such as the transformers and dead-end structures at the Site substation location. A combination of shallow foundations and mats could be utilized for support of various structures or equipment bearing on newly placed, compacted load bearing fill or the existing natural soils after proper subgrade preparation as described below. Drilled piers could also be utilized.

Based on the observed relatively high SPT N-values from very dense and/or gravelly soils encountered drilling, the designer and foundation contractor should be prepared to implement alternative installation methods for achieving sufficient foundation embedment to provide sufficient resistance for uplift and lateral loading conditions within these localized areas, if difficult driving conditions and encountered during installation. The following installation alternatives can be considered at the Site in the event that subsurface obstructions or are encountered at relatively shallow depths (i.e. less than 10 ft bgs):

- The use of predrilling to break up the oversized gravel/cobbles or other obstructions to increase post embedment for vertical and lateral support.
- The use of helical or screw-type piles that could provide increased lateral and uplift capacities at shallower embedment depths and potentially penetrate additional short distances into dense soils.
- The use of larger sized, heavier grade posts or pile driving shoes that will allow harder driving and may provide increased embedment and to achieve sufficient lateral capacity and uplift.

4.2.1 Driven Post/Helical Pile Support System

All posts should be driven or helical piles extended to bear at sufficient depths required to provide adequate axial uplift, and lateral resistances.

Allowable design bearing capacities and recommended geotechnical parameters for use in design analysis, included in Tables 5 and 6 below, can be utilized for evaluation of posts or piles for support of the PV solar array or other design analysis, as required. We recommend that lateral and uplift resistance of soils be reduced by 50% in the upper 4.5 ft (54 inches) below the ground surface to account for disturbance resulting from construction as well as to account for the negative impacts due to frost and thaw action. Allowable capacities assume a factor of safety of 2 for compression loads; a factor of safety equal to 3 was used for determining allowable uplift capacity of piles; a factor of safety equal to 1.5 should be used for transient (wind/seismic) loading conditions. The factor of safety for uplift capacity can be reduced to 2 in conjunction with pile load testing. The use of lower factors of safety is at the sole discretion and risk of the designing engineer.

Current industry experience suggests that the PV panels will prevent an insulating layer of snow from accumulate directly against the foundation posts, therefore TRC recommends using the Atlas of Soil Freezing Depth Extremes maps for snow-free bare soil to determine design frost depth for frost heave evaluation. The use of the 10-year return period for the design in evaluating frost depth, corresponds to approximately 49 inches (4.1 ft). A typical unfactored value of 15 pounds per square inch (psi) can be used for adfreeze for steel piles. While this value tends to be toward a lower bound adfreeze for steel pile, the potential exists for adfreeze forces to be higher than 15 psi, especially for smaller diameter piles and for soils containing higher granular content such as those at the site. Some conservatism is warranted for design of foundation piles for PV arrays due to the fact that vertical (compression) loads on the piles are typically low. Based on laboratory test results, the fines (silt and clay) contents of the soils withing the frost depth zone encountered were greater than 25%, which is generally considered high frost susceptibility (US Army Corps of Engineers), however, the lack of groundwater encountered during the field exploration may indicate a lower potential for development of frost heave. Pile foundations, if designed to fully resist frost heave, should consider the adfreeze stress within the full frost depth. T*he use of alternate adfreeze forces or frost penetration depths from those presented in our report may be considered at the sole discretion and risk of the designing engineer. A reduced frost depth value may be considered if some risk of differential movement of the rack system due to frost heave is acceptable.*

Table 5. Summary of Allowable Soil Bearing Capacities

Soil Description	Relative Density/ Consistency	Cohesion (psf)	Downward Skin Friction (psf) for steel/soil	Upward Skin Friction (psf) for steel/soil	Allowable Bearing Capacity (ksf***)
CLAY/SILT	“Medium” to “Stiff”	1,000	250*	150*	2
Silty SAND & ROCK FRAGEMENTS	“Medium Dense” to “Very Dense”	-	150**	75**	4

**   psf – pounds per square foot (over pile length)*

*** psf – pounds per square foot per foot (triangular distribution over pile length)*

**** ksf – kips per square foot*

Table 6. Summary of Unfactored Soil Parameters for Lateral Design
(reduce by 50% for upper 4.5 ft)

Soil Description	LPILE Soil Type	Consistency/ Relative Density	Total (Submerged) Unit Weight (pcf*)	Friction Angle (degrees)	E_{50}	Cohesion (psf**)	Soil Modulus Above/Below Water Table, k (pci***)
CLAY/ SILT	Clay	“Medium” to “Hard”	125 (NA)	-	0.01	1,000	- / -
Silty SAND &ROCK FRAGMENTS	Sand	“Medium Dense” to “Dense”	125 (NA)	34	-	-	90 / -

*	*pcf – pounds per cubic foot*
**	*psf – pounds per square foot*
***	*pci – pounds per cubic inch*

Prior to or during construction, we recommend that tension (pull) and lateral load tests be conducted on a minimum of three piles for each combination of size or system to verify the adequacy of the design. Testing should be performed in general accordance with ASTM 3689 and ASTM 3966 or in accordance with current standard practice in the industry. The test locations should coincide with the test boring locations based on the variability of the subsurface conditions. The test piles should be installed with the same means and methods used to install production piles. In the event that the means and methods or embedment depths of pile installation are revised following initial pile testing, additional pile tests should be performed to verify that sufficient resistance can be achieved with the revised means, methods, and embedment. he results should be reviewed and approved by a qualified geotechnical engineer.

4.2.2 Shallow Foundations

Shallow foundation systems such as spread footings or rigid mats can be considered for support of electrical equipment and other lightly loaded ancillary structures. Mats supporting electrical equipment can be designed for an allowable bearing capacity of 2,000 psf when constructed in accordance with the general recommendations presented in the *Earthwork* section of this report. A vertical subgrade modulus of 100 pci may be used in foundation mat design. Shallow spread footing foundations bearing on densified natural soils can be designed using the allowable bearing capacities and other design parameters shown in Tables 5 and 6, above. A typical allowable interface friction coefficient of 0.35 may be used for design of cast in place concrete foundations assuming that they are constructed on grade overlying the densified natural soils.

Transformers, dead-end structures and similar heavily loaded structure foundations or mats bearing on the existing natural soils or newly placed and compacted fill can be designed for an allowable bearing capacity of 3,000 psf, after proper subgrade preparation as follows:

1. Over-excavate the natural soils for a minimum depth of 2.0 feet below bottom of the footing depth. Over-excavation shall extend beyond the perimeter of the foundation 1 foot horizontally for each foot of depth below existing grade.
2. The exposed subgrade shall be densified in the presence of a qualified geotechnical professional to confirm suitability of exposed grade and identify any soft, loose, unstable or unsuitable (biodegradable material or waste) materials that shall be removed.

Foundation subgrades for supporting electrical equipment or other ancillary structures subjected to freezing temperatures during construction and/or the life of the structure should be established at least 4.5 ft below adjacent grades or otherwise protected against frost action. Alternatively, to resist frost heave impacts, mat slabs constructed at grade should be provided a coarse aggregate similar to AASHTO #57 aggregate layer extending to the frost depth below the mat foundations for movement sensitive equipment or minimum 24 inches thick below lightly loaded electrical equipment designed to tolerate the movement associated with potential frost heave. To guard against a punching type shear failure, minimum widths of continuous footings should be 24 inches.

Shallow excavations for foundation slabs and construction of utilities may encounter perched groundwater in low lying areas or during wet periods. If perched groundwater or surface runoff are encountered, sumps and pumps will be sufficient to control groundwater and provide stable working conditions.

4.2.3 Drilled Shafts

Axial Capacity

Alternately, based on the subsurface conditions encountered and on our experience with similar construction, drilled shafts may be considered, particularly for support of the heavier substation or transmission equipment. The bottom of drilled shafts are anticipated to bear within the very stiff to clay or medium dense granular soils. The foundation designer should verify that the overall shaft diameter and length are sufficient to provide the vertical and necessary lateral support based on recommendations presented herein. It is our experience that the required length and diameter of drilled shafts, if used to support structures subjected to high lateral loads (such as the proposed dead end structures) will be controlled by anticipated lateral loading conditions.

Drilled shafts can be designed to derive their load-carrying capacities from shaft sidewall resistance (i.e., “skin friction”), end-bearing, or a combination of the two. The following are noted with respect to axial capacity of drilled shafts:

- Where the shaft length is entirely in soil and the length of the shaft is at least twice the shaft diameter, the embedment length can be checked for adequate axial compression capacity based on the sum of the allowable load in end bearing and side friction.

- Where the shaft length is less than twice the shaft diameter, or where methods of construction preclude consideration for shaft resistance (i.e., permanent casing installed in an oversized hole) the drilled shaft should be sized based on end bearing alone.
- Shaft resistance should not be included in soil within the upper 4 ft from the ground surface to account for disturbance during construction as well as negative impacts from frost action.
- For large diameter shafts, the weight of concrete (including consideration for the effects of buoyancy) might be adequate to resist anticipated uplift (or tension) loads, where applicable. If shaft resistance must be considered in addition to the weight of the shaft, a factor of safety of 3 is recommended for use in estimating allowable uplift capacity.
- Allowable design unit resistances against axial loads are provided in Table 5 above.

Lateral Capacity

Recommended geotechnical parameters for use in LPILE analysis are included in Table 6 above. If drilled shafts are to be constructed within a distance of 3B to 5B, where B is the shaft diameter, reduction factors should be applied as appropriate to account for group effects. We recommend that lateral resistance of soils within 4 ft of the ground surface be neglected to account for disturbance resulting from both drilled shaft construction and the negative impacts due to frost action.

Construction Related Concerns

Temporary casing may be required during shaft construction to maintain sidewall stability through the soft natural soils, where cobble inclusions are present, or in excavations where groundwater and/or perched water zones are encountered.

Intimate contact between the drilled shaft and surrounding soil will be critical to achieve the lateral load resistance predicted by the LPILE models. As such, use of permanent casing in the design and installation of drilled shafts should be avoided. If use of permanent casing is required, the permanent casing should be in intimate contact with the surrounding soil. Permanent casing should not be placed in an oversized hole unless grouting of the exterior annular space is performed to create intimate contact between the casing and soil. If intimate contact is not maintained, lateral deflections will significantly exceed those estimated in the LPILE evaluations. These deflections will be very highly variable and difficult to predict as they will be dependent on the method of construction and the amount of sidewall relaxation and annular space resulting from the construction process.

If the shaft is cased so that the excavation remains stable and free of water infiltration, freefall placement of concrete could be considered, provided the contractor can direct concrete discharge through the center of the shaft and avoid contact with the reinforcement cage during freefall, which could result in unacceptable aggregate separation. In the event of water infiltration into the shaft, the reinforcement cage should be installed followed by installation of a tremie tube to the bottom of the shaft so that the shaft can be concreted using bottom-up tremie techniques. Care will need to be taken to ensure that the tremie remains inserted at the bottom of the shaft during concrete placement.

Final length and diameter of the drilled shafts will be a function of the vertical loads as well as the lateral load and deflection requirements, where applicable. Preferably, shafts should extend into the natural alluvial soils to limit settlements and maximize end bearing capacity.

4.3 Earthwork

Based on our understanding of the proposed construction, significant grading and earthwork operations are not anticipated unless material removal and replacement would be considered for support of equipment foundations. The following recommendations are provided based on the site soils encountered.

Any existing subsurface utilities, including drain tiles, if present, which conflict with the proposed development should be removed or relocated, where applicable. In areas of backfill placement and/or construction of shallow foundations, all topsoil and organic or otherwise deleterious material should be removed before foundation construction or new fill placement. Any obstructions that would interfere with new foundation construction must be removed in their entirety from a foundation location. After stripping residual topsoil and excavation to the proposed bearing elevations for shallow mat foundations, the exposed subgrade areas should be vigorously densified with as large a compactor as is practical to improve overall performance and reduce impacts of settlements within the disturbed surficial soil. Loose, soft, or otherwise unstable areas identified during the course of excavation should be densified in-place or excavated and replaced with compacted load bearing fill.

The surficial fill soils are suitable for re-use as fill/backfill, however they contain significant fine-grained (silt or clay) content and will be highly sensitive to moisture and disturbance. Therefore, they may lose strength when wet or disturbed by construction equipment and could be difficult to work with during cold or wet weather. Some moisture conditioning (wetting or drying) of the onsite soils used for backfilling should be anticipated before reuse in compacted backfills, particularly during wet seasons. Existing surficial soils with organic inclusions should be excluded from reuse as load-bearing fill. Once a subgrade has been prepared, construction traffic should be controlled in such a fashion as to minimize subgrade disturbance.

Imported load-bearing fill, if required, should consist of well-graded granular material similar to SP, SM, SW, GP, GM or GW as identified by the Unified Soil Classification System (USCS) or PADOT 2A which is not excessively moist and is free from ice and snow, roots, surface coatings, sod, loam, clay, rubbish, other deleterious or organic matter, and any particles larger than four (4) inches in diameter. Imported fill for use as load-bearing fill should have less than 65% by weight passing the No. 200 sieve, liquid limits less than 50, & Plasticity Index less than 35. Alternatively, an AASHTO No. 57 or NYSDOT Type 2 coarse aggregate layer (minimum 24 inches thick) could be considered below mat foundations supporting electrical equipment to reduce frost impacts. Imported fills for general site grading may consist of materials similar in gradation to GW, GP, GC, GM, SW, SP, SC, SM, CL, ML, CH, & MH as identified by the USCS with no index property limitations. However, imported fill materials with greater than 25% by weight passing the No. 200 sieve should be considered high frost susceptibility.

All backfills fills should be placed in relatively horizontal layers not exceeding 8 inches loose thickness. This criterion may be modified in the field depending on the conditions present at the time of construction and on the compaction equipment used. Load-bearing fills for the support of foundations should be compacted to not less than 98% of maximum dry density (ASTM D 698). All newly placed fills and backfills, if utilized for areas of the solar array posts or piles, should be compacted to not less the 95% of maximum dry density (ASTM D 698). Fills in paved areas, if planned, or areas supporting access roads should be compacted to not less than 95% of maximum dry density. Fills in landscaped areas should be compacted to at least 90% of maximum dry density (ASTM D 698).

The sidewalls of any confined excavations deeper than 4 ft must be sloped, benched or adequately shored per OSHA 29 CFR 1926 regulations. The onsite near surface soils are classified as Type B soils according to OSHA 29 CFR 1926. Short-term open excavations in the existing Type B clayey soils that are greater than 4 feet in depth shall have a maximum allowable slope of 1H:1V (45°) if dry and 1.5H:1V (34°) if submerged or where wet conditions are observed, such as perched water or significant surface runoff. The deeper onsite granular soils (sandy and/or gravelly soils) are classified as Type C soils according to OSHA 29 CFR 1926. Open excavations in the granular soils, if encountered, should not be steeper than 1.5H:1V if dry and 2H:1V if submerged or where considerable wetness if observed. Alternately, trench boxes and/or sheeting could be used in conjunction with open cut slopes when performed in accordance with OSHA 29 CFR 1926.652(b). Sloping or benching for excavations greater than 20 feet deep, if required, shall be designed by a registered professional engineer.

The contractor is solely responsible for designing, constructing, and maintaining stable, temporary excavations and should shore, slope, or bench the sides of any confined excavations deeper than 4 ft as required to maintain stability of both the excavation sides and bottom. All excavations for the project should comply with applicable local, state, and federal safety regulations including the current United States Department of Labor, Occupational Safety and Health Administration (OSHA) guidelines for Excavation and Trench Safety Standards (29 CFR Part 1926, Part P, Excavations) or other applicable jurisdictional codes for permissible temporary side-slope ratios and or shoring requirements. The contractor should avoid stockpiling excavated materials or placing construction equipment immediately adjacent to the excavation unless the excavation sidewalls are braced to withstand the anticipated surcharge load.

Daily inspections of open excavations, adjacent areas and protective systems by a “competent person” should be performed for evidence of situations that could result in cave-ins, indications of failure of a protective system, or other hazardous conditions, as applicable. The information in this report is being provided solely as a service to our client. Under no circumstance should the information provided be interpreted to mean TRC is assuming responsibility for construction Site safety.

4.4 Trench Backfill

Bedding and pipe embedment materials to be used around underground utility or electrical conduit pipes should be well graded sand or gravel conforming to the pipe manufacturer’s recommendations and should be placed and compacted in accordance with project specifications, local requirements, or governing jurisdiction. General fill to be used above pipe embedment materials should be placed and compacted in accordance with the recommendations contained in this section.

Utility trenches located adjacent to footings or foundations should not extend below an imaginary 1H:1V (horizontal:vertical) plane projected downward from the foundation bearing surface to the bottom edge of the trench. Where utility trenches will cross beneath footing bearing planes, the footing concrete should be deepened to encase the pipe, or the utility trench should be backfilled with sand/cement slurry or lean concrete within the foundation-bearing plane.

4.5 Gravel Access Roadways

After stripping of the existing topsoil proposed access roads should be proof-rolled with a heavily loaded pneumatic-tired vehicle such as a loaded water truck or tri-axle dump truck. Soft, loose or unstable areas, identified by significant pumping, rutting or similar deformation under wheel loads must be removed and replaced with compacted fill or aggregate material to achieve a stable subgrade prior to placing common fill for site grading, if required, or fill aggregate surfacing. A layer of a geogrid should be installed directly over the subgrade with adjacent rolls lapped in accordance with manufacturer's recommendations in general accordance with NYSDEC standard for limited Use Pervious Haul Roads. A layer of aggregate similar in gradation to NYSDOT Item 703-02, Size Designation 3-5 of Table 703-4 material should be placed directly over the geogrid in a single 8-inch thick layer and spread with tracked equipment in accordance with NYSDEC standards. During construction, the access road may need to be occasionally re-graded and re-densified. Any electric cables crossing below the roadway should be installed in heavy duty rigid steel conduits or installed a minimum 3 ft below finished grade to prevent damage to the cables.

4.6 Surface Drainage

Positive surface water drainage gradients at least 2 percent should be provided to direct surface water away from foundations and mat slabs towards suitable discharge facilities. Ponding of surface water should not be allowed on or adjacent to structures, slabs-on-grade, or pavements. Any rain runoff should be directed away from foundation and slabs-on-grade such as equipment pads, as applicable.

In addition, a sufficiently thick velocity dissipater, such as layer of coarse drainage aggregate of at least 3 to 4 inches in size, should be placed along water flow paths to dissipate concentrated flow of runoff water in order to minimize surface erosion.

4.7 Plans, Specifications, and Construction Review

We recommend that TRC perform a plan review of the geotechnical aspects of the project design for general conformance with the recommendations presented in this report. In addition, subsurface materials encountered in the relatively small diameter, widely spaced borings may vary significantly from other subsurface materials on the site. Therefore, we also recommend that a representative of our firm observe and confirm the geotechnical specifications of the project construction. This will allow us to form an opinion about the general conformance of the project plans and construction with our recommendations. In addition, our observations during construction will enable us to note subsurface conditions that may vary from the conditions encountered during our investigation and, if needed, provide supplemental recommendations. For the above reasons, the recommendations provided in this report are based on the assumption that TRC will be retained to provide observation and testing services during construction to confirm that conditions are similar to that assumed for design and to form an opinion as to whether the work has been performed in general accordance with the project plans and specifications. If we are not retained for these services, TRC cannot assume any responsibility for any potential claims that may arise during or after construction as a result of misuse or misinterpretation of TRC's report by others. These services are not included as part of TRC's current scope of work.

4.8 Construction Observation

TRC recommends that a qualified geotechnical professional should observe the geotechnical aspects of the earthwork for general conformance with our recommendations including site preparation, selection of fill materials, pile installation, and the placement and compaction of fill. To facilitate your construction schedule and if you wish TRC to perform these services, we request sufficient notification (72 hours in advance) for site visits. The project plans and specifications should incorporate all recommendations contained in the text of this report. These services are not included as part of TRC's current scope of work.

5.0 LIMITATIONS

This report has been prepared for Cordelio Services LLC, specifically for design of the proposed solar array and associated development to be constructed at the Flat Creek Solar project site located in the Towns of Root and Canajoharie, Montgomery County, NY as identified herein. Transfer of this report or included information is at the sole discretion of Cordelio Services LLC. TRC's contractual relationship remains with Cordelio Services LLC and limitations stated herein remain applicable regardless of end user. The opinions, conclusions, and recommendations presented in this report have been formulated in accordance with accepted geotechnical engineering practices that exist in the area at the time this report was written. No other warranty, expressed or implied, is made or should be inferred.

The opinions, conclusions and recommendations contained in this report are based upon the information obtained from our investigation, which includes data from a limited number of widely separated discrete locations, visual observations from our site reconnaissance, and review of other geotechnical data provided to us, along with local experience and engineering judgment. An attempt has been made to provide for normal contingencies; however, the possibility remains that differing or unexpected conditions may be encountered during construction. If this should occur, or if additional or contradictory data are revealed in the future, TRC should be notified so that modifications to this report can be made, if necessary. TRC is not responsible for any conclusions or opinions drawn from the data included herein, other than those specifically stated, nor are the recommendations presented in this report intended for direct use as construction specifications.

TRC should be retained to review the geotechnical aspects of the final plans and specifications for conformance with our recommendations. The recommendations provided in this report are based on the assumption that TRC will be retained to provide observation and testing services during construction to confirm that conditions are similar to that assumed for design and to form an opinion as to whether the work has been performed in accordance with the project plans and specifications. If we are not retained for these services, TRC cannot assume any responsibility for any potential claims that may arise during or after construction as a result of misuse or misinterpretation of TRC's report by others. Furthermore, TRC will cease to be the Geotechnical Engineer-of-Record at the time another consultant is retained for follow up service to this report, if applicable.

The opinions presented in this report are valid as of the present date for the property evaluated. Changes in the condition of the property will likely occur with the passage of time due to natural processes and/or the works of man. In addition, changes in applicable standards of practice can occur as a result of legislation and/or the broadening of knowledge. Furthermore, geotechnical issues may arise that were not apparent at the time of our investigation. Accordingly, the opinions presented in this report may be invalidated, wholly or partially, by changes outside of our control. Therefore, this report is subject to review and should not be relied upon after a period of three years. Similarly, this report should not be used, nor are its recommendation applicable, for any other properties or alternate developments.

We trust this report contains the information you require and thank you for the opportunity to work on this project. Please consider our firm for future geotechnical services as needed.

Sincerely,

TRC Engineers, Inc.

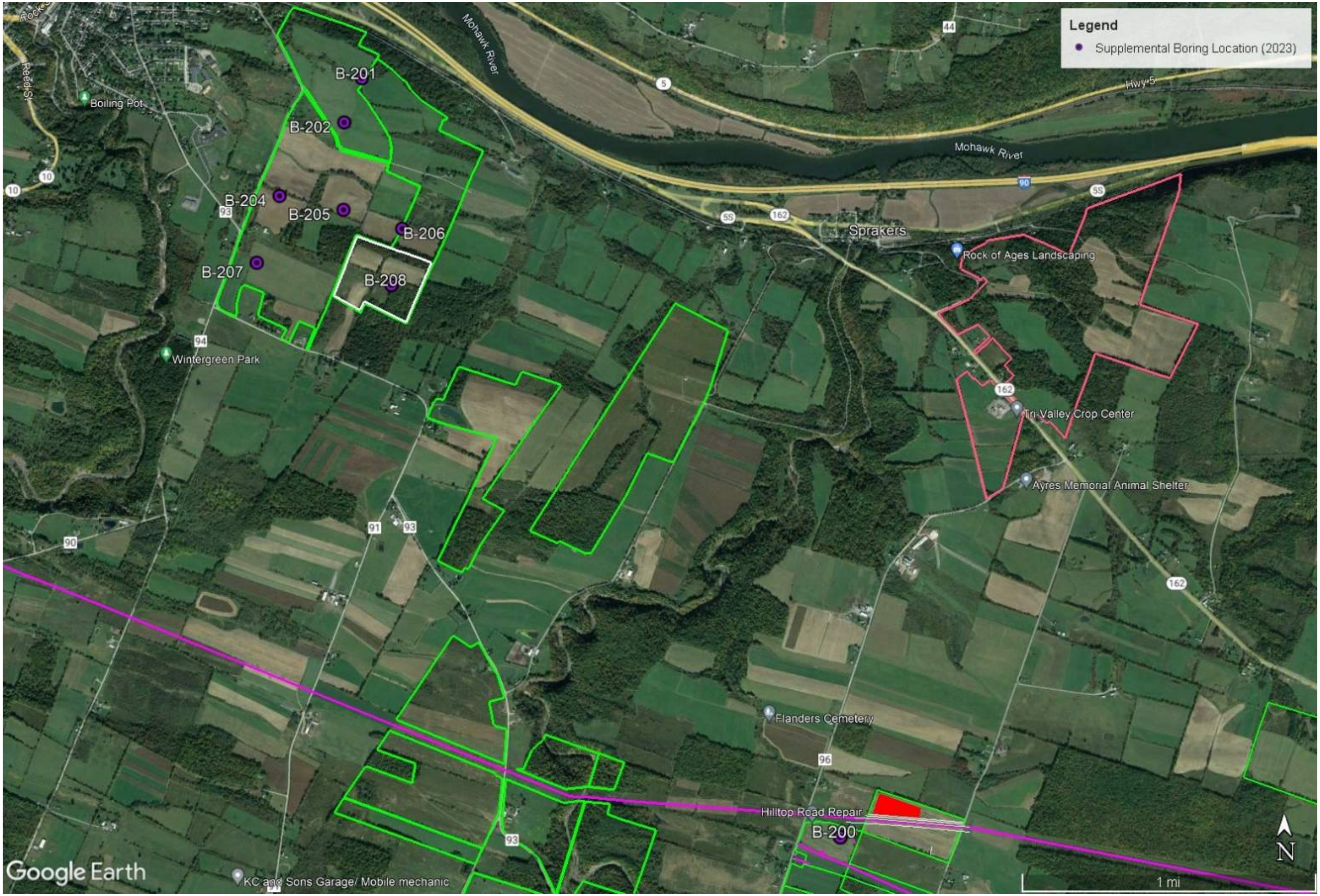
James P. Benjamin

James P. Benjamin, PE*
Geotechnical Project Manager
*NJ, PA

Izzaldin Al Mohd, PhD, PE
Chief Geotechnical Engineer
NY License No.: 105780

cc: Samantha Kranes, TRC

FIGURES



Project No. 427281.2022.GEOT

Date: October 30,2023

For: SED NY Holdings LLC

TRC
16000 Commerce Parkway, Mt. Laurel, New Jersey 08054
PH. (856) 273-1224 FAX. (856) 273-9244

APPROXIMATE TEST BORING LOCATIONS

Flat Creek Solar –Supplemental

Town of Root, Montgomery County, New York

FIGURE

1

FIELD DATA

TEST BORING LOGS

TEST BORING LOG

PROJECT: FLAT CREEK SOLAR - SUPPLEMENTAL
LOCATION: MONTOGOMERY COUNTY, NY

BORING **B-200**
G.S. ELEV.
FILE 427281.2022.GEO2
SHEET 1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NE			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	30.0 '

DRILLER R. CRUM
HELPER D. CRUM
INSPECTOR J. MATHEW
DATE STARTED 06/12/2023
DATE COMPLETED 06/12/2023

DEPTH	A	B	C	DESCRIPTION	Wc	REMARKS
			0.7	***TOPSOIL***		
	S-1	2 4 13 9	2.0	***BROWN SILTY GRAVEL, TR TO SM F/M/C SAND, TR CLAY***		
	S-2	6 6 3 5				
5						
	S-3	9 4 2 6				
	S-4	6 7 10 11		***BROWN SILTY CLAY, TR TO SM F/M/C SAND, TR GRAVEL***		
	S-5	16 19 50/0.2'				AUGER REFUSAL AT 9.2 FT (POSSIBLE BOULDER); BORING OFFSET AND CONTINUED
10						
			13.0			
15	S-6	10 12 11 24		***BROWN SILT, TR CLAY, TR GRAVEL-SIZED ROCK FRAGMENTS***		
			18.0			
20	S-7	8 10 11 13		***GRAY GRAVEL-SIZED ROCK FRAGMENTS, SM F/M/C SAND, TR CLAY***		
			23.0			
25	S-8	5 8 9 15		***GRAY GRAVEL-SIZED ROCK FRAGMENTS, SM F/M/C SAND, SM SILT, TR CLAY***		
30	S-9	8 12 10 6	30.0			
				END OF BORING AT 30'		
35						

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DRN. ERJ
CKD. JPB

TEST BORING LOG

PROJECT: FLAT CREEK SOLAR - SUPPLEMENTAL
LOCATION: MONTOGOMERY COUNTY, NY

BORING **B-201**
G.S. ELEV.
FILE 427281.2022.GEO2
SHEET 1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NE			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE					
a	FROM	0.0 '	TO	10.0 '	
d	FROM	10.0 '	TO	15.0 '	

DRILLER R. CRUM
HELPER D. CRUM
INSPECTOR J. MATHEW
DATE STARTED 06/13/2023
DATE COMPLETED 06/13/2023

DEPTH	A	B	C	DESCRIPTION	Wc	REMARKS
	S-1	1 3 4 4		***BROWN CLAYEY F/M/C SAND, TR TO SM GRAVEL***		
				2.0		
	S-2	4 4 2 4		***BROWN SILT, SM CLAY, TR GRAVEL, TR F/M/C SAND***		
5	S-3	4 4 5 5		6.0		
	S-4	5 6 9 16				
10	S-5	15 17 18 26		***BROWN SILT, TR TO SM F/M/C SAND, TR CLAY, TR GRAVEL***		
				13.0		
15	S-6	5 7 8 9		***BLACK SILT, SM F/M/C SAND, TR TO SM CLAY, TR GRAVEL***		
				15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

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DRN. ERJ
CKD. JPB

TEST BORING LOG

BORING	**B-202**
G.S. ELEV.	
FILE	427281.2022.GEO2
SHEET	1 OF 1

PROJECT: FLAT CREEK SOLAR - SUPPLEMENTAL
LOCATION: MONTOGOMERY COUNTY, NY

GROUNDWATER DATA

FIRST ENCOUNTERED NE

DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER R. CRUM
HELPER D. CRUM
INSPECTOR J. MATHEW
DATE STARTED 06/13/2023
DATE COMPLETED 06/13/2023

DEPTH	A	B	C	DESCRIPTION	Wc	REMARKS
	S-1	1 1 3 4		***BROWN CLAYEY F/M/C SAND, TR TO SM GRAVEL***		
	S-2	3 3 2 3		4.0		
5				***BROWN SILT, SM GRAVEL, TR TO SM SAND, TR TO SM CLAY***		
	S-3	4 3 8 12		6.0		
	S-4	14 25 19 25				
10	S-5	39 33 40 28		***BLACK SILTY F/M/C SAND, TR TO SM GRAVEL SIZED ROCK FRAGMENTS, TR CLAY***		
15	S-6	6 10 12 16		15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

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DRN. ERJ
CKD. JPB

TEST BORING LOG

PROJECT: FLAT CREEK SOLAR - SUPPLEMENTAL
LOCATION: MONTOGOMERY COUNTY, NY

BORING **B-204**
G.S. ELEV.
FILE 427281.2022.GEO2
SHEET 1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NE			
DEPTH	HOUR	DATE	ELAPSED TIME

▽
▼

METHOD OF ADVANCING BOREHOLE					
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	13.8 '

DRILLER R. CRUM
HELPER D. CRUM
INSPECTOR J. MATHEW
DATE STARTED 06/12/2023
DATE COMPLETED 06/12/2023

DEPTH	A	B	C	DESCRIPTION	Wc	REMARKS
	S-1	WH 2 4 5		***BROWN CLAY, TR F/M/C SAND***		
	S-2	5 6 5 4		4.0		
5						
	S-3	3 4 6 5		***BROWN SILT, TR TO SM GRAVEL, TR TO SM CLAY***		
	S-4	5 11 2 50/0.3'		8.0		AUGER REFUSAL AT 8 FT; BORING OFFSET 10 FT AND CONTINUED
10	S-5	21 36 38 41				
				GRAY BROWN GRAVEL-SIZED ROCK FRAGMENTS AND F/M/C SAND, TR TO SM SILT		
	S-6	27 50/0.3'		13.8		
15				***END OF BORING AT 13.8'***		
20						
25						
30						
35						

WH = WEIGHT OF HAMMER
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DRN. ERJ
CKD. JPB

NEW PROJECTS TEST BORING LOG 427281.2022.GEO2 FLAT CREEK SOLAR SUPPLEMENTAL.GPJ SITE BLAUVELT.GDT 3/26/24

TEST BORING LOG

PROJECT: FLAT CREEK SOLAR - SUPPLEMENTAL
LOCATION: MONTOGOMERY COUNTY, NY

BORING	**B-205**
G.S. ELEV.	
FILE	427281.2022.GEO2
SHEET	1 OF 1

GROUNDWATER DATA

FIRST ENCOUNTERED NE

DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	9.5 '
d	FROM	9.5 '	TO	10.5 '

DRILLER R. CRUM
HELPER D. CRUM
INSPECTOR J. MATHEW
DATE STARTED 06/12/2023
DATE COMPLETED 06/12/2023

DEPTH	A	B	C	DESCRIPTION	Wc	REMARKS
				0.5 ***TOPSOIL***		
	S-1	1 2 4 6		***BROWN CLAYEY F/M/C SAND, TR TO SM GRAVEL*** 2.0		
	S-2	6 4 4 2		***BROWN SILTY CLAY, TR TO SM F/M/C SAND, TR GRAVEL*** 4.0		
5	S-3	4 3 4 7		***BLACK GRAVEL SIZED ROCK FRAGMENTS AND SILT, TR TO SM F/M/C SAND*** 6.0		
	S-4	6 8 15 14		***BROWN SILTY CLAY, TR TO SM F/M/C SAND, TR GRAVEL***		
10	S-5	11 10 15 50/0.0'		10.5		AUGER REFUSAL AT 10.5 FT
				END OF BORING AT 10.5'		
15						
20						
25						
30						
35						

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DRN. ERJ
CKD. JPB

NEW PROJECTS TEST BORING LOG 427281.2022.GEO2 FLAT CREEK SUPPLEMENTAL.GPJ SITE BLAUVELT.GDT 3/26/24

TEST BORING LOG

BORING	**B-206**
G.S. ELEV.	
FILE	427281.2022.GEO2
SHEET	1 OF 1

PROJECT: FLAT CREEK SOLAR - SUPPLEMENTAL

LOCATION: MONTOGOMERY COUNTY, NY

GROUNDWATER DATA

FIRST ENCOUNTERED N/A ▽

DEPTH	HOUR	DATE	ELAPSED TIME	
5.8'	AD	6/12	0 HR	▼
NE	0	6/12	1	▽

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	6.8 '

DRILLER R. CRUM
HELPER D. CRUM
INSPECTOR J. MATHEW
DATE STARTED 06/12/2023
DATE COMPLETED 06/12/2023

DEPTH		A	B	C	DESCRIPTION	Wc	REMARKS
		S-1	4 6 4 7	▨	***BROWN CLAYEY F/M/C SAND, TR TO SM GRAVEL*** 2.0		
		S-2	5 4 3 5	▨	***BROWN SILTY CLAYEY F/M/C SAND, TR TO SM GRAVEL***		
5 ▼		S-3	3 4 2 50/0.2'	▨			
		S-4	16 50/0.3'	▨	6.8		AUGER REFUSAL AT 6 FT
					END OF BORING AT 6.8'		
10							
15							
20							
25							
30							
35							

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DRN. ERJ
CKD. JPB

TEST BORING LOG

PROJECT: FLAT CREEK SOLAR - SUPPLEMENTAL
LOCATION: MONTOGOMERY COUNTY, NY

BORING	**B-207**
G.S. ELEV.	
FILE	427281.2022.GEO2
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NE			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE					
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER	R. CRUM
HELPER	D. CRUM
INSPECTOR	J. MATHEW
DATE STARTED	06/11/2023
DATE COMPLETED	06/11/2023

DEPTH	A	B	C	DESCRIPTION	Wc	REMARKS
			0.5	***TOPSOIL (0.0 - 6.0")***		
	S-1	3 3 4 4	2.0	***BROWN CLAY, TR TO SM F/M/C SAND, TR GRAVEL***		
	S-2	5 6 9 10	4.0	***BROWN SILTY CLAY***		
5	S-3	17 13 13 15	6.0	***BROWN SILT, SM CLAY, TR F/M/C SAND***		S-3: HYDROCARBON LIKE ODOR
	S-4	6 7 10 12				
10	S-5	11 10 11 14		***BROWN SILT, TR TO SM CLAY, TR F/M/C SAND***		
15	S-6	5 9 10 13	15.0			
				END OF BORING AT 15'		
20						
25						
30						
35						

NEW PROJECTS TEST BORING LOG 427281.2022.GEO2 FLAT CREEK SUPPLEMENTAL.GPJ SITE BLAUVELT.GDT 3/26/24

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DRN. ERJ
CKD. JPB

TEST BORING LOG

PROJECT: FLAT CREEK SOLAR - SUPPLEMENTAL
LOCATION: MONTOGOMERY COUNTY, NY

BORING	**B-208**
G.S. ELEV.	
FILE	427281.2022.GEO2
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NE			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER R. CRUM
HELPER D. CRUM
INSPECTOR J. MATHEW
DATE STARTED 06/12/2023
DATE COMPLETED 06/12/2023

DEPTH	A	B	C	DESCRIPTION	Wc	REMARKS
				0.5 ***TOPSOIL***		SURFICIAL BOULDERS OBSERVED
	S-1	1 6 8 15		***BROWN CLAYEY F/M/C SAND, TR TO SM GRAVEL***		
	S-2	14 5 6 5		4.0		
5						
	S-3	5 5 6 9		***BROWN SILT, SM F/M/C SAND, TR TO SM GRAVEL, TR CLAY***		DIFFICULT AUGERING FROM 6 FT
	S-4	12 12 14 7		8.0		
10	S-5	23 37 43 46		***BLACK GRAVELLY SILT, TR TO SM F/M/C SAND, TR CLAY***		
				13.0		
				BLACKSILTY F/M/C SAND, SM GRAVEL		
15	S-6	5 7 12 15		15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

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DRN. ERJ
CKD. JPB

KEY TO SYMBOLS

Strata symbols

Symbol	Description
▨	Clay with High Plasticity
▨	Clay with Low Plasticity
▨	Silty Clay
▩	Silty Gravel
▩	Poorly-graded Gravel with Clay
▩	Poorly-graded Sandy Gravel
▥	Silt with Low Plasticity
▩	USCS Gravelly Silt
▥	USCS Sandy Silt
▨	Clayey Sand
▨	Silty, Clayey Sand
▥	Silty Sand
▩	Topsoil

Misc. Symbols

Symbol	Description
▽	Water table first encountered
▼	Water table first reading after drilling
▼	Water table second reading after drilling
▼	Water table third reading after drilling
NR	Not Recorded
MH	Moh's Hardness

Sample Type

Symbol	Description
▯	Split Barrel

Lab Symbols

FINES = Fines %

LL = Liquid Limit %

PI = Plasticity Index %

U_c = Unconfined Compressive Strength

W/V = Unit Weight

Notes:

COLUMN A) Soil sample number.

COLUMN B) FOR SOIL SAMPLE (ASTM D 1586): indicates number of blows obtained for each 6 ins. penetration of the standard split-barrel sampler. FOR ROCK CORING (ASTM D2113): indicates percent recovery (REC) per run and rock quality designation (RQD). RQD is the % of rock pieces that are 4 ins. or greater in length in a core run.

COLUMN C) Strata symbol as assigned by the geotechnical engineer.

DESCRIPTION) Description including color, texture and classification of subsurface material as applicable (see Descriptive Terms). Estimated depths to bottom of strata as interpolated from the borings are also shown.

DESCRIPTIVE TERMS: F = fine M = medium C = coarse

RELATIVE PROPORTIONS:

-Descriptive Term-	-Symbol-	-Est. Percentages-
Trace	TR	1-10
Trace to Some	TR to SM	10-15
Some	SM	15-30
Silty, Sandy, Clayey, Gravelly	-	30-40
And	and	40-50

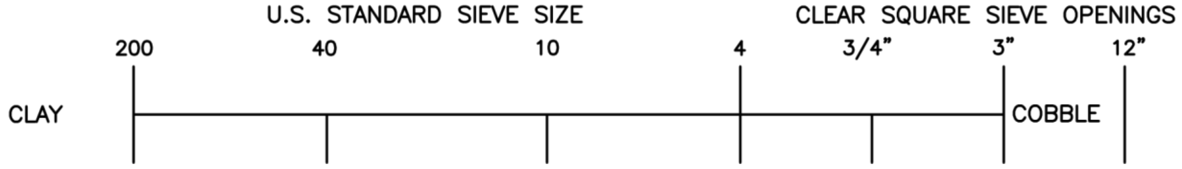
REMARKS) Special conditions or test data as noted during investigation. Note that W.O.P. indicates water observation pipes.

* Free water level as noted may not be indicative of daily, seasonal, tidal, flood, and/or long term fluctuations.

SILTS AND CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

PRIMARY DIVISIONS			SOIL TYPE		SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (Less than 5% Fines)	GW		Well graded gravels, gravel—sand mixtures, little or no fines
			GP		Poorly graded gravels or gravel—sand mixtures, little or no fines
		GRAVEL WITH FINES	GM		Silty gravels, gravel—sand—silt mixtures, plastic fines
			GC		Clayey gravels, gravel—sand—clay mixtures, plastic fines
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (Less than 5% Fines)	SW		Well graded sands, gravelly sands, little or no fines
			SP		Poorly graded sands or gravelly sands, little or no fines
		SANDS WITH FINES	SM		Silty sands, sand—silt—mixtures, non—plastic fines
			SC		Clayey sands, sand—clay mixtures, plastic fines
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50 %		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL		Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50 %		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH		Inorganic clays of high plasticity, fat clays
			OH		Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			PT		Peat and other highly organic soils

DEFINITION OF TERMS



METHODS AND TOOLS FOR **ADVANCING BOREHOLES**

a - Continuous Sampling

b - Finger type rotary cutter head 6 in. diameter (open hole)

d - Drilled in casing 3 3/8 in. ID; 8 in. OD (hollow-stem auger)

e - Drilled in casing 2 1/2 in. ID; 6 1/4 in. OD (hollow-stem auger)

f - Driven flush joint casing (BW) - 2 3/8 in. ID; 2 7/8 in. OD (300 lb. hammer, 18 in. drop)

g - Driven flush joint casing (NW) - 3 in. ID; 3 1/2 in. OD (300 lb. hammer, 18 in. drop)

h - Tricone Roller Bit - 2 3/8 in. or 2 7/8 in.

i - Drilling Mud (Slurry Method)

c_1 - Double tube diamond core barrel (BX) : core size: 1.6 in.
hole size: 2.36 in.

c_2 - Double tube diamond core barrel (NX) : core size: 2.0 in.
hole size: 2.98 in.

c_3 - 4 in. thin walled diamond bit

c_4 - 6 in. thin walled diamond bit

METHODS AND TOOLS FOR **TESTING AND SAMPLING SOILS AND/OR ROCKS**

Penetration test and split-barrel sampling of soils, ASTM D1586

140 lb. hammer, 30 in. drop. recording number of blows obtained for each 6 in. penetration usually for a total of 18 in. penetration of the standard 2 in. O.D. and 1 3/8 in. I.D. split-barrel sampler. Penetration resistance (N) is the total number of blows required for the second and third 6 in. penetration.

Thin walled tube sampling, ASTM D1587

Samples are obtained by pressing thin-walled steel, brass or aluminum tubes into soil. Standard thin-walled steel tubes:

O.D. in.	2	3
I.D. in.	1.94	2.87

Diamond core drilling, ASTM D2113

Diamond core drilling is used to recover intact samples of rock and some hard soils generally with the use of a:

BWM double tube core barrel
NWM double tube core barrel

FIELD RESISTIVITY DATA

TRC Engineers, Inc.
Field Resistivity Testing
Wenner Method

Project: Flat Creek Solar
Project No.: 427281.2022.GEO2
Location: Montgomery Co., NY
Client: SED NY Holdings, LLC
Site Conditions: _X_ Dry ___Wet __ Ideal
Date Completed: 6/12/2023
Ambient Temperature: 83˚F
Operator: J. Mathew
Rain storms previous day- No
Helper: NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 1	2.5	14.5	6,942	
	5.0	7.14	6,837	
	10.0	3.74	7,162	
	20.0	2.30	8,809	
	25.0	2.15	10,293	

Line 1 Direction:
X N-S
___ NE_SW
___ E-W
___ NW-SE

Test Location
B-200

TRC Engineers, Inc.
Field Resistivity Testing
Wenner Method

Project: Flat Creek Solar
Project No.: 427281.2022.GEO2
Location: Montgomery Co., NY
Client: SED NY Holdings, LLC
Site Conditions: _X_ Dry __Wet __ Ideal
Date Completed: 6/12/2023
Ambient Temperature: 83°F
Operator: J. Mathew
Rain storms previous day- No
Helper: NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 2	2.5	14.0	6,683	
	5.0	7.35	7,038	
	10.0	4.01	7,679	
	20.0	2.24	8,579	
	25.0	1.96	9,384	

Line 2 Direction:
___ N-S
___ NE_SW
X E-W
___ NW-SE

Test Location
B-200

TRC Engineers, Inc.
Field Resistivity Testing
Wenner Method

Project:	Flat Creek Solar	Project No.:	427281.2022.GEO2
Location:	Montgomery Co., NY	Client:	SED NY Holdings, LLC
Site Conditions:	__ Dry _X_ Wet __ Ideal	Date Completed:	6/13/2023
Ambient Temperature:	78˚F	Operator:	J. Mathew
Rain storms previous day- Yes		Helper:	NA

Test	Electrode Spacing (ft)	Resistance Φ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 1	2.5	8.18	3,916	
	5.0	5.17	4,950	
	10.0	3.05	5,841	
	20.0	1.78	6,817	
	25.0	1.64	7,852	

Line 1 Direction:

X	N-S
	NE_SW
	E-W
	NW-SE

Test Location

B-202

TRC Engineers, Inc.
Field Resistivity Testing
Wenner Method

Project:	Flat Creek Solar	Project No.:	427281.2022.GEO2
Location:	Montgomery Co., NY	Client:	SED NY Holdings, LLC
Site Conditions:	__ Dry _X_ Wet __ Ideal	Date Completed:	6/13/2023
Ambient Temperature:	78°F	Operator:	J. Mathew
Rain storms previous day- Yes		Helper:	NA

Test	Electrode Spacing (ft)	Resistance Φ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 2	2.5	9.09	4,352	
	5.0	5.49	5,257	
	10.0	2.99	5,726	
	20.0	1.89	7,239	
	25.0	1.73	8,282	

Line 2 Direction:

	N-S
	NE_SW
X	E-W
	NW-SE

Test Location

B-202

LABORATORY DATA

SUMMARY OF LABORATORY TEST DATA

Project Name: Flat Creek Solar
Montgomery Co., NY
Client Name: Sun East Development, LLC
TRC Project #: 427281.2022.GEO2

SAMPLE IDENTIFICATION			USCS Group	Moisture Content (%)	GRAIN SIZE DISTRIBUTION USCS GRADATION				PLASTICITY			
Source #	Sample #	Depth (ft)			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)
B-200	S-3 & S-4	4.0-8.0	CL-ML^1	11.2	-	-	-		21	15	6	-0.6
B-200	S-8 & S-9	23.0-30.0	GC^2	7.0	32.7	29.9	37.4		-	-	-	-
B-200 & B-207	BULK 1	0.0-5.0	CH	17.9	3.6	13.1	83.3		52	23	29	-0.2
B-201	S-2 & S-3	2.0-6.0	ML^1	11.7	-	-	-		16	13	3	-0.4
B-201, 202, 205 to 208	BULK 2 & 3	0.0-5.0	SC	7.8	12.2	40.0	47.8		20	12	8	-0.5
B-202	S-4 & S-5	6.0-10.0	SM^2	6.1	13.2	51.3	35.5		-	-	-	-
B-204	S-2	2.0-4.0	CL^1	18.6	-	-	-		27	18	9	0.1
B-205	S-4 & S-5	6.0-10.0	CL-ML^1	11.6	-	-	-		18	14	4	-0.6
B-206	S-2 & S-3	2.0-6.0	SC-SM^2	19.2	11.6	51.0	37.4		-	-	-	-
B-208	S-6	13.0-15.0	SM^2	7.9	18.0	37.3	44.7		-	-	-	-

Notes:

(1) USCS Group based on fines only. No gradation was requested to be completed.

(2) USCS Group based on grain size distribution and visual classification. An Atterberg was not requested to be completed.

DRAWN BY: TBT 07/20/23 CHECKED BY: JPB 07/20/23

SUMMARY OF LABORATORY TEST DATA

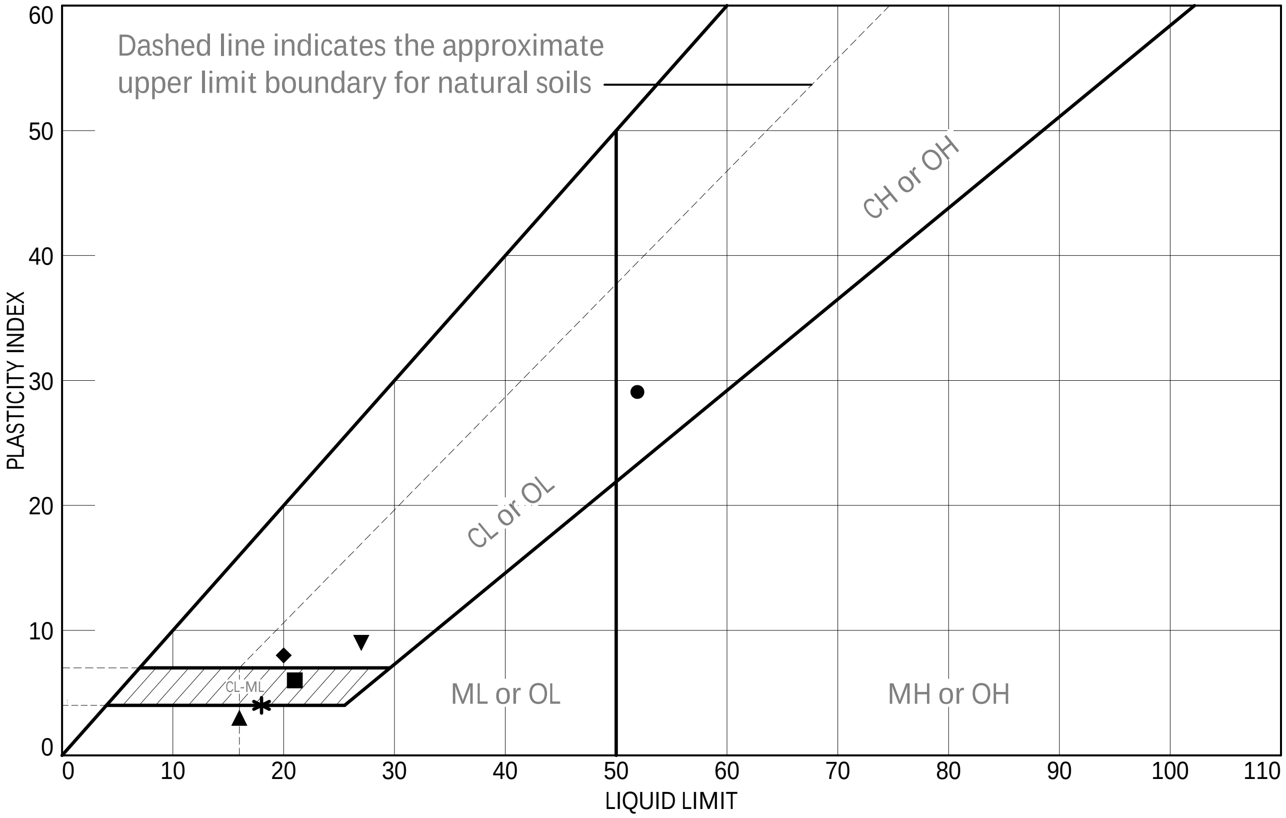
Project Name:	Flat Creek Solar Montgomery Co., NY
Client Name:	Sun East Development, LLC
TRC Project #:	427281.2022.GEO2

SAMPLE IDENTIFICATION			COMPACTION CHARACTERISTICS			Thermal Resistivity (°C-cm/W)			
Source #	Sample #	Depth (ft)	Type of Test	Maximum Density (PCF)	Optimum Moisture Content (%)	Wet	Dry	Moisture Content (%)	Dry Density (pcf)
B-201, 202, 205 to 208	BULK 2 & 3	0.0-5.0	ASTM D698, C	127.5	8.4	46.4	127.8	10.4	114.8

DRAWN BY: TBT 07/20/23

CHECKED BY: JPB 07/20/23

Atterberg Limits and Moisture Content Report



SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	LIQUIDITY INDEX	USCS
●	B-200 & B-207	BULK 1	0.0-5.0 FT	17.9	23	52	29	-0.2	CH
■	B-200	S-3 & S-4	4.0-8.0 FT	11.2	15	21	6	-0.6	CL-ML*
▲	B-201	S-2 & S-3	2.0-6.0 FT	11.7	13	16	3	-0.4	ML*
◆	B-201, 202, 204, 206, & 208	BULK 2 & 3	0.0-5.0 FT	7.8	12	20	8	-0.5	SC
▼	B-204	S-2	2.0-4.0 FT	18.6	18	27	9	0.1	CL*
*	B-205	S-4 & S-5	6.0-10.0 FT	11.6	14	18	4	-0.6	CL-ML*

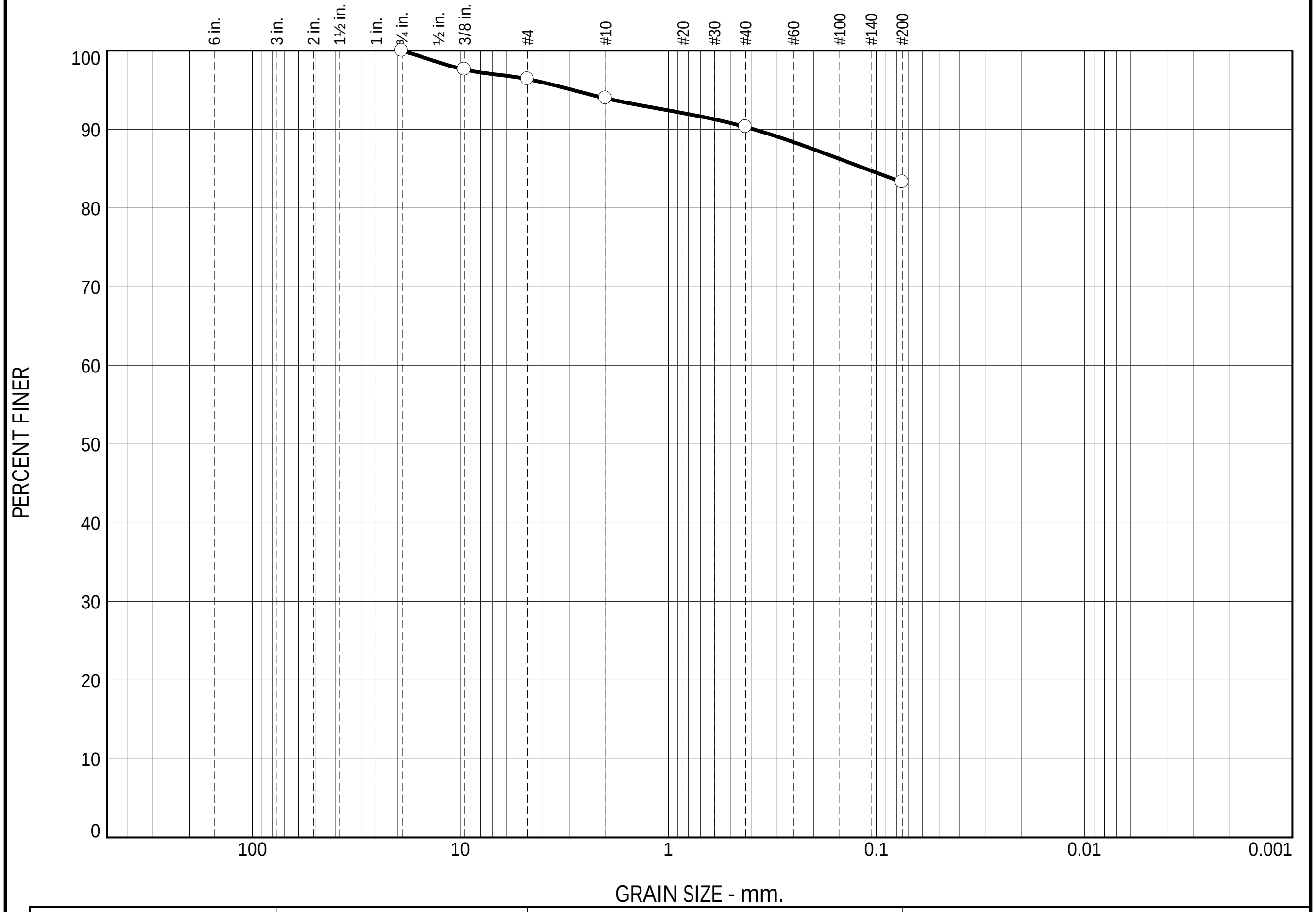
TRC
Engineers, Inc.
Mt. Laurel, NJ

Client: SUNEAST DEVELOPMENT, LLC
Project: SUNEAST - FLAT CREEK SOLAR

Project No.: 427281.2022.GEO2

Figure 1

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	3.6	2.5	3.6	7.0	83.3	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	52	23	0.1129							

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN FAT CLAY WITH SAND	06/29/23	CH	17.9

Project No. 427281.2022.GEO2 Client: SUNEAST DEVELOPMENT, LLC

Project: SUNEAST - FLAT CREEK SOLAR

○ Source: B-200 & B-207 Depth: 0.0-5.0 FT Sample No.: BULK 1

TRC Engineers, Inc.

Mt. Laurel, NJ

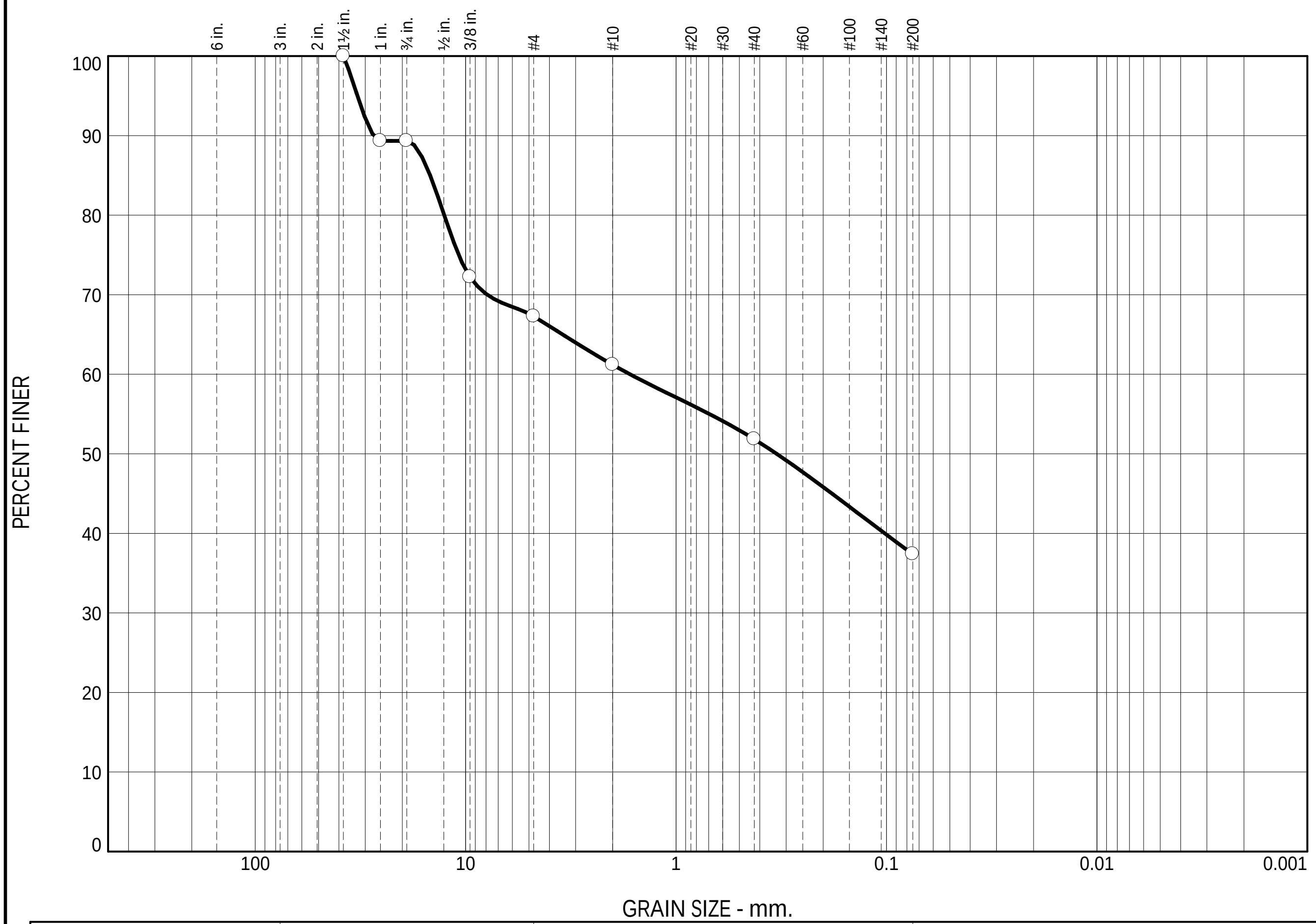
Remarks:

○SAMPLE DESCRIPTION BASED ON USCS

Figure 2

Tested By: JC 06/29/23 Checked By: JPB 07/05/23

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	10.7	22.0	6.1	9.4	14.4	37.4	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			14.7448	1.6558	0.3328					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BLACK CLAYEY GRAVEL WITH SAND	07/14/23	GC	7.0

Project No. 427281.2022.GEO2 Client: SUNEAST DEVELOPMENT, LLC
Project: SUNEAST - FLAT CREEK SOLAR

○ Source of Sample: B-200 Depth: 23.0-30.0 FT Sample Number: S-8 & S-9

Remarks:
○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

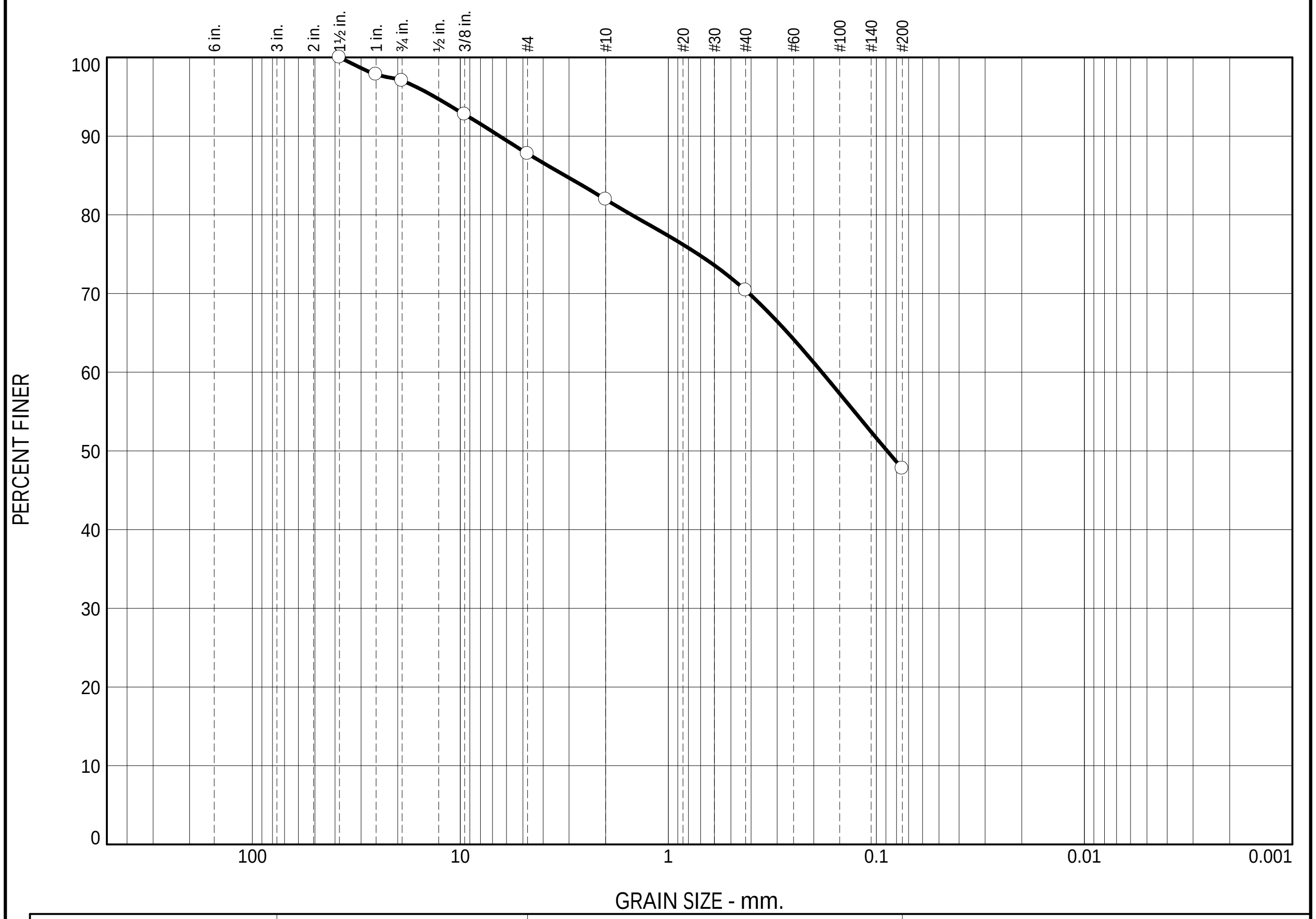
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 3

Tested By: EJ 07/14/23 Checked By: JPB 07/20/23

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	3.0	9.2	5.9	11.5	22.6	47.8	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	20	12	3.1402	0.1826	0.0887					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN CLAYEY SAND	06/29/23	SC	7.8

Project No. 427281.2022.GEO2 Client: SUNEAST DEVELOPMENT, LLC

Project: SUNEAST - FLAT CREEK SOLAR

○ Source: B-201, 202, 204, 206, & 208 Depth: 0.0-5.0 FT Sample No.: BULK 2 & 3

Remarks:

○SAMPLE DESCRIPTION
BASED ON USCS

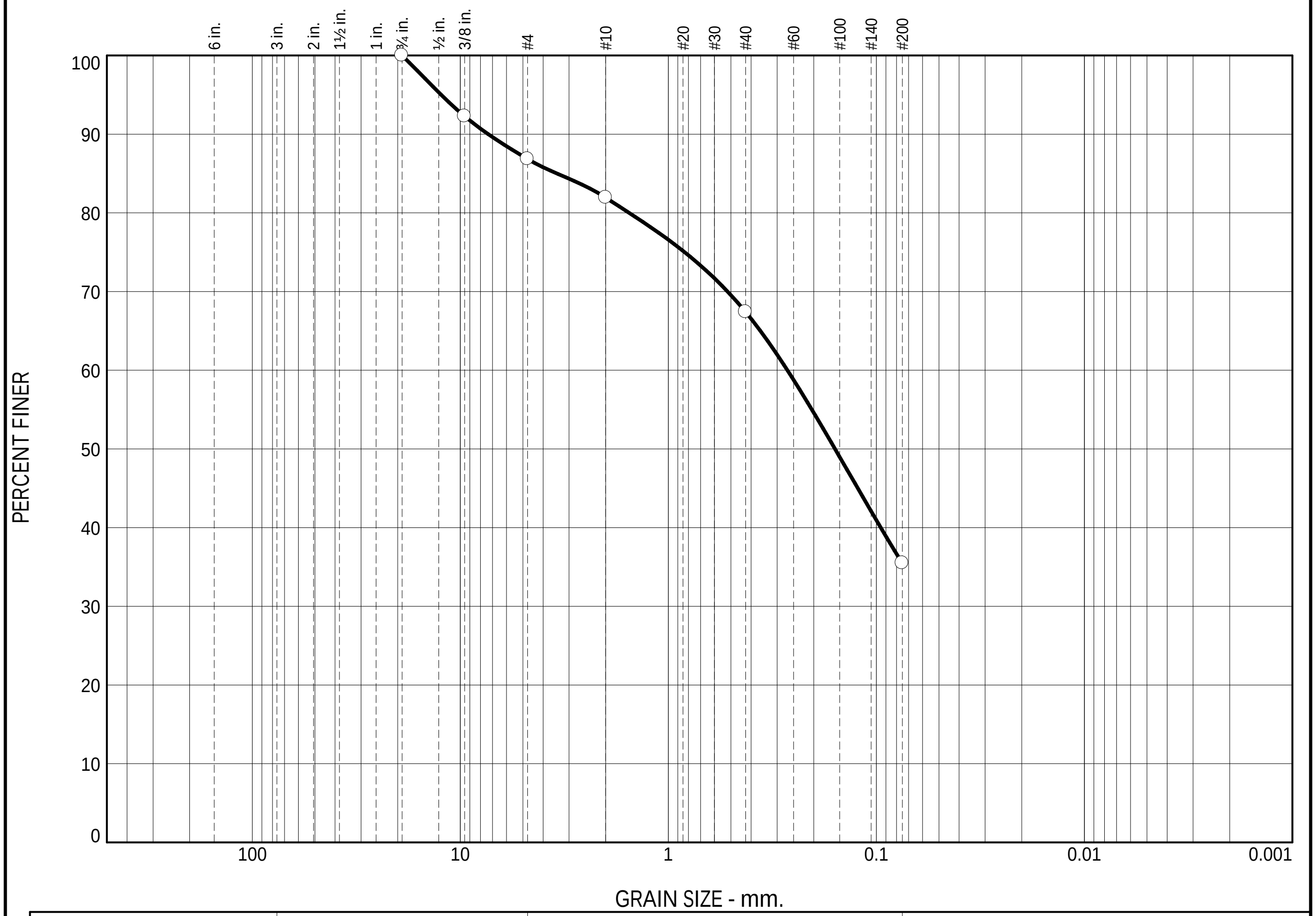
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 4

Tested By: JC 06/29/23 Checked By: JPB 07/05/23

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	13.2	4.9	14.5	31.9	35.5	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			3.4285	0.2675	0.1579					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BLACK SILTY SAND	07/14/23	SM	6.1

Project No. 427281.2022.GEO2 Client: SUNEAST DEVELOPMENT, LLC

Project: SUNEAST - FLAT CREEK SOLAR

○ Source of Sample: B-202 Depth: 6.0-10.0 FT Sample Number: S-4 & S-5

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

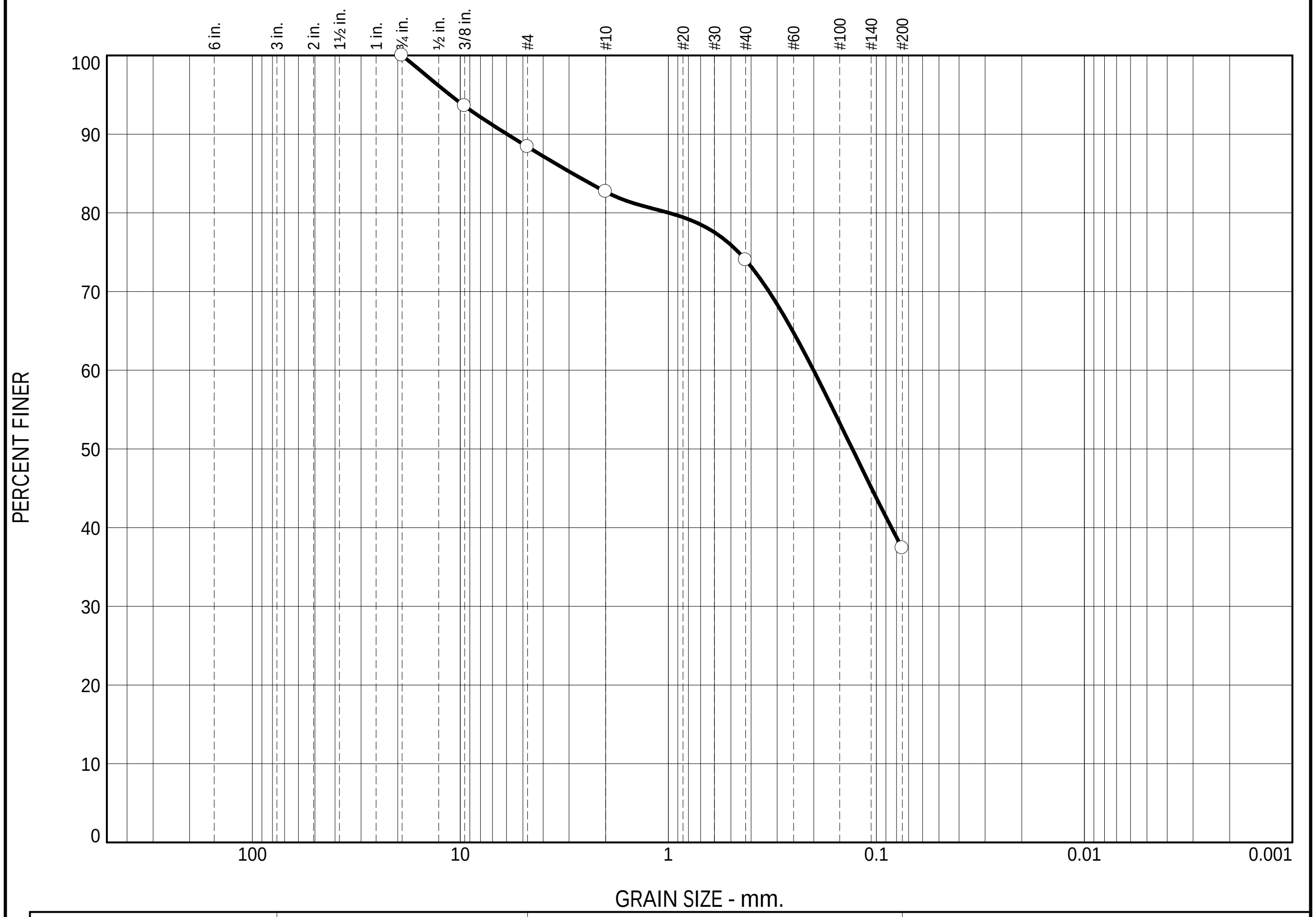
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 5

Tested By: EJ 07/14/23 Checked By: JPB 07/20/23

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	11.6	5.7	8.7	36.6	37.4	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			2.8845	0.2003	0.1304					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SILTY, CLAYEY SAND	07/14/23	SC-SM	19.2

Project No. 427281.2022.GEO2 Client: SUNEAST DEVELOPMENT, LLC
Project: SUNEAST - FLAT CREEK SOLAR

○ Source of Sample: B-206 Depth: 2.0-6.0 FT Sample Number: S-2 & S-3

Remarks:
○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

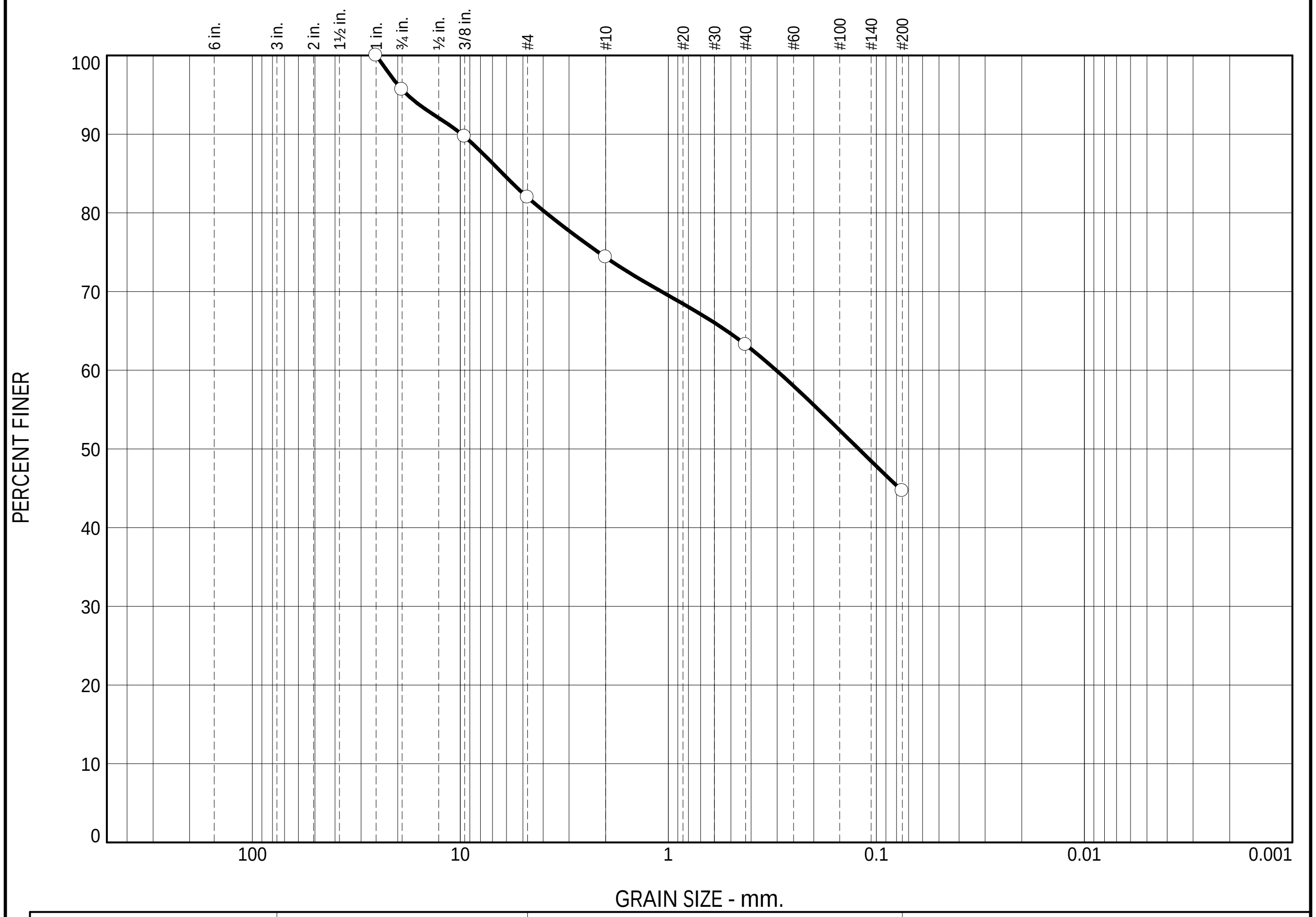
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 6

Tested By: EJ 07/14/23 Checked By: JPB 07/20/23

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	4.3	13.7	7.6	11.2	18.5	44.7	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			6.2612	0.3029	0.1216					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BLACK SILTY SAND WITH GRAVEL	07/17/23	SM	7.9

Project No. 427281.2022.GEO2 Client: SUNEAST DEVELOPMENT, LLC

Project: SUNEAST - FLAT CREEK SOLAR

○ Source of Sample: B-208 Depth: 13.0-15.0 FT Sample Number: S-6

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

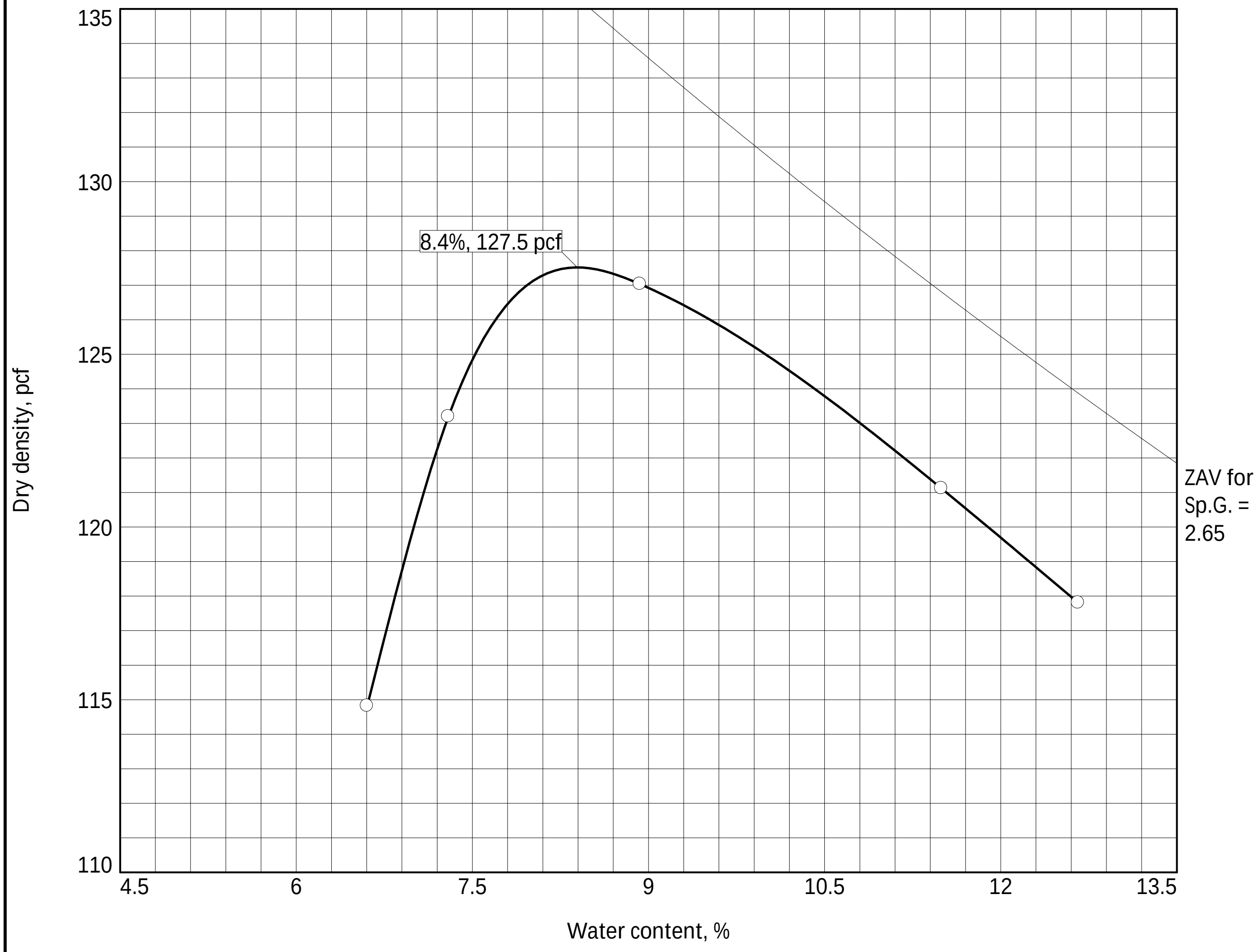
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 7

Tested By: EJ 07/17/23 Checked By: JPB 07/20/23

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method C Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
0.0-5.0 FT	SC	A-4(1)	7.8		20	8	3.0	47.8

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 127.5 pcf Optimum moisture = 8.4 %	BROWN CLAYEY SAND

Project No. 427281.2022.GEO2 Client: SUNEAST DEVELOPMENT, LLC
Project: SUNEAST - FLAT CREEK SOLAR
Date:
○ Source: B-201, 202, 204, 206, & 208 Sample No.: BULK 2 & 3

TRC Engineers, Inc.

Mt. Laurel, NJ

Remarks:
SAMPLE DESCRIPTION BASED ON VISUAL CLASSIFICATION

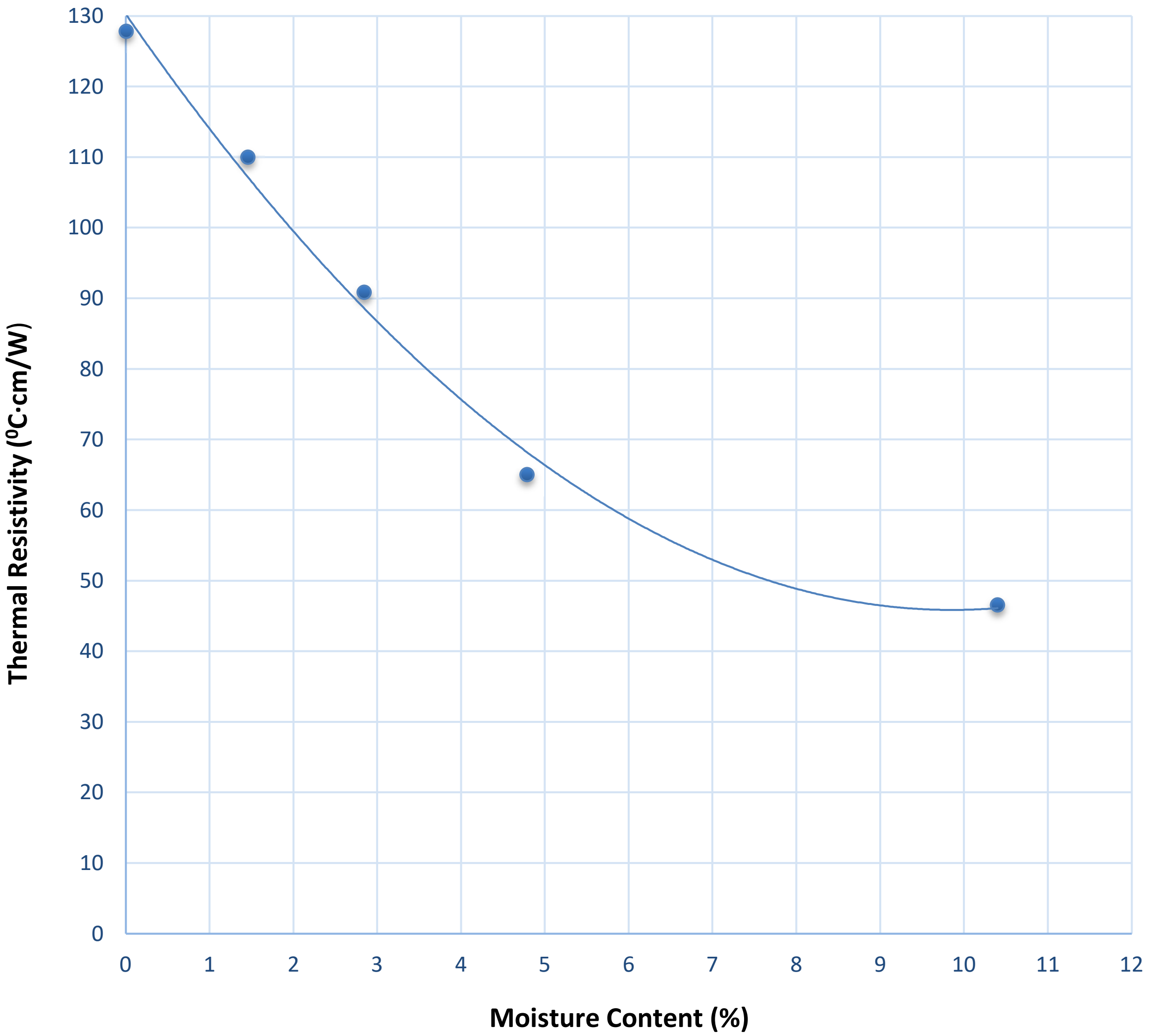
Figure 8

Tested By: EJ 06/23/23 Checked By: JPB 07/05/23

B-201, 202, 205, 206, & 206, BULK 2 & 3, 0.0-5.0 FT

THERMAL RESISTIVITY DRY-OUT CURVES

427281.2022.GEO2: FLAT CREEK SOLAR



Specimen ID:	B-201, 202, 205, 206, & 208, Bulk 2 & 3, 0.0-5.0 ft
USCS:	-
Received Moisture (avg):	7.1
LL:	-
PI:	-
P200:	-
Max. Dry Dens.:	127.5 PCF
Optimum Moisture:	8.4 %

Specimen was prepared at 2% greater than optimum moisture content and at approximate 90% of the maximum dry density determined by a modified proctor (ASTM D1557).

KE CORROSION

3028 ALDON AVE. LAS VEGAS, NV 89121

702-340-1186 KDE@KECORROSION.COM

CLIENT
TRC Solutions, Inc.
16000 Commerce Parkway, Suite B
Mount Laurel, NJ 08054

PROJECT NO: 427281.2002.GEOT2
Phase 200Lab

PROJECT
Flat Creek Solar Supplemental

DATE: June 29, 2023

LAB ID: 23-0090

Sample By: Client

Analyzed By: Kurt D. Ergun

RESULTS FOR CORROSIVITY ANALYSIS OF SOILS

Sample Number:	200, 207	201,202,205,208
Sample Location:	B-1	B-2 & B-3
Sample Depth:	0.0-5.0	0.0-5.0
Laboratory Testing Methods		
pH Analysis, ASTM D4972(in H2O)	6.80	6.69
PH Analysis, ASTM D4972(in CaCl2)	6.11	6.06
Water Soluble Sulfates, ASTM D516 (mg/kg)	84	68
Clorides, ASTM D512 (mg/kg)	75	50
Sulfides, AWWA 4500-S D (mg/kg)	Nil	Nil
Oxidation-Reduction, AWWA D1498 (mV)	+690	+695
Resistivity, ASTM G187 (ohm-cm)	2645	4510

Nil = <1.0 mg/kg

Kurt D. Ergun

Kurt D. Ergun
Chemist

Note: The tests were performed in accordance with applicable ASTM, AASHTO, or AWWA methods. Test results submitted are only applicable to samples tested at referenced locations and are not indicative of the results of similar materials.

16000 Commerce Pkwy.
Suite B
Mount Laurel, NJ 08054

T 856.273.1224
TRCcompanies.com

Flat Creek Substation Geotechnical Engineering Report

TRC Project No. 435979.0000

Date: June 26, 2024
Revised July 15, 2024

Prepared For:

SunEast Development LLC / Cordelio Services LLC

Table of Contents

16000 Commerce Pkwy.
Suite B
Mount Laurel, NJ 08054

T 856.273.1224
TRCcompanies.com

June 26, 2024
Revised July 15, 2024

Mr. Eric Trammel
Lead Project Manager, Pre-Construction
Cordelio Services LLC
55 Fifth Avenue, Suite 1805
New York, NY 10003
Submitted via e-mail:
etrammel@cordeliopower.com

Re: Supplemental Geotechnical Engineering Report
Proposed Flat Creek Solar Project - Collection Substation and POI Switchyard
Montgomery County, NY
TRC Project #: 435979.1GEO

Dear Mr. Trammel:

TRC Engineers, Inc. (TRC) is pleased to present Cordelio Servies LLC (Cordelio) our Geotechnical Engineering Report for the above referenced project. Our work was initiated in accordance with the signed Change Order #4 of Work Order #22 and completed in general accordance with the agreed scope of work presented in TRC's proposal, submitted April 12, 2024. A summary of our geotechnical exploration activities, including the laboratory test results, findings and recommendations related to the proposed Flat Creek Solar Project is summarized below.

1.0 INTRODUCTION

This report presents the results of our supplemental geotechnical exploration for the proposed photovoltaic (PV) collection substation and Point of Interconnection (POI) switchyard to be constructed at the Flat Creek Solar Project site located in Montgomery County, New York (Facility Site). TRC completed a subsurface exploration for the Facility in June of 2022 (report dated September 8, 2022) and a supplemental subsurface exploration in June of 2023 (report dated April 2, 2024). The proposed collection substation for the Facility has been relocated since our previous explorations and will be constructed adjacent to the existing New York Power Authority (NYPA) overhead transmission right-of-way (ROW) for the 345 kV Transmission Line #352.

The purpose of our exploration was to evaluate the geologic and subsurface conditions within the new collection substation and POI switchyard footprints to reduce uncertainty with respect to anticipated foundation and site construction, and to provide geotechnical recommendations for design of the proposed Facility by others.

1.1 Project Description

The collection substation and POI switchyard are located on the north side of the Facility Site and along the south side of the adjacent, existing NYPA overhead transmission ROW. Concept plans showing specific details of the substation development were provided to TRC by Reynolds Architecture Engineering (Drawing No. FLCK-760, issued for permit dated 3/7/2024) and included new transformers, switches, busses and dead-end structures, as well as ancillary equipment typical of such projects across an approximate 271 ft x 290 ft (78,590 square feet) fenced area for the collection substation and an approximate 323 ft x 482 ft (155,686 square feet) fenced area for the POI switchyard located immediately adjacent. No new retaining walls or stormwater management areas were identified to TRC at the time of this report.

The parcels evaluated as part of this investigation are primarily open agricultural land, which was generally clear of crops at the time of the field exploration along with scattered wooded areas and hedgerows to the north and west. No existing structures are currently located on or adjacent to the proposed facilities. The site is bounded by Rappa Road to the east, the NYPA overhead transmission ROW to the north and a combination of partially wooded areas and open agricultural fields to the south and west. The anticipated loading conditions have not been provided to TRC.

1.2 Scope of Services

Based on our geotechnical scope of services as presented in TRC's revised Proposal for Geotechnical Engineering Services dated June 7, 2023, the following services were completed:

- Exploration of subsurface conditions by drilling a total of eleven (11) borings on-site within the proposed collection substation, POI switchyard and point-of-interconnect areas as shown on Figure 1, *Approximate Test Boring Location Plan*.
- Evaluation of the physical and geotechnical engineering properties of the subsurface soils within the boring locations based on describing the soils by visual-manual examination by a member of our geotechnical staff.
- Engineering analysis for the proposed foundation systems for the support of the collection substation structures and associated development.
- Preparation of this report to summarize our findings, conclusions, and recommendations regarding the following:

    - Foundation support recommendations for the proposed collection substation components including assumed control building, cable trench, transformers, transmission dead end structures and supports.
    - Bearing capacity parameters for use in foundation design by others.
    - Anticipated excavation conditions and presence of potential rock or other refusal conditions, if applicable.
    - Suitability of on-site soils for reuse in back fills and requirements for imported fills.
    - Recommendations for placement, compaction and testing of fills, if applicable
    - Soil parameters (both above and below ground water table) for active, at rest and passive conditions and L-Pile soil parameters for use in foundation design by others.
    - Observed ground water conditions including perched conditions and general guidance related to the control of groundwater during construction, as applicable.
    - Frost penetration depth based on local/regional data.
    - Corrosivity potential on buried steel and concrete.
    - Preliminary Seismic Site Class parameters in accordance with ASCE 7-22
    - Other construction-related concerns, as applicable based on available site subsurface information and any available preliminary design information.

2.0 SITE CONDITIONS

2.1 Site Reconnaissance and Boring Stakeout

A limited site reconnaissance was conducted on May 13 and 14, 2024. At the time of the visit, the majority of the of the proposed development area (parcel) consisted of open fields with vegetation at the time of the site visit and several tree-lined areas. Several farmers trails were also observed throughout the Site. The southern parcel of land was planted with hay at the time of TRC's field exploration. During the field visit, TRC did not observe any structures, stockpiles or any other man-made obstructions that are likely to interfere with the proposed collection substation construction.

During the site visit, TRC also staked out the test boring locations in the field at the proposed locations. Test boring locations were determined in the field using Google Earth KMZ files and a cellphone-based GPS application at the approximate locations recommended by TRC and approved by the project team as shown on the attached Figure 1, *Approximate Test Boring Location Plan*. Prior to drilling, the U-Dig New York One-Call notification system was contacted to notify owners of public utilities in the area of the proposed testing borings for utility mark out and clearance of test boring activities.

Any observations, evaluations, and conclusions made from the site visit were disclosed by our visual observations, where applicable. Our site reconnaissance was limited to visual observations and surface features free of obstruction at the time of the field visit. TRC's observations and/or reporting do not account for other non-visible, hidden, subsurface or material condition analyses, and the professional services rendered are not guaranteed to be a representation by TRC of inaccessible and unobservable site conditions or actual conditions subsequent to the date of TRC's site visit.

2.2 Geotechnical Field Exploration

Geotechnical test borings, designated B-301 through B-311, were drilled at the approximate structure and/or equipment locations within the proposed collection substation, POI switchyard and POI footprints at the approximate locations shown on Figure 1. The test boring field exploration was performed during the period from May 14 to May 16, 2024 by TRC's in-house drilling division under the full-time supervision by a member of TRC's geotechnical engineering staff. Drilling and sampling were performed using a track-mounted drill rig. Split spoon soil sampling was performed continuously through the upper ten (10) ft bgs and at five (5)-ft intervals thereafter to the completion depths in each boring using the Standard Penetration Test (SPT) Method (American Society of Testing and Materials [ASTM] D1586). The samples were obtained by driving the split spoon sampler 24 inches into the soil with a 140-pound automatic hammer free-falling 30 inches. The number of blows required for each 6 inches of penetration was recorded separately. The SPT blow count ("N-value") of the soil was calculated as the number of blows required for the middle 12 inches (6 to 18-inch interval) of penetration or fraction thereof. The SPT N-value serves as an indicator of consistency for cohesive soils and relative density for granular soils. The borings were advanced to the target depths and terminated at depths ranging from 15 to 35.1 ft bgs. Boring depths varied based on the proposed structures and all borings were terminated at the planned depths, except where auger refusal was encountered. Upon completion, all test borings were backfilled to the approximate existing ground surface with the auger cuttings. Copies of the test boring logs are attached along with a copy of the approximate test boring location plan.

2.3 Regional Geology

According to available public geological data, the surficial geology at the construction area consists of residual soil deposits weathered in place from the underlying parent rock. Locally the Site is underlain predominantly by mudstone and shale of the Utica Shale Formation from the Middle Ordovician Age. The northeast corner of the site also lies within relatively close proximity to a geologic contact zone between the Utica Shale and carbonate limestone and dolostone of the Beekmantown Group from the Lower Ordovician Age.

2.4 Subsurface Conditions

This section presents the generalized subsurface conditions observed during the field exploration. During the field activities, observations were made of existing soil cover/topsoil thicknesses, groundwater conditions, surface features, and other site observations deemed important to the planned site development. Refer to the attached boring logs for more detailed descriptions of subsurface units, sample data, SPT results, groundwater conditions, and other pertinent information. Spatial transitions between soil units illustrated on the logs may not be well defined, or gradual and/or erratic; and represents a general interpolation of our inspector's observations obtained at the specific boring location at the time of drilling. See *Figure 1, Approximate Test Boring Locations* for a map that illustrates the approximate locations of the "as drilled" borings. It should be noted that environmental studies were not performed as part of this scope of work, and, as such, no recommendations relative to environmental compliance, including permitting, are included in the Report.

A topsoil layer, approximately 5 to 15 inches thick, was observed at the ground surface in all of the test borings.

Below the surficial cultivated topsoil, the test borings generally encountered soils that consist of predominantly of CLAY and SILTY CLAY with varying quantities of sand and gravel extending to depths ranging from approximately 13 to 23 ft bgs. SPT N-values indicate that the consistency of these soils ranges from "soft" to "medium stiff" in the upper 2 to 6 ft bgs; and becomes "stiff" to "hard" below these depths through the termination depth of each boring. Laboratory test results indicate that the materials tested are a combination of predominantly fine-grained, low plastic clay and silty clay with plastic limits ranging from 11% to 18%, liquid limits ranging from 17% to 29%, and plasticity indexes ranging from 5% to 18%. Natural moisture contents as received by the laboratory range from approximately 6% to 25%. Maximum laboratory compacted dry densities of a two representative bulk samples of the near surface (0 to 5 ft bgs) soils as determined by ASTM D 698 were approximately 112.4 pounds per cubic foot (pcf) at an optimum moisture content of 13.6% from within the Flat Creek collection substation area and approximately 107.4 pcf at an optimum moisture content of 13.6% from within the POI switchyard area with California Bearing Ratios (CBRs) of approximately 3% when compacted to approximately 95% of the maximum dry density for each sample. The unit weight of a representative samples was 130.3 pounds per cubic foot (pcf).

Below the surficial clayey soil stratum, at depths ranging from 13 to 23 feet bgs each test boring with the exception of B-301 and B-306 encountered a stratum consisting of silty clayey SAND and GRAVEL-SIZED ROCK FRAGMENTS with, generally extending to the completion depths. SPT N-values indicate the relative density of this stratum ranges from "medium dense" to "very dense". Laboratory test results indicate that the fine-grained (silt and clay) content of this layer ranges from approximately 38% to 47%. Laboratory test results on the fine-grained portions of this soil layer indicate that plastic limits ranging from 10% to 12%, liquid limits ranging from 15% to 18%, and plasticity indexes ranging from 4% to 7%. Natural moisture content as received by the laboratory ranged from approximately 9% to 10%. Unit weights of representative samples ranged from 130.1 pounds per cubic foot (pcf) to 132.3 pcf.

Auger refusal, which typically represents the apparent top of weathered rock, was encountered in test borings B-310 and B-311 at approximate depths 35.1 ft and 33.6 ft bgs, respectively. Difficult drilling conditions, which are typically indicative of hard or very dense soil conditions and/or the potential presence of oversized rock fragments, were also encountered at 8 of the 11 test boring locations. The depths and locations where difficult drilling and auger refusal were encountered are summarized in Table 1, below.

Table 1. Summary of Difficult Drilling and Auger Refusal Depths

Test Boring Location	Boring Termination Depth, ft*	Depth to Hard or Very Dense Soils (ft, bgs**)	Depth to Difficult Drilling (ft, bgs**)
B-301	15	10	NE
B-302	25	9	14.3
B-303	30	13	13.9
B-304	25	18	18.1
B-305	25	NE	NE
B-306	15	NE	NE
B-307	35	NE	22
B-308	25	22	22
B-309	35	23	23.5
B-310	35.1***	8.5	8.5
B-311	33.6***	28	24.5

**All borings completed to planned depth, except where auger refusal is noted.*
***ft, bgs = feet below existing ground surface*
**** Indicated depth of auger refusal*
NE=Not encountered

2.5 Groundwater

Observations for groundwater were attempted during drilling and shortly after completion in each test boring. Free water was observed on the drilling rods or split-spoon sampler in test borings B-303, B-305, B-307, B-309 and B-310 during drilling at depths ranging from approximately 17.0 to 23.5 ft bgs. Groundwater was observed in these test borings at depths ranging from approximately 16.8 ft bgs to 28.0 ft bgs after completion of drilling at the time of the field exploration. The water readings recorded on the logs represent the conditions at the time the measurements were taken and do not reflect daily, seasonal, or long-term fluctuations in the groundwater level or development of perched water. Hydrostatic groundwater levels and upper (perched) saturation zones should be expected to fluctuate seasonally due to variations in rainfall, runoff, evapotranspiration, irrigation methods, and other factors. Consequently, the observed measured groundwater levels or absence thereof shown on the boring logs only represent conditions at the time the readings were collected and may thus be different at the time of construction. Furthermore, the actual groundwater levels, seepage, and localized saturated conditions may be observed at shallower depths during periods of heavy precipitation. Static daily and seasonal groundwater levels and upper (perched) saturation zones would need to be determined through the installation and monitoring of piezometers, especially in fine-grained soil stratums that are present at the Site. This was outside of TRC's scope of work. The boreholes were subsequently backfilled with soil cuttings following water level measurements upon completion of drilling activities.

3.0 CORROSION EVALUATION

To evaluate the corrosion potential of the near surface soils at the Site, we submitted two (2) representative bulk soil samples from depths of approximately 1 ft to 5 ft bgs, composited from test boring locations during our subsurface exploration to an analytical laboratory for pH, chloride, soluble sulfate, and sulfate content, resistivity and oxidation reduction testing. Bulk 1 was collected from the auger cuttings within the proposed Flat Creek collection substation area and Bulk 2 was collected from the proposed POI switchyard area. The results are summarized in Table 2, below.

Table 2. Results of Corrosivity Testing

Sample	Boring No.	pH in (H20)	pH in (CaCl2)	Chlorides (mg/kg)*	Sulfates (mg/kg)*	Sulfides (mg/kg)*	Oxidation Reduction (mV)	Resistivity (ohm-cm)**
Bulk 1	B-301 to B-304	6.72	5.89	40	63	Nil	+668	4,120
Bulk 2	B-305 to B-309	6.55	5.83	50	80	Nil	+687	2,740

** mg/kg = milligrams per kilogram*
*** ohm-cm = ohm-centimeter*

Many factors can affect the corrosion potential of soil including soil moisture content, resistivity, permeability, and pH, as well as chloride and sulfate concentration. In general, soil resistivity, which is a measure of how easily electrical current flows through soils, is the most influential factor. Based on classification developed by William J. Ellis (1978), the approximate relationship between soil corrosiveness was developed as shown in Table 3 below.

Table 3. Relationship Between Soil Resistivity and Soil Corrosivity

Soil Resistivity (ohm-cm)*	Classification of Soil Corrosiveness
0 to 900	Very Severely Corrosive
900 to 2,300	Severely Corrosive
2,300 to 5,000	Moderately Corrosive
5,000 to 10,000	Mildly Corrosive
10,000 to >100,000	Very Mildly Corrosive

** ohm-cm = ohm-centimeter*

Chloride and sulfate ion concentrations and pH appear to play secondary roles in affecting corrosion potential. High chloride levels tend to reduce soil resistivity and break down otherwise protective surface deposits, which can result in corrosion of buried metallic improvements or reinforced concrete structures. Sulfate ions in the soil can lower the soil resistivity and can be highly aggressive to Portland cement concrete (PCC) by combining chemically with certain constituents of the concrete, principally tricalcium aluminate. This reaction is accompanied by expansion and eventual disruption of the concrete matrix. Soils containing high sulfate content could also cause corrosion of the reinforcing steel in concrete. Table 4.2.1 of the American

Concrete Institute (ACI, 2008) provides requirements for concrete exposed to sulfate-containing solutions as summarized in Table 4 below.

Table 4. Relationship Between Sulfate Concentration and Sulfate Exposure (Table 4.2.1 of ACI)

Water-Soluble Sulfate (SO4) in soil (ppm)*	Sulfate Exposure
0 to 1,000	Negligible
1,000 to 2,000	Moderate
2,000 to 20,000	Severe
over 20,000	Very Severe

**ppm = parts per million*

Acidity is an important factor of soil corrosivity. The lower the pH (the more acidic the environment), the higher will the soil corrosivity be with respect to buried metallic structures. As soil pH increases above 7 (the neutral value), the soil is increasingly more alkaline and less corrosive to buried steel structures due to protective surface films which form on steel in high pH environments. A pH between 5 and 8.5 is generally considered relatively passive from a corrosion standpoint.
The laboratory electrical resistivity test completed on the samples of surficial soils indicates values ranging from 2,740 to 4,120 ohm-centimeters, which would be indicative of moderately corrosive potential to buried metallic improvements.

Based on our previous experience and Table 4.2.1 of the ACI, it is our opinion that sulfate exposure to PCC may be considered negligible for the native subsurface materials tested.

4.0 FOUNDATIONS AND EARTHWORK

4.1 Site Seismic Coefficients

According to the ASCE 7-22, the site class is within “Site Class D”. Based on the soil profiles, the maximum considered earthquake ground motions in this area for 0.2 second and 1.0 second spectral responses are approximately 22% g and 5.3% g, respectively. For Site Class D, the corresponding 0.2 and 1.0 sec. design spectral response acceleration parameters S_{DS} and S_{D1} are 18% g and 7.4 % g, respectively.

4.2 Foundations

Based on the results of this investigation and our experience with similar structures, the subsurface conditions within the proposed collection substation and POI switchyard areas are suitable for support of the proposed equipment and structures. A combination of shallow foundations and mats could be utilized for support of all structures bearing on newly placed, compacted load bearing fill or the existing natural soils after proper subgrade preparation as described below. Drilled piers could also be utilized.

As noted in Table 1, eight (8) of the eleven (11) test borings encountered very dense soils and/or difficult augering at depths as shallow as 8.5 feet. Therefore, shallow refusal conditions or obstructions may be encountered within these areas and other portions of the proposed development area when attempting to excavate for foundations depending on final site grading and the required minimum foundation embedment depths.

Based on the SPT N-values, the existing residual soils underlying the cultivated layer are typically in a “very stiff” to “hard” state of consistency. Newly placed and well compacted fill would generally be expected to exhibit similar strength properties to those observed in the test borings completed for this project. Recommended parameters for use in design are summarized below, along with general observations and recommendations related to constructability.

4.2.1 Spread Footings

Shallow foundation systems such as spread footings or rigid mats bearing on newly placed and compacted load-bearing fill or densified existing soils with a minimum 8 inch undercut can be considered for support of electrical equipment and other lightly loaded ancillary structures. Mats supporting electrical equipment can be designed for an allowable bearing capacity of 2,000 psf when constructed in accordance with the general recommendations presented in the *Earthwork* section of this report. A vertical subgrade modulus of 100 pci may be used in foundation mat design. Shallow spread footing foundations bearing on densified natural soils can be designed using the allowable bearing capacities and other design parameters shown in Table 5. A typical allowable interface friction coefficient of 0.35 may be used for design of cast in place concrete foundations assuming that they are constructed on grade overlying the densified natural soils. These values can be increased by 1/3 for transient, short-term loading such as seismic and wind loads. Allowable bearing capacity assumes that final bearing elevation of all spread footings will be established a minimum 2 feet above highest anticipated groundwater levels, including possible flood stage conditions. New footing foundations and excavations adjacent to existing structures or utilities should be constructed outside a zone bounded by an imaginary 1H:1V (horizontal : vertical) plane projected upward from the base of the existing features to prevent undermining.

Table 5. Recommended Shallow Foundation Design Parameters

Soil Parameter	**Densified SILTY CLAY Soils***	**Compacted Structural Fill (USCS SW-GW / AASHTO #57)**
Total Unit Weight, γ (pcf)	120	130
ϕ	28°	34°
$\delta_{concrete}$	23°	29°
Cohesion, C’ (psf)	200	---
Undrained Cohesion, Cu (psf)- zero friction	2,500	---
Allowable Bearing Capacity (ksf)	2.5	4.0
Vertical Subgrade Modulus (pci)	100	300

* Foundations can be placed on densified existing clayey soils provided that the upper 8 inches of existing soil is over-excavated and replaced by structural fill

Transformers, dead-end structures and similar heavily loaded structure foundations or mats bearing on the densified existing natural soils or newly placed and compacted fill can

be designed for an allowable bearing capacity of 3,000 psf, after proper subgrade preparation as follows:

1. Over-excavate the natural soils for a minimum depth of 2.0 feet below bottom of the footing depth. Over-excavation shall extend beyond the perimeter of the foundation 1 foot horizontally for each foot of depth below existing grade.
2. The exposed subgrade shall be densified in the presence of a qualified geotechnical professional to confirm suitability of exposed grade and identify any soft, loose, unstable or unsuitable (biodegradable material or waste) materials that shall be removed.

Foundation subgrades for supporting structures subjected to freezing temperatures during construction and/or the life of the structures should be established at least 4.1 ft below adjacent grades or otherwise protected against frost action. Alternatively, to resist frost heave impacts, mat slabs constructed at grade should be provided a coarse aggregate similar to AASHTO #57 aggregate layer extending to the frost depth (49 inches) below the mat foundations for movement sensitive equipment or minimum 24 inches thick below lightly loaded electrical equipment designed to tolerate the movement associated with potential frost heave. To guard against a punching type shear failure, minimum widths of continuous footings should be 24 inches. Shallow foundation systems should be sized not only with consideration for allowable bearing pressure, but also to resist the anticipated lateral loading and overturning moments of the proposed structures and equipment. Shallow foundations, including reinforced mat foundations may be keyed or embedded into the harder/denser soils below the required bearing elevations where additional lateral stability or sliding resistance is required.

All slabs and foundations should be over-excavated to a minimum depth of 1 foot below the proposed bearing elevation. The undercuts should extend 1 foot laterally beyond the outside edge of the foundation. The exposed subgrade should be proof-rolled in-place and the undercut area backfilled with compacted, free draining load-bearing structural fill in accordance with the recommendations provided in the Earthwork section. This procedure is intended to create uniform and stable bearing conditions.

Shallow excavations for foundation slabs and construction of utilities may encounter perched groundwater in low lying areas or during wet periods. If perched groundwater or surface runoff are encountered, sumps and pumps will be sufficient to control groundwater and provide stable working conditions.

4.2.2 Drilled Shafts

Axial Capacity

Alternately, based on the subsurface conditions encountered and on our experience with similar construction, drilled shafts may be considered, particularly for support structures with high lateral loads and the heavier equipment such as transformers and dead-end structures. The bottom of drilled shafts are anticipated to bear within the very stiff to hard clay or medium dense granular soils. The foundation designer should verify that the overall shaft diameter and length are sufficient to provide the vertical and necessary lateral support based on recommendations presented herein. It is our experience that the required length and diameter of drilled shafts, if used to support structures subjected to high lateral loads (such as the proposed dead-end structures) will be controlled by anticipated lateral loading conditions.

Drilled shafts can be designed to derive their load-carrying capacities from shaft sidewall resistance (i.e., "skin friction"), end-bearing, or a combination of the two. The following are noted with respect to axial capacity of drilled shafts:

- Where the shaft length is entirely in soil and the length of the shaft is at least twice the shaft diameter, the embedment length can be checked for adequate axial compression capacity based on the sum of the allowable load in end bearing and side friction.
- Where the shaft length is less than twice the shaft diameter, or where methods of construction preclude consideration for shaft resistance (i.e., permanent casing installed in an oversized hole) the drilled shaft should be sized based on end bearing alone.
- Shaft resistance should not be included in soil within the upper 4 ft from the ground surface to account for disturbance during construction as well as negative impacts from frost action.
- For large diameter shafts, the weight of concrete (including consideration for the effects of buoyancy) might be adequate to resist anticipated uplift (or tension) loads, where applicable. If shaft resistance must be considered in addition to the weight of the shaft, a factor of safety of 3 is recommended for use in estimating allowable uplift capacity.
- Allowable design unit resistances against axial loads are provided in Table 6 below.

Table 6. Recommended Allowable Drilled Shaft Soil Bearing Capacities

Soil Description	**Relative Density/ Consistency**	**Allowable Shaft Resistance (ksf)***		**Allowable End Resistance (ksf)*****
		Compression**	**Uplift****	
Newly Placed Structural FILL	"Dense"	0.60	0.40	
CLAY	"Soft" to "Medium Stiff"	0.30	0.20	---****
CLAY/ SILTY CLAY	"Stiff" to "Hard"	0.45	0.30	6.0
Silty Clayey SAND & GRAVEL	"Medium Dense" to "Dense"	0.60	0.40	5.0

* Upper 4.0 feet of shaft length shall be ignored.
** Includes factors of safety of 2.5 compression and 3.0 uplift loads
*** Includes a Factor of Safety of 3.0.
****End bearing resistance shall not be considered at these shallow depths.

The piers should have a minimum diameter of at least 18 inches and extend at least 10 feet below the exterior ground surface. Piers should have a minimum center-to-center spacing of at least three pier diameters. Axial capacity in the frost zone should be ignored.

Temporary casing may be required during shaft construction to maintain sidewall stability through the natural soils. The difficult augering conditions observed in the test borings indicates the possible presence of cobbles, boulders, or large obstructions within the subsurface profile which may be encountered during drilled pier installation.

If the shaft is cased so that the excavation remains stable and free of water infiltration, freefall placement of concrete could be considered, provided the contractor can direct concrete discharge through the center of the shaft and avoid contact with the reinforcement cage during freefall, which could result in unacceptable aggregate separation. In the event of water infiltration into the shaft, the reinforcement cage should be installed followed by installation of a tremie tube to the bottom of the shaft so that the shaft can be concreted using bottom-up tremie techniques. Care will need to be taken to ensure that the tremie remains inserted at the bottom of the shaft during concrete placement.

Final length and diameter of the drilled shafts will be a function of the vertical loads as well as the lateral load and deflection requirements, where applicable.

Lateral Capacity

Recommended geotechnical parameters for use in LPILE analysis are included in Table 6 for soil conditions encountered in the test borings. If drilled shafts are to be constructed within a distance of 3B to 5B, where B is the shaft diameter, reduction factors should be applied as appropriate to account for group effects. We recommend that lateral resistance of soils within 4 ft of the ground surface be neglected to account for disturbance resulting from both drilled shaft construction and the negative impacts due to frost action.

Table 7. Summary of Unfactored Soil Parameters for Lateral Design (neglect for upper 4 ft)

Soil Description	LPILE Soil Type	Consistency/ Relative Density	Total (Submerged) Unit Weight (pcf*)	Friction Angle (degrees)	E_{50}	Cohesion (psf**)	Soil Modulus Above/Below Water Table, k (pci***)
Newly Placed Structural FILL	Sand	"Dense"	125 (NA)	34	-	-	225
CLAY	Clay	"Soft" to "Stiff"	120 (NA)	-	0.007	1,000	- / -
CLAY/ SILTY CLAY	Clay	"Stiff" to "Hard"	125 (62.6)	-	0.005	2,500	- / -
Silty Clayey SAND & GRAVEL	Sand	"Medium Dense" to "Dense"	130 (67.6)	34	-	-	225 / 125

* *pcf – pounds per cubic foot*
** *psf – pounds per square foot*
*** *pci – pounds per cubic inch*

Construction Related Concerns

Temporary casing may be required during shaft construction to maintain sidewall stability through the soft natural soils, where cobble inclusions are present, or in excavations where groundwater and/or perched water zones are encountered.

Intimate contact between the drilled shaft and surrounding soil will be critical to achieve the lateral load resistance predicted by the LPILE models. As such, use of permanent casing in the design and installation of drilled shafts should be avoided. If use of permanent casing is required, the permanent casing should be in intimate contact with the surrounding soil. Permanent casing should not be placed in an oversized hole unless grouting of the exterior annular space is performed to create intimate contact between the casing and soil. If intimate contact is not maintained, lateral deflections will significantly exceed those estimated in the LPILE evaluations. These deflections will be very highly variable and difficult to predict as they will be dependent on the method of construction and the amount of sidewall relaxation and annular space resulting from the construction process.

If the shaft is cased so that the excavation remains stable and free of water infiltration, freefall placement of concrete could be considered, provided the contractor can direct concrete discharge through the center of the shaft and avoid contact with the reinforcement cage during freefall, which could result in unacceptable aggregate separation. In the event of water infiltration into the shaft, the reinforcement cage should be installed followed by installation of a tremie tube to the bottom of the shaft so that the shaft can be concreted using bottom-up tremie techniques. Care will need to be taken to ensure that the tremie remains inserted at the bottom of the shaft during concrete placement.

Final length and diameter of the drilled shafts will be a function of the vertical loads as well as the lateral load and deflection requirements, where applicable. Preferably, shafts should extend into the natural alluvial soils to limit settlements and maximize end bearing capacity.

4.2.3 Lateral Earth Pressures

No retaining walls are currently proposed as part of the current site development. Any retaining walls proposed at a later time should be designed to resist lateral earth pressures from adjoining natural materials, backfill, and surcharge loads. Provided that adequate drainage is established as recommended below, soil parameters indicated in Table 7 below may be used to estimate lateral earth pressures on any below grade foundations, walls or other structures, as well as for temporary excavation support. The following soil parameters may be used to estimate the lateral earth pressures on any below-grade features:

Table 8. Lateral Earth Pressure Parameters

Parameter	Soft to Stiff Clay*	Very Stiff to Hard Clay*	Newly Placed Structural Fill	Silty Clayey SAND & GRAVEL	Imported Aggregate (AASHTO #57)
γ_t (pcf)	120	125	125	135	130
ϕ(deg)	26	28	32	34	34
c (psf)	100	200	0	0	0
c_a (psf)	70	140	0	0	0
δ (concrete)	17	17	20	27	27
K_p	2.56	2.77	3.25	3.54	3.54
K_o	0.56	0.53	0.47	0.44	0.44
K_a	0.38	0.36	0.31	0.28	0.28

* For the clayey soils, if the use of ϕ and c values resulted in negative lateral pressures, negative lateral pressures should be ignored and the lateral earth pressures should be evaluated based on a minimum equivalent fluid unit weight of γ K = 30 pcf (i.e., min. K_a = 0.25).

Imported fill soils similar to USCS SW-GW or AASHTO No. 57 aggregate should be used as backfill for below grade walls. Alternately, a prefabricated drain board with high in-plane transmissivity, such as Miradrain, Geotech Drainage Panels, Enkadrain drainage matting, or similar equivalents, may be used for wall drainage as an alternative to the Aggregate Material or drain rock backfill. The drainage panels should be connected to the perforated pipe at the base of the wall, or to some other closed or through-wall system. At-rest earth pressures (Ko) and the active earth pressure (Ka) should be used in the design of non-yielding and yielding structures, respectively. Backfill behind foundations and other structures should be placed with light equipment and the soils should not be over-compacted. Heavy compaction equipment and compaction effort may lead to overstress of the structures.

4.3 Earthwork

4.3.1 Subgrade Preparation and Compaction

Based on our understanding of the proposed construction and the existing site grades we anticipate that re-grading and site leveling may be needed. Proposed site grading is not currently known but cuts and fills of several feet are assumed. The following recommendations are provided based on the site soils encountered.

Any existing subsurface utilities, including drain tiles, if present, which conflict with the proposed. structure footprints or running beneath the proposed access road should be removed or relocated, and the excavation replaced with the re-compacted natural soils or imported granular soils. In areas of fill placement for the new substation pad and/or construction of shallow foundations, all debris, topsoil and organic or otherwise deleterious material, including the existing cultivated topsoil layer, should be removed before foundation construction or new fill placement. Any obstructions that would interfere with new foundation construction must be removed in their entirety from a foundation location. The stripped materials should be removed from the site or may be stockpiled for use in landscaped areas, if desired.

After stripping residual topsoil and removal of vegetation, unsuitable fills, etc. the exposed subgrade areas should be vigorously densified with a minimum 25-ton roller, or as large a compactor as is practical to improve overall performance and reduce impacts of settlements within the soft soil stratum. The residual clay soils shall be compacted by use of sheepsfoot or tamping type roller. The predominantly granular sand or gravel soils, if encountered during excavation and grading operations, may be compacted by vibratory compaction equipment. The exposed subgrades should then be thoroughly proof rolled in the presence of a qualified geotechnical inspector to check for any soft, loose, or unstable areas. Proof-rolling should be performed using a minimum 10-ton roller in static mode or a fully loaded triaxle truck and be deemed firm and non-yielding under the weight, as determined by the qualified inspector. Any soft, loose, or otherwise unstable areas detected during proof-rolling should be over-excavated to more competent material and replaced with a compacted fill. No new fills should he placed on frozen subgrades.

For new fill on sloping ground surfaces that are steeper than one vertical to four horizontal, existing ground should be benched for bonding and proper compaction of the new fill. Immediately prior to placement of the first lift on embankment fill the exposed subgrade surface should be scarified to a depth on the order of 4 to 6 inches and re-compacted after placement of the initial lift of fill material.

The existing surficial soils contain predominant fine-grained (clay / silty clay) content and will be sensitive to moisture and disturbance. Therefore, they may lose strength when wet or disturbed by construction equipment and could be difficult to work with during cold or wet weather. The presence of low-lying areas will also be highly sensitive to disturbance when wet. These soils are suitable for re-use as general fill for site grading and backfill. Some moisture conditioning (wetting or drying) of the onsite soils should be anticipated before reuse in compacted backfills, particularly during wet seasons. Existing surficial soils with organic inclusions should be excluded from reuse as load-bearing fill. Once a subgrade has been prepared, construction traffic should be controlled in such a fashion as to minimize subgrade disturbance.

Imported load-bearing fill, if required, should consist of well-graded granular material similar to SP, SM, SW, GP, GM or GW as identified by the Unified Soil Classification System (USCS) which is not excessively moist and is free from ice and snow, roots, surface coatings, sod, loam, clay, rubbish, other deleterious or organic matter, and any particles larger than four (4) inches in diameter. Imported fill for use as load-bearing fill should have less than 65% by weight passing the No. 200 sieve, liquid limits less than 50, & Plasticity Index less than 35. Alternatively, an AASHTO No. 57 or NYSDOT Type 2 coarse aggregate layer (minimum 24 inches thick) could be considered below mat foundations supporting electrical equipment to reduce frost impacts. Imported fills for general site grading may consist of materials similar in gradation to GW, GP, GC, GM, SW, SP, SC, SM, CL, ML, CH, & MH as identified by the USCS with no index property limitations. However, imported fill materials with greater than 25% by weight passing the No. 200 sieve should be considered high frost susceptibility. Any load-bearing, structural fill placement for support of buildings, structures or equipment should extend at least 5 ft beyond the edge of all foundations and structure footprints. Exterior slopes in fill areas around structures or equipment should be constructed at a slope of 2H:1V or flatter.

All backfills fills should be placed in relatively horizontal layers not exceeding 8 inches loose thickness. This criterion may be modified in the field with approval of the geotechnical engineer depending on the conditions present at the time of construction and on the compaction equipment used. Load-bearing fills for the support of foundations should be compacted to not less than 98% of maximum dry density as determined by ASTM D 698 (or approximately 95% as determined by ASTM D 1557). Fills in paved areas, if planned, or areas supporting access roads should be compacted to not less than 95% of maximum dry density by ASTM D 698 (minimum 92% as determined by ASTM D 1557). Fills in landscaped areas should be compacted to at least 90% of maximum dry density (ASTM D 698).

4.3.2 Temporary Slopes and Excavations

The sidewalls of any confined excavations deeper than 4 ft must be sloped, benched or adequately shored per OSHA 29 CFR 1926 regulations. The onsite near surface soils are classified as Type B soils according to OSHA 29 CFR 1926. Short-term open excavations in the existing Type B clayey soils that are greater than 4 feet in depth shall have a maximum allowable slope of 1H:1V (45°) if dry and 1.5H:1V (34°) if submerged or where wet conditions are observed, such as perched water or significant surface runoff. The deeper onsite granular soils (sandy and/or gravelly soils) are classified as Type C soils according to OSHA 29 CFR 1926. Open excavations in the granular soils, if encountered, should not be steeper than 1.5H:1V if dry and 2H:1V if submerged or where considerable wetness if observed. Alternately, trench boxes and/or sheeting could be used in conjunction with open cut slopes when performed in accordance with OSHA 29 CFR 1926.652(b). Sloping or benching for excavations greater than 20 feet deep, if required, shall be designed by a registered professional engineer.

The contractor is solely responsible for designing, constructing, and maintaining stable, temporary excavations and should shore, slope, or bench the sides of any confined excavations deeper than 4 ft as required to maintain stability of both the excavation sides and bottom. All excavations for the project should comply with applicable local, state, and federal safety regulations including the current United States Department of Labor, Occupational Safety and Health Administration (OSHA) guidelines for Excavation and Trench Safety Standards (29 CFR Part 1926, Part P, Excavations) or other applicable jurisdictional codes for permissible temporary side-slope ratios and or shoring requirements. The contractor should avoid stockpiling excavated materials or placing construction equipment immediately adjacent to the excavation unless the excavation sidewalls are braced to withstand the anticipated surcharge load.

Daily inspections of open excavations, adjacent areas and protective systems by a “competent person” should be performed for evidence of situations that could result in cave-ins, indications of failure of a protective system, or other hazardous conditions, as applicable. The information in this report is being provided solely as a service to our client. Under no circumstance should the information provided be interpreted to mean TRC is assuming responsibility for construction Site safety.

4.4 Trench Backfill

Bedding and pipe embedment materials to be used around underground utility or electrical conduit pipes should be well graded sand or gravel conforming to the pipe manufacturer’s recommendations and should be placed and compacted in accordance with project specifications, local requirements, or governing jurisdiction. General fill to be used above pipe embedment materials should be placed and compacted in accordance with the recommendations contained in this section.

Depended on site grading and depth of trenches, it is noted that very dense soils or obstructions, such as possible oversized gravel and/or cobbles may be encountered during excavation of trenches. Shallow obstructions if encountered during utility excavation, must be removed entirely from within the bedding zone of all trenches prior to utility construction. Excavation of cobbles (or boulders, if present) may require the use of larger equipment, including, but not limited to large heavy-duty excavators and hydraulic rams. Trench excavations should be over-excavated to provide at least 3 to 4 inches of bedding material to provide a uniform support and eliminate hard points for utilities and electrical conduits. Where direct bury of utilities will occur, a layer of clean sand, or similar material free of rock fragments should be placed immediately over the cables to prevent damage during compaction of backfill. General fill should be placed in lifts not exceeding 8 inches in uncompacted thickness and should be compacted to at least 90% maximum dry density by mechanical means only. The upper 12 inches of general fill in areas subject to wheel loads should be compacted not less than 95% maximum dry density (ASTM D 698).

Utility trenches located adjacent to footings or foundations should not extend below an imaginary 1H:1V (horizontal:vertical) plane projected downward from the foundation bearing surface to the bottom edge of the trench. Where utility trenches will cross beneath footing bearing planes, the footing concrete should be deepened to encase the pipe, or the utility trench should be backfilled with sand/cement slurry or lean concrete within the foundation-bearing plane.

4.5 Gravel Access Roadways

It is assumed that the Site will be accessed using unpaved gravel roads by heavy construction equipment temporarily during site construction periods estimated at less than six (6) months, followed by periodic light truck traffic during the remaining service life of the project.

After stripping of the existing topsoil proposed access roads should be proof-rolled with a heavily loaded pneumatic-tired vehicle such as a loaded water truck or tri-axle dump truck. Soft, loose or unstable areas, identified by significant pumping, rutting or similar deformation under wheel loads must be removed and replaced with compacted fill or aggregate material to achieve a stable subgrade prior to placing common fill for site grading, if required, or fill aggregate surfacing. A layer of a geogrid should be installed directly over the subgrade with adjacent rolls lapped in accordance with manufacturer's recommendations in general accordance with NYSDEC standard for limited Use Pervious Haul Roads. A layer of aggregate similar in gradation to NYSDOT Item 703-02, Size Designation 3-5 of Table 703-4 material should be placed directly over the geogrid in a single 12-inch thick layer and spread with tracked equipment in accordance with NYSDEC standards. During construction, the access road may need to be occasionally re-graded and re-densified. Any electric cables crossing below the roadway should be installed in heavy duty rigid steel conduits or installed a minimum 3 ft below finished grade to prevent damage to the cables.

Access road design criteria, such as traffic loads and volumes were not known at the time of this report. The project civil or geotechnical engineer should be contacted for final design once criteria are known. Final aggregate road design can be performed using an estimate CBR value of 3 for compacted onsite soils. Increased CBR values may apply for subgrades improved by the placement of geogrid reinforcement.

4.6 Surface Drainage

Positive surface water drainage gradients at least 2 percent should be provided to direct surface water away from foundations and mat slabs towards suitable stormwater discharge facilities. Ponding of surface water should not be allowed on or adjacent to structures, slabs-on-grade, or pavements. Any rain runoff should be directed away from foundation and slabs-on-grade such as equipment pads, as applicable.

In addition, a sufficiently thick velocity dissipater, such as layer of coarse drainage aggregate of adequate size based on anticipated flow velocity, should be placed along water flow paths to dissipate concentrated flow of runoff water in order to minimize surface erosion.

4.7 Plans, Specifications, and Construction Review

We recommend that TRC perform a plan review of the geotechnical aspects of the project design for general conformance with the recommendations presented in this report. In addition, subsurface materials encountered in the relatively small diameter, widely spaced borings may vary significantly from other subsurface materials on the site. Therefore, we also recommend that a representative of our firm observe and confirm the geotechnical specifications of the project construction. This will allow us to form an opinion about the general conformance of the project plans and construction with our recommendations. In addition, our observations during construction will enable us to note subsurface conditions that may vary from the conditions encountered during our investigation and, if needed, provide supplemental recommendations. For the above reasons, the recommendations provided in this report are based on the assumption that TRC will be retained to provide observation and testing services during construction to confirm that conditions are similar to that assumed for design and to form an opinion as to whether the work has been performed in general accordance with the project plans and specifications. If we are not retained for these services, TRC cannot assume any responsibility for any potential claims that may arise during or after construction as a result of misuse or misinterpretation of TRC's report by others. These services are not included as part of TRC's current scope of work.

4.8 Construction Observation

TRC recommends that a qualified geotechnical professional should observe the geotechnical aspects of the earthwork for general conformance with our recommendations including site preparation, selection of fill materials, pile installation, and the placement and compaction of fill.

To facilitate your construction schedule and if you wish TRC to perform these services, we request sufficient notification (72 hours in advance) for site visits. The project plans and specifications should incorporate all recommendations contained in the text of this report. These services are not included as part of TRC's current scope of work.

5.0 LIMITATIONS

This report has been prepared for Cordelio Services LLC, specifically for design of the proposed collection substation and POI switchyard development to be constructed at the Flat Creek Solar Facility Site located in Montgomery County, NY as identified herein. Transfer of this report or included information is at the sole discretion of Cordelio Services LLC. TRC's contractual relationship remains with Cordelio Services LLC and limitations stated herein remain applicable regardless of end user. The opinions, conclusions, and recommendations presented in this report have been formulated in accordance with accepted geotechnical engineering practices that exist in the area at the time this report was written. No other warranty, expressed or implied, is made or should be inferred.

The opinions, conclusions and recommendations contained in this report are based upon the information obtained from our investigation, which includes data from a limited number of widely separated discrete locations, visual observations from our site reconnaissance, and review of other geotechnical data provided to us, along with local experience and engineering judgment. An attempt has been made to provide for normal contingencies; however, the possibility remains that differing or unexpected conditions may be encountered during construction. If this should occur, or if additional or contradictory data are revealed in the future, TRC should be notified so that modifications to this report can be made, if necessary. TRC is not responsible for any conclusions or opinions drawn from the data included herein, other than those specifically stated, nor are the recommendations presented in this report intended for direct use as construction specifications.

TRC should be retained to review the geotechnical aspects of the final plans and specifications for conformance with our recommendations. The recommendations provided in this report are based on the assumption that TRC will be retained to provide observation and testing services during construction to confirm that conditions are similar to that assumed for design and to form an opinion as to whether the work has been performed in accordance with the project plans and specifications. If we are not retained for these services, TRC cannot assume any responsibility for any potential claims that may arise during or after construction as a result of misuse or misinterpretation of TRC's report by others. Furthermore, TRC will cease to be the Geotechnical Engineer-of-Record at the time another consultant is retained for follow up service to this report, if applicable.

The opinions presented in this report are valid as of the present date for the property evaluated. Changes in the condition of the property will likely occur with the passage of time due to natural processes and/or the works of man. In addition, changes in applicable standards of practice can occur as a result of legislation and/or the broadening of knowledge. Furthermore, geotechnical issues may arise that were not apparent at the time of our investigation. Accordingly, the opinions presented in this report may be invalidated, wholly or partially, by changes outside of our control. Therefore, this report is subject to review and should not be relied upon after a period of three years. Similarly, this report should not be used, nor are its recommendation applicable, for any other properties or alternate developments.

We trust this report contains the information you require and thank you for the opportunity to work on this project. Please consider our firm for future geotechnical services as needed.

Sincerely,

TRC Engineers, Inc.

James P. Benjamin

James P. Benjamin, PE*
Geotechnical Project Manager
*NJ, PA

Izzaldin Al Mohd, PhD, PE
Chief Geotechnical Engineer
NY License No.: 105780

cc: Samantha Kranes, TRC
Misty Darby, TRC

FIGURES

Project No. 435979.1GEO

Date: June 14,2024

For: SunEast Development LLC

16000 Commerce Parkway, Mt. Laurel, New Jersey 08054
PH. (856) 273-1224 FAX. (856) 273-9244

APPROXIMATE TEST BORING LOCATIONS

Flat Creek Solar Substation

Montgomery County, New York

FIGURE
1

FIELD DATA

TEST BORING LOGS

TEST BORING LOG

BORING	**B-301**
G.S. ELEV.	
FILE	435979.1GEO
SHEET	1 OF 1

PROJECT: FLAT CREEK SUBSTATION

LOCATION: MONTGOMERY COUNTY, NY

GROUNDWATER DATA

FIRST ENCOUNTERED NE

DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER R. CRUM
HELPER D. CRUM
INSPECTOR W. MCCART
DATE STARTED 05/14/2024
DATE COMPLETED 05/14/2024

DEPTH	A	B	C	DESCRIPTION	REC	REMARKS
				0.8 ***TOPSOIL***		
	S-1	1 1 3 3		2.0 ***BROWN CLAY, TR TO SM F/M SAND (MOIST)***	70	
	S-2	3 6 10 10		***BROWN CLAY, TR TO SM F/M/C SAND, TR F/ GRAVEL (MOIST)***	85	
5	S-3	13 17 17 18		6.0	100	
	S-4	35 19 18 23			100	
10	S-5	32 27 29 28		***DARK BROWN SILTY CLAY, SM F/M/C SAND, SM F/C GRAVEL (MOIST TO DAMP)***	100	
15	S-6	15 13 18 21		15.0	100	
				END OF BORING AT 15'		
20						
25						
30						
35						

NE=NOT ENCOUNTERED

DRN. WHM
CKD. JPB

TEST BORING LOG

PROJECT: FLAT CREEK SUBSTATION
LOCATION: MONTGOMERY COUNTY, NY

BORING B-302
G.S. ELEV.
FILE 435979.1GEO
SHEET 1 OF 1

GROUNDWATER DATA

FIRST ENCOUNTERED NE ▽

DEPTH	HOUR	DATE	ELAPSED TIME

▼

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	25.0 '

DRILLER R. CRUM
HELPER D. CRUM
INSPECTOR W. MCCART
DATE STARTED 05/14/2024
DATE COMPLETED 05/14/2024

DEPTH	A	B	C		DESCRIPTION	REC	REMARKS
	S-1	WH 1 3 4		0.7	***TOPSOIL***	60	
				2.0	***BROWN CLAY, TR F/M SAND (MOIST)***		
	S-2	5 6 6 8				75	
5	S-3	12 11 13 16			***BROWN CLAY, SM F/M/C SAND, TR TO SM GRAVEL (MOIST)***	85	
	S-4	9 12 22 23		8.0		100	
10	S-5	28 23 34 31				100	
				13.0	***DARK BROWN SILTY CLAY, SM F/M/C SAND, SM F/C GRAVEL, SM CLAY (DAMP)***		
	S-6	22 23 50/0.3'				65	
15				18.0	***DARK BROWN F/C GRAVELLY F/M/C SAND, TR CLAY (DAMP)***		DIFFUCLT AUGERING AT 14.3 FT; POSSIBLE COBBLE
20	S-7	21 14 33 13		23.0	***DARK GRAY BROWN SILTY CLAYEY F/M/C SAND AND F/C GRAVEL (DAMP)***	75	DIFFUCLT AUGERING AT 19 FT; POSSIBLE COBBLE
25	S-8	10 14 9 12		25.0	***DARK GRAY F/M/C SAND, SM F/C GRAVEL, SM CLAY***	15	
					END OF BORING AT 25'		
30							
35							

NE=NOT ENCOUNTERED

DRN. WHM
CKD. JPB

NEW PROJECTS TEST BORING LOG 435979.0GEO FLAT CREEK SUBSTATION.GPJ SITE BLAUVELT.GDT 6/17/24

TEST BORING LOG

BORING	**B-303**
G.S. ELEV.	
FILE	435979.1GEO
SHEET	1 OF 1

PROJECT: FLAT CREEK SUBSTATION

LOCATION: MONTGOMERY COUNTY, NY

GROUNDWATER DATA				
FIRST ENCOUNTERED 18.0 '				▽
DEPTH	HOUR	DATE	ELAPSED TIME	
16.8'		5/14	0 HOURS	▼
				▽

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	30.0 '

DRILLER R. CRUM
HELPER D. CRUM
INSPECTOR W. MCCART
DATE STARTED 05/14/2024
DATE COMPLETED 05/14/2024

DEPTH	A	B	C	DESCRIPTION	REC	REMARKS
				0.9 ***TOPSOIL***	50	
	S-1	WH 1 3 2		2.0 ***BROWN CLAY, TR F/M SAND (MOIST)***	80	
	S-2	4 4 6 7			85	
5				***BROWN CLAY, SM F/M/C SAND, TR TO SM GRAVEL (MOIST)***		
	S-3	9 7 8 13			85	
	S-4	1 1 4 5		8.0	100	
10	S-5	9 12 15 25				
				BROWN SILTY CLAY, SM F/M/C SAND, SM F/C GRAVEL, SM CLAY (DAMP)		
				13.0	100	
	S-6	6 50/0.4'				DIFFUCLT AUGERING AT 13.9 FT
15						
▼						
▽					39	DIFFUCLT AUGERING AT 18.5 FT
20	S-7	7 26 11 50/0.3'				
				DARK GRAY BROWN SILTY CLAYEY F/M/C SAND AND F/C GRAVEL (DAMP)		
					35	
25	S-8	7 9 9 8				
					25	
30	S-9	11 19 13 37		30.0		
				END OF BORING AT 30'		
35						

DRN. WHM
CKD. JPB

NEW PROJECTS TEST BORING LOG 435979.0GEO FLAT CREEK SUBSTATION.GPJ SITE BLAUVELT.GDT 6/17/24

TEST BORING LOG

PROJECT: FLAT CREEK SUBSTATION
LOCATION: MONTGOMERY COUNTY, NY

BORING	**B-304**
G.S. ELEV.	
FILE	435979.1GEO
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NE			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	25.0 '

DRILLER R. CRUM
HELPER D. CRUM
INSPECTOR W. MCCART
DATE STARTED 05/14/2024
DATE COMPLETED 05/14/2024

DEPTH	A	B	C	DESCRIPTION	REC	REMARKS
				0.6 ***TOPSOIL***	70	
				BROWN CLAY, TR F/M SAND (MOIST)		
	S-1	WH 3 3 4		2.0	85	
	S-2	3 5 7 9			35	
5				***BROWN CLAY, SM F/M/C SAND, TR TO SM GRAVEL (MOIST)***		
	S-3	9 15 13 13			60	
	S-4	9 12 16 18		8.0	65	
10	S-5	24 26 30 22				
				BROWN SILTY CLAY, SM F/M/C SAND, SM F/C GRAVEL, SM CLAY (DAMP)		
				13.0	100	
15	S-6	7 10 9 12				
	S-7	50/0.1'		***DARK GRAY BROWN SILTY CLAYEY F/M/C SAND AND F/C GRAVEL (DAMP)***	100	DIFFUCLT AUGERING AT 18.1 FT; POSSIBLE COBBLE
20						
				23.0	100	
				DARK GRAY SILTY CLAY, SM F/M/C SAND, SM F/C GRAVEL (DAMP)		
25	S-8	10 7 8 12		25.0		
				END OF BORING AT 25'		
30						
35						

DRN. WHM
CKD. JPB

TEST BORING LOG

BORING	**B-305**
G.S. ELEV.	
FILE	435979.1GEO
SHEET	1 OF 1

PROJECT: FLAT CREEK SUBSTATION

LOCATION: MONTGOMERY COUNTY, NY

GROUNDWATER DATA

FIRST ENCOUNTERED 23.0 ' ▽

DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	25.0 '

DRILLER R. CRUM
HELPER D. CRUM
INSPECTOR W. MCCART
DATE STARTED 05/14/2024
DATE COMPLETED 05/14/2024

DEPTH	A	B	C	DESCRIPTION	REC	REMARKS
	S-1	1 1 2 3		0.4 ***TOPSOIL*** ***BROWN CLAY, TR F/M SAND (MOIST)*** 2.0	35	
	S-2	2 3 4 3		***NO RECOVERY*** 4.0	0	
5	S-3	8 13 18 13		***BROWN SILTY CLAY, SM F/M/C SAND, SM F/C GRAVEL (MOIST)***	30	
	S-4	12 8 15 18		8.0	75	
10	S-5	21 19 28 26			65	
15	S-6	10 10 9 11		***BROWN F/M/C SANDY SILTY CLAY, SM F/C GRAVEL (DAMP)*** 18.0	55	
20	S-7	19 20 17 11		***DARK GRAY BROWN SILTY CLAYEY F/C GRAVEL AND F/M/C SAND (DAMP)*** 23.0	45	
▽ 25	S-8	7 10 10 13		***DARK GRAY CLAY, SM F/C GRAVEL, SM F/M/C SAND (WET)*** 25.0	35	
				END OF BORING AT 25'		
30						
35						

DRN. WHM
CKD. JPB

TEST BORING LOG

PROJECT: FLAT CREEK SUBSTATION
LOCATION: MONTGOMERY COUNTY, NY

BORING	**B-306**
G.S. ELEV.	
FILE	435979.1GEO
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NE			
DEPTH	HOUR	DATE	ELAPSED TIME

▽
▼

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER R. CRUM
HELPER D. CRUM
INSPECTOR W. MCCART
DATE STARTED 05/16/2024
DATE COMPLETED 05/16/2024

DEPTH	A	B	C	DESCRIPTION	REC	REMARKS
				0.7 ***TOPSOIL***	65	
	S-1	WH 3 5 4		***BROWN F/M/ SAND AND CLAY (MOIST)*** 2.0		
	S-2	4 7 8 9		***BROWN SILTY CLAY, SM F/M SAND (MOIST)*** 4.0	55	
5	S-3	8 9 7 13		***BROWN F/M/C SANDY CLAY, SM F/C GRAVEL (MOIST)*** 6.0	100	
	S-4	9 10 14 17		***BROWN CLAY, SM F/M/C SAND, TR F/ GRAVEL (MOIST)*** 8.0	25	
10	S-5	19 19 21 22		***DARK GRAY BROWN TO DARK GRAY SILTY CLAY, SMF/MC SAND, SM F/C GRAVEL (MOIST)***	80	
15	S-6	9 8 9 10		15.0	85	
				END OF BORING AT 15'		
20						
25						
30						
35						

NE=NOT ENCOUNTERED

DRN. WHM
CKD. JPB

TEST BORING LOG

PROJECT: FLAT CREEK SUBSTATION
LOCATION: MONTGOMERY COUNTY, NY

BORING **B-307**
G.S. ELEV.
FILE 435979.1GEO
SHEET 1 OF 1

GROUNDWATER DATA				
FIRST ENCOUNTERED 23.0 '				▽
DEPTH	HOUR	DATE	ELAPSED TIME	
25.2'		5/16	0 HOURS	▼
				▽

METHOD OF ADVANCING BOREHOLE					
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	35.0 '

DRILLER R. CRUM
HELPER D. CRUM
INSPECTOR W. MCCART
DATE STARTED 05/16/2024
DATE COMPLETED 05/16/2024

DEPTH		A	B	C	DESCRIPTION	REC	REMARKS
					1.3 ***TOPSOIL***	25	
		S-1	WH/1' 2 3		2.0 ***BROWN CLAY, TR F/M SAND (WET)***		
						25	
		S-2	WH/1' 3 1			35	
5					***BROWN CLAY, SM F/M/C SAND, TR F/ GRAVEL (WET)***		
		S-3	WH/1' 3 3			100	
		S-4	7 7 4 7		8.0	100	
10		S-5	11 15 15 8		***BROWN F/M/C SANDY SILTY CLAY, SM F/C GRAVEL (MOIST TO WET)***		
					13.0	100	
15		S-6	8 7 8 10				
						85	
20		S-7	13 7 5 11		***DARK GRAY SILTY CLAYEY F/M/C SAND AND F/C GRAVEL (MOIST TO WET)***		
▽							DIFFUCLT AUGERING AT 22 FT
						55	
▼ 25		S-8	7 5 5 9				
							DIFFUCLT AUGERING AT 26 FT
					28.0	60	
30		S-9	8 12 10 33				DIFFUCLT AUGERING FROM 30 TO 33 FT
					DARK GRAY SILTY CLAYEY F/C GRAVELLY F/M/C, TR TO SM F/M/C SAND (WET)		
						45	
35		S-10	11 10 8 20		35.0		

END OF BORING AT 35'

DRN. WHM
CKD. JPB

NEW PROJECTS TEST BORING LOG 435979.0GEO FLAT CREEK SUBSTATION.GPJ SITE BLAUVELT.GDT 6/17/24

TRC

TEST BORING LOG

BORING **B-308**
G.S. ELEV.
FILE 435979.1GEO
SHEET 1 OF 1

PROJECT: FLAT CREEK SUBSTATION
LOCATION: MONTGOMERY COUNTY, NY

GROUNDWATER DATA

FIRST ENCOUNTERED NE ▽

DEPTH	HOUR	DATE	ELAPSED TIME

▼

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	25.0 '

DRILLER R. CRUM
HELPER D. CRUM
INSPECTOR W. MCCART
DATE STARTED 05/15/2024
DATE COMPLETED 05/15/2024

DEPTH	A	B	C	DESCRIPTION	REC	REMARKS
	S-1	WH 1 3 4	1.1 2.0	***TOPSOIL*** ***BROWN CLAY, TR F/M SAND (MOIST)***	40	
	S-2	3 5 5 5		***BROWN CLAY AND F/M SAND, TR F/C GRAVEL (MOIST)***	70	
5	S-3	5 7 9 15			80	
	S-4	10 11 20 20	8.0		100	
10	S-5	33 29 24 25		***BROWN F/M/C SANDY SILTY CLAY, SM F/C GRAVEL (DAMP)***	90	
15	S-6	8 9 11 10			100	
20	S-7	6 8 9 9			70	
	S-8	50/0.1'	22.0		0	AUGER REFUSAL AT 22.0 FT; BROING OFFSET 30 FT SE AND CONTINUED
			23.0	***DARK GRAY F/M/C SAND AND CLAY, SM F/C GRAVEL (DAMP)***		
25	S-9	19 15 18 17	25.0	***DARK GRAY SILTY CLAYEY F/C GRAVELLY F/M/C, TR TO SM F/M/C SAND (DAMP)***	15	
				END OF BORING AT 25'		
30						
35						

NE=NOT ENCOUNTERED

DRN. WHM
CKD. JPB

TEST BORING LOG

PROJECT: FLAT CREEK SUBSTATION
LOCATION: MONTGOMERY COUNTY, NY

BORING	**B-309**
G.S. ELEV.	
FILE	435979.1GEO
SHEET	1 OF 1

GROUNDWATER DATA

FIRST ENCOUNTERED 27.5 ' ▽

DEPTH	HOUR	DATE	ELAPSED TIME	
28.0'		5/15	0 HOURS	▼
				▽

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	35.0 '

DRILLER R. CRUM
HELPER D. CRUM
INSPECTOR W. MCCART
DATE STARTED 05/15/2024
DATE COMPLETED 05/15/2024

DEPTH		A	B	C	DESCRIPTION	REC	REMARKS
					0.6 ***TOPSOIL***	35	
		S-1	WH 1 4 4		***BROWN CLAY, TR F/M SAND (WET)*** 2.0		
						70	
		S-2	4 6 7 7		***BROWN SILTY CLAY, SM F/M/C SAND (MOIST)***		
5						55	
		S-3	8 8 10 11		6.0		
						100	
		S-4	27 11 10 14		***BROWN F/C GRAVELLY CLAY, SM F/M/C SAND (MOIST)*** 8.0		
						100	
10		S-5	17 24 35 33				
					BROWN TO DARK GRAYF/M/C SANDY SILTY CLAY, SM F/C GRAVEL (DAMP TO MOIST)	60	
15		S-6	9 15 13 8				
					18.0		
						90	
20		S-7	5 4 6 5				
					DARK GRAY CLAY, SM F/M/C SAND, TR F/ GRAVEL (MOIST)		
					23.0		
						60	DIFFUCLT AUGERING AT 23.5 FT; POSSIBLE COBBLE
25		S-8	7 47 20 10				
▽ ▼					***DARK GRAY SILTY CLAYEY F/C GRAVEL, AND F/M/C SAND (MOIST)***	45	
30		S-9	22 17 10 7				
					33.0		
						45	DIFFUCLT AUGERING AT 34.5 FT; POSSIBLE COBBLE
35		S-10	7 8 6 50		***DARK GRAY F/M/C SANDY CLAY, SM F/C GRAVEL (WET)*** 35.0		

END OF BORING AT 35'

DRN. WHM
CKD. JPB

NEW PROJECTS TEST BORING LOG 435979.0GEO FLAT CREEK SUBSTATION.GPJ SITE BLAUVELT.GDT 6/17/24

TEST BORING LOG

PROJECT: FLAT CREEK SUBSTATION
LOCATION: MONTGOMERY COUNTY, NY

BORING **B-310**
G.S. ELEV.
FILE 435979.1GEO
SHEET 1 OF 2

GROUNDWATER DATA			
FIRST ENCOUNTERED 17.0 ' ▽			
DEPTH	HOUR	DATE	ELAPSED TIME
▼			

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	35.1 '

DRILLER R. CRUM
HELPER D. CRUM
INSPECTOR W. MCCART
DATE STARTED 05/16/2024
DATE COMPLETED 05/16/2024

DEPTH	A	B	C	DESCRIPTION	REC	REMARKS
				0.6 ***TOPSOIL***	40	
	S-1	WH 3 3 2		***BROWN CLAY, TR TO SM F/M/C SAND (MOIST)*** 2.0		
	S-2	4 4 3 2			15	
5	S-3	5 7 10 12		***BROWN F/M/C SANDY SILTY CLAY, TR TO SM F/C GRAVEL (MOIST)***	25	
	S-4	13 11 13 22		8.0	100	
	S-5	30 50/0.3'			50	DIFFUCLT AUGERING AT 8.5 FT
10						
15	S-6	10 5 8 9		***DARK GRAY SILTY CLAYEY F/M/C SAND AND F/C GRAVEL (MOIST)***	100	
▽				18.0		DIFFUCLT AUGERING AT 16 FT
20	S-7	6 5 5 11			15	
	S-8	50/0.2'			0	DIFFUCLT AUGERING FROM 21 TO 23 FT; POSSIBLE COBBLES AUGER REFUSAL AT 23.0 FT; BORING OFFSET 15 FT SOUTH AND CONTINUED
25				***DARK GRAY SILTY CLAYEY F/C GRAVEL AND F/M/C SAND (WET)***		
30	S-9	16 15 24 31			60	
35	S-10	46 34 37 50/0.3'			94	AUGER REFUSAL AT 35.1 FT

DRN. WHM
CKD. JPB

TEST BORING LOG

BORING	**B-310**
G.S. ELEV.	
FILE	435979.1GEO
SHEET	2 OF 2

PROJECT: FLAT CREEK SUBSTATION
LOCATION: MONTGOMERY COUNTY, NY

DEPTH		A	B	C	DESCRIPTION	REC	REMARKS
					35.1 ***END OF BORING AT 35.1'***		
40							
45							
50							
55							
60							
65							
70							
75							

TEST BORING LOG

PROJECT: FLAT CREEK SUBSTATION
LOCATION: MONTGOMERY COUNTY, NY

BORING **B-311**
G.S. ELEV.
FILE 435979.1GEO
SHEET 1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NE			
DEPTH	HOUR	DATE	ELAPSED TIME

▽
▼

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	34.2 '

DRILLER R. CRUM
HELPER D. CRUM
INSPECTOR W. MCCART
DATE STARTED 05/16/2024
DATE COMPLETED 05/16/2024

DEPTH		A	B	C	DESCRIPTION	REC	REMARKS
		S-1	WH 2 4 3		0.6 ***TOPSOIL*** ***BROWN F/M SAND, SM CLAY (MOIST)*** 2.0	45	
		S-2	4 3 5 4		***BROWN CLAY, TR TO SM F/M/C SAND, TR F/ GRAVEL (MOIST)*** 4.0	65	
5		S-3	5 6 7 10			100	
		S-4	10 10 12 15			100	
10		S-5	17 19 20 32		***BROWN F/M/C SANDY SILTY CLAY, TR TO SM F/C GRAVEL (MOIST)***	100	
					13.0		
15		S-6	4 19 17 12			80	
20		S-7	6 4 6 6		***DARK GRAY F/M/C SANDY CLAY, SM F/C GRAVEL (WET)***	100	
25		S-8	9 15 13 49			45	DIFFUCLT AUGERING AT 24.5 FT
					28.0		
30		S-9	21 20 29 30		***DARK GRAY SILTY CLAYEY F/C GRAVEL, SM F/M/C SAND (MOIST)*** 33.0	25	
		S-10	70 58 50/0.2'		***DARK GRAY F/C GRAVEL-SIZED ROCK FRAGMENTS, SM F/M/C SAND, SM SILT (DRY)*** 34.2	100	AUGER REFUSAL AT 33.6 FT
35							

END OF BORING AT 34.2'

NE=NOT ENCOUNTERED

DRN. WHM
CKD. JPB

KEY TO SYMBOLS

Strata symbols

Symbol	Description
□	Blank Graphic
▨	Clay with Low Plasticity
▨	Silty Clay
▨	USCS Low Plasticity Sandy Clay
▒	Silty, Clayey Gravel
▒	Poorly-graded Sandy Gravel
▨	Clayey Sand
▨	Silty, Clayey Sand
▒	USCS Poorly-graded Gravelly Sand
▒	Topsoil

Misc. Symbols

Symbol	Description
▽	Water table first encountered
▼	Water table first reading after drilling
▼	Water table second reading after drilling
▼	Water table third reading after drilling
NR	Not Recorded
MH	Moh's Hardness

Sample Type

Symbol	Description
▯	Split Barrel

Lab Symbols

FINES = Fines %

LL = Liquid Limit %

PI = Plasticity Index %

U_c = Unconfined Compressive Strength

W/V = Unit Weight

Notes:

COLUMN A) Soil sample number.

COLUMN B) FOR SOIL SAMPLE (ASTM D 1586): indicates number of blows obtained for each 6 ins. penetration of the standard split-barrel sampler. FOR ROCK CORING (ASTM D2113): indicates percent recovery (REC) per run and rock quality designation (RQD). RQD is the % of rock pieces that are 4 ins. or greater in length in a core run.

COLUMN C) Strata symbol as assigned by the geotechnical engineer.

DESCRIPTION) Description including color, texture and classification of subsurface material as applicable (see Descriptive Terms). Estimated depths to bottom of strata as interpolated from the borings are also shown.

DESCRIPTIVE TERMS: F = fine M = medium C = coarse

RELATIVE PROPORTIONS:

-Descriptive Term-	-Symbol-	-Est. Percentages-
Trace	TR	1-10
Trace to Some	TR to SM	10-15
Some	SM	15-30
Silty, Sandy, Clayey, Gravelly	-	30-40
And	and	40-50

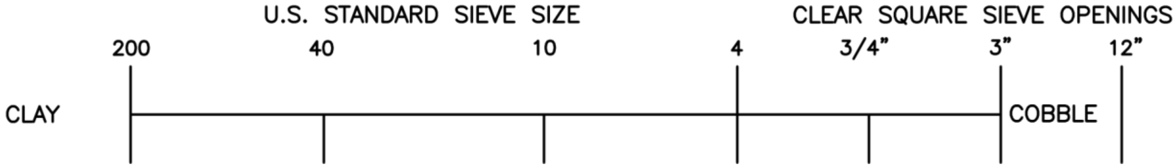
REMARKS) Special conditions or test data as noted during investigation. Note that W.O.P. indicates water observation pipes.

* Free water level as noted may not be indicative of daily, seasonal, tidal, flood, and/or long term fluctuations.

SILTS AND CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

PRIMARY DIVISIONS			SOIL TYPE		SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (Less than 5% Fines)	GW	●	Well graded gravels, gravel–sand mixtures, little or no fines
			GP	○	Poorly graded gravels or gravel–sand mixtures, little or no fines
		GRAVEL WITH FINES	GM	○	Silty gravels, gravel–sand–silt mixtures, plastic fines
			GC	▨	Clayey gravels, gravel–sand–clay mixtures, plastic fines
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (Less than 5% Fines)	SW	⁘	Well graded sands, gravelly sands, little or no fines
			SP	⁘	Poorly graded sands or gravelly sands, little or no fines
		SANDS WITH FINES	SM	▥	Silty sands, sand–silt–mixtures, non–plastic fines
			SC	▨	Clayey sands, sand–clay mixtures, plastic fines
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50 %		ML	▥	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL	▨	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	▤	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50 %		MH	▥	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH	▨	Inorganic clays of high plasticity, fat clays
			OH	≋	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			PT	⁘	Peat and other highly organic soils

DEFINITION OF TERMS



METHODS AND TOOLS FOR **ADVANCING BOREHOLES**

a - Continuous Sampling

b - Finger type rotary cutter head 6 in. diameter (open hole)

d - Drilled in casing 3 3/8 in. ID; 8 in. OD (hollow-stem auger)

e - Drilled in casing 2 1/2 in. ID; 6 1/4 in. OD (hollow-stem auger)

f - Driven flush joint casing (BW) - 2 3/8 in. ID; 2 7/8 in. OD (300 lb. hammer, 18 in. drop)

g - Driven flush joint casing (NW) - 3 in. ID; 3 1/2 in. OD (300 lb. hammer, 18 in. drop)

h - Tricone Roller Bit - 2 3/8 in. or 2 7/8 in.

i - Drilling Mud (Slurry Method)

c_1 - Double tube diamond core barrel (BX) : core size: 1.6 in.
hole size: 2.36 in.

c_2 - Double tube diamond core barrel (NX) : core size: 2.0 in.
hole size: 2.98 in.

c_3 - 4 in. thin walled diamond bit

c_4 - 6 in. thin walled diamond bit

METHODS AND TOOLS FOR **TESTING AND SAMPLING SOILS AND/OR ROCKS**

Penetration test and split-barrel sampling of soils, ASTM D1586

140 lb. hammer, 30 in. drop. recording number of blows obtained for each 6 in. penetration usually for a total of 18 in. penetration of the standard 2 in. O.D. and 1 3/8 in. I.D. split-barrel sampler. Penetration resistance (N) is the total number of blows required for the second and third 6 in. penetration.

Thin walled tube sampling, ASTM D1587

Samples are obtained by pressing thin-walled steel, brass or aluminum tubes into soil. Standard thin-walled steel tubes:

O.D. in.	2	3
I.D. in.	1.94	2.87

Diamond core drilling, ASTM D2113

Diamond core drilling is used to recover intact samples of rock and some hard soils generally with the use of a:

BWM double tube core barrel
NWM double tube core barrel

LABORATORY DATA

SUMMARY OF LABORATORY TEST DATA

Project Name:	SunEast Flat Creek Solar 94C Root, NY
Client Name:	SunEast Development, LLC
TRC Project #:	435979.1GEO

SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION USCS GRADATION				Moisture Content (%)	PLASTICITY				Dry Density (pcf)
Source #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)	
B-301	S-2 & S-3	2.0-6.0	CL[1]	-	-	-		13.4	23	15	8	-0.2	-
B-302, 303, & 304	S-2	2.0-4.0	CL[1]	-	-	-		16.3	25	15	10	0.1	-
B-302, 303, & 304	S-3	4.0-6.0	CL[2]	19.5	20.9	59.6		12.6	-	-	-	-	-
B-302, 303, & 304	S-5	8.0-10.0	CL-ML	20.8	22.7	56.5		10.7	20	13	7	-0.3	-
B-304	S-6	13.0-15.0	SC-SM	25.5	30.3	44.2		10.0	18	12	6	-0.3	132.3
B-304	S-8	18.0-25.0	CL-ML[1]	-	-	-		9.9	17	12	5	-0.4	130.3
B-305	S-3 & S-4	4.0-8.0	CL-ML[1]	-	-	-		12.4	19	14	5	-0.3	-
B-306	S-5 & S-6	8.0-15.0	CL-ML[2]	21.9	20.7	57.4		9.2	-	-	-	-	-
B-307 & B-309	S-3	4.0-6.0	CL-ML[1]	-	-	-		18.3	23	16	7	0.3	-
B-307	S-6	13.0-15.0	SC-SM	21.8	33.1	45.1		9.3	15	11	4	-0.4	131.8

DRAWN BY: TBT 06/10/24

CHECKED BY: JPB 06/10/24

SUMMARY OF LABORATORY TEST DATA

Project Name: SunEast Flat Creek Solar 94C
Root, NY
Client Name: SunEast Development, LLC
TRC Project #: 435979.1GEO

SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION USCS GRADATION				Moisture Content (%)	PLASTICITY				Dry Density (pcf)
Source #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)	
B-307	S-9 & S-10	28.0-35.0	GC-GM[2]	42.1	19.8	38.1		9.4	-	-	-	-	-
B-308	S-5	8.0-10.0	CL-ML	13.9	30.3	55.8		9.9	18	11	7	-0.2	-
B-310 & B-311	S-3 & S-4	4.0-8.0	CL-ML	14.4	33.4	52.2		14.7	20	14	6	0.1	-
B-310	S-6	13.0-15.0	SC-SM	20.1	33.9	46.0		10.4	16	12	4	-0.4	130.1
B-310	S-9	28.0-30.0	CL-ML[2]	30.9	22.0	47.1		6.3	-	-	-	-	-
B-311	S-7	18.0-20.0	SC-SM	16.8	35.8	47.4		9.9	17	10	7	0.0	-
BULK 1	-	0.0-5.0	CL	3.4	13.1	83.5		24.5	25	16	9	0.9	-
BULK 2	-	0.0-5.0	CL	3.2	15.1	81.7		24.8	29	18	11	0.6	-

Notes:

1. USCS based on fines only. A gradation was not requested.
2. USCS based on grain-size distribution and visual classification. Atterberg limits testing was not requested.

DRAWN BY: TBT 06/10/24

CHECKED BY: JPB 06/10/24

SUMMARY OF LABORATORY TEST DATA

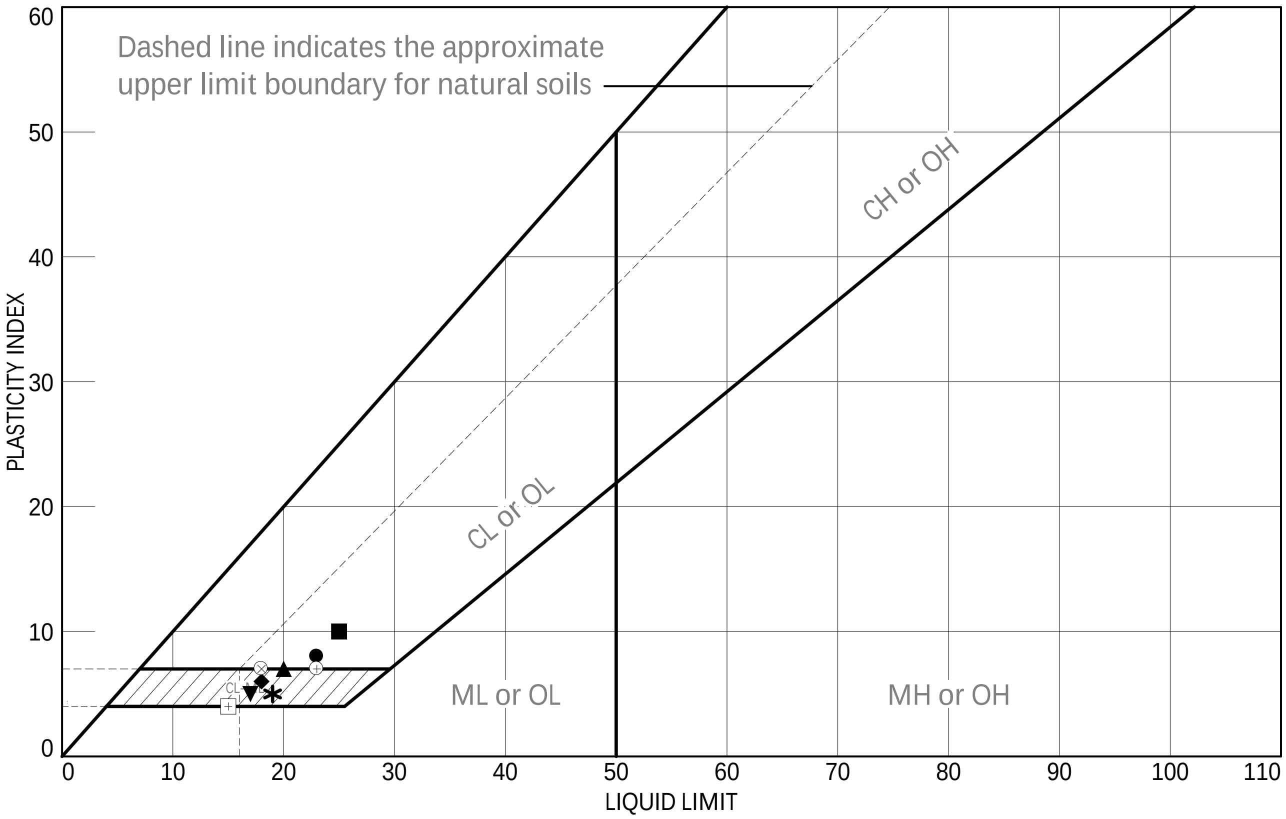
Project Name: SunEast Flat Creek Solar 94C
Root, NY
Client Name: SunEast Development, LLC
TRC Project #: 435979.1GEO

SAMPLE IDENTIFICATION			COMPACTION CHARACTERISTICS			CALIFORNIA BEARING RATIO	
Source #	Sample #	Depth (ft)	Type of Test	Maximum Density (PCF)	Optimum Moisture Content (%)	% Compaction	0.10 in.
BULK 1	-	0.0-5.0	ASTM D698	112.4	13.6	94.9	3.0
BULK 2	-	0.0-5.0	ASTM D698	107.4	12.6	95.2	2.8

DRAWN BY: TBT 06/10/24

CHECKED BY: JPB 06/10/24

Atterberg Limits and Moisture Content Report



SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	LIQUIDITY INDEX	USCS
●	B-301	S-2 & S-3	2.0-6.0 FT	13.4	15	23	8	-0.2	CL*
■	B-302, 303, & 304	S-2	2.0-4.0 FT	16.3	15	25	10	0.1	CL*
▲	B-302, 303, & 304	S-5	8.0-10.0 FT	10.7	13	20	7	-0.3	CL-ML
◆	B-304	S-6	13.0-15.0 FT	10.0	12	18	6	-0.3	SC-SM
▼	B-304	S-8	18.0-25.0 FT	9.9	12	17	5	-0.4	CL-ML*
✱	B-305	S-3 & S-4	4.0-8.0 FT	12.4	14	19	5	-0.3	CL-ML*
⊕	B-307 & B-309	S-3	4.0-6.0 FT	18.3	16	23	7	0.3	CL-ML*
⊞	B-307	S-6	13.0-15.0 FT	9.3	11	15	4	-0.4	SC-SM
⊗	B-308	S-5	8.0-10.0 FT	9.9	11	18	7	-0.2	CL-ML

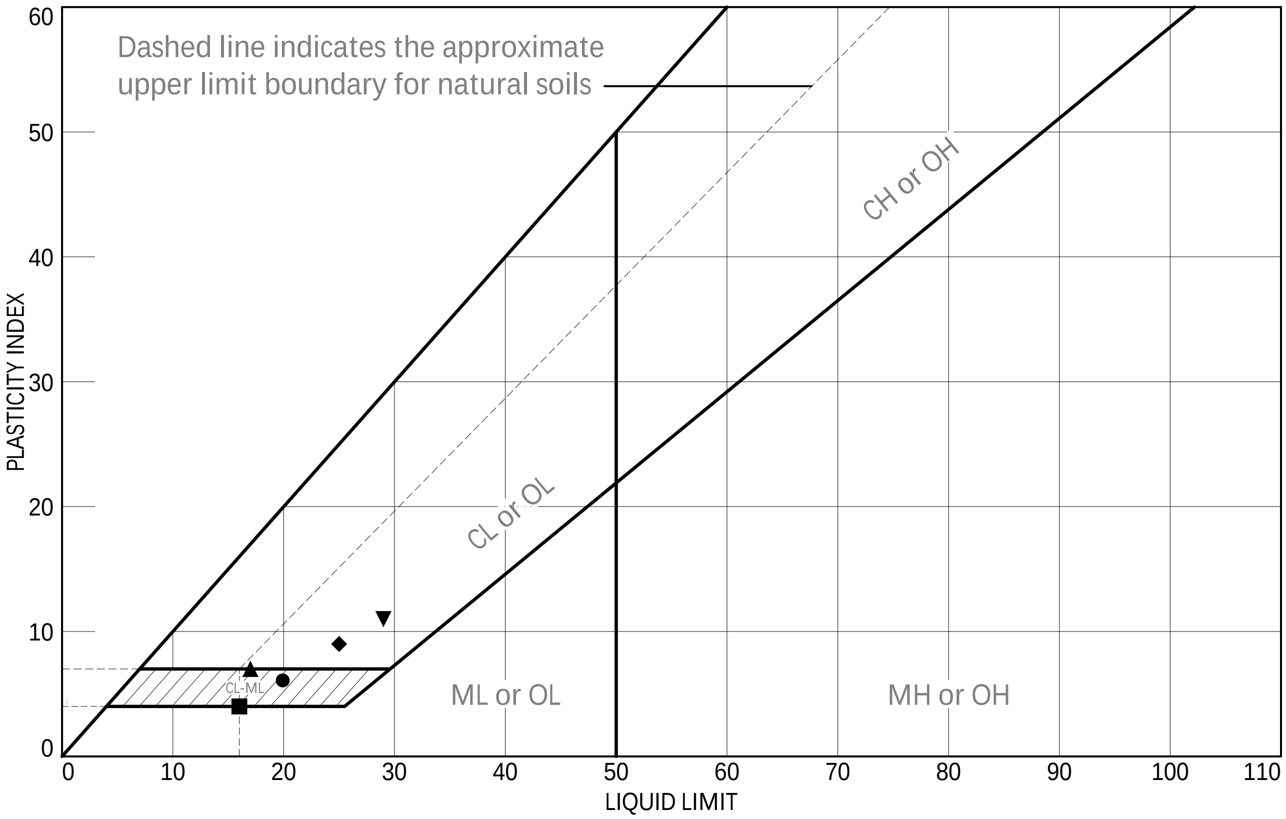
TRC
Engineers, Inc.
Mt. Laurel, NJ

Client: SUNEAST DEVELOPMENT, LLC
Project: SUNEAST FLAT CREEK SOLAR 94C

Project No.: 435979.1GEO

Figure 1

Atterberg Limits and Moisture Content Report



SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	LIQUIDITY INDEX	USCS
●	B-310 & B-311	S-3 & S-4	4.0-8.0 FT	14.7	14	20	6	0.1	CL-ML
■	B-310	S-6	13.0-15.0 FT	10.4	12	16	4	-0.4	SC-SM
▲	B-311	S-7	18.0-20.0 FT	9.9	10	17	7	0.0	SC-SM
◆	BULK 1		0.0-5.0 FT	24.5	16	25	9	0.9	CL
▼	BULK 2		0.0-5.0 FT	24.8	18	29	11	0.6	CL

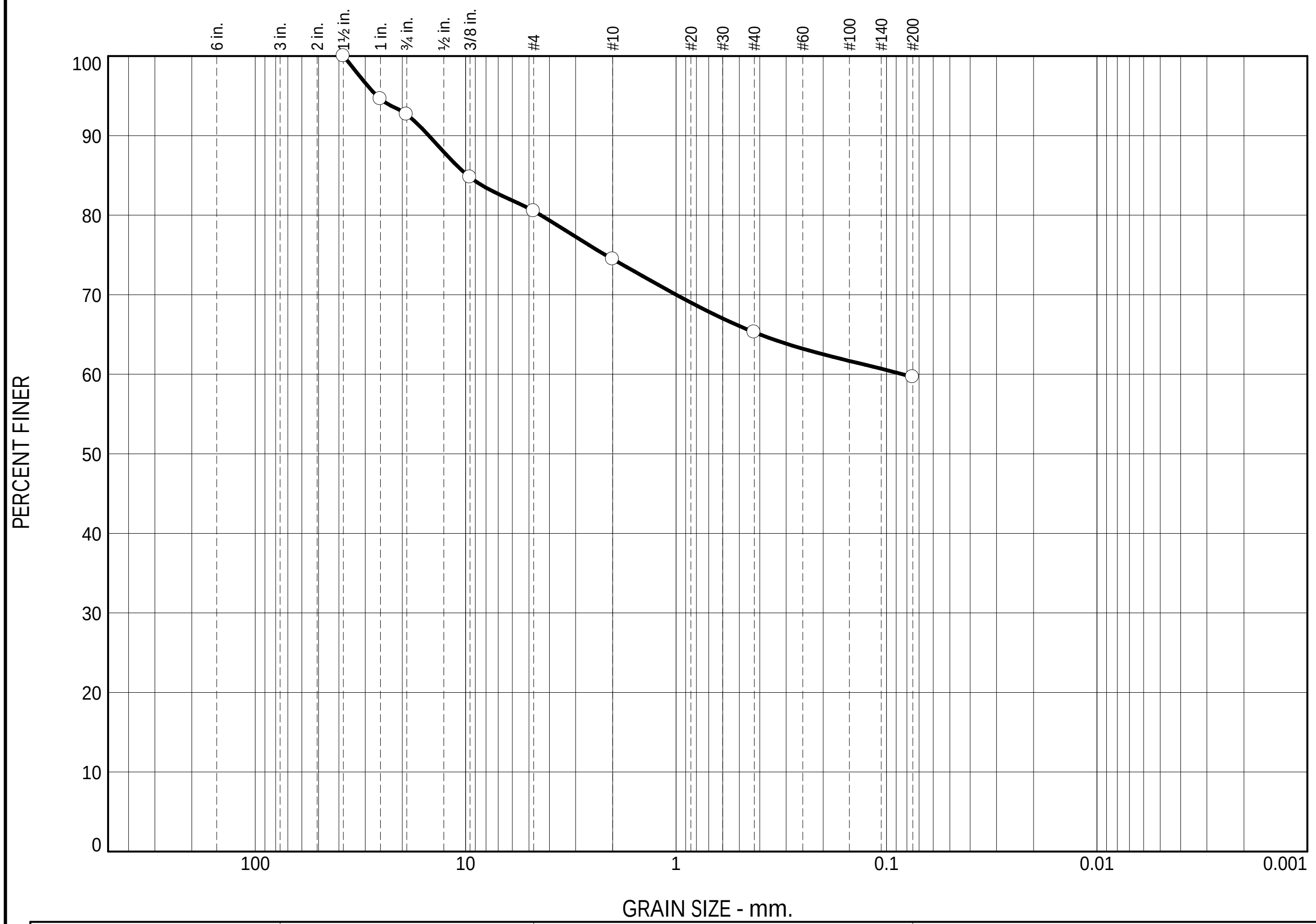
TRC
Engineers, Inc.
Mt. Laurel, NJ

Client: SUNEAST DEVELOPMENT, LLC
Project: SUNEAST FLAT CREEK SOLAR 94C

Project No.: 435979.1GEO

Figure 2

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	7.3	12.2	6.0	9.2	5.7	59.6	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			9.7704	0.0838						

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SANDY CLAY WITH GRAVEL	06/03/24	CL	12.6

Project No. 435979.1GEO Client: SUNEAST DEVELOPMENT, LLC

Project: SUNEAST FLAT CREEK SOLAR 94C

○ Source of Sample: B-302, 303, & 304 Depth: 4.0-6.0 FT Sample Number: S-3

Remarks:

○SAMPLE DESCRIPTION BASED ON GRAIN-SIZE DISTRIBUTION AND VISUAL CLASSIFICATION

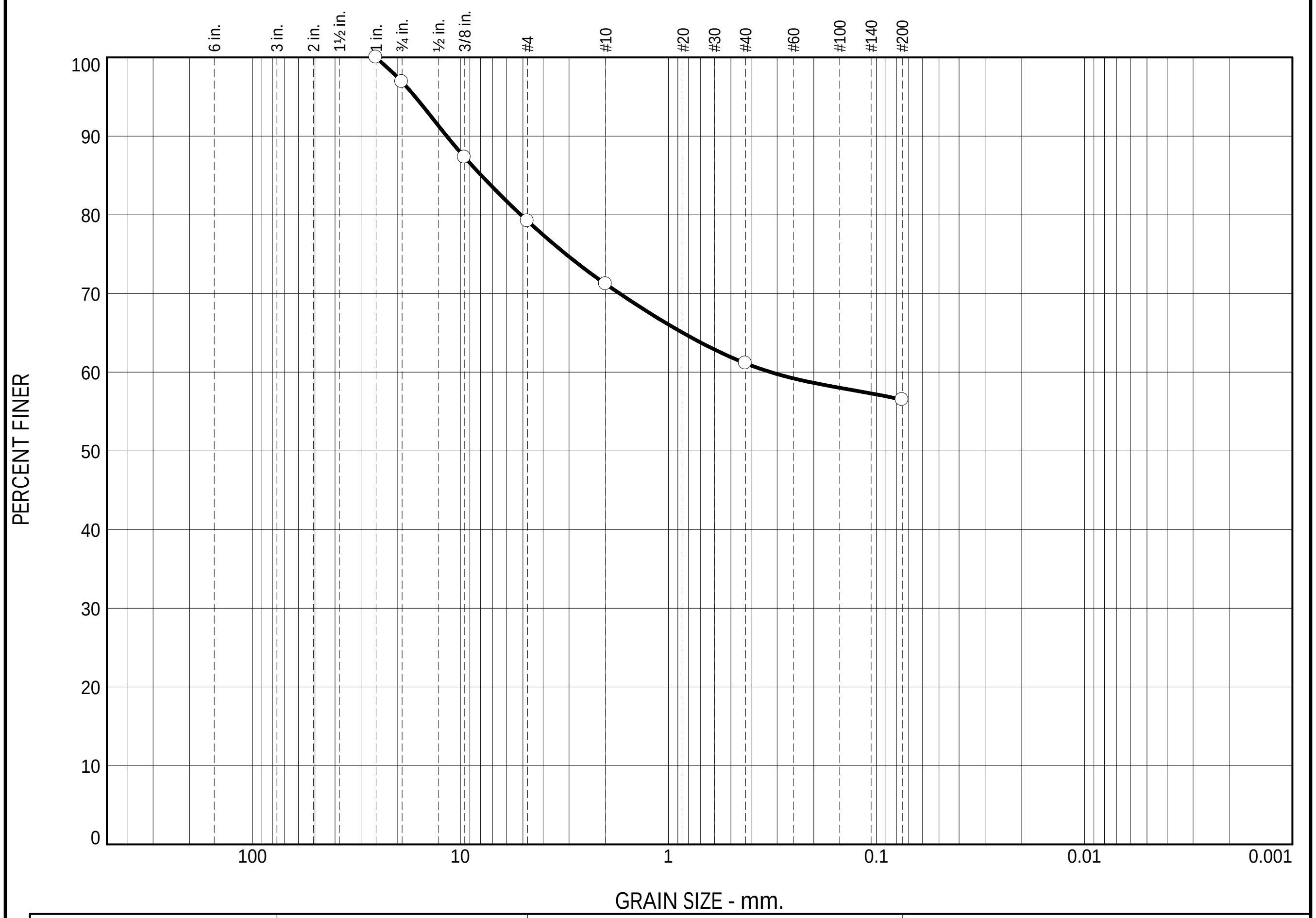
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 3

Tested By: JC 06/03/24 Checked By: JPB 06/05/24

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	3.1	17.7	8.0	10.1	4.6	56.5	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	20	13	7.9150	0.3214						

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SANDY SILTY CLAY WITH GRAVEL	06/03/24	CL-ML	10.7

Project No. 435979.1GEO Client: SUNEAST DEVELOPMENT, LLC

Project: SUNEAST FLAT CREEK SOLAR 94C

○ Source: B-302, 303, & 304 Depth: 8.0-10.0 FT Sample No.: S-5

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS

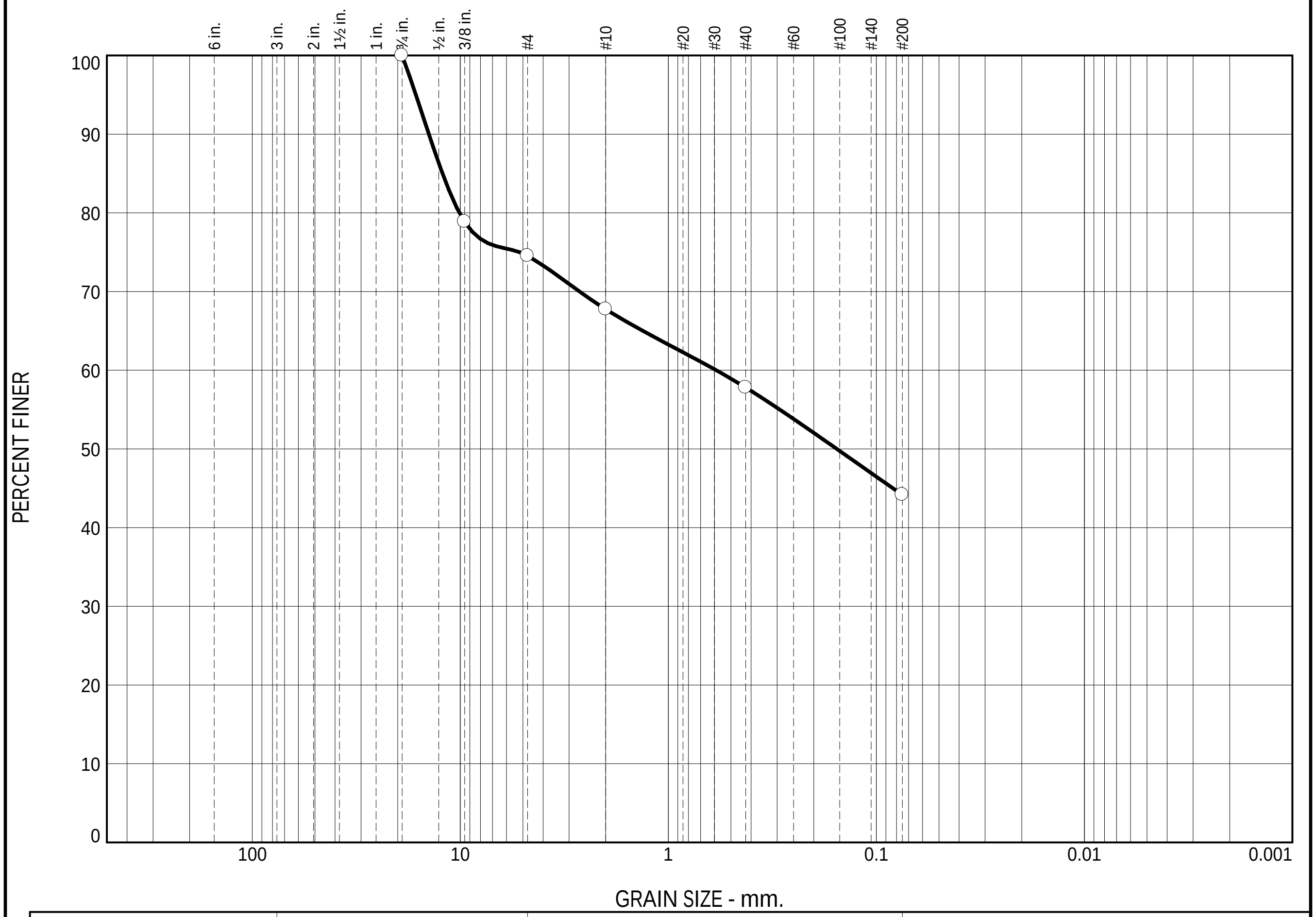
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 4

Tested By: JC 06/04/24 Checked By: JPB 06/05/24

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	25.5	6.8	9.9	13.6	44.2	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	18	12	12.1742	0.5886	0.1549					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ GRAY SILTY, CLAYEY SAND WITH GRAVEL	06/04/24	SC-SM	10.0

Project No. 435979.1GEO Client: SUNEAST DEVELOPMENT, LLC

Project: SUNEAST FLAT CREEK SOLAR 94C

○ Source of Sample: B-304 Depth: 13.0-15.0 FT Sample Number: S-6

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS

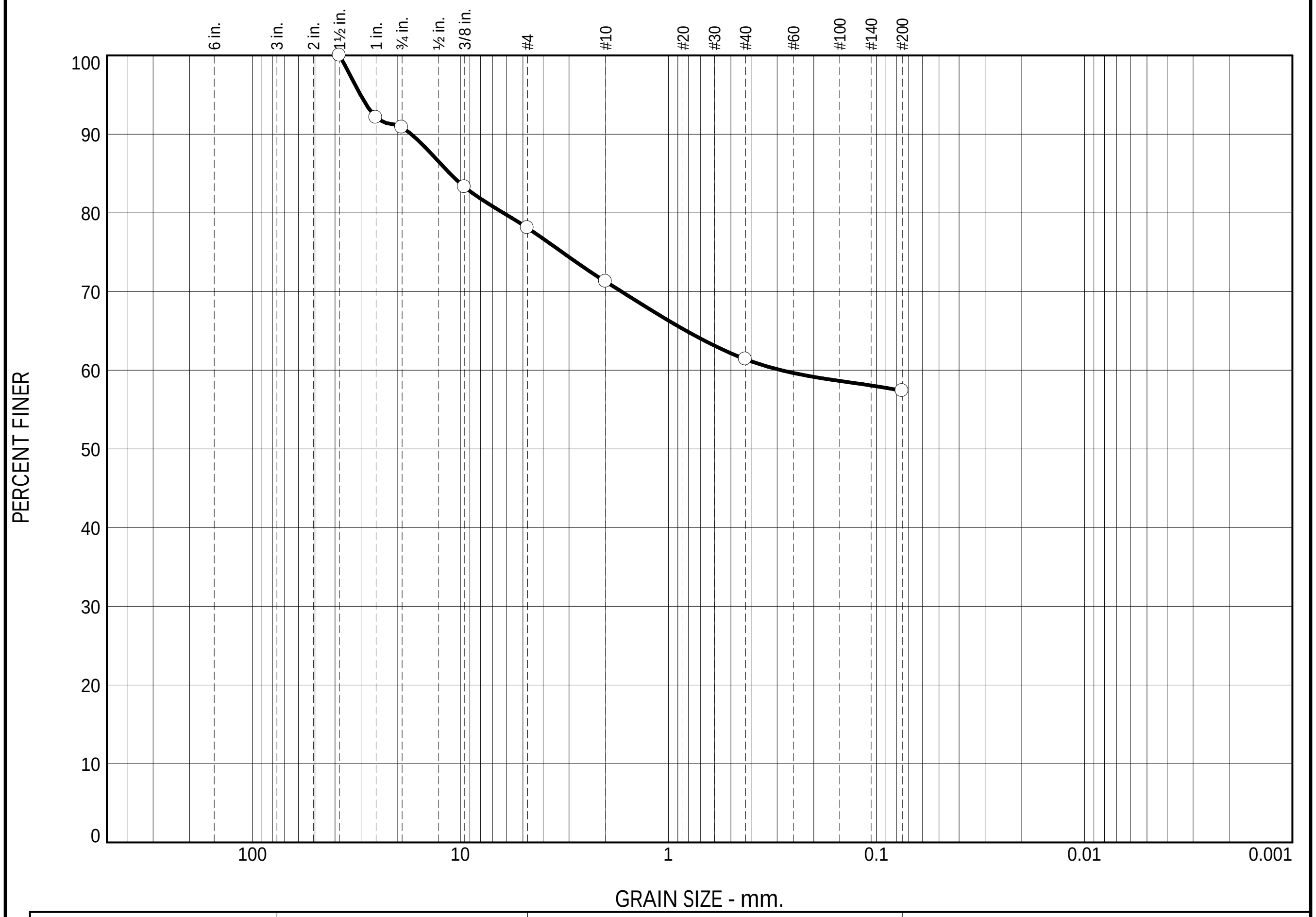
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 5

Tested By: JC 06/04/24 Checked By: JPB 06/06/24

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	9.2	12.7	6.8	9.9	4.0	57.4	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			11.2079	0.2858						

	MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○	DARK BROWN/BROWN GRAVELLY SILTY CLAY WITH SAND	06/04/24	CL-ML	9.2

Project No. 435979.1GEO Client: SUNEAST DEVELOPMENT, LLC
Project: SUNEAST FLAT CREEK SOLAR 94C

○ Source of Sample: B-306 Depth: 8.0-15.0 FT Sample Number: S-5 & S-6

Remarks:
○SAMPLE DESCRIPTION BASED ON GRAIN-SIZE DISTRIBUTION AND VISUAL CLASSIFICATION

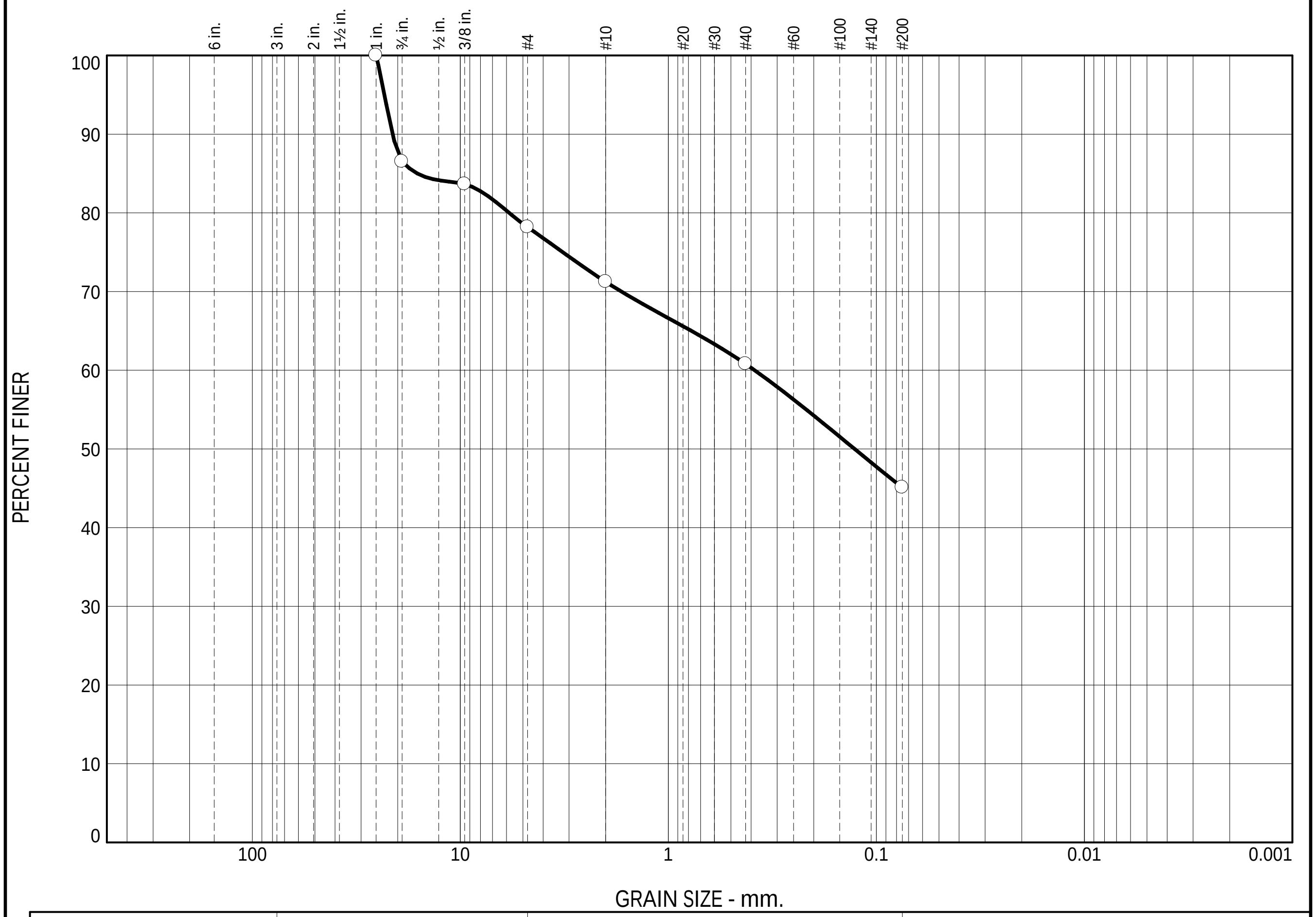
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 6

Tested By: JC 06/04/24 Checked By: JPB 06/06/24

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	13.5	8.3	7.0	10.4	15.7	45.1	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	15	11	16.0717	0.3851	0.1272					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN/GRAY SILTY, CLAYEY SAND WITH GRAVEL	06/05/24	SC-SM	9.3

Project No. 435979.1GEO Client: SUNEAST DEVELOPMENT, LLC
Project: SUNEAST FLAT CREEK SOLAR 94C

○ Source of Sample: B-307 Depth: 13.0-15.0 FT Sample Number: S-6

Remarks:
○SAMPLE DESCRIPTION BASED ON USCS

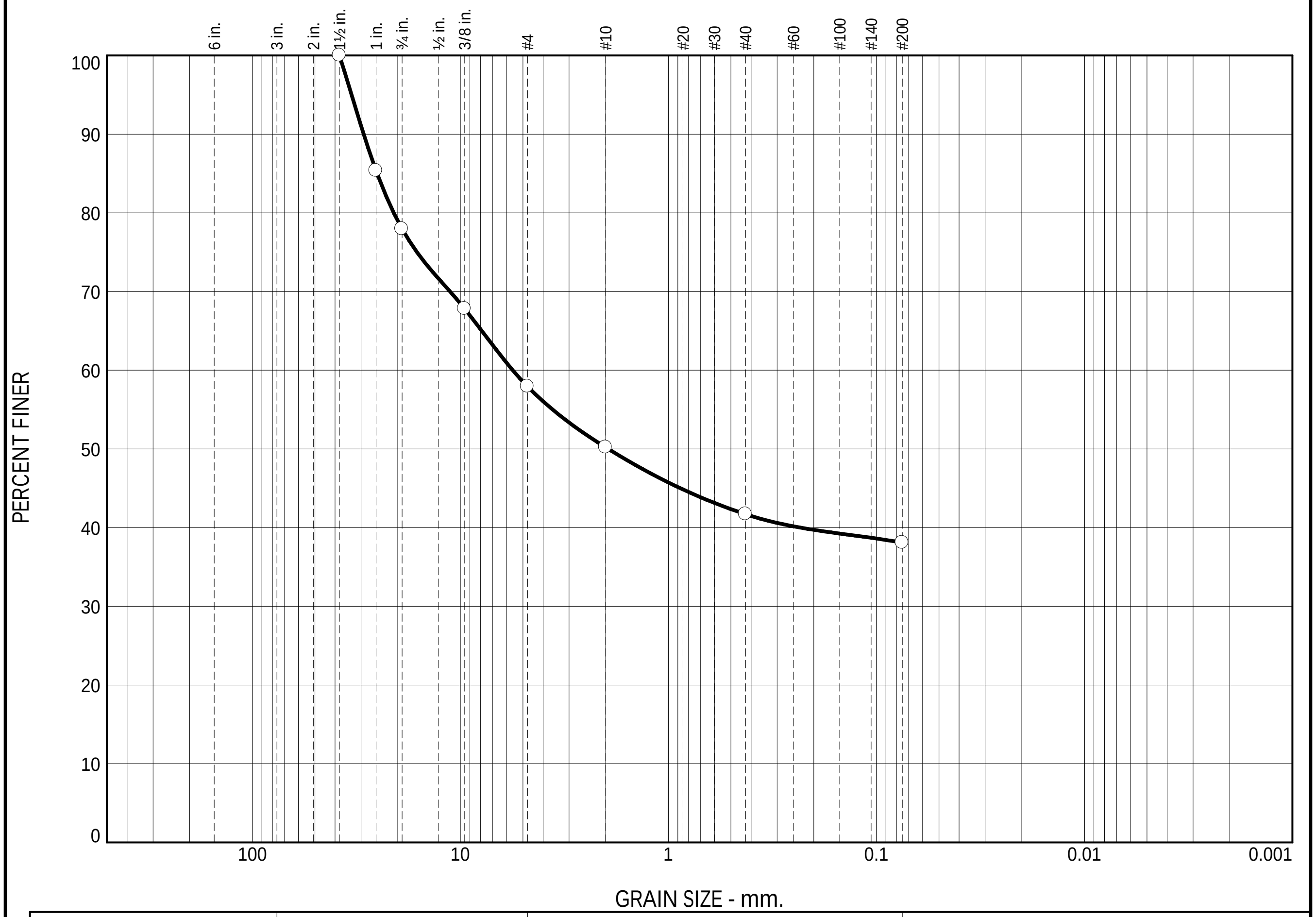
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 7

Tested By: JC 06/05/24 Checked By: JPB 06/06/24

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	22.0	20.1	7.7	8.5	3.6	38.1	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			25.1156	5.5994	1.9445					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ GRAY AND BROWN SILTY CLAYEY GRAVEL WITH SAND	06/05/24	GC-GM	9.4

Project No. 435979.1GEO Client: SUNEAST DEVELOPMENT, LLC
Project: SUNEAST FLAT CREEK SOLAR 94C

○ Source of Sample: B-307 Depth: 28.0-30.0 FT Sample Number: S-9 & S-10

Remarks:
○SAMPLE DESCRIPTION BASED ON GRAIN-SIZE DISTRIBUTION AND VISUAL CLASSIFICATION

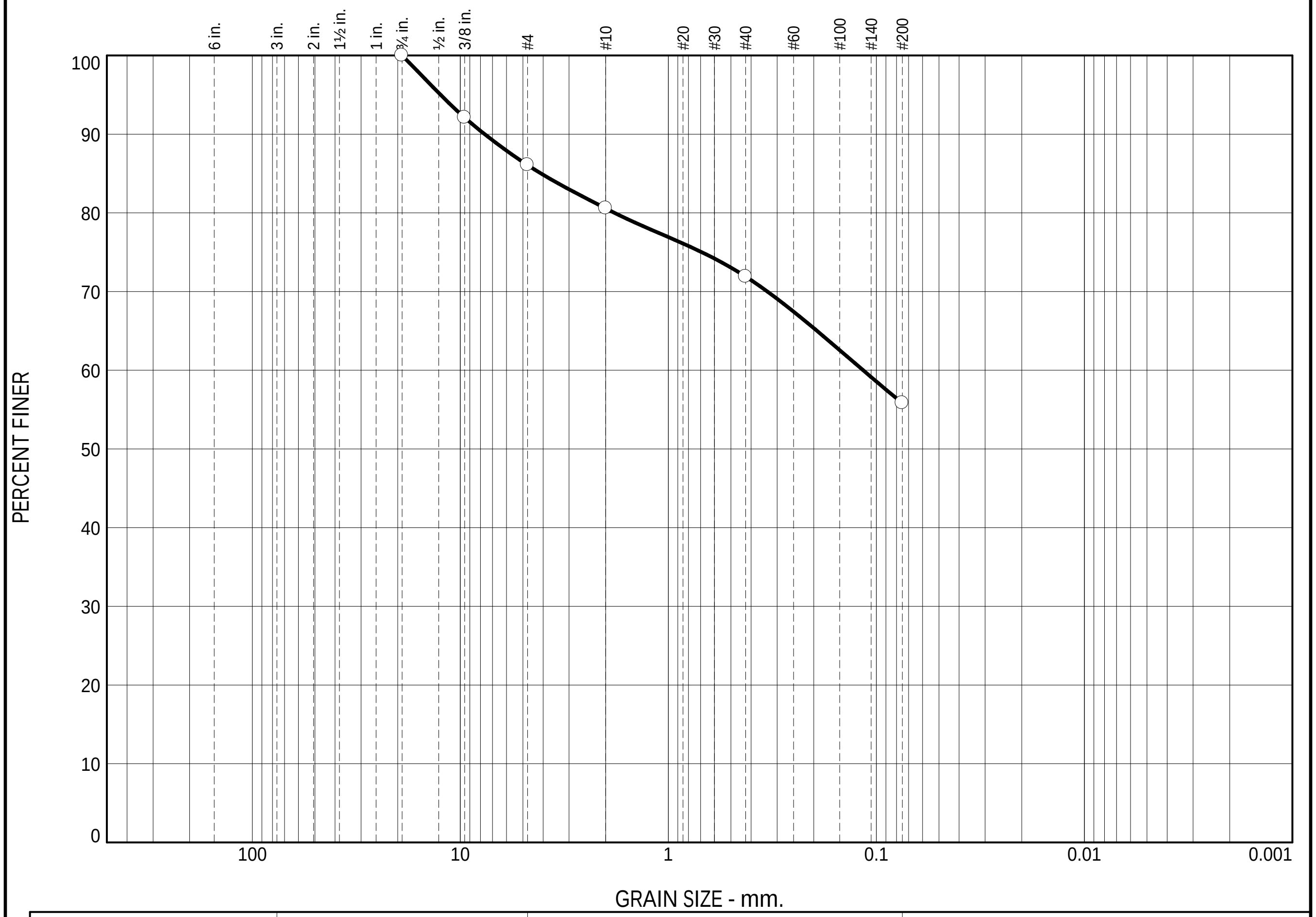
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 8

Tested By: JC 06/05/24 Checked By: JPB 06/06/24

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	13.9	5.5	8.7	16.1	55.8	

╳	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	18	11	4.0916	0.1158						

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN/DARK GRAY SANDY SILTY CLAY	06/05/24	CL-ML	9.9

Project No. 435979.1GEO Client: SUNEAST DEVELOPMENT, LLC

Project: SUNEAST FLAT CREEK SOLAR 94C

○ Source of Sample: B-308 Depth: 8.0-10.0 FT Sample Number: S-5

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS

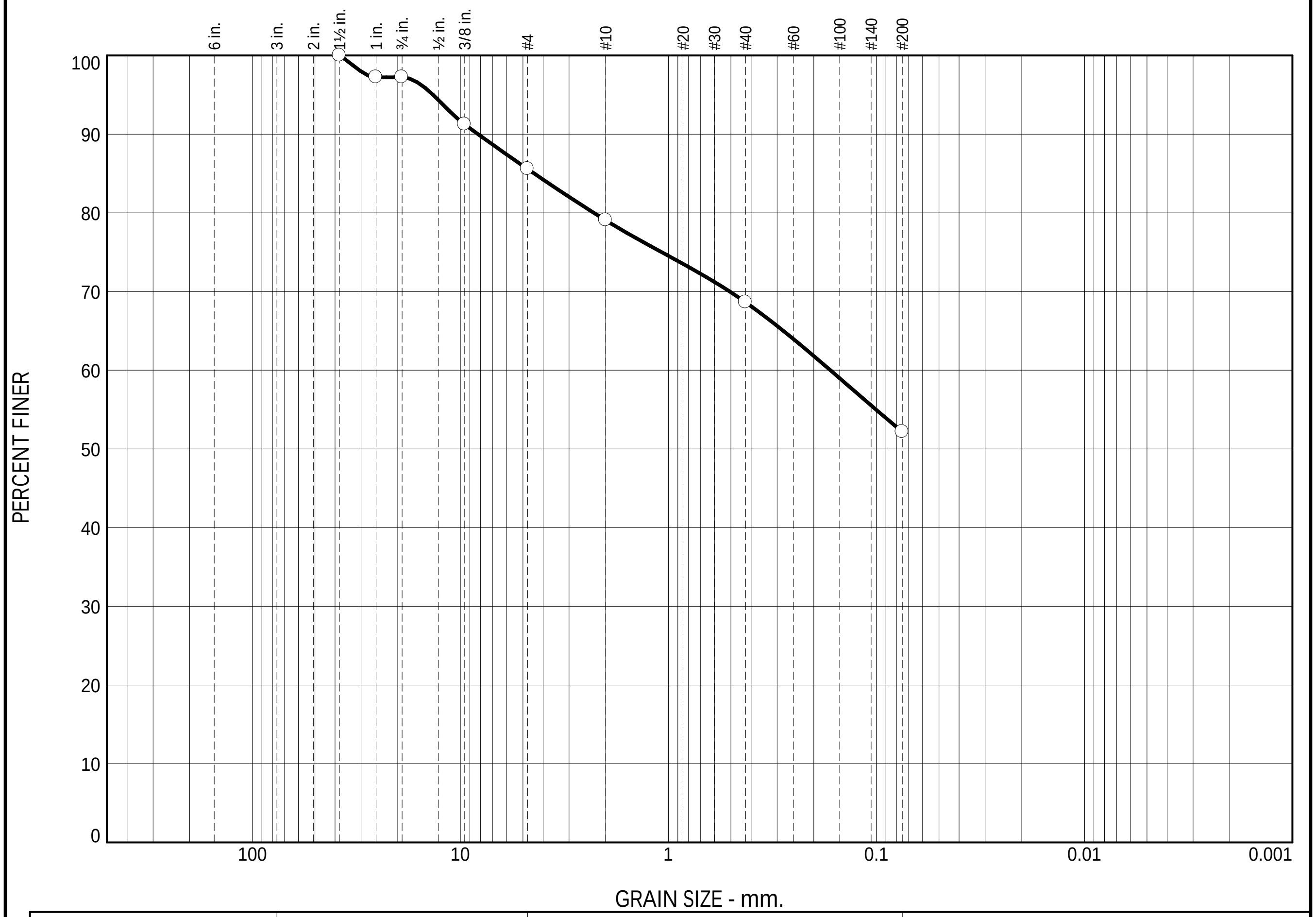
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 9

Tested By: OA 06/05/24 Checked By: JPB 06/06/24

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	2.8	11.6	6.5	10.5	16.4	52.2	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	20	14	4.4140	0.1662						

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SANDY SILTY CLAY	06/05/24	CL-ML	14.7

Project No. 435979.1GEO Client: SUNEAST DEVELOPMENT, LLC
Project: SUNEAST FLAT CREEK SOLAR 94C

○ Source: B-310 & B-311 Depth: 4.0-8.0 FT Sample No.: S-3 & S-4

Remarks:
○SAMPLE DESCRIPTION
BASED ON USCS

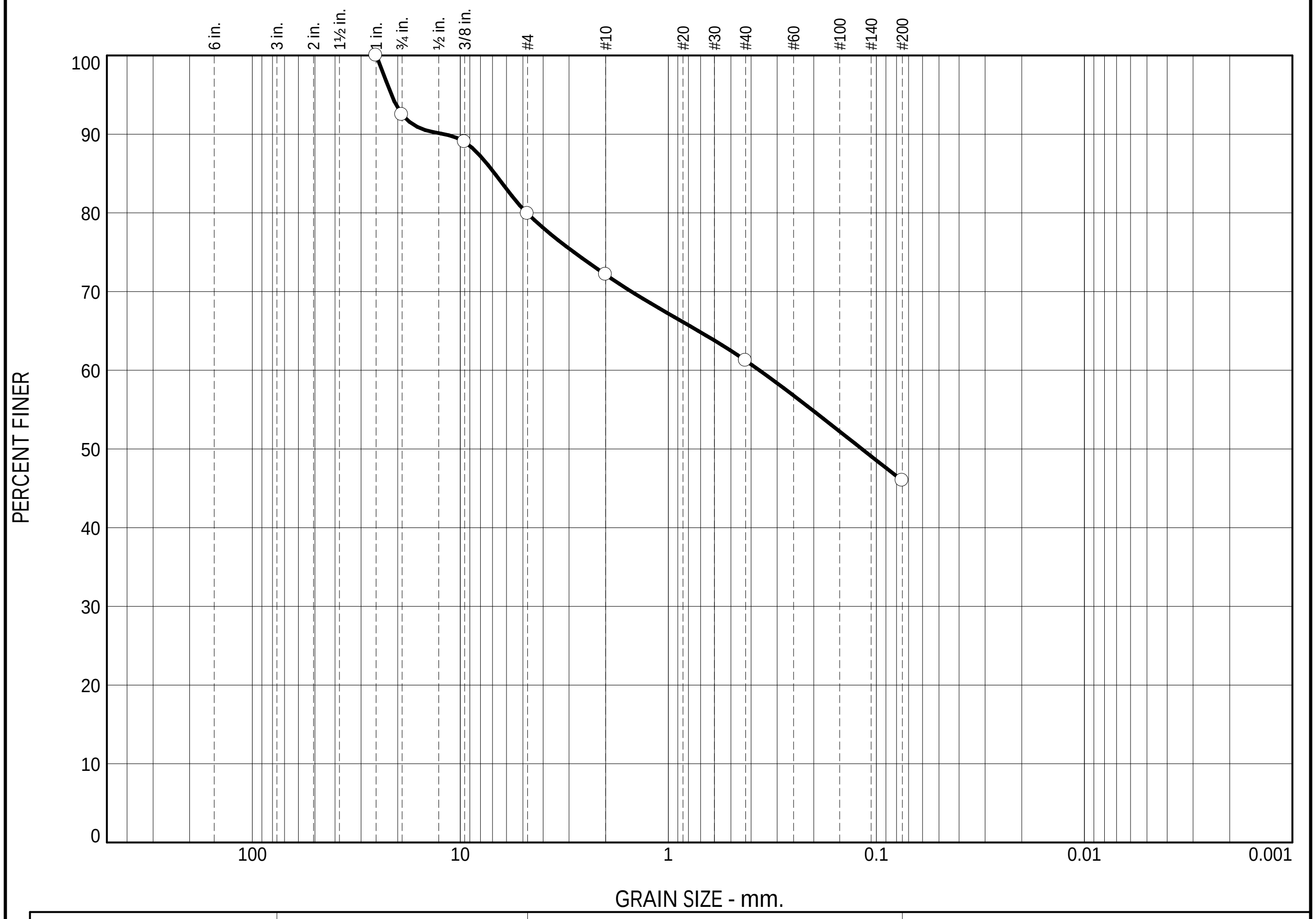
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 10

Tested By: JC 06/05/24 Checked By: JPB 06/06/24

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	7.5	12.6	7.7	11.0	15.2	46.0	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	16	12	6.8314	0.3648	0.1174					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ DARK GRAY SILTY, CLAYEY SAND WITH GRAVEL	06/05/24	SC-SM	10.4

Project No. 435979.1GEO Client: SUNEAST DEVELOPMENT, LLC
Project: SUNEAST FLAT CREEK SOLAR 94C

○ Source of Sample: B-310 Depth: 13.0-15.0 FT Sample Number: S-6

Remarks:
○SAMPLE DESCRIPTION
BASED ON USCS

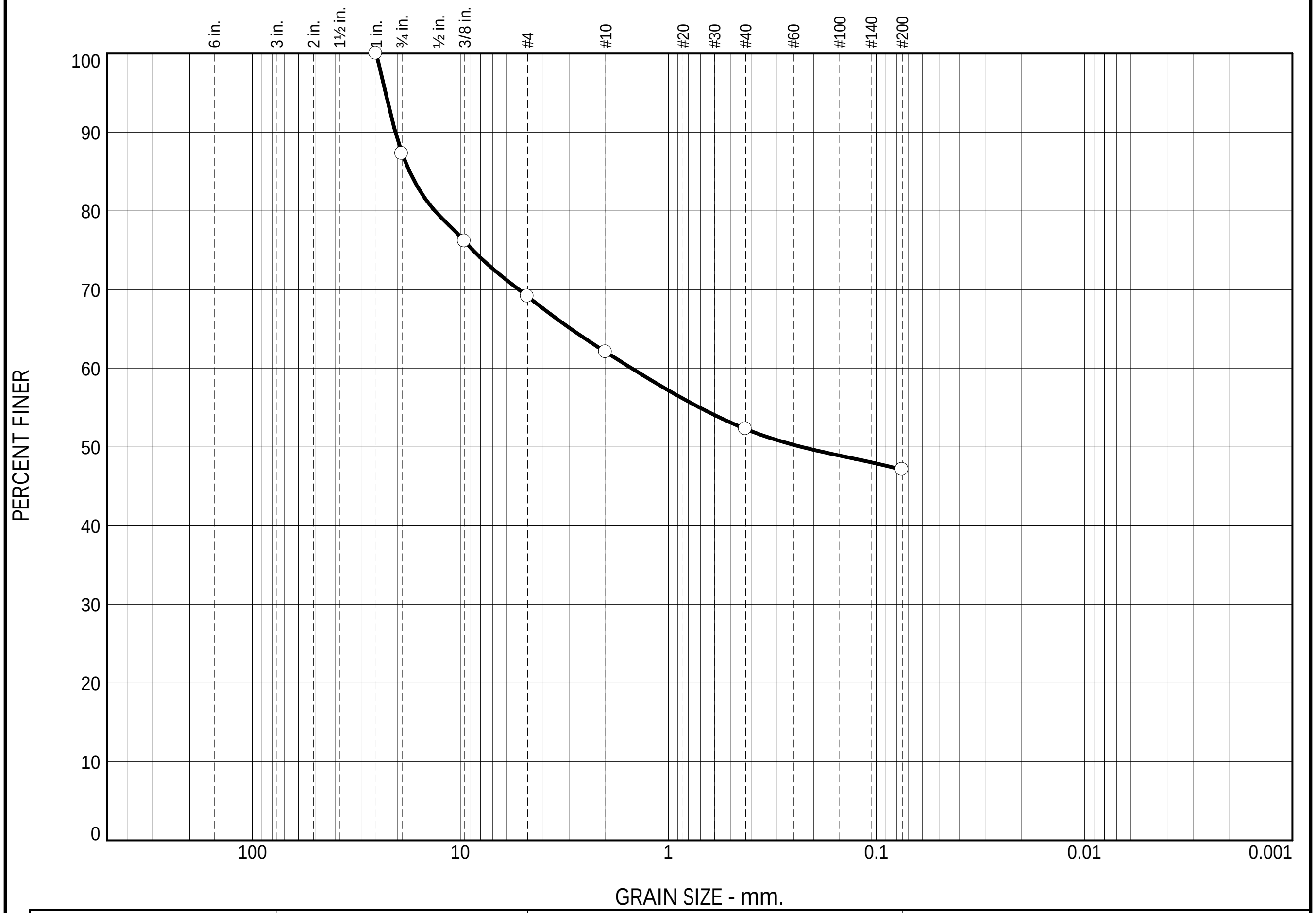
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 11

Tested By: OA 06/05/24 Checked By: JPB 06/06/24

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	12.7	18.2	7.0	9.8	5.2	47.1	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			17.5289	1.5013	0.2283					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN/DARK BROWN GRAVELLY SILTY CLAY WITH SAND	06/04/24	CL-ML	6.3

Project No. 435979.1GEO Client: SUNEAST DEVELOPMENT, LLC
Project: SUNEAST FLAT CREEK SOLAR 94C

○ Source of Sample: B-310 Depth: 28.0-30.0 FT Sample Number: S-9

TRC Engineers, Inc.

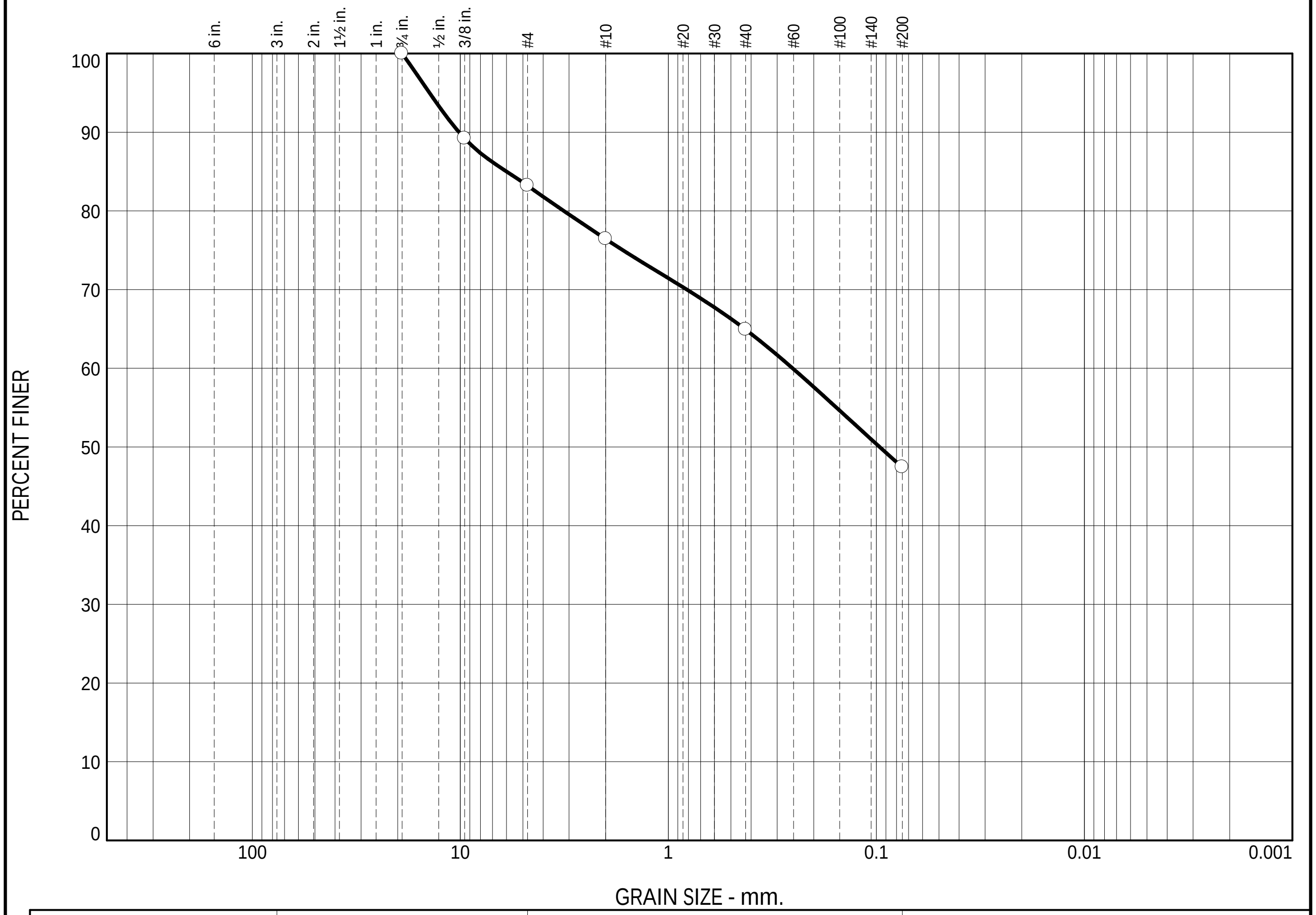
Mt. Laurel, NJ

Remarks:
○SAMPLE DESCRIPTION BASED ON GRAIN-SIZE DISTRIBUTION AND VISUAL CLASSIFICATION

Figure 12

Tested By: JC 06/04/24 Checked By: JPB 06/06/24

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	16.8	6.8	11.5	17.5	47.4	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	17	10	5.9967	0.2526	0.0965					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ GRAY SILTY, CLAYEY SAND WITH GRAVEL	06/03/24	SC-SM	9.9

Project No. 435979.1GEO Client: SUNEAST DEVELOPMENT, LLC
Project: SUNEAST FLAT CREEK SOLAR 94C

○ Source of Sample: B-311 Depth: 18.0-20.0 FT Sample Number: S-7

Remarks:
○SAMPLE DESCRIPTION BASED ON USCS

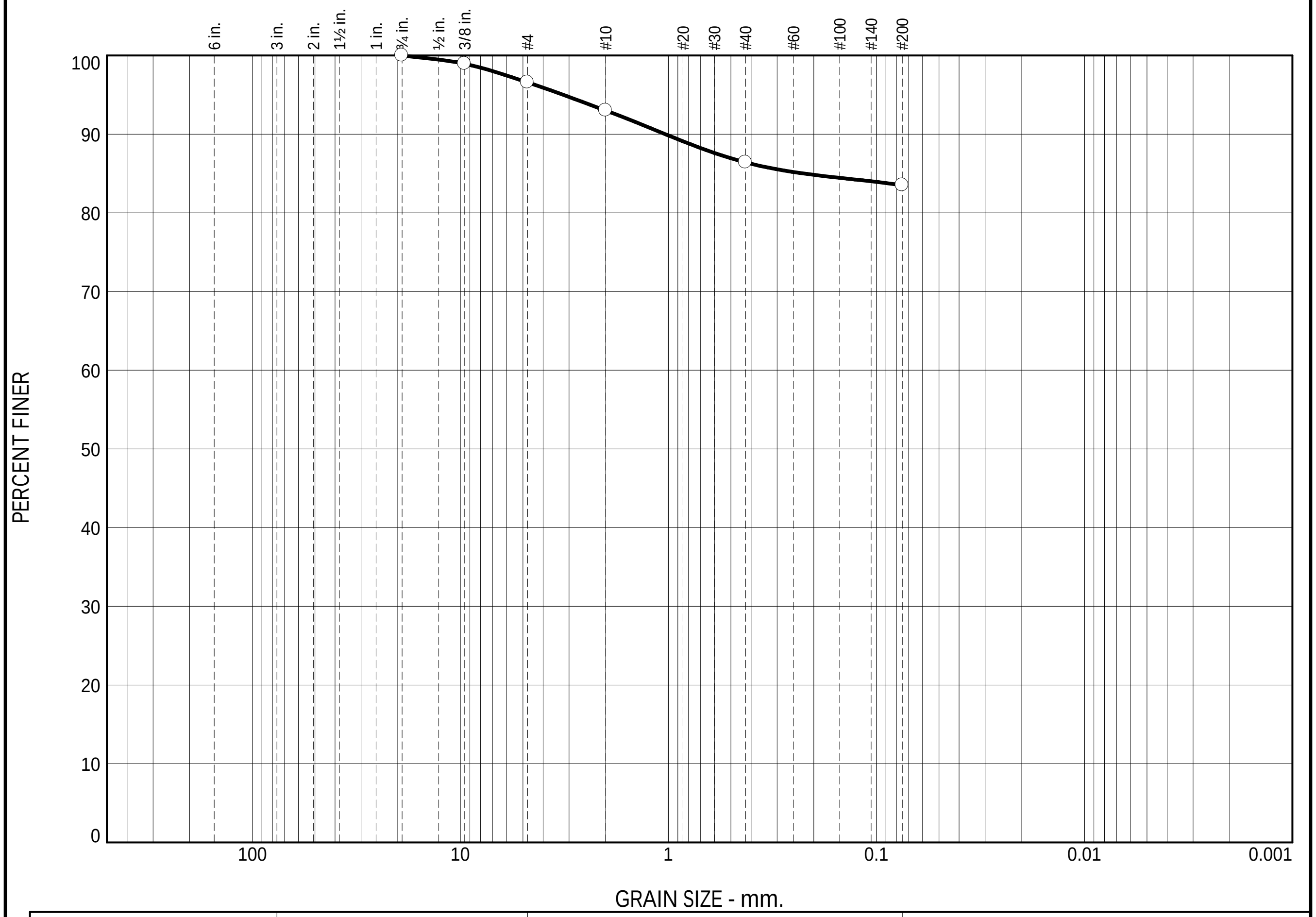
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 13

Tested By: OA 06/03/24 Checked By: JPB 06/06/24

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	3.4	3.6	6.6	2.9	83.5	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	25	16	0.2231							

	MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○	BROWN LEAN CLAY WITH SAND	05/28/24	CL	24.5

Project No. 435979.1GEO Client: SUNEAST DEVELOPMENT, LLC
Project: SUNEAST FLAT CREEK SOLAR 94C

○ Source of Sample: BULK 1 Depth: 0.0-5.0 FT

Remarks:
○SAMPLE DESCRIPTION
BASED ON USCS

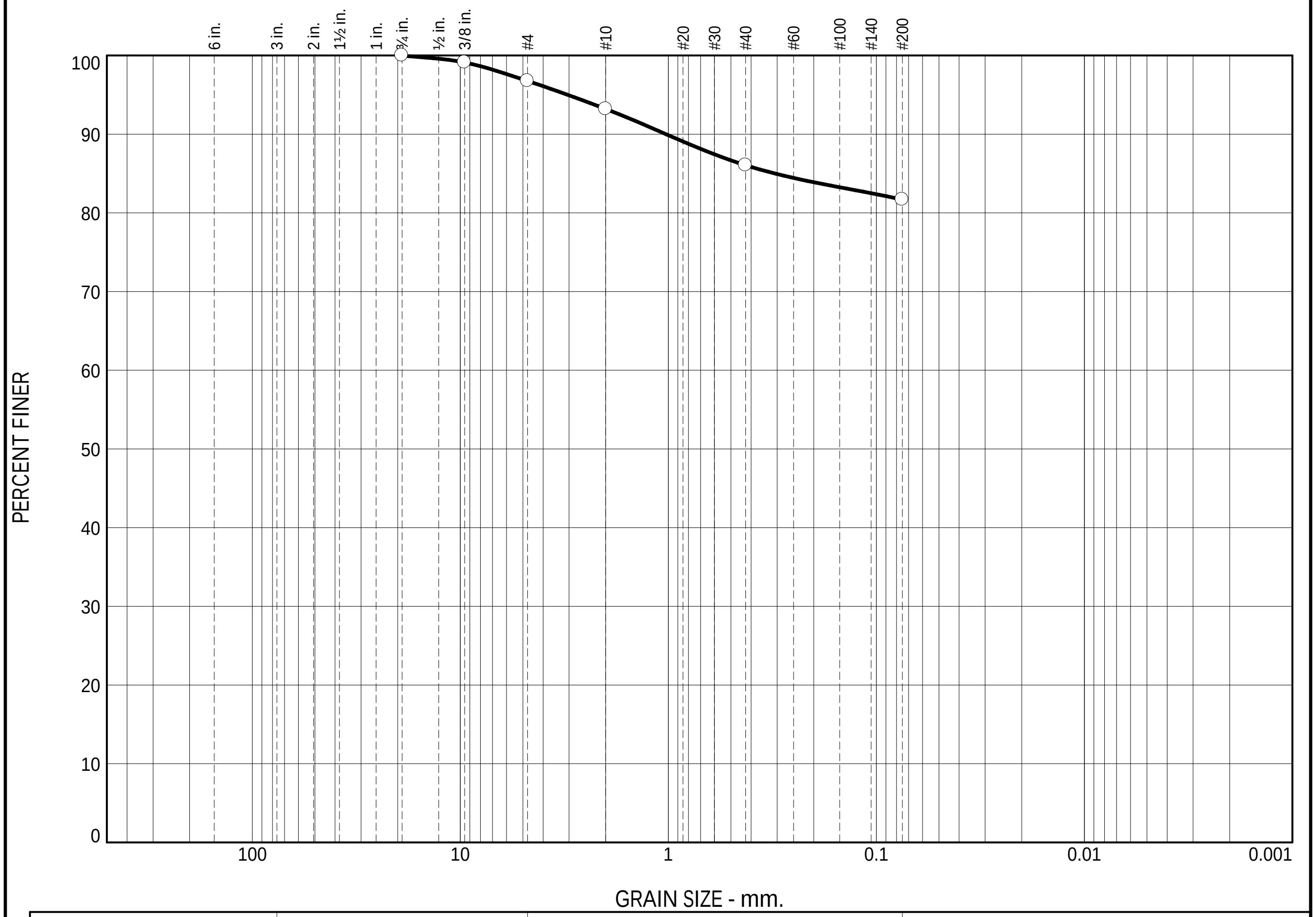
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 14

Tested By: JC 05/28/24 Checked By: JPB 05/31/24

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	3.2	3.6	7.2	4.3	81.7	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	29	18	0.3065							

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN LEAN CLAY WITH SAND	06/03/24	CL	24.8

Project No. 435979.1GEO Client: SUNEAST DEVELOPMENT, LLC
Project: SUNEAST FLAT CREEK SOLAR 94C

○ Source of Sample: BULK 2 Depth: 0.0-5.0 FT

Remarks:
○SAMPLE DESCRIPTION
BASED ON USCS

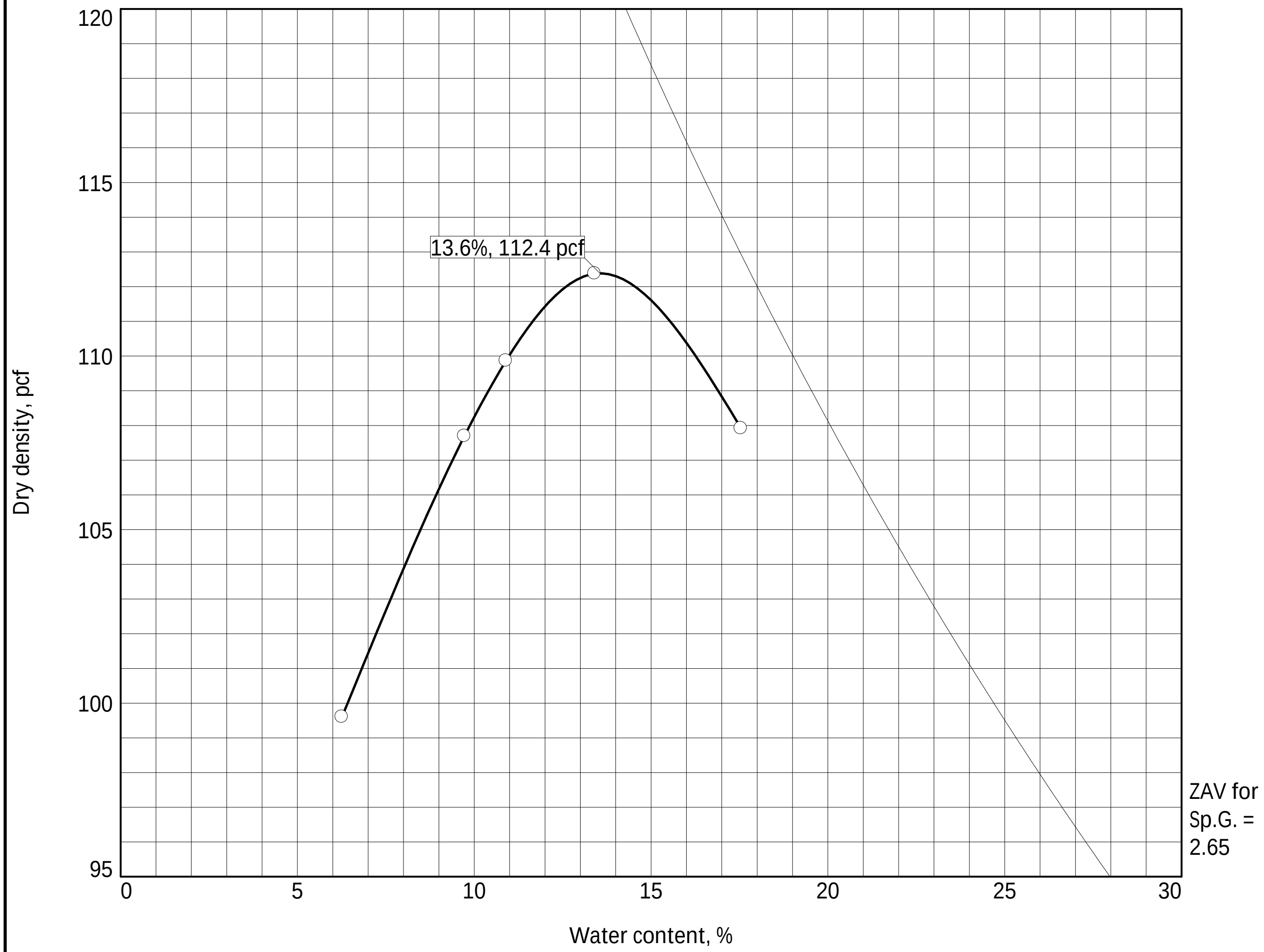
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 15

Tested By: JC 06/03/24 Checked By: JPB 06/11/24

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method C Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
0.0-5.0 FT	CL	A-4(5)	24.5		25	9	0.0	83.5

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 112.4 pcf Optimum moisture = 13.6 %	BROWN LEAN CLAY WITH SAND

Project No. 435979.1GEO Client: SUNEAST DEVELOPMENT, LLC

Project: SUNEAST FLAT CREEK SOLAR 94C

Date:

○ Source of Sample: BULK 1

TRC Engineers, Inc.

Mt. Laurel, NJ

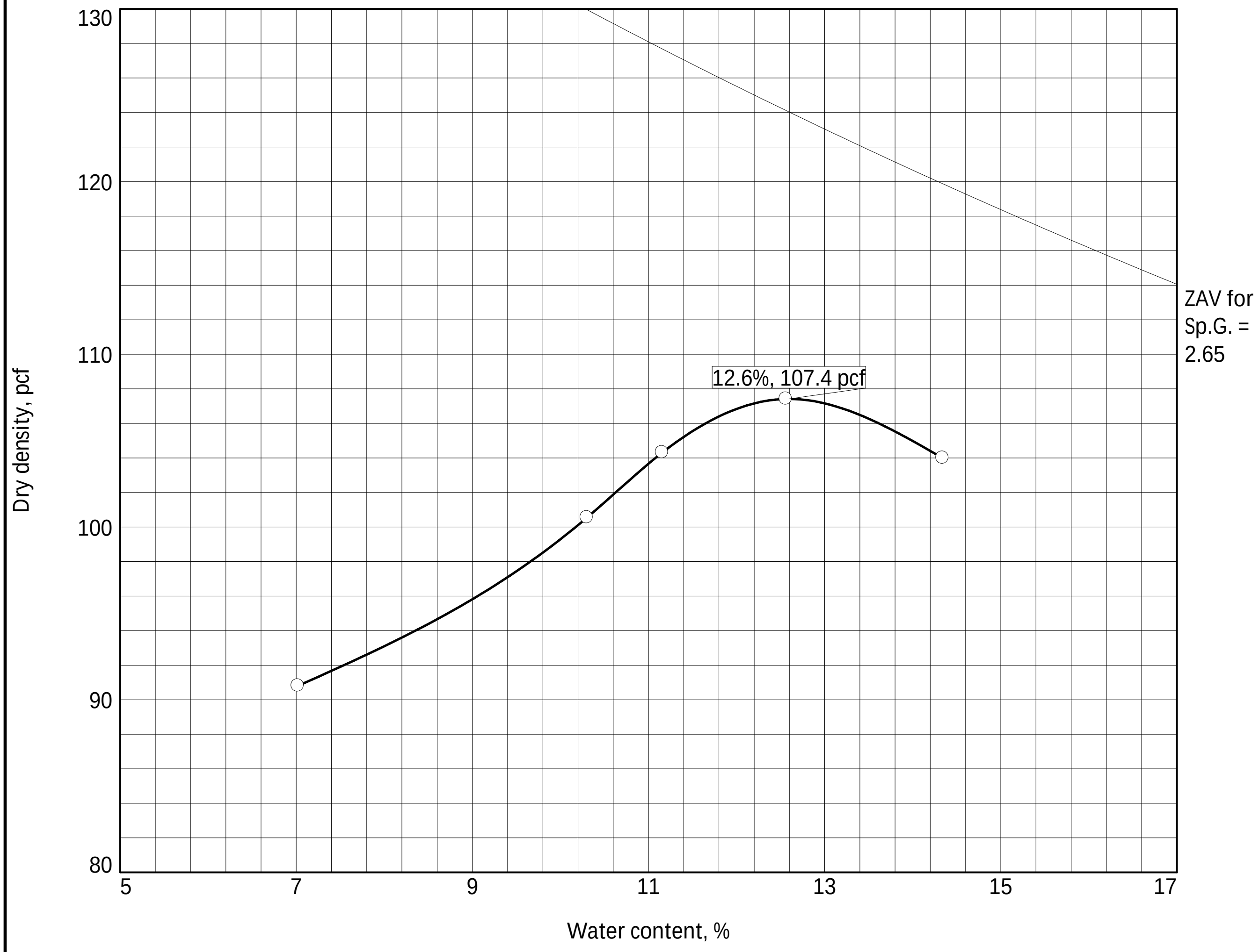
Remarks:

SAMPLE DESCRIPTION BASED ON USCS

Figure 16

Tested By: RJM 05/30/24 Checked By: JPB 05/31/24

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method C Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
0.0-5.0 FT	CL	A-6(7)	24.8		29	11	0.0	81.7

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 107.4 pcf Optimum moisture = 12.6 %	BROWN LEAN CLAY WITH SAND

Project No. 435979.1GEO Client: SUNEAST DEVELOPMENT, LLC
Project: SUNEAST FLAT CREEK SOLAR 94C
Date:
○ Source of Sample: BULK 2

TRC Engineers, Inc.

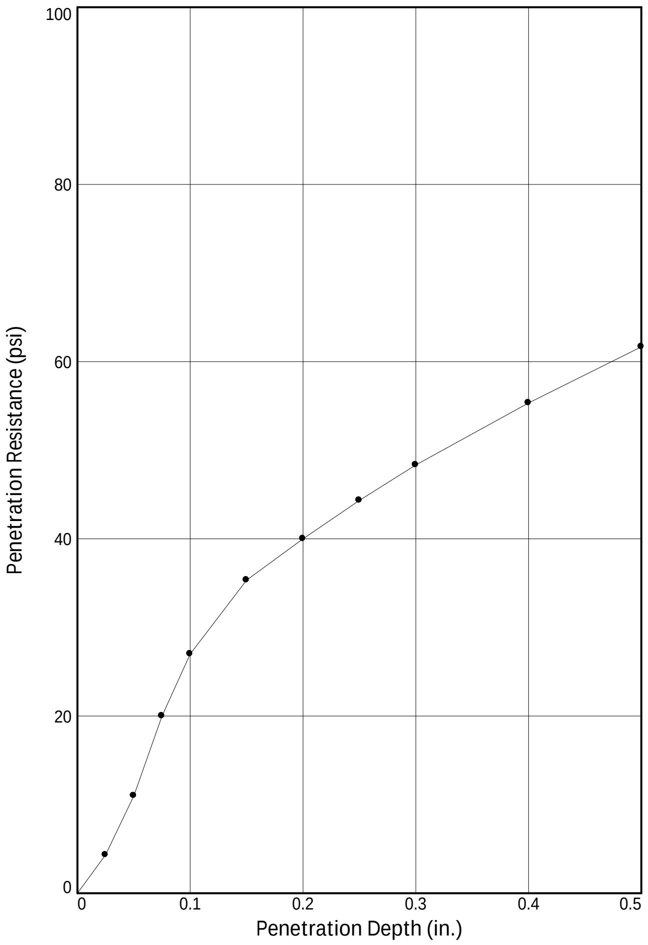
Mt. Laurel, NJ

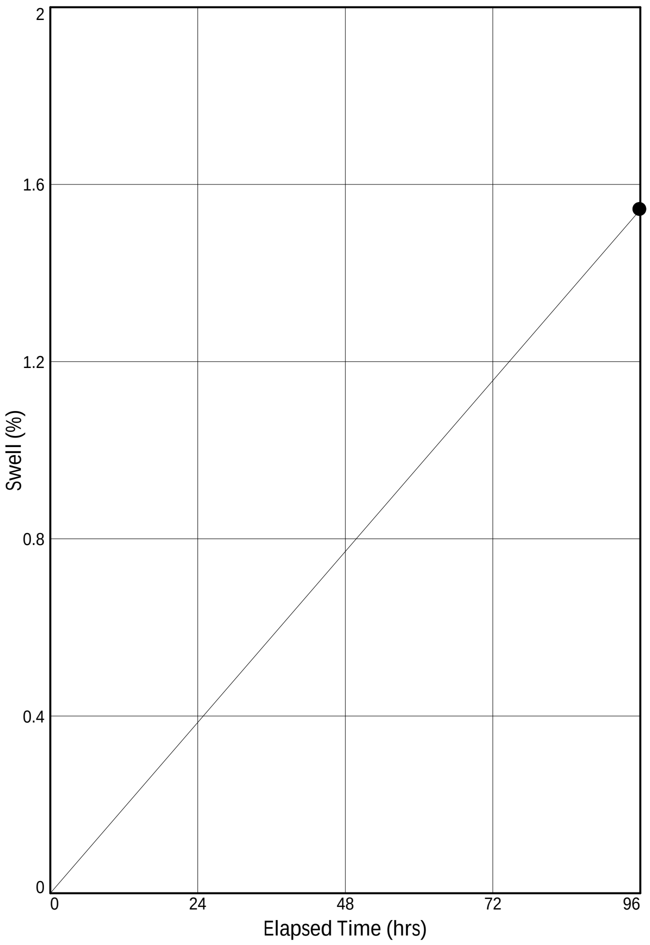
Remarks:
SAMPLE DESCRIPTION BASED ON USCS

Figure 17

Tested By: RJM 05/30/24 Checked By: JPB 05/31/24

BEARING RATIO TEST REPORT
ASTM D1883-21





	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ●	106.7	94.9	13.6	105.1	93.5	21.3	3.0	2.8	0.018	10	1.5
2 ▲											
3 ■											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
BROWN LEAN CLAY WITH SAND	CL	112.4	13.6	25	9

Project No: 435979.1GEO

Project: SUNEAST FLAT CREEK SOLAR 94C

Source of Sample: BULK 1 Depth: 0.0-5.0 FT

Date:

BEARING RATIO TEST REPORT

TRC Engineers, Inc.

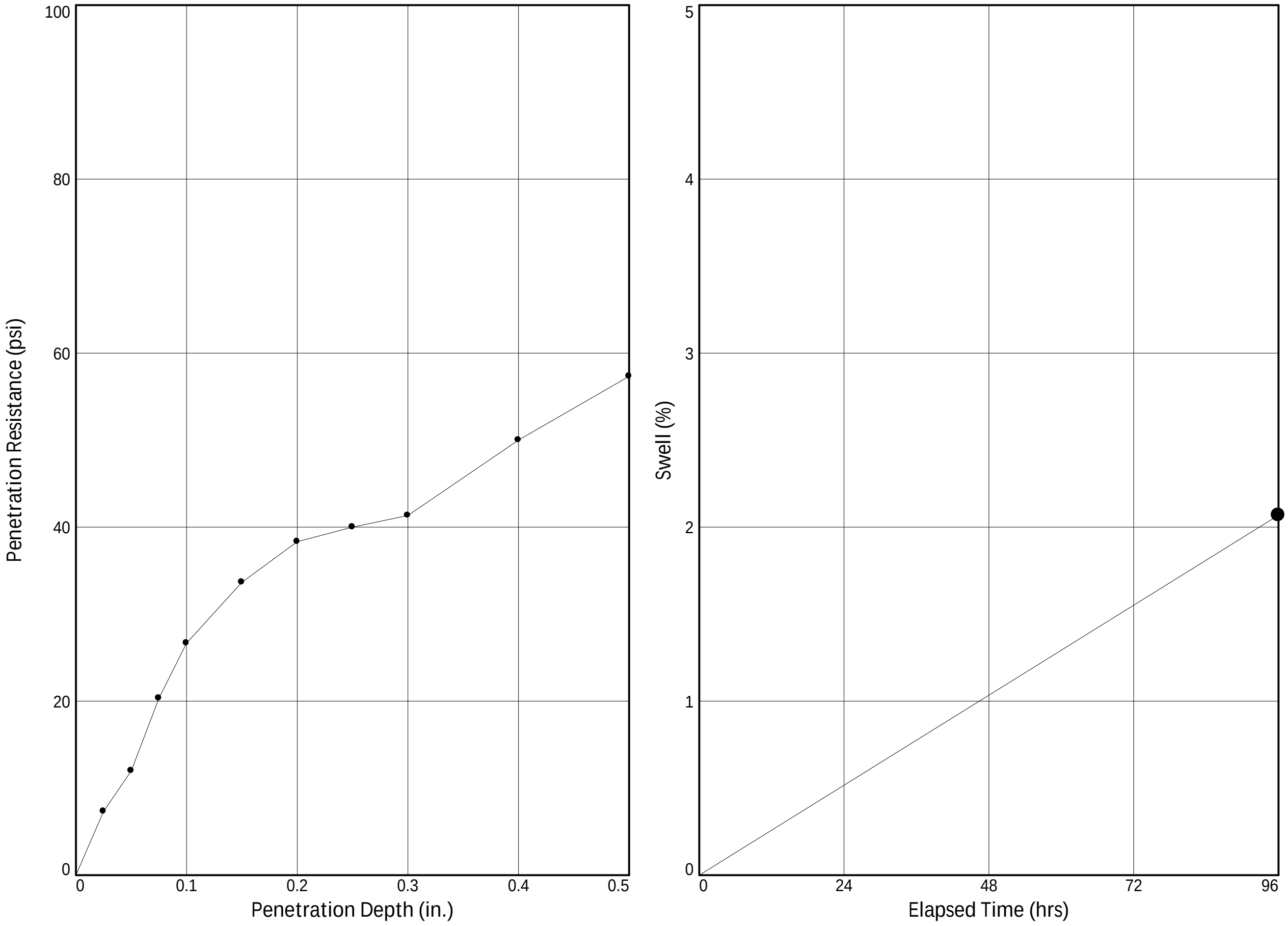
Test Description:

SAMPLE DESCRIPTION
BASED ON USCS

Figure 18

Tested By: JC 06/10/24 Checked By: JPB 06/10/24

BEARING RATIO TEST REPORT
ASTM D1883-21



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ●	102.2	95.2	12.6	100.1	93.2	26.1	2.8	2.6	0.013	10	2.1
2 ▲											
3 ■											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
BROWN LEAN CLAY WITH SAND	CL	107.4	12.6	29	11

Project No: 435979.1GEO

Project: SUNEAST FLAT CREEK SOLAR 94C

Source of Sample: BULK 2 Depth: 0.0-5.0 FT

Date:

Test Description:

SAMPLE DESCRIPTION
BASED ON USCS

BEARING RATIO TEST REPORT

TRC Engineers, Inc.

Figure 19

Tested By: JC 06/10/24 Checked By: JPB 06/10/24

TRC ENGINEERS, INC.
UNIT WEIGHT

Job # **435979.1GEO**

Job Name: **Suneast Flat Creek Solar 94C**

Source No. **B-304**

Sample No. **S-6**

Client Name: **Suneast Development, LLC**

Depth (FT): **13.0-15.0**

Height 2.26

Diameter 1.49

	g
Moist Sample Weight + Tare (g)	277.88
Dry Sample Weight + Tare (g)	264.23
Tare weight (g)	127.43

	g	lbs
Moist Sample Weight - Tare	150.45	0.331388
Dry Sample Weight - Tare	136.8	0.301322
Weight of Water	13.65	-
Moisture %	10.0	-
Moisture Content	0.100	-

Sample Total Area 1.74 in2

Total Volume (cu in) 3.94

Total Volume (cu ft) 0.0022775

Dry Unit Weight (pcf) **132.3**

Wet Unit Weight (pcf) **145.5**

TRC ENGINEERS, INC.
UNIT WEIGHT

Job # **435979.1GEO**

Job Name: **Suneast Flat Creek Solar 94C**

Source No. **B-304**

Sample No. **S-8**

Client Name: **Suneast Development, LLC**

Depth (FT): **18.0-25.0**

Height 1.58

Diameter 1.48

	g
Moist Sample Weight + Tare (g)	235.78
Dry Sample Weight + Tare (g)	226.63
Tare weight (g)	134.32

	g	lbs
Moist Sample Weight - Tare	101.46	0.223480
Dry Sample Weight - Tare	92.31	0.203326
Weight of Water	9.15	-
Moisture %	9.9	-
Moisture Content	0.099	-

Sample Total Area 1.71 in2

Total Volume (cu in) 2.70

Total Volume (cu ft) 0.0015602

Dry Unit Weight (pcf) **130.3**

Wet Unit Weight (pcf) **143.2**

TRC ENGINEERS, INC.
UNIT WEIGHT

Job # **435979.1GEO**

Job Name: **Suneast Flat Creek Solar 94C**

Source No. **B-307**

Sample No. **S-6**

Client Name: **Suneast Development, LLC**

Depth (FT): **13.0-15.0**

Height 0.97

Diameter 1.45

	g
Moist Sample Weight + Tare (g)	193.96
Dry Sample Weight + Tare (g)	188.82
Tare weight (g)	133.50

	g	lbs
Moist Sample Weight - Tare	60.46	0.133172
Dry Sample Weight - Tare	55.32	0.121850
Weight of Water	5.14	-
Moisture %	9.3	-
Moisture Content	0.093	-

Sample Total Area 1.65 in2

Total Volume (cu in) 1.60

Total Volume (cu ft) 0.0009248

Dry Unit Weight (pcf) **131.8**

Wet Unit Weight (pcf) **144.0**

TRC ENGINEERS, INC.
UNIT WEIGHT

Job # **435979.1GEO**

Job Name: **Suneast Flat Creek Solar 94C**

Source No. **B-310**

Sample No. **S-6**

Client Name: **Suneast Development, LLC**

Depth (FT): **13.0-15.0**

Height 2.46

Diameter 1.55

	g
Moist Sample Weight + Tare (g)	309.54
Dry Sample Weight + Tare (g)	293.17
Tare weight (g)	135.24

	g	lbs
Moist Sample Weight - Tare	174.30	0.383921
Dry Sample Weight - Tare	157.93	0.347863
Weight of Water	16.37	-
Moisture %	10.4	-
Moisture Content	0.104	-

Sample Total Area 1.88 in2

Total Volume (cu in) 4.62

Total Volume (cu ft) 0.0026736

Dry Unit Weight (pcf) **130.1**

Wet Unit Weight (pcf) **143.6**

KE CORROSION

3028 ALDON AVE. LAS VEGAS, NV 89121

702-340-1186 KDE@KECORROSION.COM

CLIENT
TRC Solutions, Inc.
16000 Commerce Parkway, Suite B
Mount Laurel, NJ 08054

PROJECT NO: 435979.1GEO 200Lab

PROJECT
Flat Creek Substation

DATE: May 28, 2024

LAB ID: 24-0068

Sample By: Client

Analyzed By: Kurt D. Ergun

RESULTS FOR CORROSIVITY ANALYSIS OF SOILS

Sample Number:		
Sample Location:	Bulk 1	Bulk 2
Sample Depth:	0.0-5.0	0.0-5.0
Laboratory Testing Methods		
pH Analysis, ASTM D4972(in H2O)	6.72	6.55
PH Analysis, ASTM D4972(in CaCl2)	5.89	5.83
Water Soluble Sulfates, ASTM D516 (mg/kg)	63	80
Clorides, ASTM D512 (mg/kg)	40	50
Sulfides, AWWA 4500-S (mg/kg)	Nil	Nil
Oxidation-Reduction, ASTM D1498 (mV)	+668	+687
Resistivity, ASTM G187 (ohm-cm)	4120	2740

Nil = <1.0 mg/kg

Kurt D. Ergun

Kurt D. Ergun
Chemist

Note: The tests were performed in accordance with applicable ASTM, AASHTO, or AWWA methods. Test results submitted are only applicable to samples tested at referenced locations and are not indicative of the results of similar materials.

Appendix E – NOAA Atlas 14 Point Precipitation Frequency Estimate Tables

NOAA Atlas 14, Volume 10, Version 3
Location name: Town of Canajoharie, New York, USA*
Latitude: 42.8798°, Longitude: -74.5395°
Elevation: 756 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.270 (0.214-0.339)	0.326 (0.258-0.410)	0.418 (0.329-0.526)	0.495 (0.388-0.626)	0.601 (0.454-0.784)	0.680 (0.504-0.902)	0.763 (0.547-1.04)	0.855 (0.579-1.18)	0.987 (0.641-1.40)	1.09 (0.693-1.57)
10-min	0.382 (0.303-0.480)	0.462 (0.366-0.581)	0.593 (0.468-0.747)	0.702 (0.550-0.886)	0.851 (0.644-1.11)	0.964 (0.713-1.28)	1.08 (0.774-1.47)	1.21 (0.820-1.67)	1.40 (0.908-1.98)	1.55 (0.981-2.23)
15-min	0.450 (0.357-0.565)	0.544 (0.431-0.684)	0.698 (0.551-0.879)	0.825 (0.647-1.04)	1.00 (0.757-1.31)	1.13 (0.839-1.50)	1.27 (0.911-1.73)	1.43 (0.965-1.97)	1.64 (1.07-2.33)	1.82 (1.15-2.62)
30-min	0.611 (0.485-0.768)	0.738 (0.585-0.928)	0.945 (0.746-1.19)	1.12 (0.876-1.41)	1.35 (1.02-1.77)	1.53 (1.13-2.03)	1.72 (1.23-2.34)	1.92 (1.30-2.65)	2.21 (1.44-3.13)	2.44 (1.55-3.51)
60-min	0.773 (0.613-0.971)	0.933 (0.739-1.17)	1.19 (0.942-1.50)	1.41 (1.11-1.78)	1.71 (1.29-2.23)	1.93 (1.43-2.56)	2.17 (1.55-2.94)	2.42 (1.64-3.34)	2.78 (1.80-3.93)	3.06 (1.94-4.40)
2-hr	0.992 (0.792-1.24)	1.17 (0.932-1.46)	1.46 (1.16-1.83)	1.70 (1.34-2.14)	2.03 (1.54-2.62)	2.28 (1.70-2.99)	2.54 (1.82-3.41)	2.82 (1.92-3.85)	3.19 (2.09-4.47)	3.48 (2.22-4.95)
3-hr	1.14 (0.911-1.41)	1.33 (1.06-1.65)	1.64 (1.30-2.04)	1.90 (1.50-2.37)	2.25 (1.72-2.90)	2.52 (1.88-3.29)	2.80 (2.02-3.74)	3.09 (2.12-4.21)	3.49 (2.29-4.86)	3.80 (2.43-5.38)
6-hr	1.41 (1.14-1.74)	1.64 (1.32-2.02)	2.01 (1.61-2.48)	2.31 (1.84-2.88)	2.74 (2.10-3.50)	3.06 (2.30-3.96)	3.39 (2.46-4.49)	3.75 (2.58-5.05)	4.24 (2.80-5.85)	4.63 (2.98-6.49)
12-hr	1.71 (1.39-2.10)	1.99 (1.62-2.45)	2.46 (1.99-3.03)	2.85 (2.28-3.51)	3.38 (2.62-4.29)	3.78 (2.86-4.87)	4.20 (3.08-5.55)	4.67 (3.24-6.24)	5.35 (3.56-7.32)	5.90 (3.82-8.18)
24-hr	2.04 (1.67-2.49)	2.39 (1.95-2.91)	2.95 (2.40-3.61)	3.42 (2.77-4.20)	4.07 (3.18-5.14)	4.56 (3.48-5.83)	5.07 (3.75-6.65)	5.65 (3.94-7.48)	6.50 (4.35-8.80)	7.19 (4.69-9.88)
2-day	2.42 (1.99-2.92)	2.81 (2.31-3.40)	3.45 (2.82-4.18)	3.98 (3.24-4.84)	4.71 (3.70-5.89)	5.26 (4.04-6.66)	5.84 (4.33-7.57)	6.48 (4.55-8.50)	7.39 (4.98-9.91)	8.13 (5.34-11.0)
3-day	2.68 (2.21-3.23)	3.09 (2.55-3.73)	3.76 (3.09-4.55)	4.32 (3.53-5.24)	5.09 (4.01-6.33)	5.67 (4.37-7.14)	6.28 (4.67-8.08)	6.94 (4.89-9.05)	7.87 (5.32-10.5)	8.62 (5.68-11.6)
4-day	2.90 (2.40-3.48)	3.32 (2.75-3.99)	4.02 (3.31-4.84)	4.59 (3.76-5.55)	5.38 (4.25-6.67)	5.98 (4.62-7.50)	6.60 (4.92-8.46)	7.27 (5.15-9.45)	8.21 (5.57-10.9)	8.96 (5.92-12.1)
7-day	3.46 (2.88-4.14)	3.91 (3.25-4.67)	4.64 (3.84-5.56)	5.25 (4.32-6.31)	6.08 (4.83-7.48)	6.72 (5.21-8.36)	7.37 (5.52-9.35)	8.06 (5.74-10.4)	9.00 (6.14-11.8)	9.73 (6.46-13.0)
10-day	4.00 (3.34-4.76)	4.47 (3.73-5.32)	5.24 (4.35-6.25)	5.88 (4.86-7.03)	6.75 (5.38-8.26)	7.43 (5.78-9.18)	8.11 (6.08-10.2)	8.81 (6.30-11.3)	9.75 (6.68-12.8)	10.5 (6.98-13.9)
20-day	5.65 (4.75-6.68)	6.20 (5.21-7.33)	7.10 (5.94-8.41)	7.84 (6.52-9.32)	8.87 (7.11-10.7)	9.67 (7.55-11.8)	10.4 (7.85-13.0)	11.2 (8.07-14.2)	12.2 (8.41-15.8)	12.9 (8.64-16.9)
30-day	7.07 (5.98-8.33)	7.69 (6.48-9.06)	8.69 (7.30-10.3)	9.52 (7.95-11.3)	10.7 (8.58-12.8)	11.6 (9.07-14.0)	12.4 (9.36-15.3)	13.2 (9.58-16.7)	14.2 (9.86-18.3)	14.9 (10.0-19.4)
45-day	8.89 (7.54-10.4)	9.58 (8.11-11.2)	10.7 (9.03-12.6)	11.6 (9.76-13.7)	12.9 (10.4-15.5)	13.9 (11.0-16.8)	14.9 (11.2-18.2)	15.7 (11.4-19.8)	16.7 (11.7-21.4)	17.4 (11.8-22.5)
60-day	10.4 (8.88-12.2)	11.2 (9.50-13.1)	12.4 (10.5-14.5)	13.4 (11.3-15.8)	14.8 (12.0-17.6)	15.9 (12.6-19.1)	17.0 (12.8-20.6)	17.8 (13.0-22.3)	18.8 (13.2-24.0)	19.4 (13.2-25.1)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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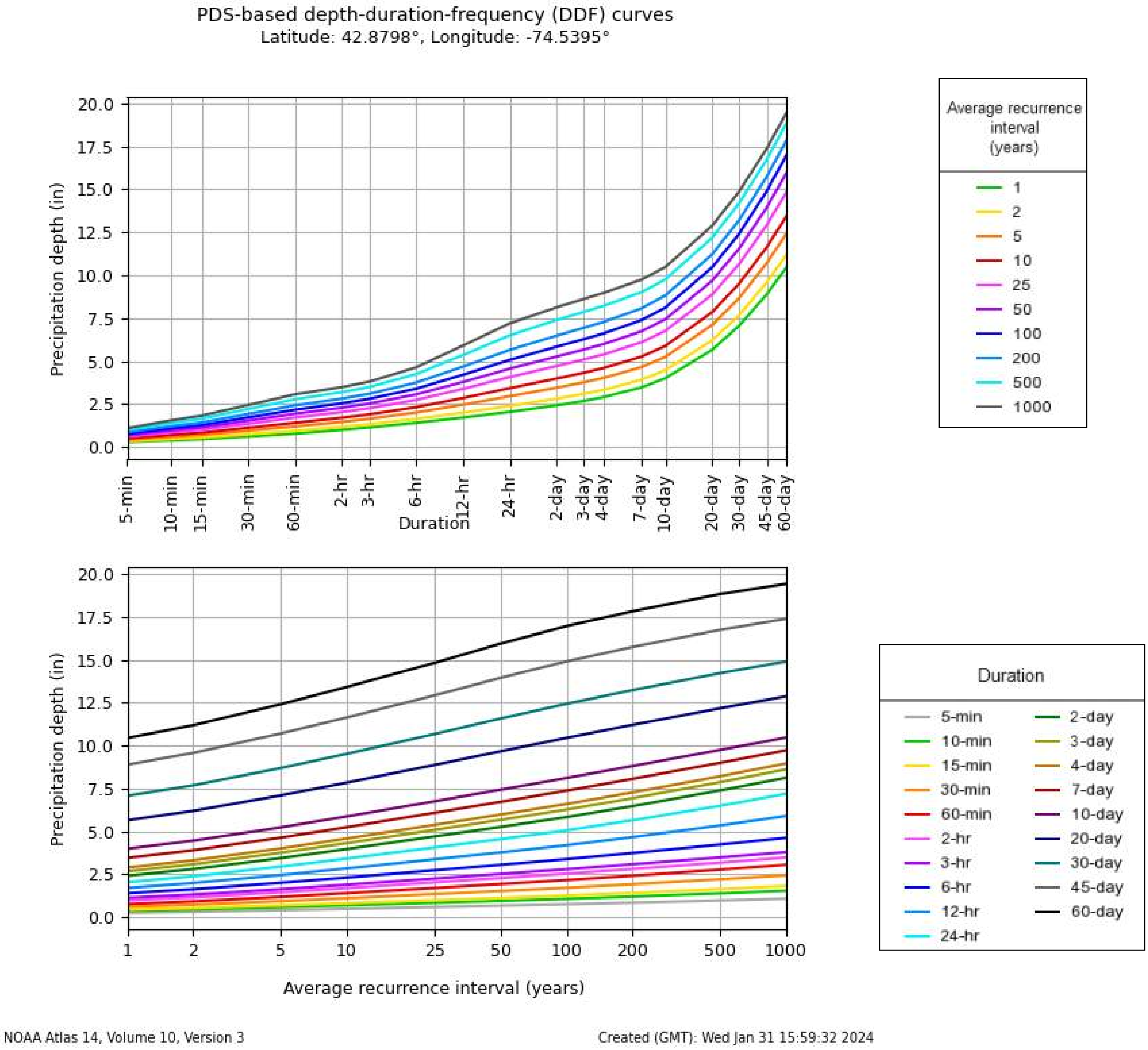
PF graphical



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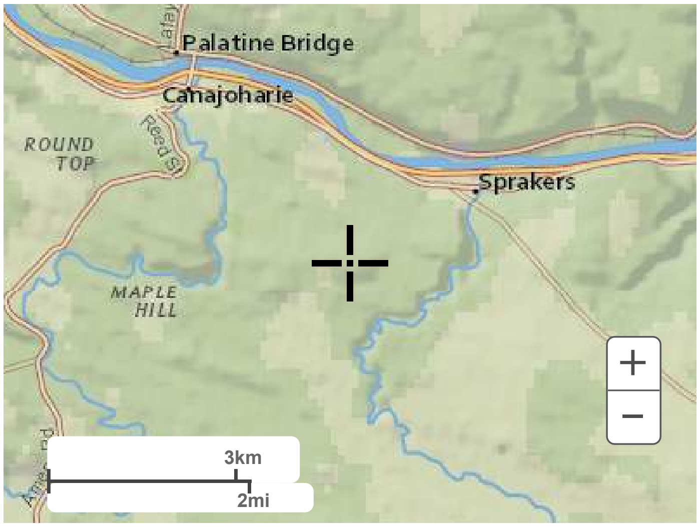
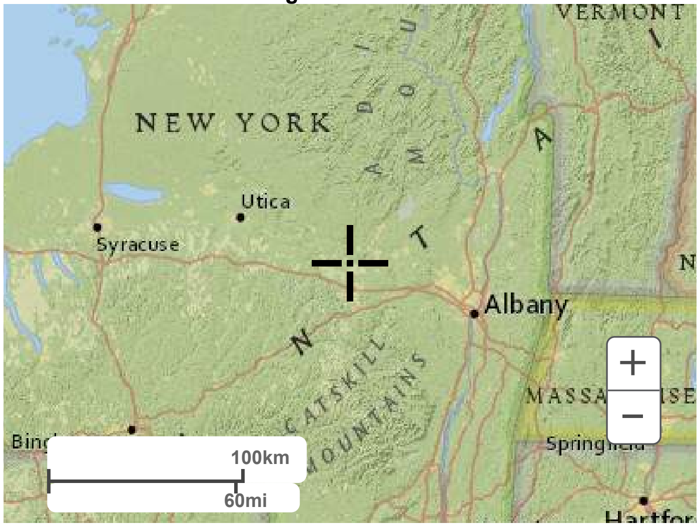
Maps & aerials

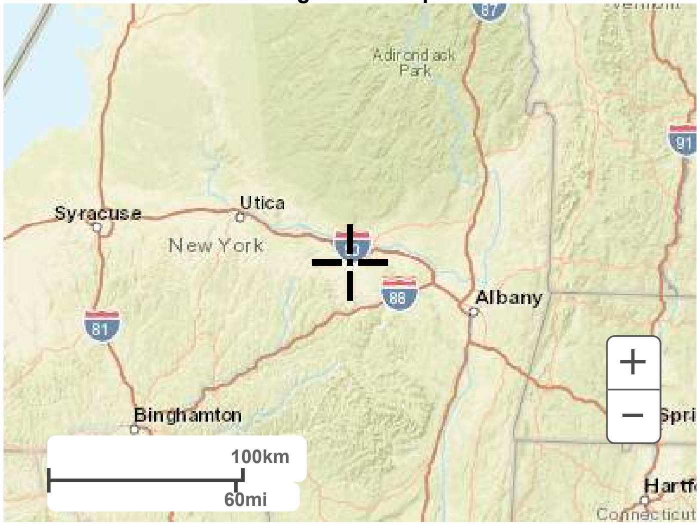
Small scale terrain



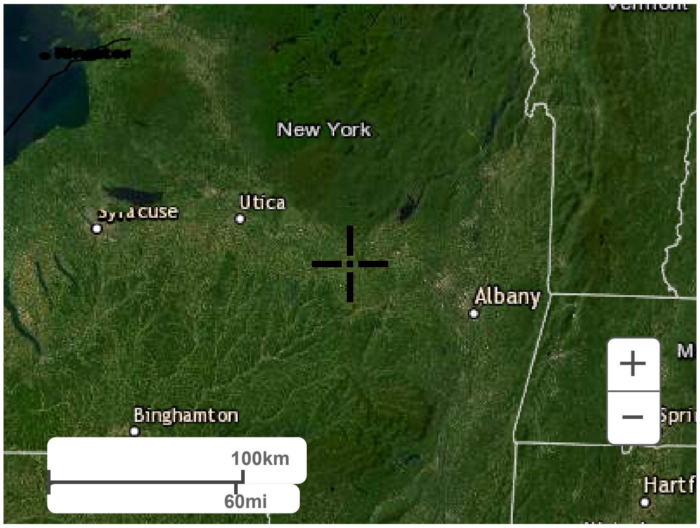
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Appendix F – Design Drawings

Refer to Exhibit 5 of the Application for the Design Drawings.

Design Drawings will be provided in the Final SWPPP prior to the commencement of construction.

Appendix G – Standards and Specifications for Erosion and Sediment Controls

STANDARD AND SPECIFICATIONS FOR CONSTRUCTION ROAD STABILIZATION

Definition & Scope

The stabilization of temporary construction access routes, on-site vehicle transportation routes, and construction parking areas to control erosion on temporary construction routes and parking areas.

Conditions Where Practice Applies

All traffic routes and parking areas for temporary use by construction traffic.

Design Criteria

Construction roads should be located to reduce erosion potential, minimize impact on existing site resources, and maintain operations in a safe manner. Highly erosive soils, wet or rocky areas, and steep slopes should be avoided. Roads should be routed where seasonal water tables are deeper than 18 inches. Surface runoff and control should be in accordance with other standards.

Road Grade – A maximum grade of 12% is recommended, although grades up to 15% are possible for short distances.

Road Width – 12 foot minimum for one-way traffic or 24 foot minimum for two-way traffic.

Side Slope of Road Embankment – 2:1 or flatter.

Ditch Capacity – On-site roadside ditch and culvert capacities shall be the 10 yr. peak runoff.

Composition – Use a 6-inch layer of NYS DOT sub-base Types 1,2,3, 4 or equivalent as specified in NYSDOT Standard Specifications.

Construction Specifications

1. Clear and strip roadbed and parking areas of all vegetation, roots, and other objectionable material.

2. Locate parking areas on naturally flat areas as available. Keep grades sufficient for drainage, but not more than 2 to 3 percent.

3. Provide surface drainage and divert excess runoff to stabilized areas.

4. Maintain cut and fill slopes to 2:1 or flatter and stabilized with vegetation as soon as grading is accomplished.

5. Spread 6-inch layer of sub-base material evenly over the full width of the road and smooth to avoid depressions.

6. Provide appropriate sediment control measures to prevent offsite sedimentation.

Maintenance

Inspect construction roads and parking areas periodically for condition of surface. Top dress with new gravel as needed. Check ditches for erosion and sedimentation after rainfall events. Maintain vegetation in a healthy, vigorous condition. Areas producing sediment should be treated immediately.

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 PROTECTING VEGETATION DURING CONSTRUCTION

Definition & Scope

The protection of trees, shrubs, ground cover and other vegetation from damage by construction equipment. In order to preserve existing vegetation determined to be important for soil erosion control, water quality protection, shade, screening, buffers, wildlife habitat, wetland protection, and other values.

Conditions Where Practices Applies

On planned construction sites where valued vegetation exists and needs to be preserved.

Design Criteria

1. Planning Considerations

   A. Inventory:

      1) Property boundaries, topography, vegetation and soils information should be gathered. Identify potentially high erosion areas, areas with tree windthrow potential, etc. A vegetative cover type map should be made on a copy of a topographic map which shows other natural and manmade features. Vegetation that is desirable to preserve because of its value for screening, shade, critical erosion control, endangered species, aesthetics, etc., should be identified and marked on the map.

      2) Based upon this data, general statements should be prepared about the present condition, potential problem areas, and unique features of the property.

   B. Planning:

      1) After engineering plans (plot maps) are prepared, another field review should take place and recommendations made for the vegetation to be saved. Minor adjustments in location of roads, dwellings, and utilities may be needed. Construction on steep slopes, erodible soils, wetlands, and streams should be avoided. Clearing limits should be delineated (See "Determine Limits of Clearing and Grading" on page 2.2).

      2) Areas to be seeded and planted should be identified. Remaining vegetation should blend with their surroundings and/or provide special function such as a filter strip, buffer zone, or screen.

      3) Trees and shrubs of special seasonal interest, such as flowering dogwood, red maple, striped maple, serviceberry, or shadbush, and valuable potential shade trees should be identified and marked for special protective treatment as appropriate.

      4) Trees to be cut should be marked on the plans. If timber can be removed for salable products, a forester should be consulted for marketing advice.

      5) Trees that may become a hazard to people, personal property, or utilities should be removed. These include trees that are weak-wooded, disease-prone, subject to windthrow, or those that have severely damaged root systems.

      6) The vigor of remaining trees may be improved by a selective thinning. A forester should be consulted for implementing this practice.

2. Measures to Protect Vegetation

   A. Limit soil placement over existing tree and shrub roots to a maximum of 3 inches. Soils with loamy texture and good structure should be used.

   B. Use retaining walls and terraces to protect roots of trees and shrubs when grades are lowered. Lowered grades should start no closer than the dripline of the tree. For narrow-canopied trees and shrubs, the stem diameter in inches is converted to feet and doubled, such that a 10 inch tree should be protected to 20 feet.

   C. Trenching across tree root systems should be the same minimum distance from the trunk, as in "B". Tunnels under root systems for underground utilities should start 18 inches or deeper below the normal ground surface. Tree roots which must be severed should be cut clean. Backfill material that will be in contact with the roots should be topsoil or a prepared planting soil mixture.

   D. Construct sturdy fences, or barriers, of wood, steel, or other protective material around valuable vegetation for protection from construction equipment. Place barriers far enough away from trees, but not less than the specifications in "B", so that tall equipment such as backhoes and dump trucks do not contact tree branches.

E. Construction limits should be identified and clearly marked to exclude equipment.

F. Avoid spills of oil/gas and other contaminants.

G. Obstructive and broken branches should be pruned properly. The branch collar on all branches whether living or dead should not be damaged. The 3 or 4 cut method should be used on all branches larger than two inches at the cut. First cut about one-third the way through the underside of the limb (about 6-12 inches from the tree trunk). Then (approximately an inch further out) make a second cut through the limb from the upper side. When the branch is removed, there is no splintering of the main tree trunk. Remove the stub. If the branch is larger than 5-6 inches in diameter, use the four cut system. Cuts 1 and 2 remain the same and cut 3 should be from the underside of the limb, on the outside of the branch collar. Cut 4 should be from the top and in alignment with the 3rd cut. Cut 3 should be 1/4 to 1/3 the way through the limb. This will prevent the bark from peeling down the trunk. Do not paint the cut surface.

H. Penalties for damage to valuable trees, shrubs, and herbaceous plants should be clearly spelled out in the contract.

PROTECTING TREES IN HEAVY USE AREAS

The compaction of soil over the roots of trees and shrubs by the trampling of recreationists, vehicular traffic, etc., reduces oxygen, water, and nutrient uptake by feeder roots. This weakens and may eventually kill the plants. Table 2.6 rates the “Susceptibility of Tree Species to Compaction.”

Where heavy compaction is anticipated, apply and maintain a 3 to 4 inch layer of undecayed wood chips or 2 inches of No. 2 washed, crushed gravel. In addition, use of a wooden or plastic mat may be used to lessen compaction, if applicable.

Table 2.6
Susceptibility of Tree Species to Compaction[1]

Resistant:

Box elder	*Acer negundo*	Willows	*Salix spp.*
Green ash	*Fraxinus pennsylvanica*	Honey locust	*Gleditsia triacanthos*
Red elm	*Ulmus rubra*	Eastern cottonwood	*Populus deltoides*
Hawthornes	*Crataegus spp.*	Swamp white oak	*Quercus bicolor*
Bur oak	*Quercus macrocarpa*	Hophornbeam	*Ostrya virginiana*
Northern white cedar	*Thuja occidentalis*		

Intermediate:

Red maple	*Acer rubrum*	Sweetgum	*Liquidambar styraciflua*
Silver maple	*Acer saccharinum*	Norway maple	*Acer platanoides*
Hackberry	*Celtis occidentalis*	Shagbark hickory	*Carya ovata*
Black gum	*Nyssa sylvatica*	London plane	*Platanus x hybrida*
Red oak	*Quercus rubra*	Pin oak	*Quercus palustris*
Basswood	*Tilia americana*		

Susceptible:

Sugar maple	*Acer saccharum*	Austrian Pine	*Pinus nigra*
White pine	*Pinus strobus*	White ash	*Fraxinus americana*
Blue spruce	*Picea pungens*	Paper birch	*Betula papyrifera*
White oak	*Quercus alba*	Moutain ash	*Sorbus aucuparia*
Red pine	*Pinus resinosa*	Japanese maple	*Acer palmatum*

[1] If a tree species does not appear on the list, insufficient information is available to rate it for this purpose.

STANDARD AND SPECIFICATIONS FOR SITE POLLUTION PREVENTION

Definition & Scope

A collection of management practices intended to control non-sediment pollutants associated with construction activities to prevent the generation of pollutants due to improper handling, storage, and spills and prevent the movement of toxic substances from the site into surface waters.

Conditions Where Practice Applies

On all construction sites where the earth disturbance exceeds 5,000 square feet, and involves the use of fertilizers, pesticides, petroleum based chemicals, fuels and lubricants, as well as sealers, paints, cleared woody vegetation, garbage, and sanitary wastes.

Design Criteria

The variety of pollutants on a particular site and the severity of their impacts depend on factors such as the nature of the construction activity, the physical characteristics of the construction site, and the proximity of water bodies and conveyances to the pollutant source.

1. All state and federal regulations shall be followed for the storage, handling, application, usage, and disposal of pesticides, fertilizers, and petroleum products.

2. Vehicle and construction equipment staging and maintenance areas will be located away from all drainage ways with their parking areas graded so the runoff from these areas is collected, contained and treated prior to discharge from the site.

3. Provide sanitary facilities for on-site personnel.

4. Store, cover, and isolate construction materials including topsoil, and chemicals, to prevent runoff of pollutants and contamination of groundwater and surface waters.

5. Develop and implement a spill prevention and control plan. The plan should include NYSDEC's spill reporting and initial notification requirements.

6. Provide adequate disposal for solid waste including woody debris, stumps, and other construction waste and include these methods and directions in the construction details on the site construction drawings. Fill, woody debris, stumps and construction waste shall not be placed in regulated wetlands, streams or other surface waters.

7. Distribute or post informational material regarding proper handling, spill response, spill kit location, and emergency actions to be taken, to all construction personnel.

8. Refueling equipment shall be located at least 100 feet from all wetlands, streams and other surface waters.

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.

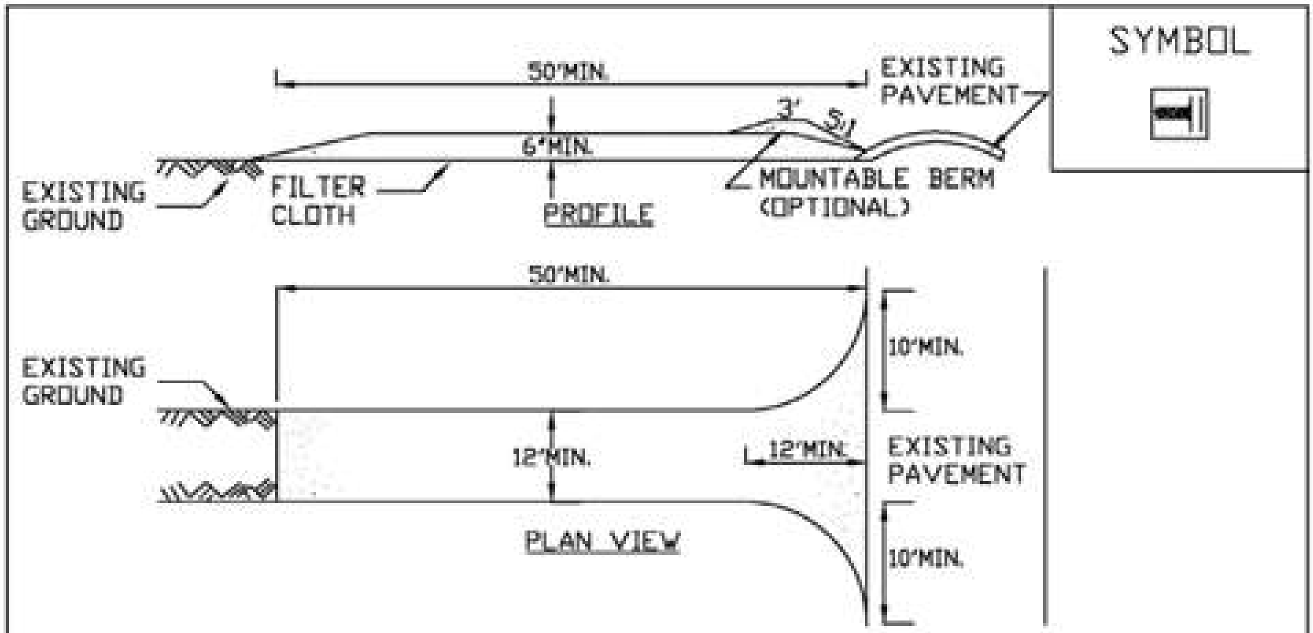
[3] Fabrics not meeting these specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.

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 TEMPORARY ACCESS WATERWAY CROSSING

Definition & Scope

A temporary access waterway crossing is a structure placed across a waterway to provide access for construction purposes for a period of less than one year. Consideration should be given to stream flow capacity and velocity anticipated during the period of time that the temporary structures will be in place. Temporary access crossings shall not be utilized to maintain traffic for the general public. The purpose of the temporary access waterway crossing is to provide safe, environmentally sound access across a waterway for construction equipment by establishing minimum standards and specifications for the design, construction, maintenance, and removal of the structure. This standard and specification may represent a channel constriction, thus, the temporary nature of waterway access crossing must be stressed. They should be planned to be in service for the shortest practical period of time and removed as soon as their function is completed.

Conditions Where Practice Applies

This standard and specification for temporary access waterway crossings is applicable in non-tidal waterways. It provides designs based on waterway geometry rather than the drainage area contributing to the point of crossing.

The principal consideration for development of the standard and specifications is concern for erosion and sediment control, tracking soil into waterways, blocking fish passage and destruction of aquatic habitat. Structural utility and safety must also be considered when designing temporary access waterway crossings to withstand expected loads.

The three types of standard temporary access waterway crossings are bridges, culverts, and fords.

General Requirements

1. In-Stream Excavation: In-Stream excavation shall be limited to only that necessary to allow installation of the standard methods as presented in Subsection “Temporary Access Waterway Crossing Methods.”

2. Elimination of Fish Migration Barriers: Of the two basic methods presented in Subsection “Temporary Access Waterway Crossing Methods,” bridges pose the least potential for creating barriers to aquatic migration. The construction of any specific crossing method as presented in Subsection “Temporary Access Waterway Crossing Methods,” shall not cause a significant water level difference between the upstream and downstream water surface elevations. Fish spawning or migration within waterways generally occurs between October 1 to May 31 for water classified for trout and from March 15 to July 15 for other streams. Fish spawning or migration dates can vary across New York and restrictions imposed by the NYS Department of Environmental Conservation may vary and must be checked.

3. Crossing Alignment: The temporary waterway crossing shall be at right angles to the stream. Where approach conditions dictate, the crossing may vary 15 degrees from a line drawn perpendicular to the centerline of the stream at the intended crossing location.

4. Road Approaches: The centerline of both roadway approaches shall coincide with the crossing alignment centerline for a minimum distance of 50 feet from each bank of the waterway being crossed. If physical or right-of-way restraints preclude the 50 feet minimum, a shorter distance may be provided. All fill materials associated with the roadway approach shall be limited to a maximum height of 2 feet above the existing flood plain elevation.

5. Surface Water Diverting Structure: A water diverting structure such as a swale shall be constructed (across the roadway on both roadway approaches) 50 feet (maximum) on either side of the waterway crossing. This will prevent roadway surface runoff from directly entering the waterway. The 50 feet is measured from the top of the waterway bank. Design criteria for this diverting structure shall be in accordance with the “Standard and Specification” for

the individual design standard of choice. If the roadway approach is constructed with a reverse grade away from the waterway, a separate diverting structure is not required.

6. Road Width: All crossings shall have one traffic lane. The minimum width shall be 12 feet with a maximum width of 20 feet.

7. Time of Operation: All temporary crossing shall be removed within 14 calendar days after the structure is no longer needed. Unless prior written approval is obtained, all structures shall be removed within one year from the date of the installation.

8. Materials

A. Aggregate: There shall be no earth or soil materials used for construction within the waterway channel. NYS DOT specifications for coarse aggregate designation No. 4 (2” to 4”), also referenced as AASHTO designation No. 1, shall be the minimum acceptable aggregate size for temporary crossings. Larger aggregates will be allowed.

B. Filter Cloth: Filter cloth is a fabric consisting of either woven or nonwoven plastic, polypropylene, or nylon used to distribute the load, retain fines, allow increased drainage of the aggregate and reduce mixing of the aggregate with the subgrade soil. The designer shall specify the appropriate filter fabric/cloth for a specific use.

Temporary Access Waterway Crossing Methods

The following criteria for erosion and sediment control shall be considered when selecting a specific temporary access waterway crossing standard method:

1. Site aesthetics: Select a standard design method that will least disrupt the existing terrain of the stream reach. Consider the effort that will be required to restore the area after the temporary crossing is removed.

2. Site location: Locate the temporary crossing where there will be the least disturbance to the soils of the existing waterway banks. When possible, locate the crossing at a point receiving minimal surface runoff.

3. Physical site constraints: The physical constraints of a site may preclude the selection of one or more of the standard methods.

4. Time of year: The time of year may preclude the selection of one or more of the standard methods due to fish spawning or migration restrictions.

5. Vehicular loads and traffic patterns: Vehicular loads, traffic patterns, and frequency of crossing should be considered in choosing a specific method.

6. Maintenance of crossing: The standard methods will require various amounts of maintenance. The bridge method should require the least maintenance, whereas the ford method will probably require more intensive maintenance.

7. Removal of the Structure: Ease of removal and subsequent damage to the waterway should be primary factors in considering the choice of a standard method.

Temporary Access Bridge (Figure 2.2 on page 2.36)

A temporary access bridge is a structure made of wood, metal, or other materials, which provides access across a stream or waterway.

Considerations:

1. This is the preferred method for temporary access waterway crossings. Normally, bridge construction causes the least disturbance to the waterway bed and banks when compared to the other access waterway crossings.

2. Most bridges can be quickly removed and reused.

3. Temporary access bridges pose the least chance for interference with fish migration when compared to the other temporary access waterway crossings.

4. Span width will be limited by the length of the bridging material and weight of equipment that will drive over the temporary bridge. Spans of over 10 feet are difficult to construct.

5. Restrictions and Permits: A permit from the New York State Department of Environmental Conservation, Division of Environmental Permits, Regional Permit Administrator, will be needed to install and remove temporary access culverts in streams with a classification of C(T) and higher. Installation and removal may not be permitted during the period of time from the start of trout spawning until the eggs have hatched. In some instances, restrictions may also be applied to bass spawning waters.

Construction Specifications:

1. Restriction: Construction, use, or removal of a temporary access bridge will not normally have any time of year restrictions if construction, use, or

removal does not disturb the stream or its banks.

2. Bridge Placement: A temporary bridge structure shall be constructed at or above bank elevation to prevent the entrapment of floating materials and debris.

3. Abutments: Abutments shall be placed parallel to and on stable banks.

4. Bridge Span: Bridges shall be constructed to span the entire channel. If a footing, pier, or bridge support is constructed within the waterway, a stream- disturbance permit may be required.

5. Stringers: Stringers shall either be logs, saw timber, pre-stressed concrete beams, metal beams, or other approved materials.

6. Deck Material: Decking shall be of sufficient strength to support the anticipated load. All decking members shall be placed perpendicular to the stringers, butted tightly, and securely fastened to the stringers. Decking materials must be butted tightly to prevent any soil material tracked onto the bridge from falling into the waterway below.

7. Run Planks (optional): Run planking shall be securely fastened to the length of the span. One run plank shall be provided for each track of the equipment wheels. Although run planks are optional, they may be necessary to properly distribute loads.

8. Curbs or Fenders: Curbs or fenders may be installed along the outer sides of the deck. Curbs or fenders are an option, which will provide additional safety.

9. Bridge Anchors: Bridges shall be securely anchored at only one end using steel cable or chain. Anchoring at only one end will prevent channel obstruction in the event that floodwaters float the bridge. Acceptable anchors are large trees, large boulders, or driven steel anchors. Anchoring shall be sufficient to prevent the bridge from floating downstream and possibly causing an obstruction to the flow.

10. Stabilization: All areas disturbed during installation shall be stabilized within 14 calendar days of that disturbance in accordance with the Standard and Specification for Temporary Construction Area Seeding on page 4.58.

Bridge Maintenance Requirements

1. Inspection: Periodic inspection shall be performed by the user to ensure that the bridge, streambed, and streambanks are maintained and not damaged.

2. Maintenance: Maintenance shall be performed, as needed to ensure that the structure complies with the standard and specifications. This shall include removal and disposal of any trapped sediment or debris. Sediment shall be disposed of outside of the floodplain and stabilized.

Bridge Removal and Clean-Up Requirements

1. Removal: When the temporary bridge is no longer needed, all structures including abutments and other bridging materials shall be removed within 14 calendar days. In all cases, the bridge materials shall be removed within one year of installation.

2. Final Clean-Up: Final clean-up shall consist of removal of the temporary bridge from the waterway, protection of banks from erosion, and removal of all construction materials. All removed materials shall be stored outside the waterway floodplain.

3. Method: Removal of the bridge and clean-up of the area shall be accomplished without construction equipment working in the waterway channel.

4. Final Stabilization: All areas disturbed during removal shall be stabilized within 14 calendar days of that disturbance in accordance with the Standard and Specifications for Permanent Construction Area Planting on page 4.42.

Temporary Access Culvert (Figure 2.3 on page 2.37)

A temporary access culvert is a structure consisting of a section(s) of circular pipe, pipe arches, or oval pipes of reinforcing concrete, corrugated metal, or structural plate, which is used to convey flowing water through the crossing.

Considerations

1. Temporary culverts are used where a) the channel is too wide for normal bridge construction, b) anticipated loading may prove unsafe for single span bridges, or c) access is not needed from bank to bank.

2. This temporary waterway crossing method is normally preferred over a ford type of crossing, since disturbance to the waterway is only during construction and removal of the culvert.

3. Temporary culverts can be salvaged and reused.

Construction Specifications

1. Restrictions and Permits: A permit from the New York State Department of Environmental

Conservation, Division of Environmental Permits, Regional Permit Administrator, will be needed to install and remove temporary access culverts in streams with a classification of C(T) and higher. Installation and removal may not be permitted during the period of time from the start of trout spawning until the eggs have hatched. In some instances, restrictions may also be applied to bass spawning waters.

2. Culvert Strength: All culverts shall be strong enough to support their cross sectional area under maximum expected loads.

3. Culvert Size: The size of the culvert pipe shall be the largest pipe diameter that will fit into the existing channel without major excavation of the waterway channel or without major approach fills. If a channel width exceeds 3 feet, additional pipes may be used until the cross sectional area of the pipes is greater than 60 percent of the cross sectional area of the existing channel. The minimum size culvert that may be used is 12-inch diameter pipe.

4. Culvert Length: The culvert(s) shall extend a minimum of one foot beyond the upstream and downstream toe of the aggregate placed around the culvert. In no case shall the culvert exceed 40 feet in length.

5. Filter Cloth: Filter cloth shall be placed on the streambed and streambanks prior to placement of the pipe culvert(s) and aggregate. The filter cloth shall cover the streambed and extend a minimum six inches and a maximum one foot beyond the end of the culvert and bedding material. Filter cloth reduces settlement and improves crossing stability.

6. Culvert Placement: The invert elevation of the culvert shall be installed on the natural streambed grade to minimize interference with fish migration (free passage of fish).

7. Culvert Protection: The culvert(s) shall be covered with a minimum of one foot of aggregate. If multiple culverts are used, they shall be separated by at least 12 in. of compacted aggregate fill. At the minimum, the bedding and fill material used in the construction of the temporary access culvert crossings shall conform with the aggregate requirements cited in the General Requirements subsection.

8. Stabilization: All areas disturbed during culvert installation shall be stabilized within 14 calendar days of the disturbance in accordance with the Standard for Permanent Construction Area Plantings.

Culvert Maintenance Requirements

1. Inspection: Periodic inspection shall be performed to ensure that the culverts, streambed, and streambanks are not damaged, and that sediment is not entering the stream or blocking fish passage or migration.

2. Maintenance: Maintenance shall be performed, as needed in a timely manner to ensure that structures are in compliance with this standard and specification. This shall include removal and disposal of any trapped sediment or debris. Sediment shall be disposed of and stabilized outside the waterway flood plain.

Culvert Removal and Clean-Up Requirements

1. Removal: When the crossing has served its purpose, all structures, including culverts, bedding, and filter cloth materials shall be removed within 14 calendar days. In all cases, the culvert materials shall be removed within one year of installation. No structure shall be removed during the spawning season (generally October 1 through May 31 for trout waters and March 15 through July 15 for other waters).

2. Final Clean-Up: Final clean-up shall consist of removal of the temporary structure from the waterway, removal of all construction materials, restoration of original stream channel cross section, and protection of the streambanks from erosion. Removed material shall be stored outside of the waterway floodplain.

3. Method: Removal of the structure and clean-up of the area shall be accomplished without construction equipment working in the waterway channel.

4. Final Stabilization: All areas disturbed during culvert removal shall be stabilized within 14 calendar days of the disturbance in accordance with the Standard for Permanent Construction Area Plantings.

NOTE: Any temporary access crossing shall conform to the technical requirements of this Standard and Specifications as well as any specific requirement imposed by the New York State Department of Environmental Conservation and the US Army Corps of Engineers. Permits may be required for streambank disturbance.

Figure 2.2
Temporary Access Bridge

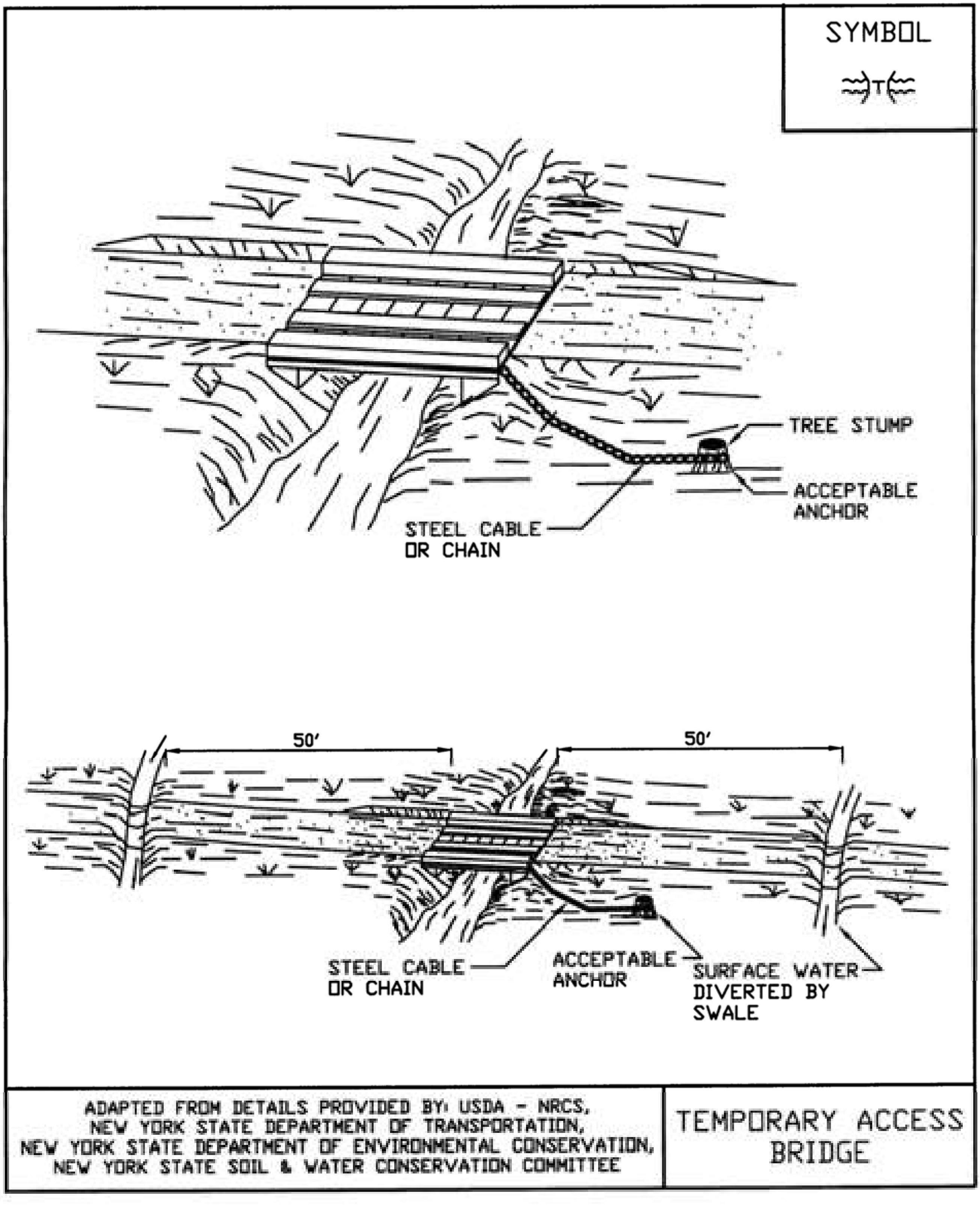


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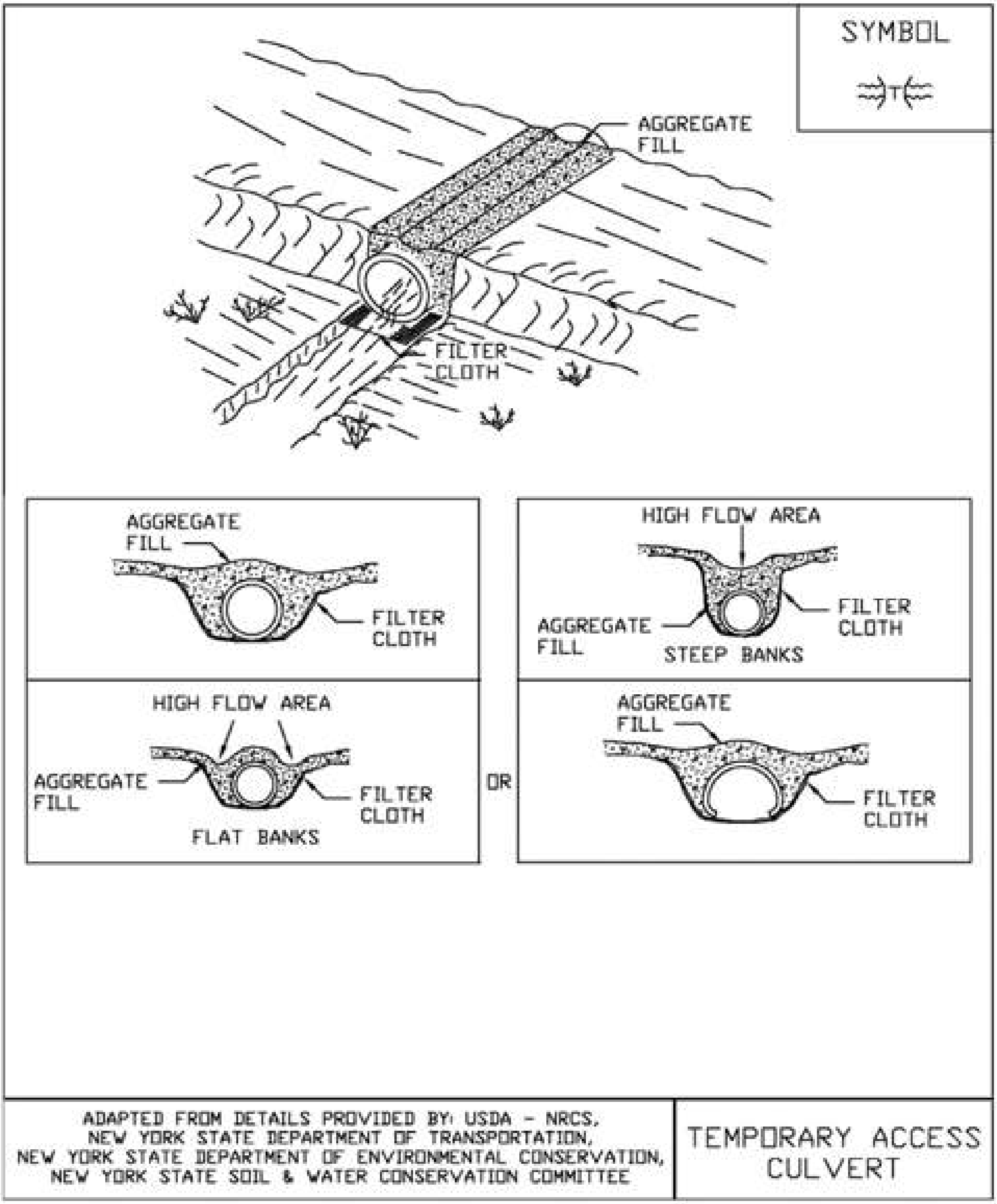
Figure 2.3
Temporary Access Culvert



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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.

STANDARD AND SPECIFICATIONS FOR CHECK DAM

Definition & Scope

Small barriers or dams constructed of stone, bagged sand or gravel, or other durable materials across a drainageway to reduce erosion in a drainage channel by reducing the velocity of flow in the channel.

Conditions Where Practice Applies

This practice is used as a **temporary** and, in some cases, a **permanent** measure to limit erosion by reducing velocities in open channels that are degrading or subject to erosion or where permanent stabilization is impractical due to short period of usefulness and time constraints of construction.

Design Criteria

Drainage Area: Maximum drainage area above the check dam shall not exceed two (2) acres.

Height: Not greater than 2 feet. Center shall be maintained 9 inches lower than abutments at natural ground elevation.

Side Slopes: Shall be 2:1 or flatter.

Spacing: The check dams shall be spaced as necessary in the channel so that the crest of the downstream dam is at the elevation of the toe of the upstream dam. This spacing is equal to the height of the check dam divided by the channel slope.

Therefore:

$$S = \frac{h}{s}$$

Where:

S = spacing interval (ft.)
h = height of check dam (ft.)
s = channel slope (ft./ft.)

Example:

For a channel with a 4% slope and 2 ft. high stone check dams, they are spaced as follows:

$$S = \frac{2\ \text{ft}}{0.04\ \frac{\text{ft}}{\text{ft}}} = 50\ \text{ft}$$

For stone check dams: Use a well graded stone matrix 2 to 9 inches in size (NYS – DOT Light Stone Fill meets these requirements).

The overflow of the check dams will be stabilized to resist erosion that might be caused by the check dam. See Figure 3.1 on page 3.3 for details.

Check dams should be anchored in the channel by a cutoff trench 1.5 ft. wide and 0.5 ft. deep and lined with filter fabric to prevent soil migration.

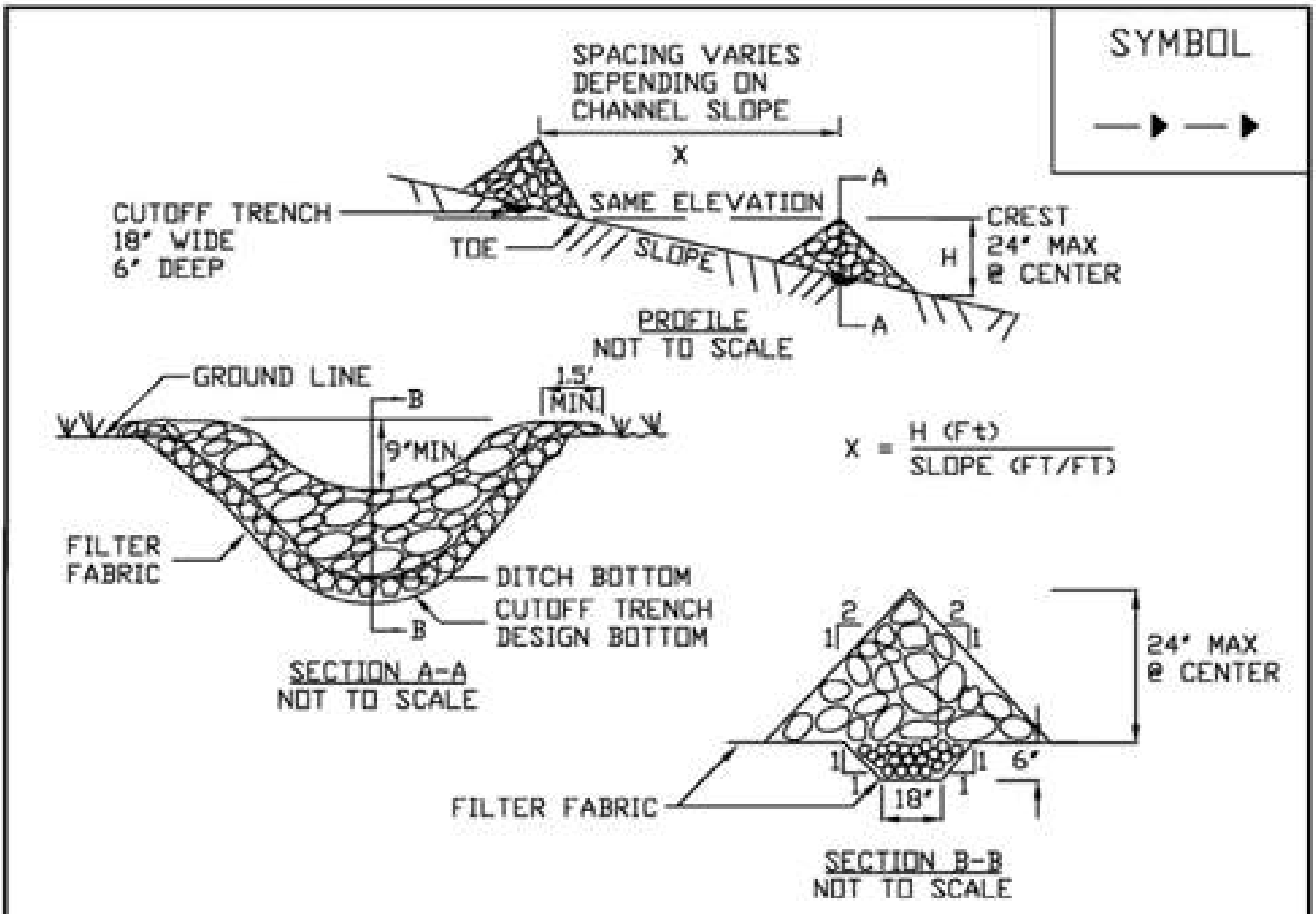
For filter sock or fiber roll check dams: The check dams will be anchored by staking the dam to the earth contact surface. The dam will extend to the top of the bank. The check dam will have a splash apron of NYS DOT #2 crushed stone extending a minimum 3 feet downstream from the dam and 1 foot up the sides of the channel. The compost and materials for a filter sock check dam shall meet the requirements shown in the standard for Compost Filter Sock on page 5.7.

Maintenance

The check dams should be inspected after each runoff event. Correct all damage immediately. If significant erosion has occurred between structures, a liner of stone or other suitable material should be installed in that portion of the channel or additional check dams added.

Remove sediment accumulated behind the dam as needed to allow channel to drain through the stone check dam and prevent large flows from carrying sediment over the dam.

Figure 3.1
Stone Check Dam Detail



CONSTRUCTION SPECIFICATIONS

1. STONE WILL BE PLACED ON A FILTER FABRIC FOUNDATION TO THE LINES, GRADES AND LOCATIONS SHOWN IN THE PLAN.
2. SET SPACING OF CHECK DAMS TO ASSUME THAT THE ELEVATIONS OF THE CREST OF THE DOWNSTREAM DAM IS AT THE SAME ELEVATION OF THE TOE OF THE UPSTREAM DAM.
3. EXTEND THE STONE A MINIMUM OF 1.5 FEET BEYOND THE DITCH BANKS TO PREVENT CUTTING AROUND THE DAM.
4. PROTECT THE CHANNEL DOWNSTREAM OF THE LOWEST CHECK DAM FROM SCOUR AND EROSION WITH STONE OR LINER AS APPROPRIATE.
5. ENSURE THAT CHANNEL APPURTENANCES SUCH AS CULVERT ENTRANCES BELOW CHECK DAMS ARE NOT SUBJECT TO DAMAGE OR BLOCKAGE FROM DISPLACED STONE.

MAXIMUM DRAINAGE AREA 2 ACRES.

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STANDARD AND SPECIFICATIONS FOR EARTH DIKE

Definition & Scope

A **temporary** berm or ridge of compacted soil, located in such a manner as to channel water to a desired location. Its purpose is to direct runoff to a sediment trapping device, thereby reducing the potential for erosion and off site sedimentation. Earth dikes can also be used for diverting clean water away from disturbed areas.

Conditions Where Practice Applies

Earth dikes are often constructed across disturbed areas and around construction sites such as graded parking lots and subdivisions. The dikes shall remain in place until the disturbed areas are permanently stabilized.

Design Criteria

See Figure 3.5 on page 3.15 for details.

General

	Dike A	Dike B
Drainage Area	<5 Ac	5-10 Ac
Dike Height	18 in.	36 in.
Dike Width	24 in.	36 in.
Flow Width	4 ft.	6 ft.
Flow Depth in Channel	8 in.	15 in.
Side Slopes	2:1 or flatter	2:1 or flatter
Grade	0.5% Min. 10% Max.	0.5% Min. 10% Max.

For drainage areas larger than 10 acres, refer to the Standard and Specifications for Diversion on page 3.9.

Stabilization

Stabilization of the dike shall be completed within 2 days of installation in accordance with the standard and specifications for seed and straw mulch or straw mulch only if not in seeding season. The flow channel shall be stabilized as per the following criteria:

Type of Treatment	Channel Grade[1]	Flow Channel	
		A (<5 Ac.)	B (5-10 Ac.)
1	0.5-3.0%	Seed & Straw Mulch	Seed & Straw Mulch
2	3.1-5.0%	Seed & Straw Mulch	Seed and cover with RECP, sod, or lined with plastic or 2” stone
3	5.1-8.0%	Seed and cover with RECP, Sod, or line with plastic or 2 in. stone	Line with 4-8 in. rip-rap or, geotextile
4	8.1-10%	Line with 4-8 in. rip-rap or geotextile	Site Specific Design

[1] In highly erodible soils, as defined by the local approving agency, refer to the next higher slope grade for type of stabilization.

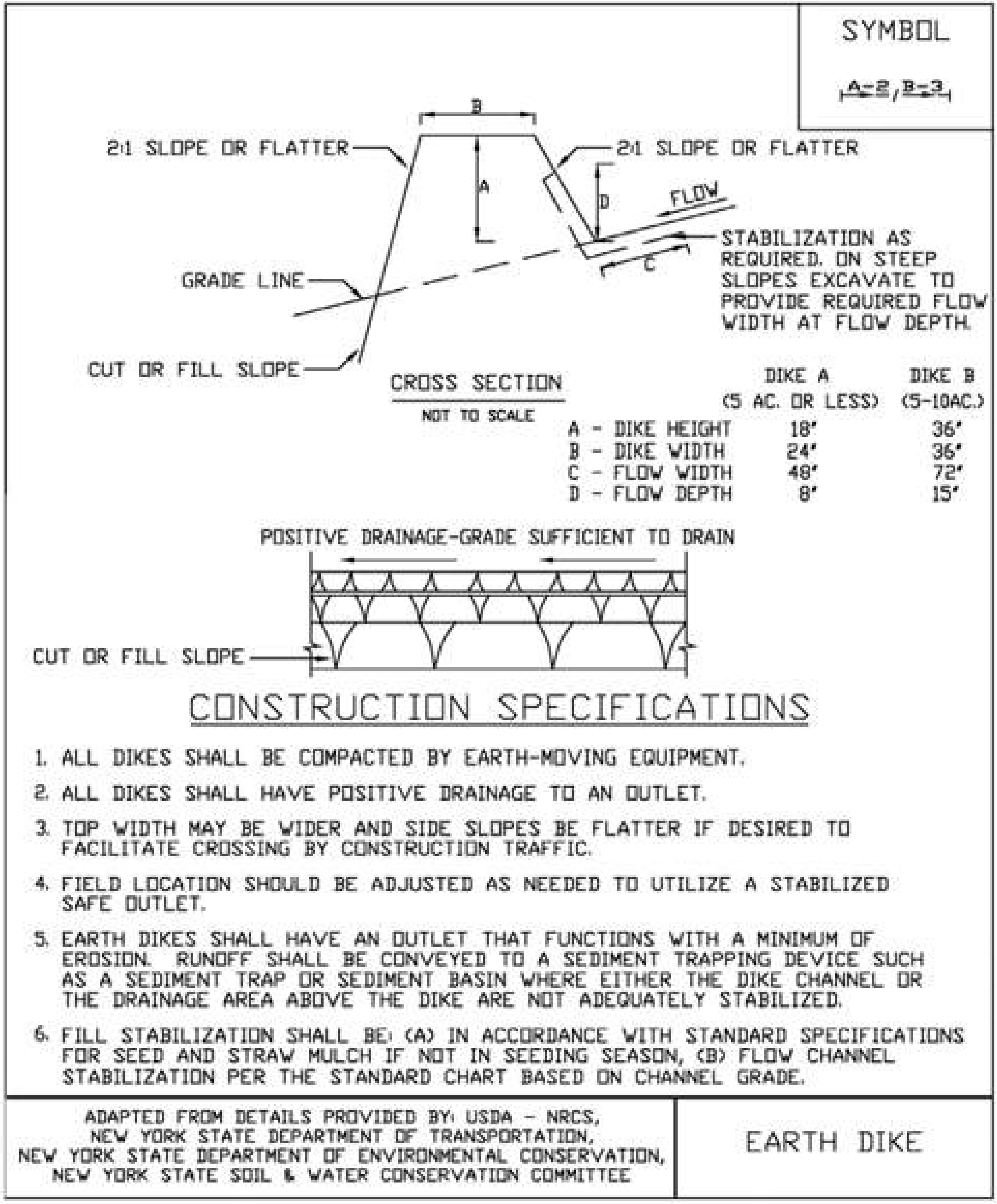
Outlet

Earth dikes shall have an outlet that functions with a minimum of erosion.

Runoff shall be conveyed to a sediment trapping device until the drainage area above the dike is adequately stabilized.

The on-site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet.

Figure 3.5
Earth Dike Detail



	DIKE A (5 AC. OR LESS)	DIKE B (5-10AC.)
A - DIKE HEIGHT	18"	36"
B - DIKE WIDTH	24"	36"
C - FLOW WIDTH	48"	72"
D - FLOW DEPTH	8"	15"

CONSTRUCTION SPECIFICATIONS

1. ALL DIKES SHALL BE COMPACTED BY EARTH-MOVING EQUIPMENT.
2. ALL DIKES SHALL HAVE POSITIVE DRAINAGE TO AN OUTLET.
3. TOP WIDTH MAY BE WIDER AND SIDE SLOPES BE FLATTER IF DESIRED TO FACILITATE CROSSING BY CONSTRUCTION TRAFFIC.
4. FIELD LOCATION SHOULD BE ADJUSTED AS NEEDED TO UTILIZE A STABILIZED SAFE OUTLET.
5. EARTH DIKES SHALL HAVE AN OUTLET THAT FUNCTIONS WITH A MINIMUM OF EROSION. RUNOFF SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE SUCH AS A SEDIMENT TRAP OR SEDIMENT BASIN WHERE EITHER THE DIKE CHANNEL OR THE DRAINAGE AREA ABOVE THE DIKE ARE NOT ADEQUATELY STABILIZED.
6. FILL STABILIZATION SHALL BE: (A) IN ACCORDANCE WITH STANDARD SPECIFICATIONS FOR SEED AND STRAW MULCH IF NOT IN SEEDING SEASON, (B) FLOW CHANNEL STABILIZATION PER THE STANDARD CHART BASED ON CHANNEL GRADE.

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EARTH DIKE

STANDARD AND SPECIFICATIONS FOR FLOW DIFFUSER

Definition & Scope

A permanent non-erosive outlet for concentrated runoff constructed to diffuse flow uniformly through a stone matrix onto a stablilized area in the form of shallow, low velocity, sheet flow.

Conditions Where Practice Applies

Where sediment-free stormwater runoff can be released in low velocity sheet flow down stabilized areas without causing erosion; where the ground slope at the outlet of the diffuser is less than 30% and the runoff will not re-concentrate after release; and where construction of a flow spreader is not practicable.

Design Criteria

1. **Drainage area:** The maximum drainage area to the diffuser may not exceed 0.10 acre per foot length of the flow diffuser. The drainage area served by the diffuser discharging directly cannot be 10-20% more than half the size of the receiving buffer area.

2. **Discharge from diffuser onto receiving area:** The peak stormwater flow rate from a flow diffuser onto a receiving area from a 10-year 24-hour storm must be less than 0.25 cubic feet per second (0.25 cfs) per linear foot of weir crest length.

3. **Receiving area of buffer:** Each flow diffuser shall have a vegetated receiving area with a minimum continuous length of 150 feet and the capacity to pass the flow without erosion. The receiving area shall be stable prior to the construction of the flow diffuser. The receiving area shall have topography regular enough to prevent undue flow concentration before entering a stable watercourse but it shall have a slope that is less than 30%. If the receiving area is not presently stable, then the receiving area shall be stabilized prior to construction of the flow diffuser. The receiving area below the flow diffuser shall be protected from harm during construction. Sodding and/or turf reinforcement mat (TRM) in combination with vegetative measures shall stabilize disturbed areas. The receiving area shall not be used by the flow diffuser until stabilization has been accomplished. A temporary diversion may be necessary in this case.

4. **Cross-section:** The minimum stone diffuser cross-section shall be trapezoidal with a height of 1 foot above natural ground; top width equal to 2 foot and side slope equal to 1 horizontal to 1 vertical. The storage area behind the diffuser shall be excavated to a depth of 1 foot and overall width of storage area equal to 6 feet minimum.

5. **Sizing the diffuser:** The length of the stone diffuser is governed by the size of the stone in the structure, the height of the diffuser, and the flow length through it. The following equation is used to establish the design of the diffuser:

$$Q_d = \frac{h^{3/2} W}{[(\frac{L}{D}) + 2.5 + L^2]^{0.5}}$$

Where:

Q_d = Outflow through the stone diffuser (cfs)
h = Ponding depth behind the diffuser (ft.)
W = Linear length of the diffuser along centerline (ft.)
L = Average horizontal flow length through the diffuser perpendicular to the centerline (ft.)
D = Average stone diameter (d_{50}) in the structure (ft.)

The maximum d_{50} size shall be 9” or 0.75’.

The designer shall calculate the length of diffuser needed depending on the geometry of the cross-section and rock size to be used recognizing that the maximum allowable discharge through the diffuser shall be 0.25 cfs per foot of length.

Once the discharge is calculated for the 10 year storm for the drainage area to the diffuser (Q_{10}) it can be divided by the design discharge of the diffuser to determine the diffuser length as follows:

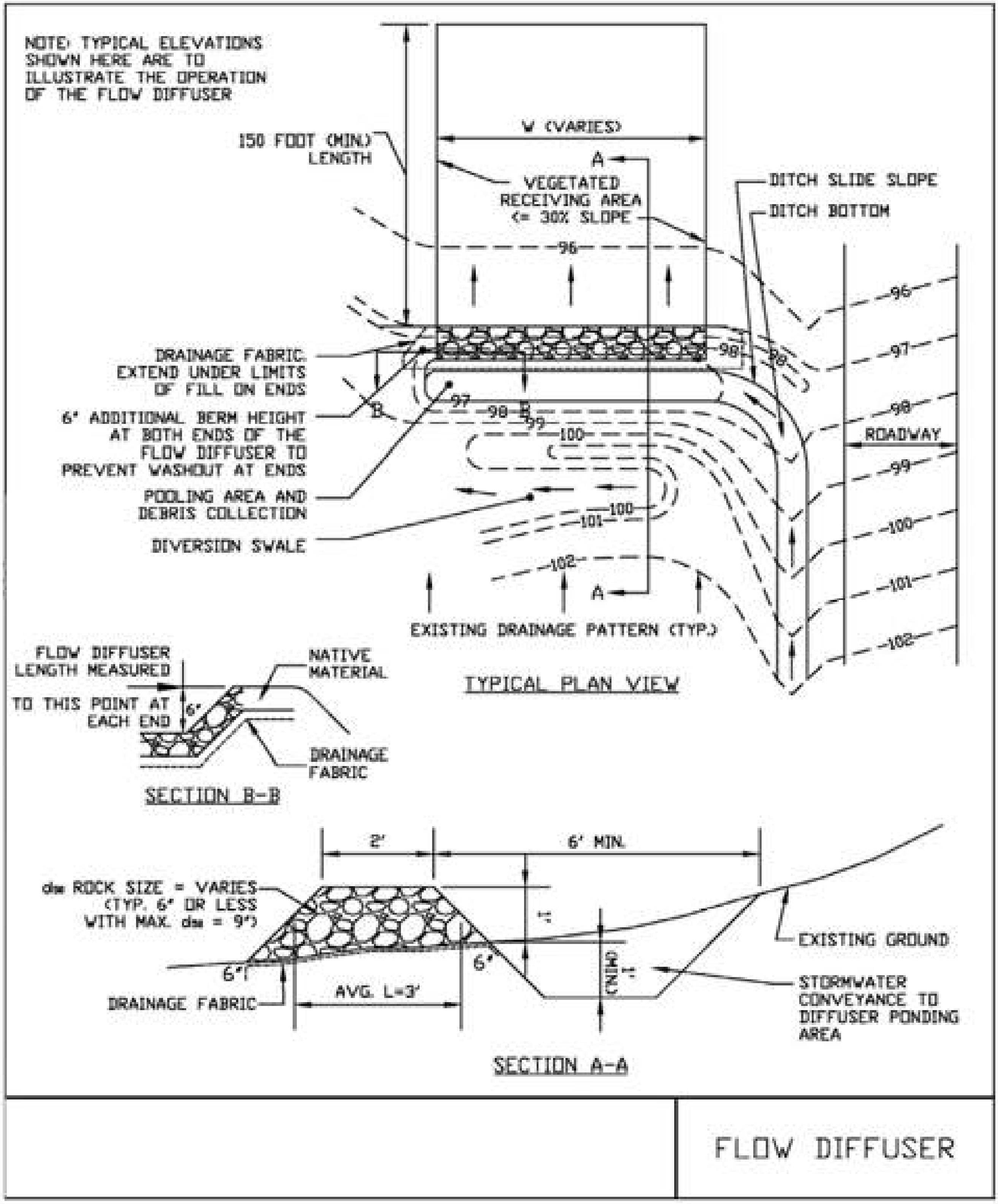
$$W = \frac{Q_{10}}{Q_d}$$

Where:

Q_d = Outflow through the stone diffuser (cfs/ft)
Q_{10} = Discharge rate for the 10 year storm (cfs)
W = Linear length of the diffuser along centerline (ft.)

Design examples are shown in Appendix B.

Figure 3.6
Flow Diffuser Detail



STANDARD AND SPECIFICATIONS FOR FLOW SPREADER

Definition & Scope

A **permanent or temporary,** non-erosive outlet for concentrated runoff, constructed to disperse concentrated flow uniformly over a hardened weir into a stabilized area as shallow, low velocity, sheet flow.

Conditions Where Practice Applies

Where sediment-free storm runoff can be released in sheet flow down a stabilized slope without causing erosion; where a hardened level weir can be constructed without filling; where the area below the weir is uniform with a slope of 10% or less and the runoff will not re-concentrate after release; and where no traffic will disturb the flow spreader.

Design Criteria

1. **Drainage area:** The maximum drainage area to the spreader may not exceed 5 acres.

2. **Discharge to a flow spreader:** The peak stormwater flow rate to a flow spreader due to runoff from a 10-year 24-hour storm must be less than 0.5 cubic feet per second (0.5 cfs) per foot length of flow spreader lip.

3. **Length of flow spreader:** The flow spreader length may not be more than 30 feet if flow is entering from one end of the spreader. Longer lengths require flow to split evenly from the center of the spreader.

4. **Receiving area of buffer:** Each flow spreader shall have a vegetated receiving area with the capacity to pass the flow without erosion. The receiving area shall be stable prior to the construction of the flow spreader. The receiving area shall have topography regular enough to prevent undue flow concentration before entering a stable watercourse but it shall have a slope that is less than 10%. If the receiving area is not presently stable, then the receiving area shall be stabilized prior to construction of the flow spreader. The receiving area below the flow spreader shall be protected from harm during construction. Sodding and/or turf reinforced mat in combination with vegetative measures shall stabilize disturbed areas. The receiving area shall not be used by the flow spreader until stabilization has been accomplished. A temporary diversion may be necessary in this case.

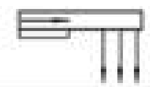
5. **Weir:** The weir of the flow spreader should consist of a pressure treated 2”x12” timber plank laid on edge and set at level elevation perpendicular to flow. Alternate hardened weir structures may be used as long as a hard, durable, continuous weir is maintained.

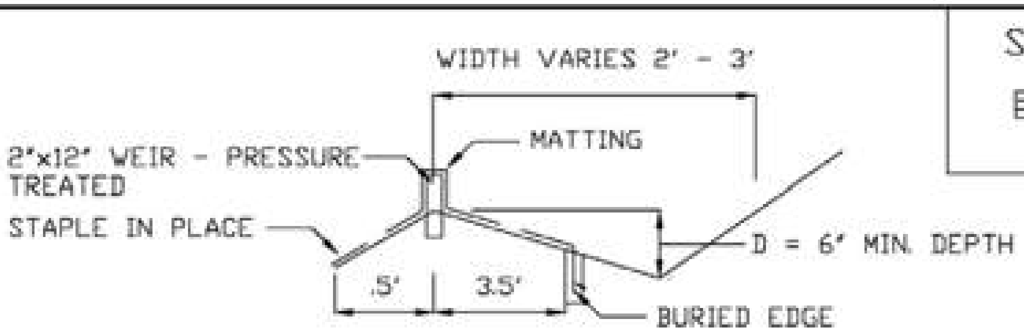
6. **Channel:** The flow spreader entrance channel shall be a minimum of 1 foot deep with a minimum 2 foot bottom width to trap sediment and reduce lateral flow velocities. Side slopes shall be 2:1 or flatter. The channel shall be constructed with a 0% grade to ensure uniform flow distribution. Velocity entering the channel shall be reduced to ensure non-erosive low approach velocity in the weir.

7. **Maintenance:** Long term maintenance of the flow spreader is essential to ensure its continued effectiveness. The following provisions should be followed. In the first year the flow spreader should be inspected semi annually and following major storm events for any signs of channelization and should be immediately repaired. After the first year, annual inspection should be sufficient. Spreaders constructed of wood, asphalt, stone or concrete curbing require periodic inspection to check for damage and to be repaired as needed.
    A. **Inspections:** At least once a year, the spreader pool should be inspected for sand accumulation and debris that may reduce capacity.
    B. **Maintenance Access:** Flow spreaders should be sited to provide easy access for removal of accumulated sediment and rehabilitation of the berm.
    C. **Debris Removal:** Debris buildup within the channel should be removed when it has accumulated to approximately 10 to 20% of design volume or channel capacity. Remove debris such as leaf litter, branches, tree growth and any sediment build-up from the spreader and dispose of appropriately.
    D. **Mowing:** Vegetated spreaders may require mowing.

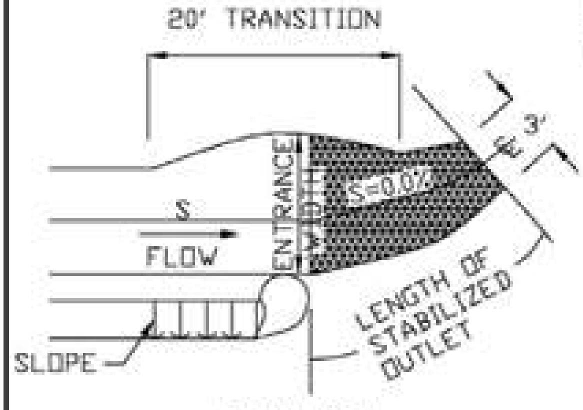
Figure 3.7
Flow Spreader Detail

SYMBOL





CROSS SECTION
NOT TO SCALE



PLAN VIEW
NOT TO SCALE

Q(cfs)	E.W.(ft)	D(ft)	LENGTH(ft)
0-5	10	0.5	10
5-10	16	0.6	20
10-15	24	0.7	30

E.W. - ENTRANCE WIDTH
D - DEPTH

CONSTRUCTION SPECIFICATIONS

1. THE MATTING SHOULD BE A MINIMUM OF 4FT. WIDE EXTENDING 6 INCHES OVER THE WEIR AND BURIED 6 INCHES DEEP IN A VERTICAL TRENCH ON THE LOWER EDGE. THE UPPER EDGE SHOULD BUTT AGAINST SMOOTHLY CUT SOD AND BE SECURELY HELD IN PLACE WITH CLOSELY SPACED HEAVY DUTY WIRE STAPLES AT LEAST 12 INCHES IN LENGTH.
2. ENSURE THAT THE WEIR IS LEVEL TO UNIFORMLY SPREAD DISCHARGE.
3. THE WEIR SHALL BE PLACED IN UNDISTURBED SOIL NOT FILL.
4. A 20 FOOT TRANSITION SECTION WILL BE CONSTRUCTED FROM THE DIVERSION CHANNEL TO THE SPREADER TO SMOOTHLY BLEND THE DIFFERENT DIMENSION AND GRADES.
5. THE RUNOFF DISCHARGE WILL BE OUTLETED ONTO A STABILIZED VEGETATED SLOPE NOT EXCEEDING 10%.
6. SEED AND MULCH THE DISTURBED AREA IMMEDIATELY AFTER CONSTRUCTION.

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FLOW SPREADER

STANDARD AND SPECIFICATIONS FOR PERIMETER DIKE/SWALE

Definition & Scope

A **temporary** ridge of soil formed by excavating an adjoining swale located along the perimeter of the site or disturbed area. Its purpose is to prevent off site storm run-on from entering a disturbed area and to prevent sediment laden storm runoff from leaving the construction site or disturbed area.

Conditions Where Practice Applies

Perimeter dike/swale is constructed to divert flows from entering a disturbed area, or along tops of slopes to prevent flows from eroding the slope, or along base of slopes to direct sediment laden flows to a trapping device.

The perimeter dike/swale shall remain in place until the disturbed areas are permanently stabilized.

Design Criteria

See Figure 3.14 on page 3.36 for details.

The perimeter dike/swale shall not be constructed outside property lines or setbacks without obtaining legal easements from affected adjacent property owners. A design is not required for perimeter dike/swale. The following criteria shall be used:

Drainage area – Less than 2 acres (for drainage areas larger than 2 acres but less than 10 acres, see earth dike or construction ditch; for drainage areas larger than 10 acres, see standard and specifications for diversion).

Height – 18 inches minimum from bottom of swale to top of dike evenly divided between dike height and swale depth.

Bottom width of dike – 2 feet minimum.

Width of swale – 2 feet minimum.

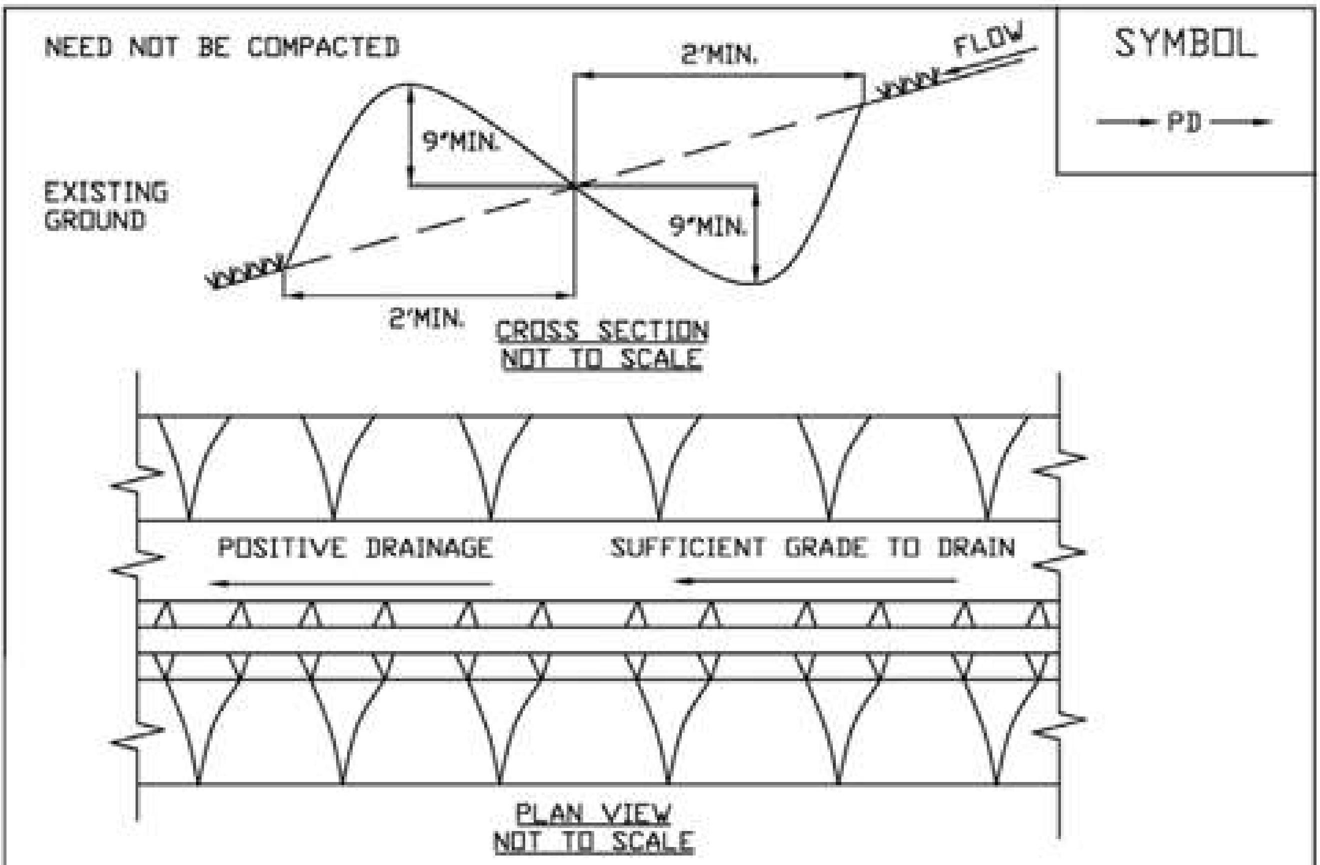
Grade – Dependent upon topography, but shall have positive drainage (sufficient grade to drain) to an adequate outlet. Maximum allowable grade not to exceed 8 percent.

Stabilization – The disturbed area of the dike and swale shall be stabilized within 2 days of installation, in accordance with the standard and specifications for construction ditch (page 3.4).

Outlet

1. Perimeter dike/swale shall have a stabilized outlet.
2. Diverted runoff from a protected or stabilized upland area shall outlet directly onto an undisturbed stabilized area.
3. Diverted runoff from a disturbed or exposed upland area shall be conveyed to a sediment trapping device such as a sediment trap, sediment basin, or to an area protected by any of these practices.
4. The on-site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet.

Figure 3.14
Perimeter Dike/Swale Detail



CONSTRUCTION SPECIFICATIONS

1. ALL PERIMETER DIKE/SWALE SHALL HAVE UNINTERRUPTED POSITIVE GRADE TO AN OUTLET.
2. DIVERTED RUNOFF FROM A DISTURBED AREA SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE.
3. DIVERTED RUNOFF FROM AN UNDISTURBED AREA SHALL OUTLET INTO AN UNDISTURBED STABILIZED AREA AT NON-EROSIVE VELOCITY.
4. THE SWALE SHALL BE EXCAVATED OR SHAPED TO LINE GRADE, AND CROSS SECTION AS REQUIRED TO MEET THE CRITERIA SPECIFIED IN THE STANDARD.
5. STABILIZATION OF THE AREA DISTURBED BY THE DIKE AND SWALE SHALL BE DONE IN ACCORDANCE WITH THE STANDARD AND SPECIFICATIONS FOR TEMPORARY SEEDING AND MULCHING, AND SHALL BE DONE WITHIN 2 DAYS.
6. PERIODIC INSPECTION AND REQUIRED MAINTENANCE MUST BE PROVIDED AFTER EACH RAIN EVENT.

MAX. DRAINAGE AREA LIMIT: 2 ACRES

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PERIMETER DIKE OR SWALE

STANDARD AND SPECIFICATIONS FOR ROCK OUTLET PROTECTION

Definition & Scope

A **permanent** section of rock protection placed at the outlet end of the culverts, conduits, or channels to reduce the depth, velocity, and energy of water, such that the flow will not erode the receiving downstream reach.

Conditions Where Practice Applies

This practice applies where discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This applies to:

1. Culvert outlets of all types.
2. Pipe conduits from all sediment basins, dry storm water ponds, and permanent type ponds.
3. New channels constructed as outlets for culverts and conduits.

Design Criteria

The design of rock outlet protection depends entirely on the location. Pipe outlet at the top of cuts or on slopes steeper than 10 percent, cannot be protected by rock aprons or riprap sections due to re-concentration of flows and high velocities encountered after the flow leaves the apron.

Many counties and state agencies have regulations and design procedures already established for dimensions, type and size of materials, and locations where outlet protection is required. Where these requirements exist, they shall be followed.

Tailwater Depth

The depth of tailwater immediately below the pipe outlet must be determined for the design capacity of the pipe. If the tailwater depth is less than half the diameter of the outlet pipe, and the receiving stream is wide enough to accept divergence of the flow, it shall be classified as a Minimum Tailwater Condition; see Figure 3.16 on page 3.42 as an example. If the tailwater depth is greater than half the pipe diameter and the receiving stream will continue to confine the flow, it shall be classified as a Maximum Tailwater Condition; see Figure 3.17 on page 3.43 as an example. Pipes which outlet onto flat areas with no defined channel may be assumed to have a Minimum Tailwater Condition; see Figure 3.16 on page 3.42 as an example.

Apron Size

The apron length and width shall be determined from the curves according to the tailwater conditions:

Minimum Tailwater – Use Figure 3.16 on page 3.42
Maximum Tailwater – Use Figure 3.17 on page 3.43

If the pipe discharges directly into a well defined channel, the apron shall extend across the channel bottom and up the channel banks to an elevation one foot above the maximum tailwater depth or to the top of the bank, whichever is less.

The upstream end of the apron, adjacent to the pipe, shall have a width two (2) times the diameter of the outlet pipe, or conform to pipe end section if used.

Bottom Grade

The outlet protection apron shall be constructed with no slope along its length. There shall be no overfall at the end of the apron. The elevation of the downstream end of the apron shall be equal to the elevation of the receiving channel or adjacent ground.

Alignment

The outlet protection apron shall be located so that there are no bends in the horizontal alignment.

Materials

The outlet protection may be done using rock riprap, grouted riprap, or gabions. Outlets constructed on the bank of a stream or wetland shall not use grouted rip-rap, gabions or concrete.

Riprap shall be composed of a well-graded mixture of rock size so that 50 percent of the pieces, by weight, shall be larger than the d_{50} size determined by using the charts. A well-graded mixture, as used herein, is defined as a mixture composed primarily of larger rock sizes, but with a sufficient mixture of other sizes to fill the smaller voids between the rocks. The diameter of the largest rock size in such a mixture shall be 1.5 times the d_{50} size.

Thickness

The minimum thickness of the riprap layer shall be 1.5 times the maximum rock diameter for d_{50} of 15 inches or less; and 1.2 times the maximum rock size for d_{50} greater than 15 inches. The following chart lists some examples:

D_{50} (inches)	d_{max} (inches)	Minimum Blanket Thickness (inches)
4	6	9
6	9	14
9	14	20
12	18	27
15	22	32
18	27	32
21	32	38
24	36	43

Rock Quality

Rock for riprap shall consist of field rock or rough unhewn quarry rock. The rock shall be hard and angular and of a quality that will not disintegrate on exposure to water or weathering. The specific gravity of the individual rocks shall be at least 2.5.

Filter

A filter is a layer of material placed between the riprap and the underlying soil surface to prevent soil movement into and through the riprap. Riprap shall have a filter placed under it in all cases.

A filter can be of two general forms: a gravel layer or a plastic filter cloth. The plastic filter cloth can be woven or non-woven monofilament yarns, and shall meet these base requirements: thickness 20-60 mils, grab strength 90-120 lbs; and shall conform to ASTM D-1777 and ASTM D-1682.

Gravel filter blanket, when used, shall be designed by comparing particle sizes of the overlying material and the base material. Design criteria are available in Standard and Specification for Anchored Slope and Channel Stabilization on page 4.7.

Gabions

Gabions shall be made of hexagonal triple twist mesh with heavily galvanized steel wire. The maximum linear dimension of the mesh opening shall not exceed 4 ½ inches and the area of the mesh opening shall not exceed 10 square inches.

Gabions shall be fabricated in such a manner that the sides, ends, and lid can be assembled at the construction site into a rectangular basket of the specified sizes. Gabions shall be of single unit construction and shall be installed according to manufacturer's recommendations.

The area on which the gabion is to be installed shall be graded as shown on the drawings. Foundation conditions shall be the same as for placing rock riprap, and filter cloth shall be placed under all gabions. Where necessary, key, or tie, the structure into the bank to prevent undermining of the main gabion structure.

Maintenance

Once a riprap outlet has been installed, the maintenance needs are very low. It should be inspected after high flows for evidence of scour beneath the riprap or for dislodged rocks. Repairs should be made immediately.

Design Procedure

1. Investigate the downstream channel to assure that nonerosive velocities can be maintained.
2. Determine the tailwater condition at the outlet to establish which curve to use.
3. Use the appropriate chart with the design discharge to determine the riprap size and apron length required. It is noted that references to pipe diameters in the charts are based on full flow. For other than full pipe flow, the parameters of depth of flow and velocity must be used to adjust the design discharges.
4. Calculate apron width at the downstream end if a flare section is to be employed.

Design Examples are demonstrated in Appendix B.

Construction Specifications

1. The subgrade for the filter, riprap, or gabion shall be prepared to the required lines and grades. Any fill required in the subgrade shall be compacted to a density of approximately that of the surrounding undisturbed material.
2. The rock or gravel shall conform to the specified grad-

ing limits when installed respectively in the riprap or filter.

3. Filter cloth shall be protected from punching, cutting, or tearing. Any damage other than an occasional small hole shall be repaired by placing another piece of cloth over the damaged part or by completely replacing the cloth. All overlaps, whether for repairs or for joining two pieces of cloth shall be a minimum of one foot.

4. Rock for the riprap or gabion outlets may be placed by equipment. Both shall each be constructed to the full course thickness in one operation and in such a manner as to avoid displacement of underlying materials. The rock for riprap or gabion outlets shall be delivered and placed in a manner that will ensure that it is reasonably homogenous with the smaller rocks and spalls filling the voids between the larger rocks. Riprap shall be placed in a manner to prevent damage to the filter blanket or filter cloth. Hand placement will be required to the extent necessary to prevent damage to the permanent works.

Figure 3.16

Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)

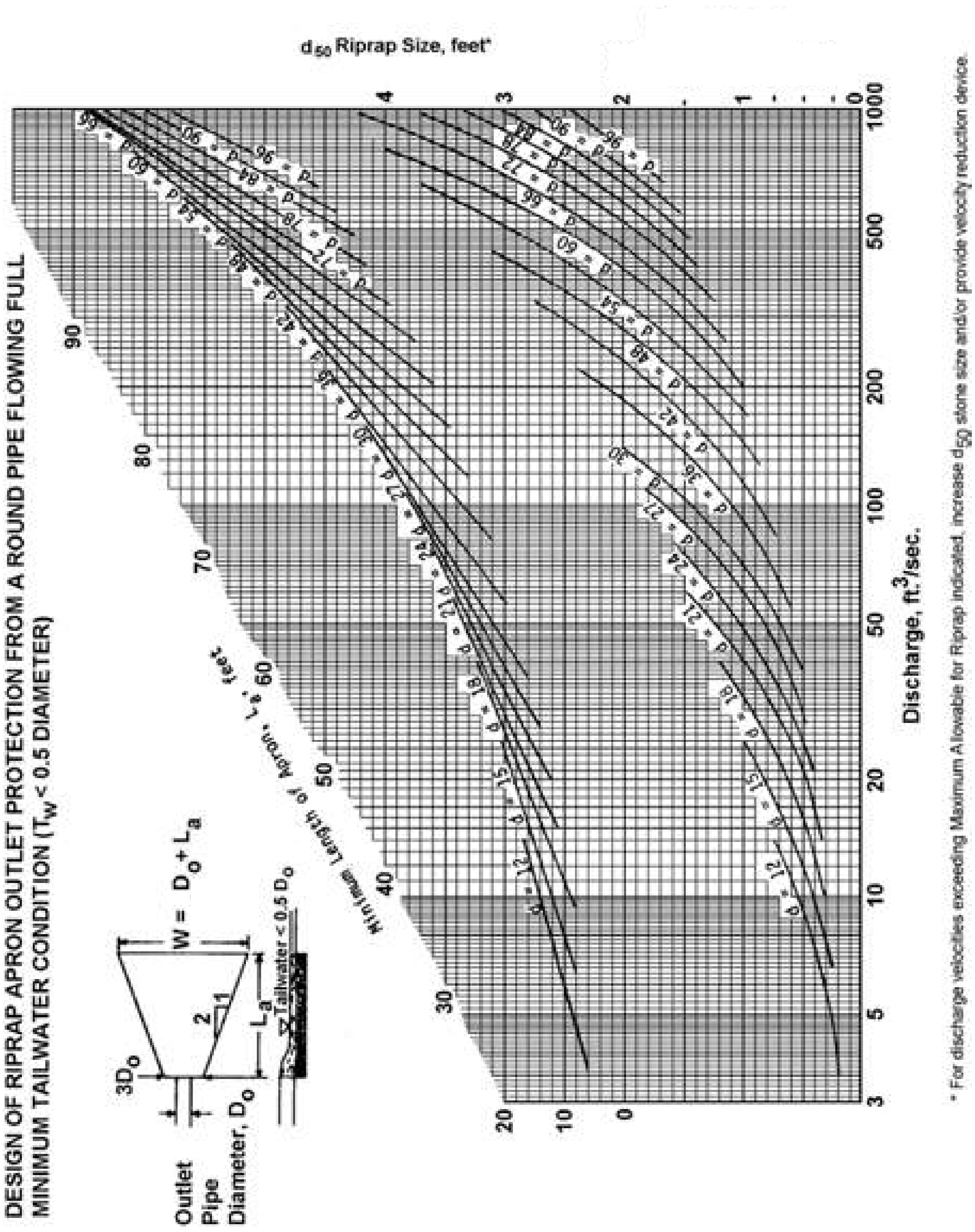
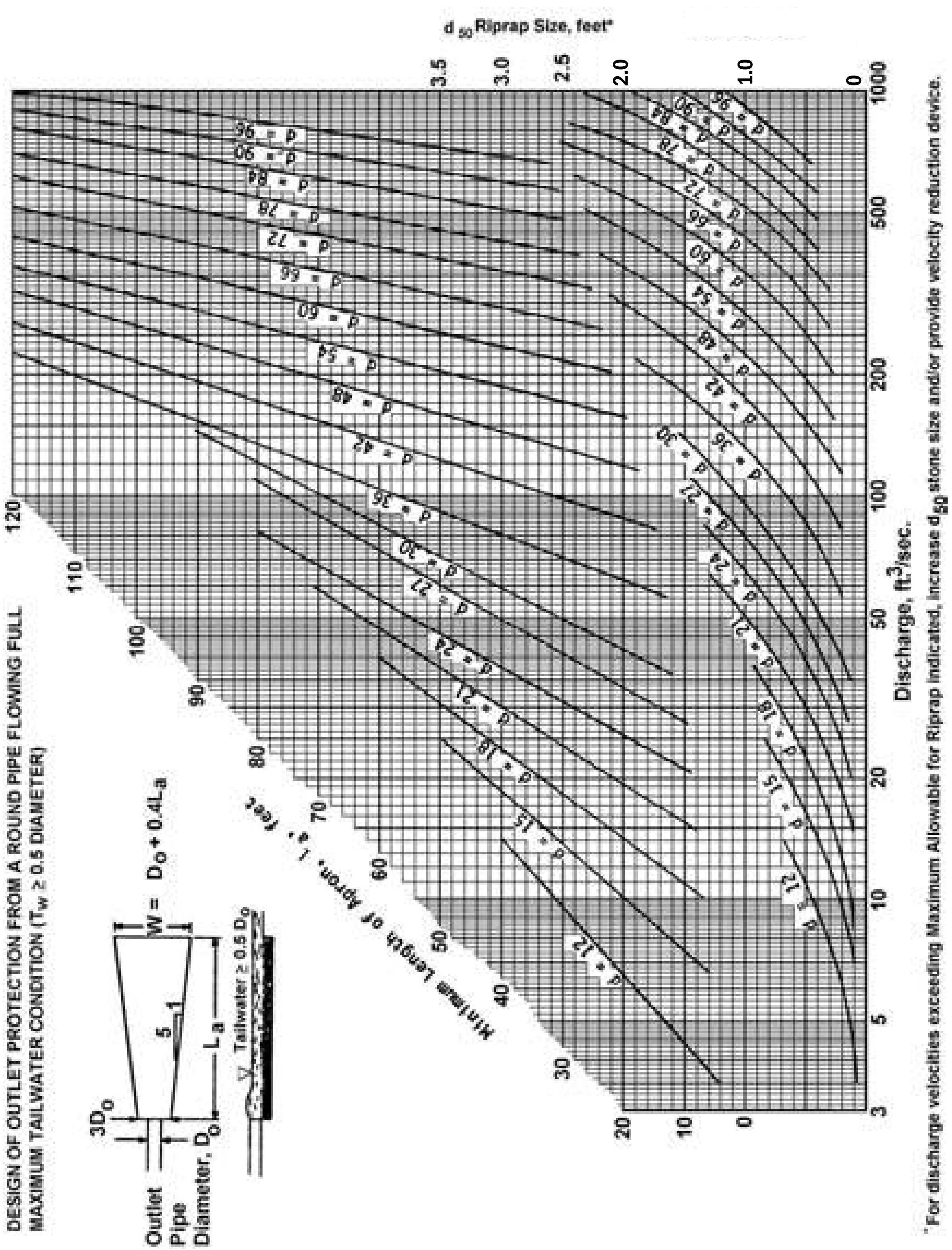


Figure 3.17
Outlet Protection Design—Maximum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Maximum Tailwater Condition: $T_w \geq 0.5D_o$) (USDA - NRCS)



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

Figure 3.18
Riprap Outlet Protection Detail (1)

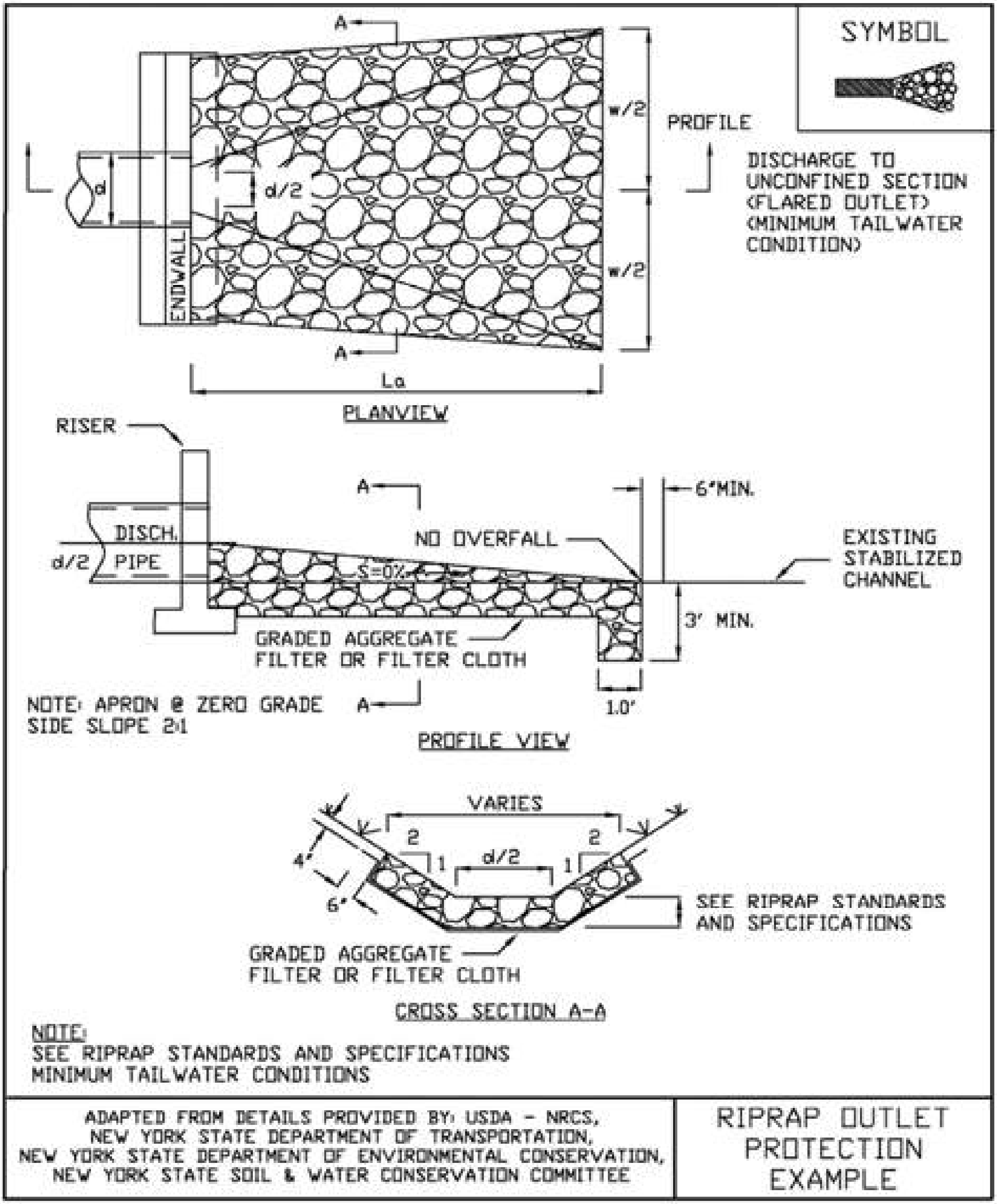


Figure 3.19
Riprap Outlet Protection Detail (2)

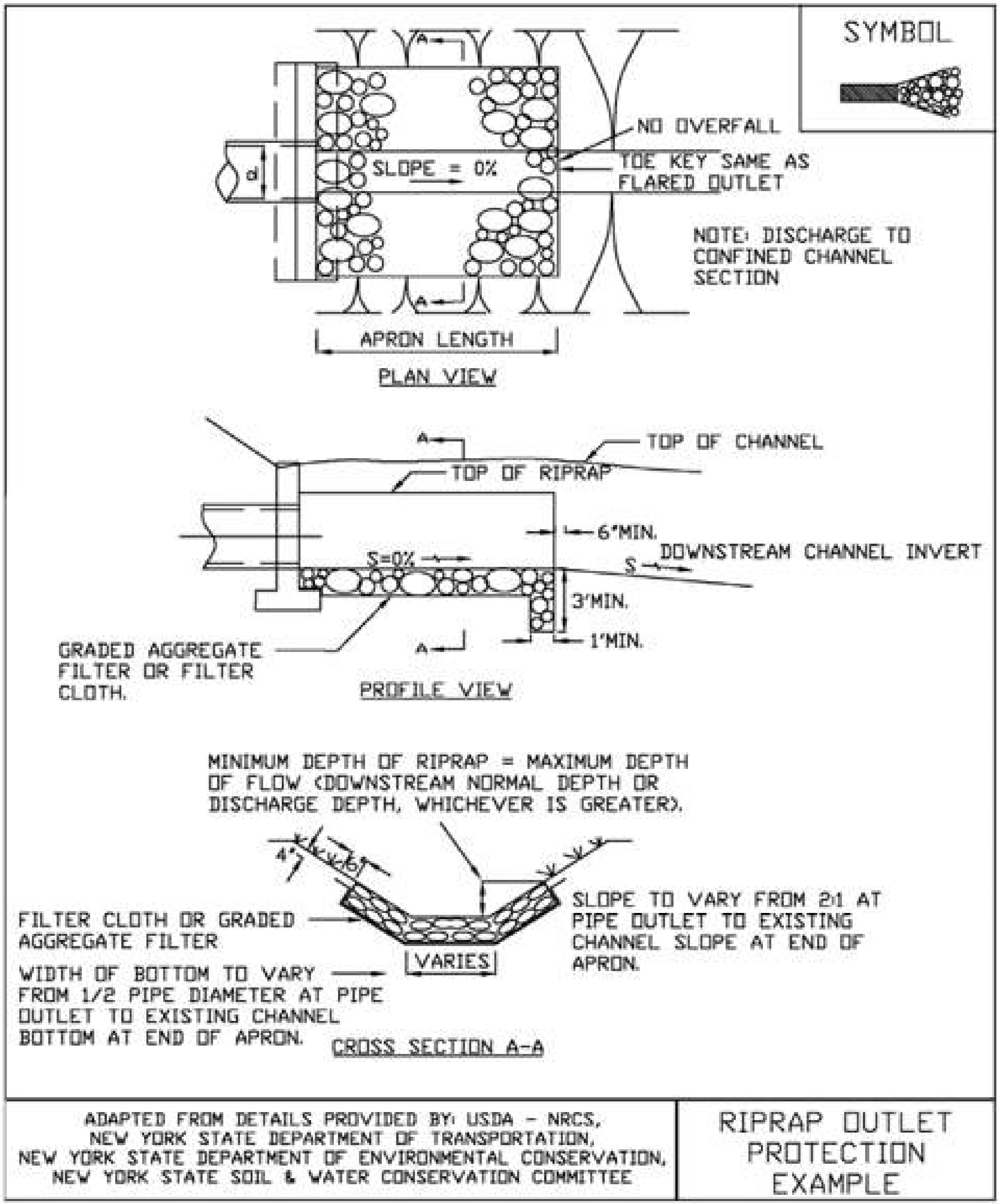


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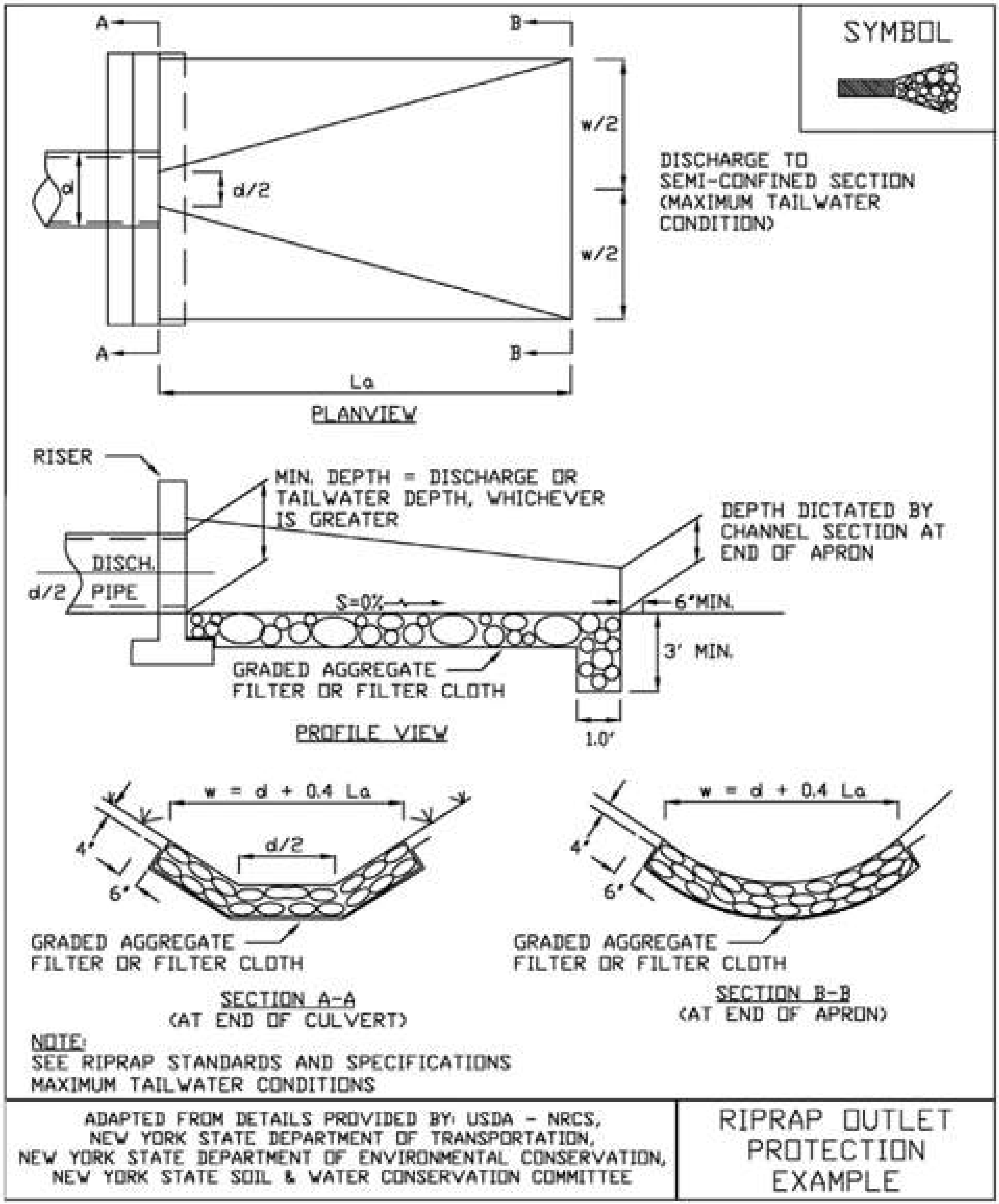
Figure 3.20
Riprap Outlet Protection Detail (3)



STANDARD AND SPECIFICATIONS FOR WATER BAR

Definition & Scope

A **permanent** or **temporary** ridge, ridge and channel, a structural channel, or flow deflector, constructed diagonally across a sloping road or utility right-of-way that is subject to erosion to limit the accumulation of erosive velocity of water by diverting surface runoff at pre-designed intervals.

Conditions Where Practice Applies

Where runoff protection is needed to prevent erosion from increased concentrated flow on narrow, steep access roads, driveways, and entrance ways to lot parcels as well as utility access right-of-ways generally up to 100 feet in width

Design Criteria

Design computations are not required.

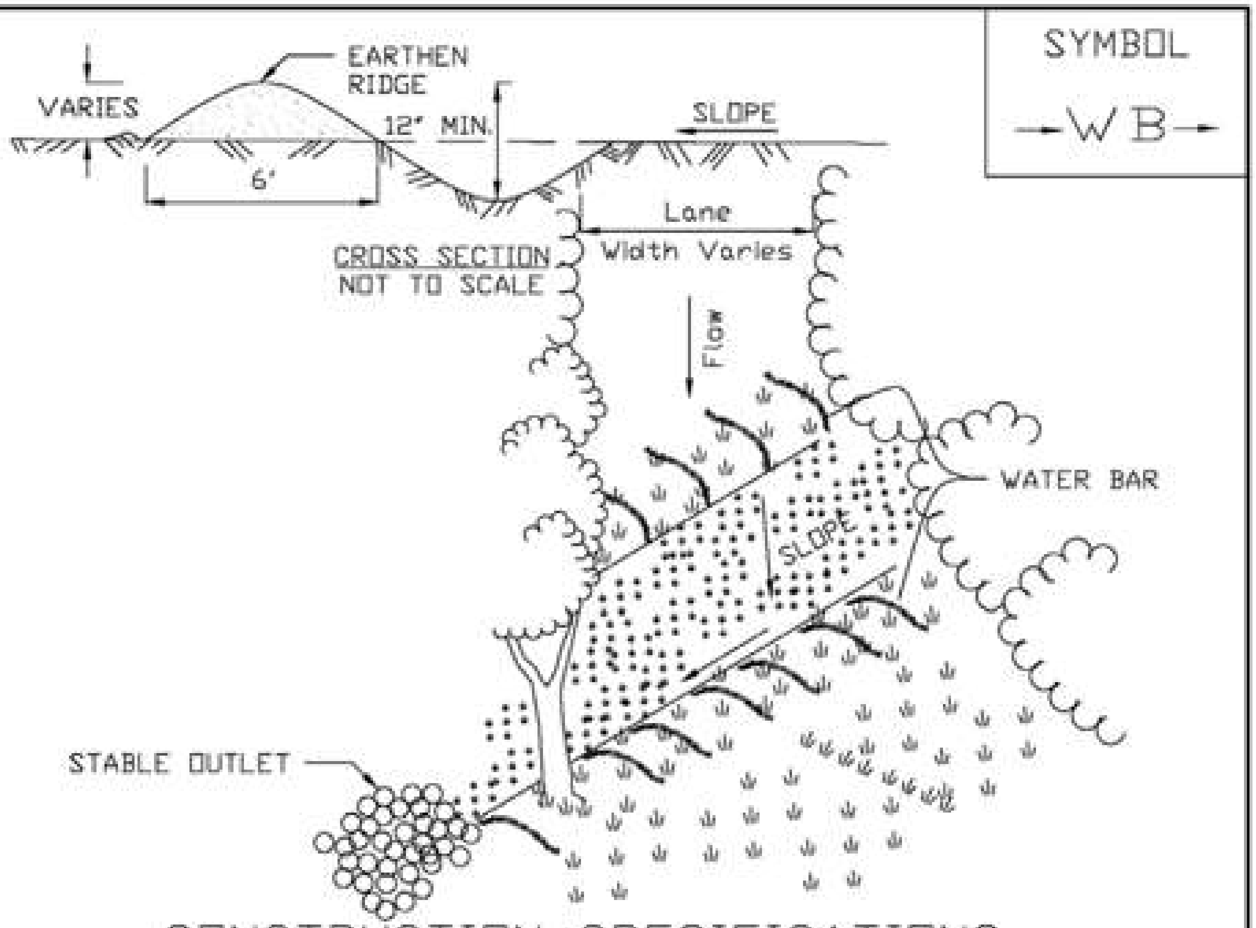
1. The design height shall be minimum of 12 inches measured from channel bottom to ridge top.
2. The side slopes shall be 2:1 or flatter, a minimum of 4:1 where vehicles cross.
3. The base width of the ridge shall be six feet minimum.
4. The spacing of the water bars shall be as follows (Site spacing may need to be adjusted for field conditions to use the most suitable areas for water disposal):

Slope (%)	Spacing (ft.)
<5	125
5 TO 10	100
10 TO 20	75
20 TO 35	50
>35	25

5. The positive grade of the water bar shall not exceed 2%. A crossing angle of approximately 60 degrees is preferred.
6. Once diverted, water must be conveyed to a stable system (i.e. vegetated swale or storm sewer system). Water bars should have stable, unrestricted outlets, either natural or constructed.

See Figure 3.22 on page 3.53 for details.

Figure 3.22
Water Bar Detail



CONSTRUCTION SPECIFICATIONS

1. INSTALL THE WATER BAR AS SOON AS THE RIGHT OF WAY IS CLEARED AND GRADED.
2. DISK OR STRIP THE SOD FROM THE BASE FOR THE CONSTRUCTED RIDGE BEFORE PLACING FILL.
3. TRACK THE RIDGE TO COMPACT IT TO THE DESIGN CROSS SECTION.
4. THE UNRESTRICTED OUTLET SHALL BE LOCATED ON AN UNDISTURBED AREA. FIELD SPACING WILL BE ADJUSTED TO USE THE MOST STABLE OUTLET AREAS. OUTLET PROTECTION WILL BE PROVIDED WHEN NATURAL AREAS ARE NOT ADEQUATE.
5. VEHICLE CROSSING SHALL BE STABILIZED WITH GRAVEL. EXPOSED AREAS SHALL BE SEEDED AND MULCHED WITHIN 2 DAYS.
6. PERIODICALLY INSPECT WATER BARS FOR EROSION DAMAGE AND SEDIMENT. CHECK OUTLET AREAS AND MAKE REPAIRS AS NEEDED TO RESTORE OPERATION.

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WATER BARS

STANDARD AND SPECIFICATIONS FOR ANCHORED STABILIZATION MATTING

Definition and Scope

A **temporary** or **permanent** protective covering placed on a prepared, seeded planting area that is anchored in place by staples or other means to aid in controlling erosion by absorbing rain splash energy and withstand overland flow as well as provide a microclimate to protect and promote seed establishment.

Conditions Where Practice Applies

Anchored stabilization mats are required for seeded earthen slopes steeper than 3 horizontal to 1 vertical; in vegetated channels where the velocity of the design flow exceeds the allowable velocity for vegetation alone (usually greater than 5 feet per second); on streambanks and shorelines where moving water is likely to erode newly seeded or planted areas; and in areas where wind prevents standard mulching with straw. This standard does not apply to slopes stabilized with sod, rock riprap or hard armor material.

Design Criteria

Slope Applications - Anchored stabilization mats for use on slopes are primarily used as mulch blankets where the mesh material is within the blanket or as a netting over previously placed mulch. These stabilization mats are NOT effective in preventing slope failures.

1. Required on all slopes steeper than 3:1
2. Matting will be designed for proper longevity need and strength based on intended use.
3. All installation details and directions will be included on the site erosion and sediment control plan and will follow manufactures specifications.

Channel Applications - Anchored stabilization mats, for use in supporting vegetation in flow channels, are generally a non-degradable, three dimensional plastic structure which can be filled with soil prior to planting. This structure provides a medium for root growth where the matting and roots become intertwined forming a continuous anchor for the vegetated lining.

1. Channel stabilization shall be based on the tractive force method.
2. For maximum design shear stresses less than 2 pounds per square foot, a temporary or bio-degradable mat may be used.
3. The design of the final matting shall be based on the mats ability to resist the tractive shear stress at bank full flow.
4. The installation details and procedures shall be included on the site erosion and sediment control plan and will follow manufacturers specifications.

Construction Specifications

1. Prepare soil before installing matting by smoothing the surface, removing debris and large stone, and applying lime, fertilizer and seed. Refer to manufacturers installation details.
2. Begin at the top of the slope by anchoring the mat in a 6” deep x 6” wide trench. Backfill and compact the trench after stapling.
3. In channels or swales, begin at the downslope end, anchoring the mat at the bottom and top ends of the blanket. When another roll is needed, the upslope roll

should overlay the lower layer, shingle style, so that channel flows do not peel back the material.

4. Roll the mats down a slope with a minimum 4” overlap. Roll center mat in a channel in direction of water flow on bottom of the channel. Do not stretch blankets. Blankets shall have good continuous contact with the underlying soil throughout its entire length.

5. Place mats end over end (shingle style) with a 6” overlap, use a double row of staggered staples 4” apart to secure mats.

6. Full length edge of mats at top of side slopes must be anchored in 6” deep x 6” wide trench; backfill and compact the trench after stapling.

7. Mats on side slopes of a channel must be overlapped 4” over the center mat and stapled.

8. In high flow channel applications, a staple check slot is recommended at 30 to 40 foot intervals. Use a row of staples 4” apart over entire width of the channel. Place a second row 4” below the first row in a staggered pattern.

9. The terminal end of the mats must be anchored in a 6”x6” wide trench. Backfill and compact the trench after stapling.

10. Stapling and anchoring of blanket shall be done in accordance with the manufactures recommendations.

Maintenance

Blanketed areas shall be inspected weekly and after each runoff event until perennial vegetation is established to a minimum uniform 80% coverage throughout the blanketed area. Damaged or displaced blankets shall be restored or replaced within 2 calendar days.

STANDARD AND SPECIFICATIONS FOR ARMORED SLOPE AND CHANNEL STABILIZATION

Definition & Scope

A **permanent** layer of stone designed to protect and stabilize areas subject to erosion by protecting the soil surface from rain splash, sheet flow, rill and gully erosion and channel erosion. It can also be used to improve the stability of soil slopes that are subject to seepage or have poor soil structure.

Conditions Where Practice Applies

Riprap is used for cut and fill slopes subject to seepage, erosion, or weathering, particularly where conditions prohibit the establishment of vegetation. Riprap is also used for channel side slopes and bottoms, temporary dewatering diversion channels where the flow velocities exceed 6 feet/second, grade sills, on shorelines subject to erosion, and at inlets and outlets to culverts, bridges, slope drains, grade stabilization structures, and storm drains.

Slope Stabilization Design Criteria

Gradation – Riprap shall be a well-graded mixture with 50% by weight larger than the specified design size. The diameter of the largest stone size in such a mixture should be 1.5 times the d_{50} size with smaller sizes grading down to 1 inch. The designer should select the size or sizes that equal or exceed that minimum size based on riprap gradations commercially available in the area.

Thickness – The minimum layer thickness shall be 1.5 times the maximum stone diameter, but in no case less than 6 inches.

Quality – Stone for riprap shall be hard, durable field or quarry materials. They shall be angular and not subject to breaking down when exposed to water or weathering. The specific gravity shall be at least 2.5.

Size – The sizes of stones used for riprap protection are determined by purpose and specific site conditions:

1. Slope Stabilization – Riprap stone for slope stabilization not subject to flowing water or wave action shall be sized for the proposed grade. The gradient of the slope to be stabilized shall be less than the natural angle of repose of the stone selected. Angles of repose of riprap stones may be estimated from Figure 4.1.

   Riprap used for surface stabilization of slopes does not add significant resistance to sliding or slope failure and should not be considered a retaining wall. Slopes approaching 1.5:1 may require special stability analysis. The inherent stability of the soil must be satisfactory before riprap is used for surface stabilization.

2. Channel Stabilization - Design criteria for sizing stone for stability of channel side slopes are presented under Channel Stabilization Design Criteria on page 4.10.

2. Outlet Protection – Design criteria for sizing stone and determining dimensions of riprap aprons are presented in Standards and Specifications for Rock Outlet Protection on page 3.39.

Filter Blanket – A filter blanket is a layer of material placed between the riprap and the underlying soil to prevent soil movement into or through the riprap. A suitable filter may consist of a well-graded gravel or sand-gravel layer or a synthetic filter fabric manufactured for this purpose. The design of a gravel filter blanket is based on the ratio of particle size in the overlying filter material to that of the base material in accordance with the criteria below. Multiple layers may be designed to affect a proper filter if necessary.

A gravel filter blanket should have the following relationship for a stable design:

$$\frac{d_{15} \text{ filter}}{d_{85} \text{ base}} \leq 5$$

$$5 < \frac{d_{15} \text{ filter}}{d_{50} \text{ base}} \leq 40$$

and

$$\frac{d_{50} \text{ filter}}{d_{50} \text{ base}} \leq 40$$

Filter refers to the overlying material while base refers to the underlying material. These relationships must hold between the base and filter and the filter and riprap to prevent migration of material. In some cases, more than one filter may be needed. Each filter layer should be a minimum of 6 inches thick, unless an acceptable filter fabric is used.

A synthetic filter fabric may be used with or in place of gravel filters. The following particle size relationships should exist:

1. Filter fabric covering a base containing 50% or less by weight of fine particles (#200 sieve size):

    A. $$\frac{d_{85} \text{ base (mm)}}{\text{EOS} \times \text{filter fabric (mm)}} > 1$$

    B. total open area of filter fabric should not exceed 36%

2. Filter fabric covering other soils:

    A. EOS is no larger than 0.21 mm (#70 sieve size)

    B. total open area of filter fabric should not exceed 10%

*EOS – Equivalent opening size compared to a U.S. standard sieve size.

No filter fabric should have less than 4% open area or an EOS less than U.S. Standard Sieve #100 (0.15 mm). The permeability of the fabric must be greater than that of the soil. The fabric may be made of woven or nonwoven monofilament yarns and should meet the following minimum requirements:

Thickness 20-60 mils

grab strength 90-120 lbs.

conform to ASTM D-1682 or ASTM D-177

Filter blankets should always be provided where seepage is significant or where flow velocity and duration of flow or turbulence may cause underlying soil particles to move though the riprap.

Construction Specifications

Subgrade Preparation – Prepare the subgrade for riprap and filter to the required lines and grades shown on the plans. Compact any fill required in the subgrade to a density approximating that of the undisturbed material or overfill depressions with riprap. Remove brush, trees, stumps, and other objectionable material. Cut the subgrade sufficiently deep so that the finished grade of the riprap will be at the elevation of the surrounding area. Channels shall be excavated sufficiently to allow placement of the riprap in a manner such that the finished inside dimensions and grade of the riprap meet design specifications.

Sand and gravel filter blanket – Place the filter blanket immediately after the ground foundation is prepared. For gravel, spread filter stone in a uniform layer to the specified depth. Where more than one layer of filter material is used, spread the layers with minimal mixing.

Synthetic filter fabric – Place the cloth directly on the prepared foundation. Overlap the edges by at least 2 feet, and space the anchor pins every 3 feet along the overlap. Bury the upper and lower ends of the cloth a minimum of 12 inches below ground. Take precautions not to damage the cloth by dropping the riprap. If damage occurs, remove the riprap and repair the sheet by adding another layer of filter fabric with a minimum overlap of 12 inches around the damaged area. Where large stones are to be placed, a 4-inch layer of fine sand or gravel is recommended to protect the filter cloth. Filter fabric is not recommended as a filter on slopes steeper than 2 horizontal to 1 vertical.

Stone placement – Placement of the riprap shall follow immediately after placement of the filter. Place riprap so that it forms dense, well-graded mass of stone with a minimum of voids. The desired distribution of stones throughout the mass may be obtained by selective loading at the quarry and controlled dumping during final placement. Place riprap to its full thickness in one operation. Do not place riprap by dumping through chutes or other methods that cause segregation of stone sizes. Be careful not to dislodge the underlying base or filter when placing the stones.

The toe of the riprap shall be keyed into a stable foundation at its base as shown in Figure 4.2 - Typical Riprap Slope Protection Detail. The toe should be excavated to a depth of 2.0 feet. The design thickness of the riprap shall extend a minimum of 3 feet horizontally from the slope. The finished slope should be free of pockets of small stone or clusters of large stones. Hand placing may be necessary to achieve proper distribution of stone sizes to produce a relatively smooth, uniform surface. The finished grade of the riprap should blend with the surrounding area.

Maintenance

Riprap shall be inspected periodically for scour or dislodged stones. Control weed and brush growth as needed.

Figure 4.1
Angles of Repose of Riprap Stones (FHWA)

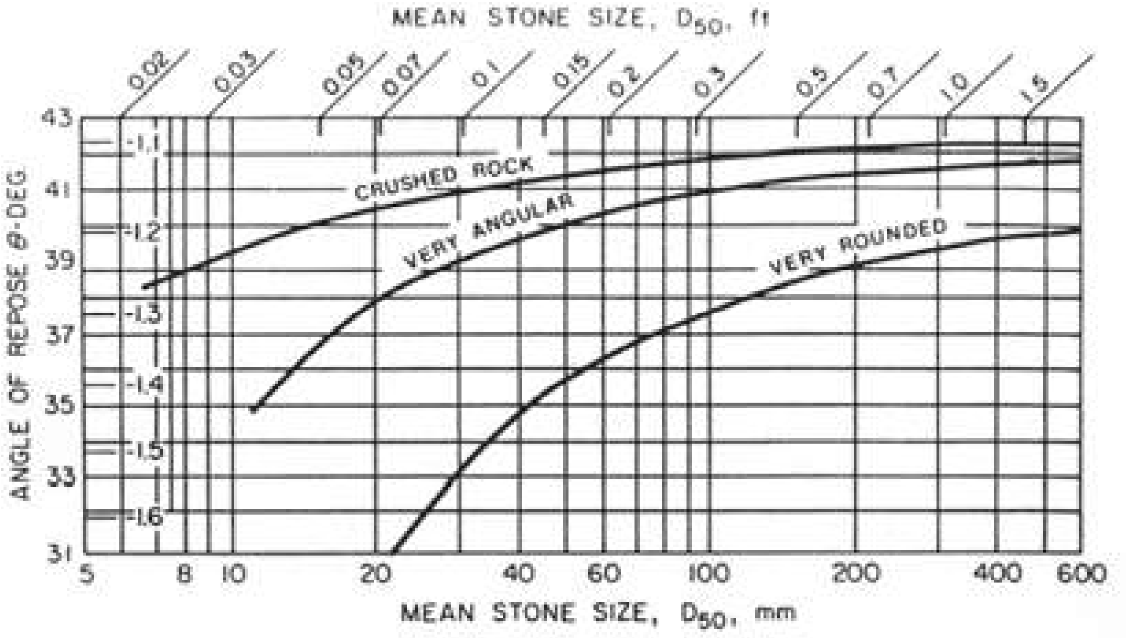
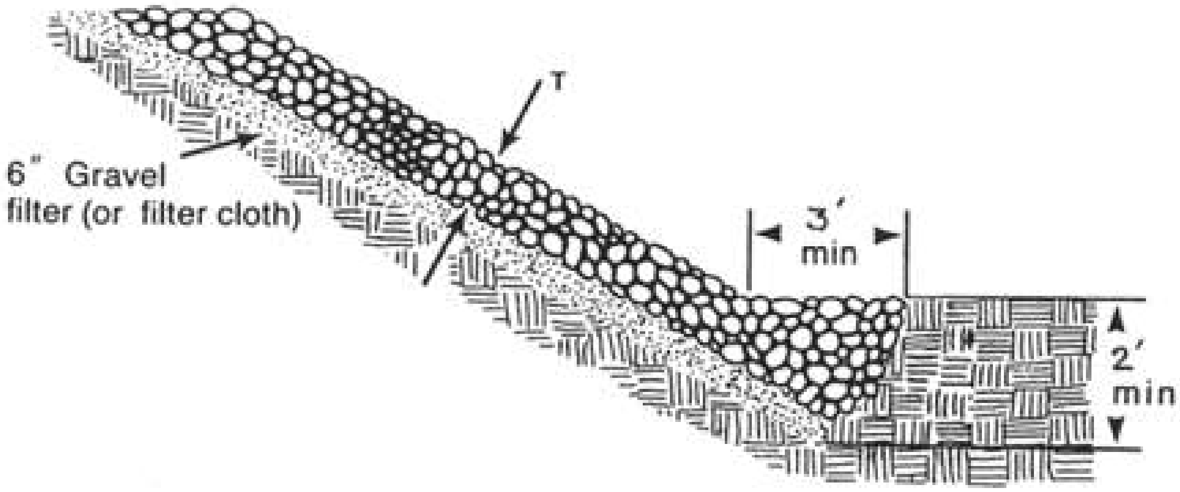


Figure 4.2
Typical Riprap Slope Protection Detail



Channel Stabilization Design Criteria

1. Since each channel is unique, measures for structural channel stabilization should be installed according to a design based on specific site conditions.

2. The plan and profile of the design reach should approximate a naturally stable channel from the project area, based on a stable "reference reach" for the subject channel type.

3. Develop designs according to the following principles:

   - Make protective measures compatible with other channel modifications planned or being carried out in the channel reaches.
   - Whenever excavation and re-shaping work is proposed within channels, the design should provide functional channel dimensions and geometry at each section. Work proposed within a stream channel may require permits from the NYS DEC and US Army Corps of Engineers.
   - Use the design velocity of the peak discharge of the 10-year storm or bankfull discharge, whichever is less. Structural measures should be capable of withstanding greater flows without serious damage.
   - Ensure that the channel bottom is stable or stabilized by structural means before installing any permanent slope protection.
   - Channel stabilization should begin at a stable location and end at a stable point along the bank.
   - Changes in alignment should not be done without a complete analysis of the environmental and stability effects on the entire system.
   - Provisions should be made to maintain and improve fish and wildlife habitat. For example, restoring lost vegetation will provide valuable shade, food, and/or cover.
   - Ensure that all requirements of state law and all permit requirements of local, state, and federal agencies are met.

Construction Specifications

Riprap – Riprap is the most commonly used material to structurally stabilize a channel. While riprap will provide the structural stabilization necessary, the side slope can be enhanced with vegetative material to slow the velocity of water, filter debris, and enhance habitat. See Principles of Biotechnical Practices on page 4.1, for more information.

1. Side slope – slopes shall be graded to 2:1 or flatter prior to placing bedding, filter fabric, or riprap.

2. Filter – filters should be placed between the base material and the riprap and meet the requirements of criteria listed pages 4.7 and 4.8.

3. Gradation – The gradation of the riprap is dependent on the velocity expected against the bank for the design conditions. See Table 4.1 on page 4.12. Once the velocity is known, gradation can be selected from the table for the appropriate class of rock. Note, this table was developed for a 2:1 slope; if the slope steepens to 1.5:1 the gradations should be increased 20%. The riprap should extend 2 feet below the channel bottom and be keyed into the side slope both at the upstream end and downstream end of the proposed work or reach.

See Figure 4.3 on page 4.13 for details.

Reinforced Concrete - Is often used to armor eroding sections of flow channel by constructing walls, bulk heads, or stabilize bank linings in urban areas for redevelopment work. Provide positive drainage behind these structures to relieve uplift pressures.

Grid Pavers – Modular concrete units with or without void areas can be used to stabilize flow channel. Units with void areas can allow the establishment of vegetation. These structures may be obtained in a variety of shapes (Figure 4.4) or they may be formed and poured in place. Maintain design and installation in accordance with manufacturer's instructions.

Revetment – Structural support or armoring to protect an embankment from erosion. Riprap and gabions are commonly used. Also used is a hollow fabric mattress with cells that receive a concrete mixture. Any revetment should be installed to a depth below the anticipated channel degradation and into the channel bed as necessary to provide stability.

Modular Pre-Cast Units – Interlocking modular precast units of different sizes, shapes, heights, and depths, have been developed for a wide variety of applications. They provide vertical support in tight areas as well as durability. Many types are available with textured surfaces. They also act as gravity retaining walls. They should be designed and installed in accordance with the manufacturer's recommendations (Figure 4.4). All areas disturbed by construction should be stabilized as soon as the structural measures are complete.

Maintenance

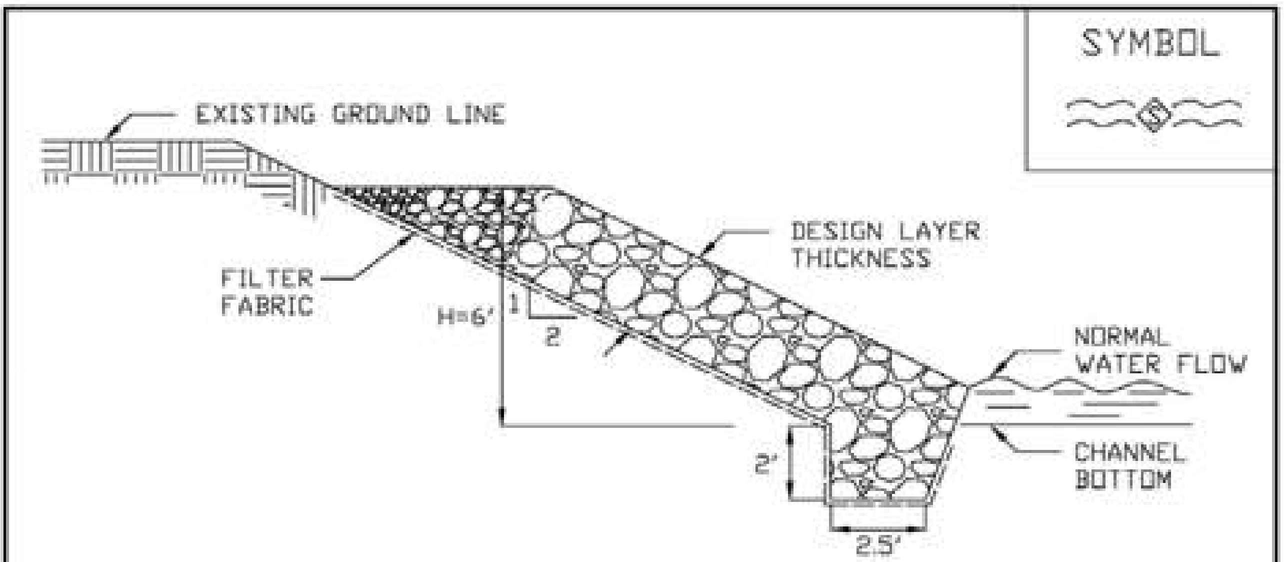
Check stabilized flow channel sections after every high-water event, and make any needed repairs immediately to prevent any further damage or unraveling of the existing work.

Table 4.1 - Riprap Gradations for Channel Stabilization

Class	Layer Thickness (in.)	Max. Velocity (ft/s)	Wave Height (ft.)		PERCENT FINER BY WEIGHT											
					D_{10}			D_{50}			D_{85}			D_{100}		
					Wt. (lbs.)	d_o (in.)	d□ (in.)	Wt. (lbs.)	d_o (in.)	d□ (in.)	Wt. (lbs.)	d_o (in.)	d□ (in.)	Wt. (lbs.)	d_o (in.)	d□ (in.)
I	18	8.5	-		5	5	4	50	10	8	100	13	10	150	15	12
II	18	10	-		17	7	6	170	15	12	340	19	15	500	22	18
III	24	12	2		46	10	8	460	21	17	920	26	21	1400	30	24
IV	36	14	3		150	15	12	1500	30	25	3000	39	32	4500	47	36
V	48	17	4.8		370	20	16	3700	42	34	7400	53	43	11,000	60	49

d_o = gravel material d□ = angular rock riprap
Wt = weight in pounds

Figure 4.3
Riprap Channel Stabilization



RIPRAP DESIGN TABLE

REACH	CLASS	THICKNESS	LAYER	HEIGHT	D10	D50	D85	D100	FILTER

CONSTRUCTION SPECIFICATIONS

1. SLOPE SHALL BE GRADED TO 2:1 OR FLATTER PRIOR TO PLACING FILTER, FILTER FABRIC, OR RIPRAP.
2. RIPRAP SHALL BE PLACED TO MAINTAIN A UNIFORM GRADATION. LARGER STONE SHALL BE PLACED AT THE TOE.
3. ENDS OF THE RIPRAP SHALL BE KEYED INTO A STABLE BANK. WHEN TYING INTO OTHER STRUCTURES, LARGER RIPRAP CAN BE LAID IN STEPS OR STACKED AS NEEDED TO FIT. STONES LARGER THAN THOSE DESIGNED FOR FLOW SHALL BE USED FOR THIS PURPOSE.
4. REMAINING DISTURBED AREAS SHALL BE GRADED AND PERMANENTLY SEEDED AND MULCHED.

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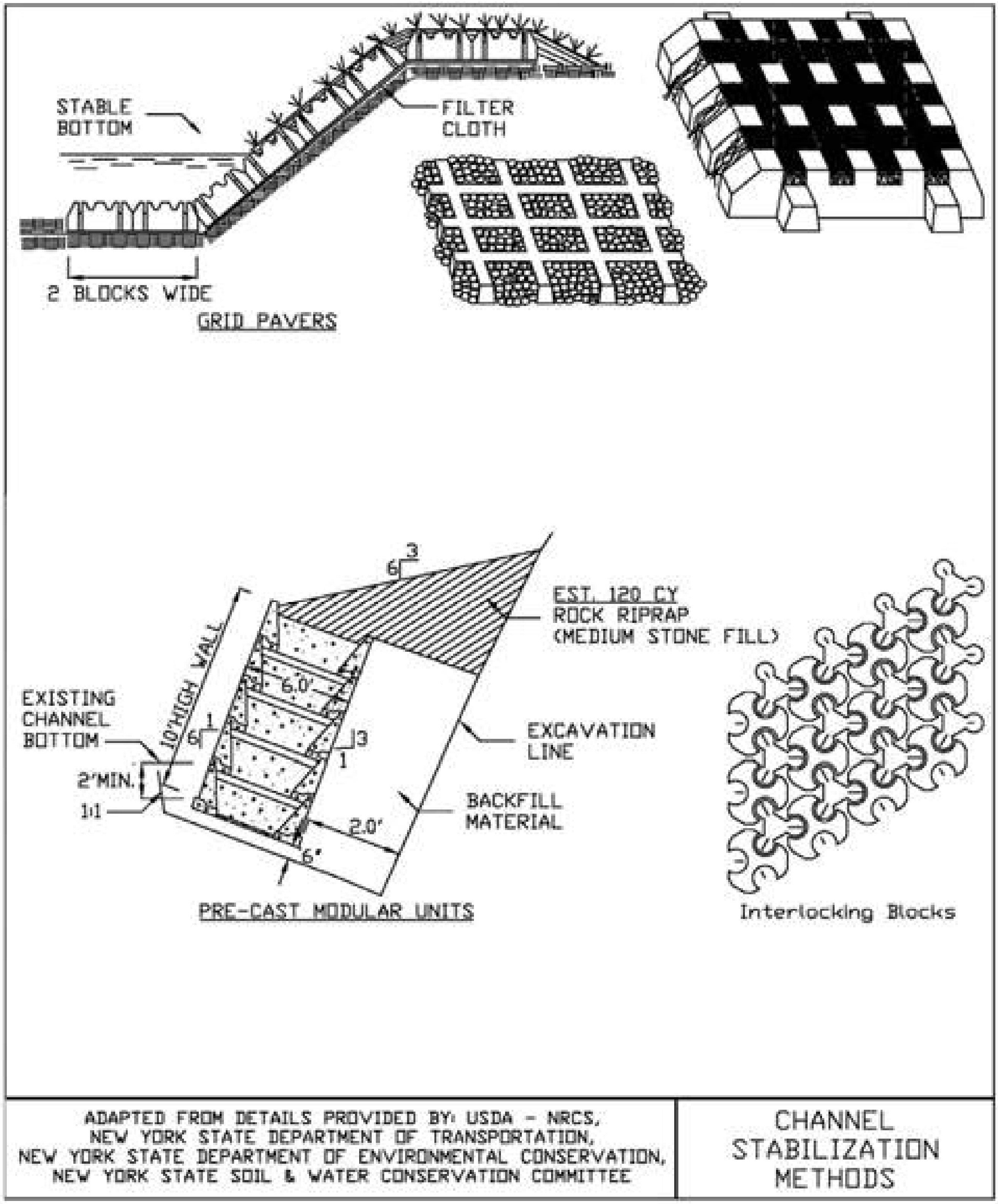
RIPRAP
CHANNEL
STABILIZATION

Figure 4.4
Channel Stabilization Methods



STANDARD AND SPECIFICATIONS FOR FERTILIZER APPLICATION

Definition & Scope

The **permanent** incorporation of fertilizer into the planting zone of the soil profile to provide nutrient amendments to the soil for vigorous support to plant and vegetation growth.

Conditions Where Practice Applies

This standard applies to all areas where permanent seeding, sodding, and plant establishment is required. All application of fertilizer shall be in accordance with Nutrient Runoff Law - ECL Article 17, Title 21. Phosphorus runoff poses a threat to water quality. Therefore, under New York Law, fertilizer containing phosphorus may only be applied to lawn or non-agricultural turf when:

1. A soil test indicates that additional phosphorus is needed for growth of that lawn or non-agricultural turf, or

2. The fertilizer is used for newly established lawn or non -agricultural turf during the first growing season.

For projects located within watersheds where enhanced phosphorus removal standards are required as part of its post-construction stormwater management plan, use of any fertilizer containing more than 0.67 percent phosphate (P_20_5) content will be done only with a valid soil test demonstrating the need for that formulation.

Design Criteria

Fertilizer is sold with an analysis printed on the tag or bag shown as three numbers separated by a dash, such as 5-10-5. The first number is the percent of the total weight of the bag that is nitrogen (N), the second is the percent of phosphate (phosphorus, P), and the third is the percent of potash (potassium, K). Other elements are sometimes included and are listed with these three basic components.

For example a 40 lb bag of 5-10-5 fertilizer contains 5% of 40 lbs of Nitrogen which equals 2 lbs. There is 10% of 40 lbs of phosphate (phosphorus) which equals 4 lbs, and there is 5% of potash (potassium), another 2 lbs., for a total of 8 lbs of active fertilizer in the 40 lb bag. The rest is filler to aid in spreading the material over the area to be treated.

Specify the design fertilizer mix and application rates based on the results of the soil tests.

Specifications

1. In no case shall fertilizer be applied between December 1 and April 1 annually.

2. Fertilizer shall not be spread within 20 feet of a surface water.

3. Any fertilizer falling or spilled into impervious surface areas such as parking lots, roadways, and sidewalks should be immediately contained and legally applied or placed in an appropriate container.

4. Incorporate the fertilizer, and lime if specified, into the top 2-4 inches of the topsoil or soil profile.

5. When applying fertilizer by hydro seeding care should be taken to apply mix only to seed bed areas at an appropriate flow rate to prevent erosion and spraying onto impervious areas.

STANDARD AND SPECIFICATIONS FOR LANDGRADING

Definition & Scope

Permanent reshaping of the existing land surface by grading in accordance with an engineering topographic plan and specification to provide for erosion control and vegetative establishment on disturbed, reshaped areas.

Design Criteria

The grading plan should be based upon the incorporation of building designs and street layouts that fit and utilize existing topography and desirable natural surrounding to avoid extreme grade modifications. Information submitted must provide sufficient topographic surveys and soil investigations to determine limitations that must be imposed on the grading operation related to slope stability, effect on adjacent properties and drainage patterns, measures for drainage and water removal, and vegetative treatment, etc.

Many municipalities and counties have regulations and design procedures already established for land grading and cut and fill slopes. Where these requirements exist, they shall be followed.

The plan must show existing and proposed contours of the area(s) to be graded. The plan shall also include practices for erosion control, slope stabilization, safe disposal of runoff water and drainage, such as waterways, lined ditches, reverse slope benches (include grade and cross section), grade stabilization structures, retaining walls, and surface and subsurface drains. The plan shall also include phasing of these practices. The following shall be incorporated into the plan:

1. Provisions shall be made to safely convey surface runoff to storm drains, protected outlets, or to stable water courses to ensure that surface runoff will not damage slopes or other graded areas; see standards and specifications for Grassed Waterway, Diversion, or Grade Stabilization Structure.
2. Cut and fill slopes that are to be stabilized with grasses shall not be steeper than 2:1. When slopes exceed 2:1, special design and stabilization consideration are required and shall be adequately shown on the plans. (Note: Where the slope is to be mowed, the slope should be no steeper than 3:1, although 4:1 is preferred because of safety factors related to mowing steep slopes.)
3. Reverse slope benches or diversion shall be provided whenever the vertical interval (height) of any 2:1 slope exceeds 20 feet; for 3:1 slope it shall be increased to 30 feet and for 4:1 to 40 feet. Benches shall be located to divide the slope face as equally as possible and shall convey the water to a stable outlet. Soils, seeps, rock outcrops, etc., shall also be taken into consideration when designing benches.
    A. Benches shall be a minimum of six feet wide to provide for ease of maintenance.
    B. Benches shall be designed with a reverse slope of 6:1 or flatter to the toe of the upper slope and with a minimum of one foot in depth. Bench gradient to the outlet shall be between 2 percent and 3 percent, unless accompanied by appropriate design and computations.
    C. The flow length within a bench shall not exceed 800 feet unless accompanied by appropriate design and computations; see Standard and Specifications for Diversion on page 3.9
4. Surface water shall be diverted from the face of all cut and/or fill slopes by the use of diversions, ditches and swales or conveyed downslope by the use of a designed structure, except where:
    A. The face of the slope is or shall be stabilized and the face of all graded slopes shall be protected from surface runoff until they are stabilized.
    B. The face of the slope shall not be subject to any concentrated flows of surface water such as from natural drainage ways, graded ditches, downspouts, etc.
    C. The face of the slope will be protected by anchored stabilization matting, sod, gravel, riprap, or other stabilization method.

5. Cut slopes occurring in ripable rock shall be serrated as shown in Figure 4.9 on page 4.26. The serrations shall be made with conventional equipment as the excavation is made. Each step or serration shall be constructed on the contour and will have steps cut at nominal two-foot intervals with nominal three-foot horizontal shelves. These steps will vary depending on the slope ratio or the cut slope. The nominal slope line is 1 ½: 1. These steps will weather and act to hold moisture, lime, fertilizer, and seed thus producing a much quicker and longer-lived vegetative cover and better slope stabilization. Overland flow shall be diverted from the top of all serrated cut slopes and carried to a suitable outlet.

6. Subsurface drainage shall be provided where necessary to intercept seepage that would otherwise adversely affect slope stability or create excessively wet site conditions.

7. Slopes shall not be created so close to property lines as to endanger adjoining properties without adequately protecting such properties against sedimentation, erosion, slippage, settlement, subsidence, or other related damages.

8. Fill material shall be free of brush, rubbish, rocks, logs, stumps, building debris, and other objectionable material. It should be free of stones over two (2) inches in diameter where compacted by hand or mechanical tampers or over eight (8) inches in diameter where compacted by rollers or other equipment. Frozen material shall not be placed in the fill nor shall the fill material be placed on a frozen foundation.

9. Stockpiles, borrow areas, and spoil shall be shown on the plans and shall be subject to the provisions of this Standard and Specifications.

10. All disturbed areas shall be stabilized structurally or vegetatively in compliance with the Permanent Construction Area Planting Standard on page 4.42.

Construction Specifications

See Figures 4.9 and 4.10 for details.

1. All graded or disturbed areas, including slopes, shall be protected during clearing and construction in accordance with the erosion and sediment control plan until they are adequately stabilized.

2. All erosion and sediment control practices and measures shall be constructed, applied and maintained in accordance with the erosion and sediment control plan and these standards.

3. Topsoil required for the establishment of vegetation shall be stockpiled in amount necessary to complete finished grading of all exposed areas.

4. Areas to be filled shall be cleared, grubbed, and stripped of topsoil to remove trees, vegetation, roots, or other objectionable material.

5. Areas that are to be topsoiled shall be scarified to a minimum depth of four inches prior to placement of topsoil.

6. All fills shall be compacted as required to reduce erosion, slippage, settlement, subsidence, or other related problems. Fill intended to support buildings, structures, and conduits, etc., shall be compacted in accordance with local requirements or codes.

7. All fill shall be placed and compacted in layers not to exceed 9 inches in thickness.

8. Except for approved landfills or nonstructural fills, fill material shall be free of frozen particles, brush, roots, sod, or other foreign objectionable materials that would interfere with, or prevent, construction of satisfactory fills.

9. Frozen material or soft, mucky or highly compressible materials shall not be incorporated into fill slopes or structural fills.

10. Fill shall not be placed on saturated or frozen surfaces.

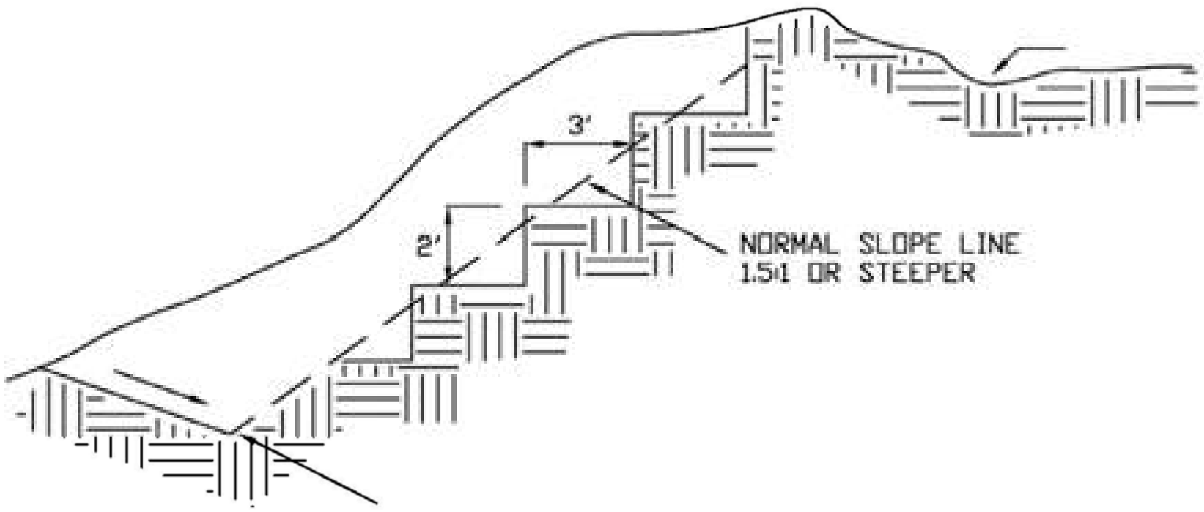
11. All benches shall be kept free of sediment during all phases of development.

12. Seeps or springs encountered during construction shall be handled in accordance with the Standard and Specification for Subsurface Drain on page 3.48 or other approved methods.

13. All graded areas shall be permanently stabilized immediately following finished grading.

14. Stockpiles, borrow areas, and spoil areas shall be shown on the plans and shall be subject to the provisions of this Standard and Specifications.

Figure 4.9
Typical Section of Serrated Cut Slope



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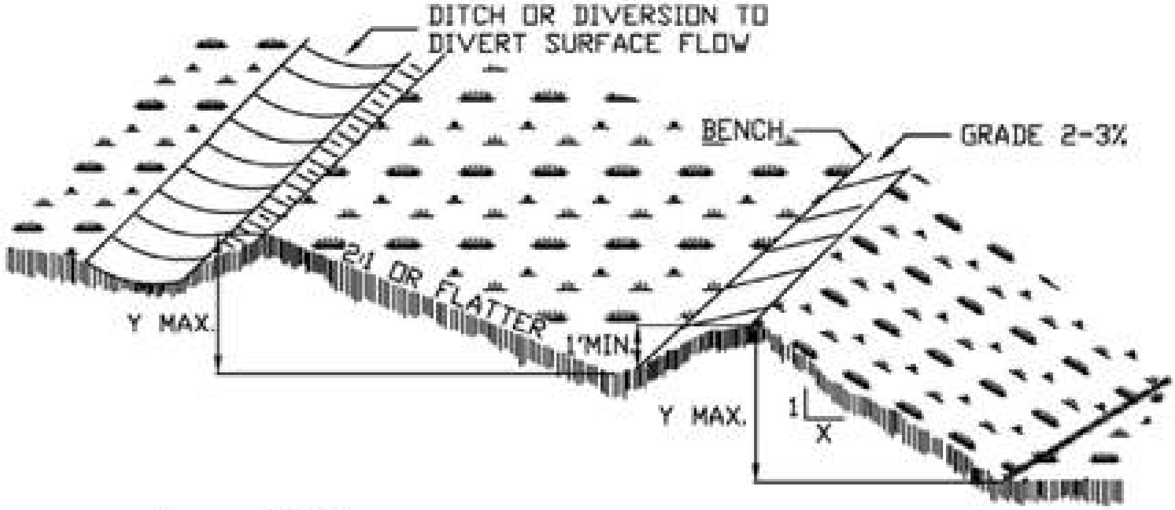
TYPICAL SECTION OF SERRATED CUT SLOPE

Figure 4.10
Landgrading



X	Y(MAX)
2	20'
3	30'
4	40'

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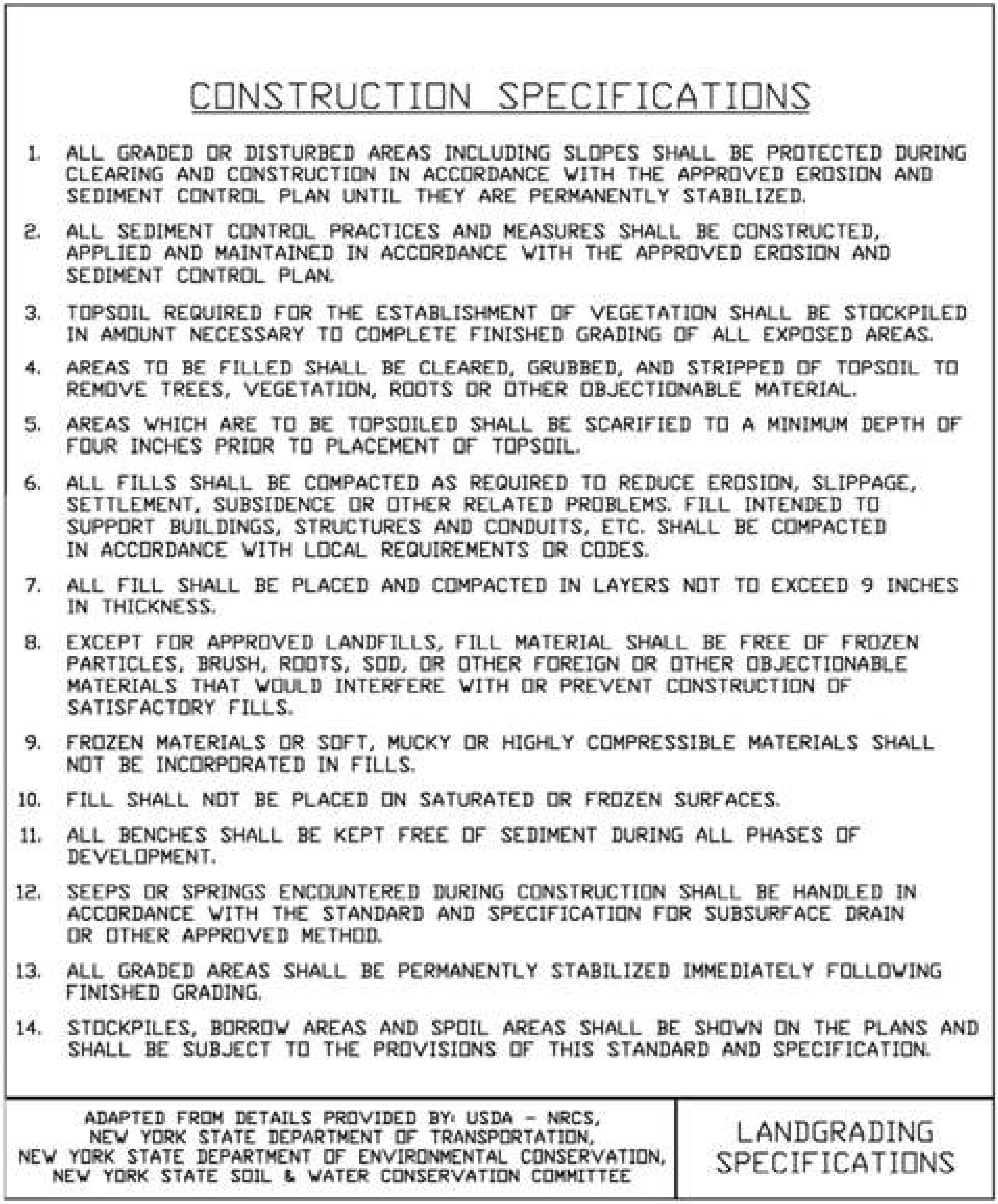
LANDGRADING
DETAIL

Figure 4.11
Landgrading - Construction Specifications



CONSTRUCTION SPECIFICATIONS

1. ALL GRADED OR DISTURBED AREAS INCLUDING SLOPES SHALL BE PROTECTED DURING CLEARING AND CONSTRUCTION IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN UNTIL THEY ARE PERMANENTLY STABILIZED.
2. ALL SEDIMENT CONTROL PRACTICES AND MEASURES SHALL BE CONSTRUCTED, APPLIED AND MAINTAINED IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN.
3. TOPSOIL REQUIRED FOR THE ESTABLISHMENT OF VEGETATION SHALL BE STOCKPILED IN AMOUNT NECESSARY TO COMPLETE FINISHED GRADING OF ALL EXPOSED AREAS.
4. AREAS TO BE FILLED SHALL BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL TO REMOVE TREES, VEGETATION, ROOTS OR OTHER OBJECTIONABLE MATERIAL.
5. AREAS WHICH ARE TO BE TOPSOILED SHALL BE SCARIFIED TO A MINIMUM DEPTH OF FOUR INCHES PRIOR TO PLACEMENT OF TOPSOIL.
6. ALL FILLS SHALL BE COMPACTED AS REQUIRED TO REDUCE EROSION, SLIPPAGE, SETTLEMENT, SUBSIDENCE OR OTHER RELATED PROBLEMS. FILL INTENDED TO SUPPORT BUILDINGS, STRUCTURES AND CONDUITS, ETC. SHALL BE COMPACTED IN ACCORDANCE WITH LOCAL REQUIREMENTS OR CODES.
7. ALL FILL SHALL BE PLACED AND COMPACTED IN LAYERS NOT TO EXCEED 9 INCHES IN THICKNESS.
8. EXCEPT FOR APPROVED LANDFILLS, FILL MATERIAL SHALL BE FREE OF FROZEN PARTICLES, BRUSH, ROOTS, SOD, OR OTHER FOREIGN OR OTHER OBJECTIONABLE MATERIALS THAT WOULD INTERFERE WITH OR PREVENT CONSTRUCTION OF SATISFACTORY FILLS.
9. FROZEN MATERIALS OR SOFT, MUCKY OR HIGHLY COMPRESSIBLE MATERIALS SHALL NOT BE INCORPORATED IN FILLS.
10. FILL SHALL NOT BE PLACED ON SATURATED OR FROZEN SURFACES.
11. ALL BENCHES SHALL BE KEPT FREE OF SEDIMENT DURING ALL PHASES OF DEVELOPMENT.
12. SEEPS OR SPRINGS ENCOUNTERED DURING CONSTRUCTION SHALL BE HANDLED IN ACCORDANCE WITH THE STANDARD AND SPECIFICATION FOR SUBSURFACE DRAIN OR OTHER APPROVED METHOD.
13. ALL GRADED AREAS SHALL BE PERMANENTLY STABILIZED IMMEDIATELY FOLLOWING FINISHED GRADING.
14. STOCKPILES, BORROW AREAS AND SPOIL AREAS SHALL BE SHOWN ON THE PLANS AND SHALL BE SUBJECT TO THE PROVISIONS OF THIS STANDARD AND SPECIFICATION.

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STANDARD AND SPECIFICATIONS FOR LOOSE STABILIZATION BLANKETS

Definition and Scope

Blankets of various materials placed pneumatically, hydraulically, or other means on a prepared planting area or a critical area where existing vegetation can remain to reduce rain splash and sheet erosion and promote vegetative stabilization.

Conditions Where Practice Applies

Loose blankets are an appropriate stabilization practice for any soil surface that is rocky, frozen, flat, or steep. They can be used on streambanks, road cuts and embankments, and construction site areas where stormwater runoff occurs as sheet flow. They should not be used in areas of concentrated flow.

Design Criteria

Compost Blanket

Material: 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 composts produced in New York State (or approved for importation) must meet NYS DEC's 6 NYCRR Part 360 (Soild 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 metal content. When using compost blankets adjacent to surface waters, the compost should have a low nutrient value.**

Placement: The method of application and depth of compost depend upon site conditions. Vegetation of the compost blanket is generally archived by incorporating seed into the compost before it is applied. However, seeding may occur after the application if needed.

The compost application rate will be in accordance with the following table. Compost is not recommended for slopes steeper than 2H:1V. Slopes with problem soils and more runoff will require greater application rates.

Compost Application Rates

Slope Length (ft)	<3H:1V Slopes	3H:1V to 2H:1V Slopes
20 or less	270 cy/acre (2" Layer)	540 cy/acre (4" Layer)
20 to 60	405 cy/acre (3" Layer)	675 cy/acre (5" Layer)
60 to 100	540 cy/acre (4" Layer)	810 cy/acre (6" Layer)*

* For slopes between 2H:1V and 1H:1V use this rate with a max. slope length of 40 ft.

Construction Specifications

1. Compost shall be placed evenly and must provide 100% soil coverage (no soil visible). On highly unstable soils, use compost in conjunction with appropriate structural measures.
2. Spread the compost uniformly to the design thickness by hand or mechanically (e.g. with a manure spreader, front end loader, dozer, pneumatic blower, etc.) and then track (compact) the compost layer using a bulldozer or other appropriate equipment.
3. When using a pneumatic (blower) unit, shoot the compost directly at soil, to provide a tighter interface between the soil and compost and prevent water from moving between the two layers.
4. Apply compost layer approximately 3 feet beyond the top of the slope or overlap it into existing vegetation.
5. Follow by seeding or ornamental planting as specified.
6. When planting immediate grass, wildflower, or legume seeding or ornamental planting, use only a well composted product that contains no substances toxic to plants.

7. Very coarse composts should be avoided if the slope is to be landscaped or seeded, as it will make planting and crop establishment more difficult. Composts containing fibrous particles that range in size produce a more stable mat.

Hydraulically Applied Blankets

These blankets are formed by mixing different types of materials with water and are then applied using standard hydroseeding equipment. These blankets should not be used in areas of concentrated flow such as ditches and channels.

A. Bonded Fiber Matrix (BFM) - This method makes use of a cross-linked hydrocolloid tackifier to bond thermally processed wood fibers. Application rates vary according to site conditions. For slopes up to 3H:1V the BFM should be applied at a rate of 3,000 lb/acre. Steeper slopes may need as much as 4,000 lb/acre in accordance with the manufacturer's recommendations.

   BFMs should only be used when no rain is forecast for at least 48 hours following the application. This is to allow the tackifier sufficient time to cure properly. Once properly applied, a BFM is very effective in preventing accelerated erosion. **Bonded Fiber Matrix should not be applied between September 30 and April 1 to allow for proper curing of the polymer.**

B. Flexible Growth Medium (FGM) - This method has the added component of 1/2 inch long, crimped manmade fibers which add a mechanical bond to the chemical bond provided by BFMs. This increases the blanket's resistance to both raindrop impact and erosion due to runoff. Unlike BFMs, a flexible growth medium typically does not require a curing time to be effective. Properly applied, an FGM is also very effective.

   There is no need to smooth the slope prior to application. In fact some roughening of the surface (either natural or mechanically induced) is preferable. However, large rocks (≥ 9 inches) and existing rills should be removed prior to application. Mixing and application rates should follow manufacturer's recommendations.

C. Polymer Stabilized Fiber Matrix (PSFM) - PSFMs make use of a linear soil stabilization tackifier that works directly on soil to maintain soil structure, maintain pore space capacity and flocculate dislodged sediment that will significantly reduce runoff turbidity. PSFMs can be used in re-vegetation applications and for site winterization and/or dormant seeding - fall planting for spring germination - applications. Application rates vary according to site conditions and should be in accordance with manufacturers recommendations.

Construction Specifications

BFMs, FGMs and PSFMs are typically applied in two stages. Unless specifically recommended to be applied in one application by the manufacturer, the seed mixture and soil amendments should be applied first. If the seed is applied at the same time as the hydraulically applied blankets, the bonded fibers may keep the seed from making sufficient contact with the soil to germinate. After the seed mixture is applied, the hydraulically applied blankets should be sprayed over the area at the required application rate, according to the manufactures recommendations.

STANDARD AND SPECIFICATIONS FOR MULCHING

Definition and Scope

Applying coarse plant residue or chips, or other suitable materials, to cover the soil surface to provide initial erosion control while a seeding or shrub planting is establishing. Mulch will conserve moisture and modify the surface soil temperature and reduce fluctuation of both. Mulch will prevent soil surface crusting and aid in weed control. Mulch can also be used alone for temporary stabilization in non-growing months. Use of stone as a mulch could be more permanent and should not be limited to non-growing months.

Conditions Where Practice Applies

On soils subject to erosion and on new seedings and shrub plantings. Mulch is useful on soils with low infiltration rates by retarding runoff.

Criteria

Site preparation prior to mulching requires the installation of necessary erosion control or water management practices and drainage systems.

Slope, grade and smooth the site to fit needs of selected mulch products.

Remove all undesirable stones and other debris to meet the needs of the anticipated land use and maintenance required.

Apply mulch after soil amendments and planting is accomplished or simultaneously if hydroseeding is used.

Select appropriate mulch material and application rate or material needs. Hay mulch shall not be used in wetlands or in areas of permanent seeding. Clean straw mulch is preferred alternative in wetland application. Determine local availability.

Select appropriate mulch anchoring material.

NOTE: The best combination for grass/legume establishment is straw (cereal grain) mulch applied at 2 ton/acre (90 lbs./1000sq.ft.) and anchored with wood fiber mulch (hydromulch) at 500 – 750 lbs./acre (11 – 17 lbs./1000 sq. ft.). The wood fiber mulch must be applied through a hydroseeder immediately after mulching.

Table 4.2
Guide to Mulch Materials, Rates, and Uses

Mulch Material	Quality Standards	per 1000 Sq. Ft.	per Acre	Depth of Application	Remarks
Wood chips or shavings	Air-dried. Free of objectionable coarse material	500-900 lbs.	10-20 tons	2-7”	Used primarily around shrub and tree plantings and recreation trails to inhibit weed competition. Resistant to wind blowing. Decomposes slowly.
Wood fiber cellulose (partly digested wood fibers)	Made from natural wood usually with green dye and dispersing agent	50 lbs.	2,000 lbs.	—	Apply with hydromulcher. No tie down required. Less erosion control provided than 2 tons of hay or straw.
Gravel, Crushed Stone or Slag	Washed; Size 2B or 3A—1 1/2”	9 cu. yds.	405 cu. yds.	3”	Excellent mulch for short slopes and around plants and ornamentals. Use 2B where subject to traffic. (Approximately 2,000 lbs./cu. yd.). Frequently used over filter fabric for better weed control.
Hay or Straw	Air-dried; free of undesirable seeds & coarse materials	90-100 lbs. 2-3 bales	2 tons (100-120 bales)	cover about 90% surface	Use small grain straw where mulch is maintained for more than three months. Subject to wind blowing unless anchored. Most commonly used mulching material. Provides the best micro-environment for germinating seeds.
Jute twisted yarn	Undyed, unbleached plain weave. Warp 78 ends/yd., Weft 41 ends/yd. 60-90 lbs./roll	48” x 50 yds. or 48” x 75 yds.	—	—	Use without additional mulch. Tie down as per manufacturers specifications. Good for center line of concentrated water flow.
Excelsior wood fiber mats	Interlocking web of excelsior fibers with photodegradable plastic netting	4’ x 112.5’ or 8’ x 112.5’.	—	—	Use without additional mulch. Excellent for seeding establishment. Anchor as per manufacturers specifications. Approximately 72 lbs./roll for excelsior with plastic on both sides. Use two sided plastic for centerline of waterways.
Straw or coconut fiber, or combination	Photodegradable plastic net on one or two sides	Most are 6.5 ft. x 3.5 ft.	81 rolls	—	Designed to tolerate higher velocity water flow, centerlines of waterways, 60 sq. yds. per roll.

Table 4.3
Mulch Anchoring Guide

Anchoring Method or Material	Kind of Mulch to be Anchored	How to Apply
1. Peg and Twine	Hay or straw	After mulching, divide areas into blocks approximately 1 sq. yd. in size. Drive 4-6 pegs per block to within 2" to 3" of soil surface. Secure mulch to surface by stretching twine between pegs in criss-cross pattern on each block. Secure twine around each peg with 2 or more tight turns. Drive pegs flush with soil. Driving stakes into ground tightens the twine.
2. Mulch netting	Hay or straw	Staple the light-weight paper, jute, wood fiber, or plastic nettings to soil surface according to manufacturer's recommendations. Should be biodegradable. Most products are not suitable for foot traffic.
3. Wood cellulose fiber	Hay or straw	Apply with hydroseeder immediately after mulching. Use 500 lbs. wood fiber per acre. Some products contain an adhesive material ("tackifier"), possibly advantageous.
4. Mulch anchoring tool	Hay or straw	Apply mulch and pull a mulch anchoring tool (blunt, straight discs) over mulch as near to the contour as possible. Mulch material should be "tucked" into soil surface about 3".
5. Tackifier	Hay or straw	Mix and apply polymeric and gum tackifiers according to manufacturer's instructions. Avoid application during rain. A 24-hour curing period and a soil temperature higher than 45^0 Fahrenheit are required.

STANDARD AND SPECIFICATIONS FOR PERMANENT CONSTRUCTION AREA PLANTING

Definition & Scope

Establishing **permanent** grasses with other forbs and/or shrubs to provide a minimum 80% perennial vegetative cover on areas disturbed by construction and critical areas to reduce erosion and sediment transport. Critical areas may include but are not limited to steep excavated cut or fill slopes as well as eroding or denuded natural slopes and areas subject to erosion.

Conditions Where Practice Applies

This practice applies to all disturbed areas void of, or having insufficient, cover to prevent erosion and sediment transport. See additional standards for special situations such as sand dunes and sand and gravel pits.

Criteria

All water control measures will be installed as needed prior to final grading and seedbed preparation. Any severely compacted sections will require chiseling or disking to provide an adequate rooting zone, to a minimum depth of 12”, see Soil Restoration Standard. The seedbed must be prepared to allow good soil to seed contact, with the soil not too soft and not too compact. Adequate soil moisture must be present to accomplish this. If surface is powder dry or sticky wet, postpone operations until moisture changes to a favorable condition. If seeding is accomplished within 24 hours of final grading, additional scarification is generally not needed, especially on ditch or stream banks. Remove all stones and other debris from the surface that are greater than 4 inches, or that will interfere with future mowing or maintenance.

Soil amendments should be incorporated into the upper 2 inches of soil when feasible. **The soil should be tested to determine the amounts of amendments needed.** Apply ground agricultural limestone to attain a pH of 6.0 in the upper 2 inches of soil. If soil must be fertilized before results of a soil test can be obtained to determine fertilizer needs, apply commercial fertilizer at 600 lbs. per acre of 5-5-10 or equivalent. If manure is used, apply a quantity to meet the nutrients of the above fertilizer. This requires an appropriate manure analysis prior to applying to the site. Do not use manure on sites to be planted with birdsfoot trefoil or in the path of concentrated water flow.

Seed mixtures may vary depending on location within the state and time of seeding. Generally, warm season grasses should only be seeded during early spring, April to May. These grasses are primarily used for vegetating excessively drained sands and gravels. See Standard and Specification for Sand and Gravel Mine Reclamation. Other grasses may be seeded any time of the year when the soil is not frozen and is workable. When legumes such as birdsfoot trefoil are included, spring seeding is preferred. See Table 4.4, “Permanent Construction Area Planting Mixture Recommendations” for additional seed mixtures.

General Seed Mix:	**Variety**	**lbs./ acre**	**lbs/1000 sq. ft.**
Red Clover[1] OR	Acclaim, Rally, Red Head II, Renegade	8[2]	0.20
Common white clover[1]	Common	8	0.20
PLUS			
Creeping Red Fescue	Common	20	0.45
PLUS			
Smooth Bromegrass OR	Common	2	0.05
Ryegrass (perennial)	Pennfine/Linn	5	0.10

[1] add inoculant immediately prior to seeding
[2] Mix 4 lbs each of Empire and Pardee OR 4 lbs of Birdsfoot and 4 lbs white clover per acre. All seeding rates are given for Pure Live Seed (PLS)

Pure Live Seed, or (PLS) refers to the amount of live seed in a lot of bulk seed. Information on the seed bag label includes the type of seed, supplier, test date, source of seed, purity, and germination. Purity is the percentage of pure seed. Germination is the percentage of pure seed that will produce normal plants when planted under favorable conditions.

To compute Pure Live Seed multiply the “germination percent” times the “purity” and divide that by 100 to get Pure Live Seed.

$$\text{Pure Live Seed (PLS)} = \frac{\%\text{ Germination} \times \%\text{ Purity}}{100}$$

For example, the PLS for a lot of Kentucky Blue grass with 75% purity and 96% germination would be calculated as follows:

$$\frac{(96) \times (75)}{100} = 72\%\ \text{Pure Live Seed}$$

For 10lbs of PLS from this lot =

$$\frac{10}{0.72} = 13.9\ \text{lbs}$$

Therefore, 13.9 lbs of seed is the actual weight needed to meet 10lbs PSL from this specific seed lot.

Time of Seeding: The optimum timing for the general seed mixture is early spring. Permanent seedings may be made any time of year if properly mulched and adequate moisture is provided. Late June through early August is not a good time to seed, but may facilitate covering the land without additional disturbance if construction is completed. Portions of the seeding may fail due to drought and heat. These areas may need reseeding in late summer/fall or the following spring.

Method of seeding: Broadcasting, drilling, cultipack type seeding, or hydroseeding are acceptable methods. Proper soil to seed contact is key to successful seedings.

Mulching: Mulching is essential to obtain a uniform stand of seeded plants. Optimum benefits of mulching new seedings are obtained with the use of small grain straw applied at a rate of 2 tons per acre, and anchored with a netting or tackifier. See the Standard and Specifications for Mulching for choices and requirements.

Irrigation: Watering may be essential to establish a new seeding when a drought condition occurs shortly after a new seeding emerges. Irrigation is a specialized practice and care must be taken not to exceed the application rate for the soil or subsoil. When disconnecting irrigation pipe, be sure pipes are drained in a safe manor, not creating an erosion concern.

80% Perennial Vegetative Cover

50% Perennial Vegetative Cover

Table 4.4
Permanent Construction Area Planting Mixture Recommendations

Seed Mixture	Variety	Rate in lbs./acre (PLS)	Rate in lbs./ 1, 000 ft^2
Mix #1			
Creeping red fescue	Ensylva, Pennlawn, Boreal	10	.25
Perennial ryegrass	Pennfine, Linn	10	.25
*This mix is used extensively for shaded areas.			
Mix #2			
Switchgrass	Shelter, Pathfinder, Trailblazer, or Blackwell	20	.50
*This rate is in pure live seed, this would be an excellent choice along the upland edge of a wetland to filter runoff and provide wildlife benefits. In areas where erosion may be a problem, a companion seeding of sand lovegrass should be added to provide quick cover at a rate of 2 lbs. per acre (0.05 lbs. per 1000 sq. ft.).			
Mix #3			
Switchgrass	Shelter, Pathfinder, Trailblazer, or Blackwell	4	.10
Big bluestem	Niagara	4	.10
Little bluestem	Aldous or Camper	2	.05
Indiangrass	Rumsey	4	.10
Coastal panicgrass	Atlantic	2	.05
Sideoats grama	El Reno or Trailway	2	.05
Wildflower mix		.50	.01
*This mix has been successful on sand and gravel plantings. It is very difficult to seed without a warm season grass seeder such as a Truax seed drill. Broadcasting this seed is very difficult due to the fluffy nature of some of the seed, such as bluestems and indiangrass.			
Mix #4			
Switchgrass	Shelter, Pathfinder, Trailblazer, or Blackwell	10	.25
Coastal panicgrass	Atlantic	10	.25
*This mix is salt tolerant, a good choice along the upland edge of tidal areas and roadsides.			
Mix #5			
Saltmeadow cordgrass (Spartina patens)—This grass is used for tidal shoreline protection and tidal marsh restoration. It is planted by vegetative stem divisions. 'Cape' American beachgrass can be planted for sand dune stabilization above the saltmeadow cordgrass zone.			
Mix #6			
Creeping red fescue	Ensylva, Pennlawn, Boreal	20	.45
Chewings Fescue	Common	20	.45
Perennial ryegrass	Pennfine, Linn	5	.10
Red Clover	Common	10	.45
*General purpose erosion control mix. Not to be used for a turf planting or play grounds.			

STANDARD AND SPECIFICATIONS FOR SOIL RESTORATION

Definition & Scope

The decompaction of areas of a development site or construction project where soils have been disturbed to recover the original properties and porosity of the soil; thus providing a sustainable growth medium for vegetation, reduction of runoff and filtering of pollutants from stormwater runoff.

Conditions Where Practice Applies

Soil restoration is to be applied to areas whose heavy construction traffic is done and final stabilization is to begin. This is generally applied in the cleanup, site restoration, and landscaping phase of construction followed by the permanent establishment of an appropriate ground cover to maintain the soil structure. Soil restoration measures should be applied over and adjacent to any runoff reduction practices to achieve design performance.

Design Criteria

1. Soil restoration areas will be designated on the plan views of areas to be disturbed.
2. Soil restoration will be completed in accordance with Table 4.6 on page 4.53.

Specification for Full Soil Restoration

During periods of relatively low to moderate subsoil moisture, the disturbed subsoils are returned to rough grade and the following Soil Restoration steps applied:

1. Apply 3 inches of compost over subsoil. The compost 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, except for “Particle Size” 100% will pass the 1/2” sieve. **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.**

2. Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor mounted disc, or tiller, to mix and circulate air and compost into the subsoil.
3. Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off the site.
4. Apply topsoil to a depth of 6 inches.
5. Vegetate as required by the seeding plan. Use appropriate ground cover with deep roots to maintain the soil structure.
6. Topsoil may be manufactured as a mixture or a mineral component and organic material such as compost.

At the end of the project an inspector should be able to push a 3/8” metal bar 12 inches into the soil just with body weight. This should not be performed within the drip line of any existing trees or over utility installations that are within 24 inches of the surface.

Maintenance

Keep the site free of vehicular and foot traffic or other weight loads. Consider pedestrian footpaths.

Table 4.6
Soil Restoration Requirements

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

STANDARD AND SPECIFICATIONS FOR SURFACE ROUGHENING

Definition & Scope

Roughening a bare soil surface whether through creating horizontal grooves across a slope, stair-stepping, or tracking with construction equipment to aid the establishment of vegetative cover from seed, to reduce runoff velocity and increase infiltration, and to reduce erosion and provide for trapping of sediment.

Conditions Where Practice Applies

All construction slopes require surface roughening to facilitate stabilization with vegetation, particularly slopes steeper than 3:1.

Design Criteria

There are many different methods to achieve a roughened soil surface on a slope. No specific design criteria is required. However, the selection of the appropriate method depends on the type of slope. Methods include tracking, grooving, and stair-stepping. Steepness, mowing requirements, and/or a cut or fill slope operation are all factors considered in choosing a roughening method.

Construction Specifications

1. Cut Slope, No mowing.

   A. Stair-step grade or groove cut slopes with a gradient steeper than 3:1 (Figure 4.18).

   B. Use stair-step grading on any erodible material soft enough to be ripped with a bulldozer. Slopes of soft rock with some soil are particularly suited to stair-step grading.

   C. Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the “step” to the vertical wall.

   D. Do not make vertical cuts more than 2 feet in soft materials or 3 feet in rocky materials.

Grooving uses machinery to create a series of ridges and depressions that run perpendicular to the slope following the contour. Groove using any appropriate implement that can be safely operated on the slope, such as disks, tillers, spring harrows, or the teeth of a front-end loader bucket. Do not make the grooves less than 3 inches deep or more than 15 inches apart.

2. Fill Slope, No mowing

   A. Place fill to create slopes with a gradient no steeper than 2:1 in lifts 9 inches or less and properly compacted. Ensure the face of the slope consists of loose, uncompacted fill 4 to 6 inches deep. Use grooving as described above to roughen the slope, if necessary.

   B. Do not back blade or scrape the final slope face.

3. Cuts/Fills, Mowed Maintenance

   A. Make mowed slopes no steeper than 3:1.

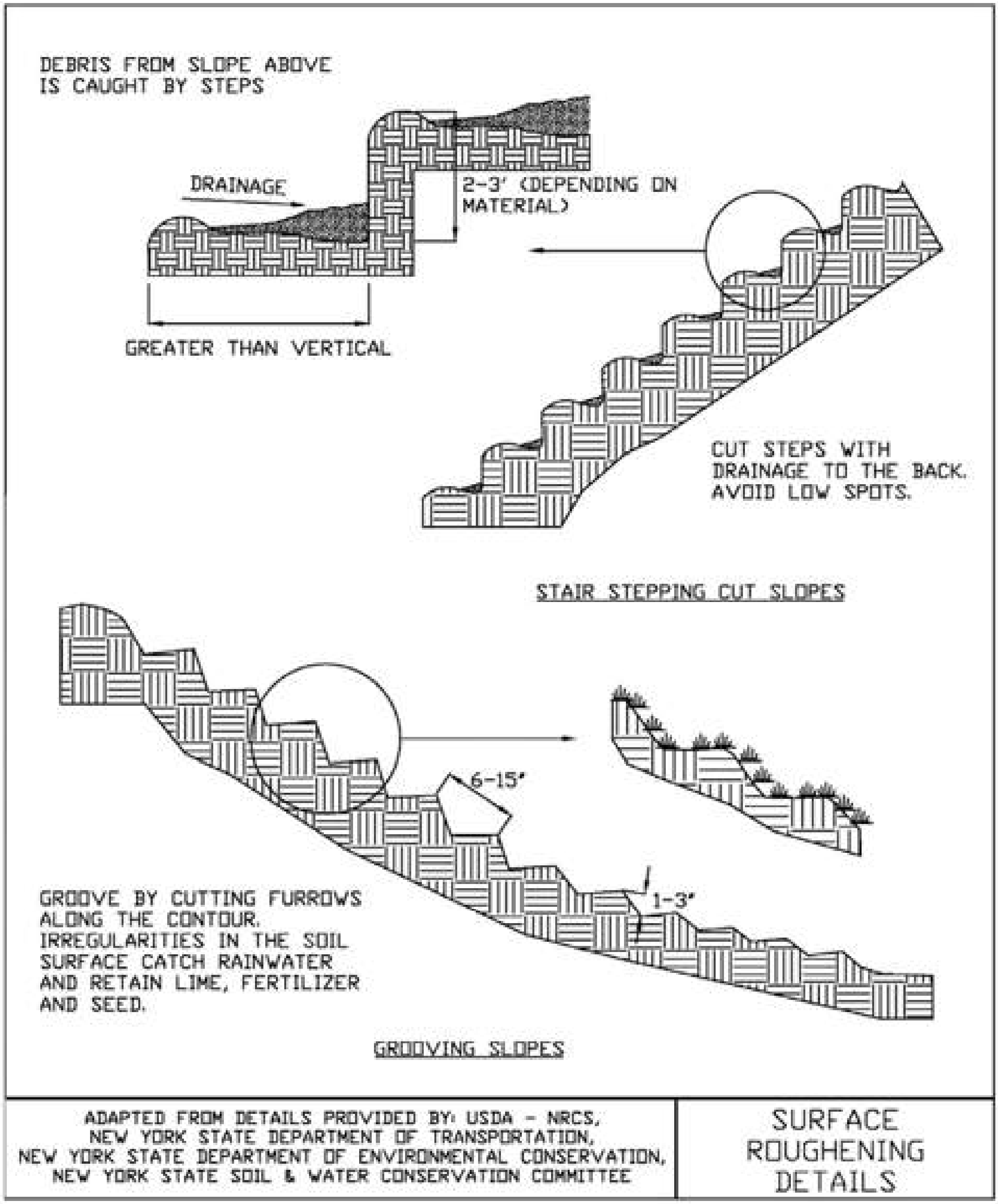
   B. Roughen these areas to shallow grooves by normal tilling, disking, harrowing, or use of cultipacker-seeder. Make the final pass of such tillage equipment on the contour.

   C. Make grooves at least 1 inch deep and a maximum of 10 inches apart.

   D. Excessive roughness is undesirable where mowing is planned.

Tracking should be used primarily in sandy soils to avoid undue compaction of the soil surface. Tracking is generally not as effective as the other roughening methods described. (It has been used as a method to track down mulch.) Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not back-blade during the final grading operation.

Figure 4.18
Surface Roughening



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

STANDARD AND SPECIFICATIONS FOR TEMPORARY CONSTRUCTION AREA SEEDING

Definition & Scope

Providing temporary erosion control protection to disturbed areas and/or localized critical areas for an interim period by covering all bare ground that exists as a result of construction activities or a natural event. Critical areas may include but are not limited to steep excavated cut or fill slopes and any disturbed, denuded natural slopes subject to erosion.

Conditions Where Practice Applies

Temporary seedings may be necessary on construction sites to protect an area, or section, where final grading is complete, when preparing for winter work shutdown, or to provide cover when permanent seedings are likely to fail due to mid-summer heat and drought. The intent is to provide temporary protective cover during temporary shutdown of construction and/or while waiting for optimal planting time.

Criteria

Water management practices must be installed as appropriate for site conditions. The area must be rough graded and slopes physically stable. Large debris and rocks are usually removed. Seedbed must be seeded within 24 hours of disturbance or scarification of the soil surface will be necessary prior to seeding.

Fertilizer or lime are not typically used for temporary seedings.

IF: Spring or summer or early fall, then seed the area with ryegrass (annual or perennial) at 30 lbs. per acre (Approximately 0.7 lb./1000 sq. ft. or use 1 lb./1000 sq. ft.).

IF: Late fall or early winter, then seed Certified ‘Aroostook’ winter rye (cereal rye) at 100 lbs. per acre (2.5 lbs./1000 sq. ft.).

Any seeding method may be used that will provide uniform application of seed to the area and result in relatively good soil to seed contact.

Mulch the area with hay or straw at 2 tons/acre (approx. 90 lbs./1000 sq. ft. or 2 bales). Quality of hay or straw mulch allowable will be determined based on long term use and visual concerns. Mulch anchoring will be required where wind or areas of concentrated water are of concern. Wood fiber hydromulch or other sprayable products approved for erosion control (nylon web or mesh) may be used if applied according to manufacturers’ specification. Caution is advised when using nylon or other synthetic products. They may be difficult to remove prior to final seeding and can be a hazard to young wildlife species.

STANDARD AND SPECIFICATIONS FOR TOPSOILING

Definition & Scope

Spreading a specified quality and quantity of topsoil materials on graded or constructed subsoil areas to provide acceptable plant cover growing conditions, thereby reducing erosion; to reduce irrigation water needs; and to reduce the need for nitrogen fertilizer application.

Conditions Where Practice Applies

Topsoil is applied to subsoils that are droughty (low available moisture for plants), stony, slowly permeable, salty or extremely acid. It is also used to backfill around shrub and tree transplants. This standard does not apply to wetland soils.

Design Criteria

1. Preserve existing topsoil in place where possible, thereby reducing the need for added topsoil.
2. Conserve by stockpiling topsoil and friable fine textured subsoils that must be stripped from the excavated site and applied after final grading where vegetation will be established. Topsoil stockpiles must be stabilized. Stockpile surfaces can be stabilized by vegetation, geotextile or plastic covers. This can be aided by orientating the stockpile lengthwise into prevailing winds.
3. Refer to USDA Natural Resource Conservation Service soil surveys or soil interpretation record sheets for further soil texture information for selecting appropriate design topsoil depths.

Site Preparation

1. As needed, install erosion and sediment control practices such as diversions, channels, sediment traps, and stabilizing measures, or maintain if already installed.
2. Complete rough grading and final grade, allowing for depth of topsoil to be added.
3. Scarify all compact, slowly permeable, medium and fine textured subsoil areas. Scarify at approximately right angles to the slope direction in soil areas that are steeper than 5 percent. Areas that have been overly compacted shall be decompacted in accordance with the Soil Restoration Standard.
4. Remove refuse, woody plant parts, stones over 3 inches in diameter, and other litter.

Topsoil Materials

1. Topsoil shall have at least 6 percent by weight of fine textured stable organic material, and no greater than 20 percent. Muck soil shall not be considered topsoil.
2. Topsoil shall have not less than 20 percent fine textured material (passing the NO. 200 sieve) and not more than 15 percent clay.
3. Topsoil treated with soil sterilants or herbicides shall be so identified to the purchaser.
4. Topsoil shall be relatively free of stones over 1 1/2 inches in diameter, trash, noxious weeds such as nut sedge and quackgrass, and will have less than 10 percent gravel.
5. Topsoil containing soluble salts greater than 500 parts per million shall not be used.
6. Topsoil may be manufactured as a mixture of a mineral component and organic material such as compost.

Application and Grading

1. Topsoil shall be distributed to a uniform depth over the area. It shall not be placed when it is partly frozen, muddy, or on frozen slopes or over ice, snow, or standing water puddles.
2. Topsoil placed and graded on slopes steeper than 5 percent shall be promptly fertilized, seeded, mulched, and stabilized by “tracking” with suitable equipment.
3. Apply topsoil in the amounts shown in Table 4.7 below:

Table 4.7 - Topsoil Application Depth		
Site Conditions	**Intended Use**	**Minimum Topsoil Depth**
1. Deep sand or loamy sand	Mowed lawn	6 in.
	Tall legumes, unmowed	2 in.
	Tall grass, unmowed	1 in.
2. Deep sandy loam	Mowed lawn	5 in.
	Tall legumes, unmowed	2 in.
	Tall grass, unmowed	none
3. Six inches or more: silt loam, clay loam, loam, or silt	Mowed lawn	4 in.
	Tall legumes, unmowed	1 in.
	Tall grass, unmowed	1 in.

STANDARD AND SPECIFICATIONS FOR VEGETATING WATERWAYS

Definition & Scope

Waterways are a **permanently** constructed conveyance channel, shaped or graded. They are vegetated for the safe transport of excess surface water from construction sites and urban areas without damage from erosion.

Conditions Where Practice Applies

This standard applies to vegetating waterways and similar water carrying structures.

Supplemental measures may be required with this practice. These may include: subsurface drainage to permit the growth of suitable vegetation and to eliminate wet spots; a section stabilized with asphalt, stone, or other suitable means; or additional storm drains to handle snowmelt or storm runoff.

Retardance factors for determining waterway dimensions are shown in Table 3.1 on page 3.10 and "Maximum Permissible Velocities for Selected Grass and Legume Mixtures" (See Table 4.10 on page 4.79).

Design Criteria

Waterways or outlets shall be protected against erosion by vegetative means as soon after construction as practical. Vegetation must be well established before diversions or other channels are outletted into them. Consideration should be given to the use of turf reinforcement mats, excelsior matting, other rolled erosion control products, or sodding of channels to provide erosion protection as soon after construction as possible. It is strongly recommended that the center line of the waterway be protected with one of the above materials to avoid center gullies and to protect seedlings from erosion before establishment.

1. Liming, fertilizing, and seedbed preparation.

    A. Lime to pH 6.5.

    B. **The soil should be tested to determine the amounts of amendments needed.** If the soil must be fertilized before results of a soil test can be obtained to determine fertilizer needs, apply commercial fertilizer at 1.0 lbs/1,000 sq. ft. of N, P_2O_5, and K_2O.

    C. Lime and fertilizer shall be mixed thoroughly into the seedbed during preparation.

    D. Channels, except for paved section, shall have at least 4 inches of topsoil.

    E. Remove stones and other obstructions that will hinder maintenance.

2. Timing of Seeding.

    A. Early spring and late August are best.

    B. Temporary cover to protect from erosion is recommended during periods when seedings may fail.

3. Seed Mixtures:

Mixtures	Rate per Acre (lbs)	Rate per 1,000 sq. ft. (lbs)
A. White clover or ladino clover[1]	8	0.20
Smooth bromegrass	20	0.45
Creeping red fescue[2]	2	0.05
Total	30	0.70
OR		
B. Smooth bromegass[3]	25	0.60
Creeping red fescue	20	0.50
Perennial ryegrass	10	0.20
Total	55	1.30

[1] Inoculate with appropriate inoculum immediately prior to seeding. Ladino or birdsfoot trefoil may be substituted for common white clover and seeded at the same rate.

[2] Perennial ryegrass may be substituted for the creeping red fescue but increase seeding rate to 5 lbs/acre (0.1 lb/1,000 sq. ft).

[3] Use this mixture in areas which are mowed frequently. Common white clover may be added if desired and seeded at 8 lbs/acre (0.2 lb/1,000 sq. ft.)

4. Seeding

Select the appropriate seed mixture and apply uniformly over the area. Rolling or cultipacking across the waterway is desirable.

Waterway centers or crucial areas may be sodded. Refer to the standard and specification for Stabilization with Sod. Be sure sod is securely anchored using staples or stakes.

5. Mulching

All seeded areas will be mulched. Channels more than 300 feet long, and/or where the slope is 5 percent or more, must have the mulch securely anchored. Refer to the standard and specifications for Mulching for details.

6. Maintenance

Fertilize, lime, and mow as needed to maintain dense protective vegetative cover.

Waterways shall not be used for roadways.

If rills develop in the centerline of a waterway, prompt attention is required to avoid the formation of gullies. Either stone and/or compacted soil fill with excelsior or filter fabric as necessary may be used during the establishment phase. See Figure 4.25, Rill Maintenance Measures. Spacing between rill maintenance barriers shall not exceed 100 feet.

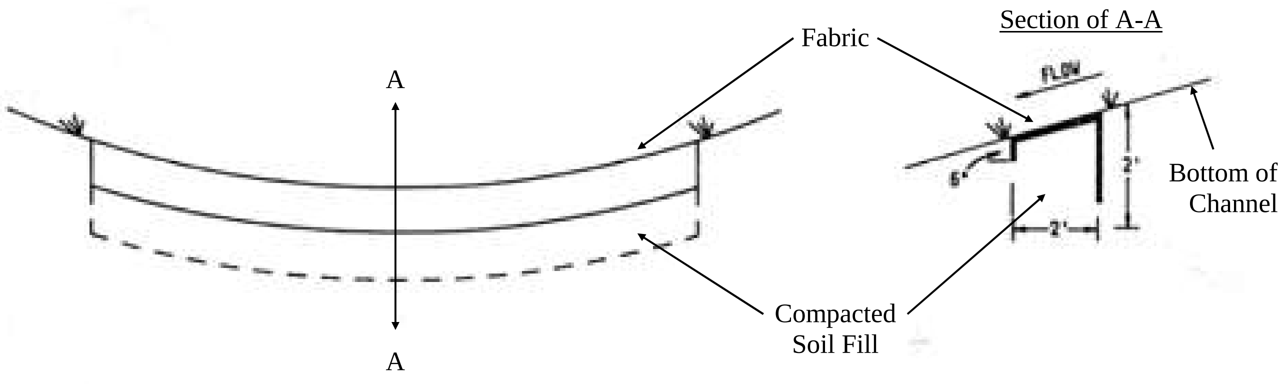
Table 4.10
Maximum Permissible Velocities for Selected Seed Mixtures

Cover	Slope Range [2] (%)	Permissible Velocity [1]	
		Erosion-resistant Soils (ft. per sec.) K=0.10 - 0.35 [3]	**Easily Eroded Soils (ft. per sec.) K=0.36 - 0.80**
Smooth Bromegrass Hard Fescue	0-5 5-10 Over 10	7 6 5	5 4 3
Grass Mixtures	[2] 0-5 5-10	5 4	4 3
White/Red Clover Alfalfa Red Fescue	[4] 0-5	3.5	2.5

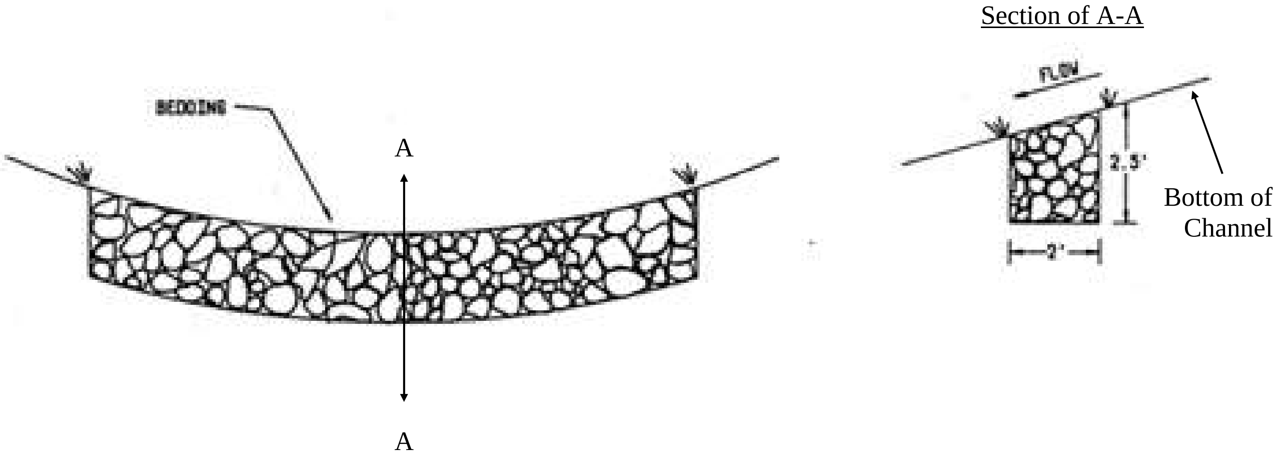
[1] Use velocities exceeding 5 feet per second only where good covers and proper maintenance can be obtained.
[2] Do not use on slopes steeper than 10 percent except for vegetated side slopes in combination with a stone, concrete, or highly resistant vegetative center section.
[3] K is the soil erodibility factor used in the Revised Universal Soil Loss Equation. Visit Appendix A or consult the appropriate USDA-NRCS technical guide for K values for New York State soils.
[4] Do not use on slopes steeper than 5 percent except for vegetated side slopes in combination with a stone, concrete, or highly resistant vegetative center section.
[5] Annuals - use on mild slopes or as temporary protection until permanent covers are established.
[6] Use on slopes steeper than 5 percent is not recommended.

Figure 4.25
Rill Maintenance Measures

Filter Fabric



Stone



STANDARD AND SPECIFICATIONS FOR BUFFER FILTER STRIP

Land Slope (%)	Minimum Filter Strip Width (ft.)
≤10	50
20	60
30	85
40	105
50	125
60	145
70	165

Definition & Scope

A **temporary/permanent** well vegetated grassed area below a disturbed area that can be used to remove sediment from runoff prior to it reaching surface waters or other designated areas of concern, such as parking lots and road pavement.

Condition Where Practice Applies

This practice is effective when the flow is in the form of sheet flow and the vegetative cover is established prior to disturbance. Surface water must be protected from sediment-laden runoff until buffer filter strip vegetation is established, and then the proposed disturbance can be undertaken. This practice is effective when the flow is in the form of sheet flow (maximum of 150 feet).

Design Criteria

1. The vegetation should be a well established perennial grass. Wooded and brushy areas are not acceptable for purposes of sediment removal.

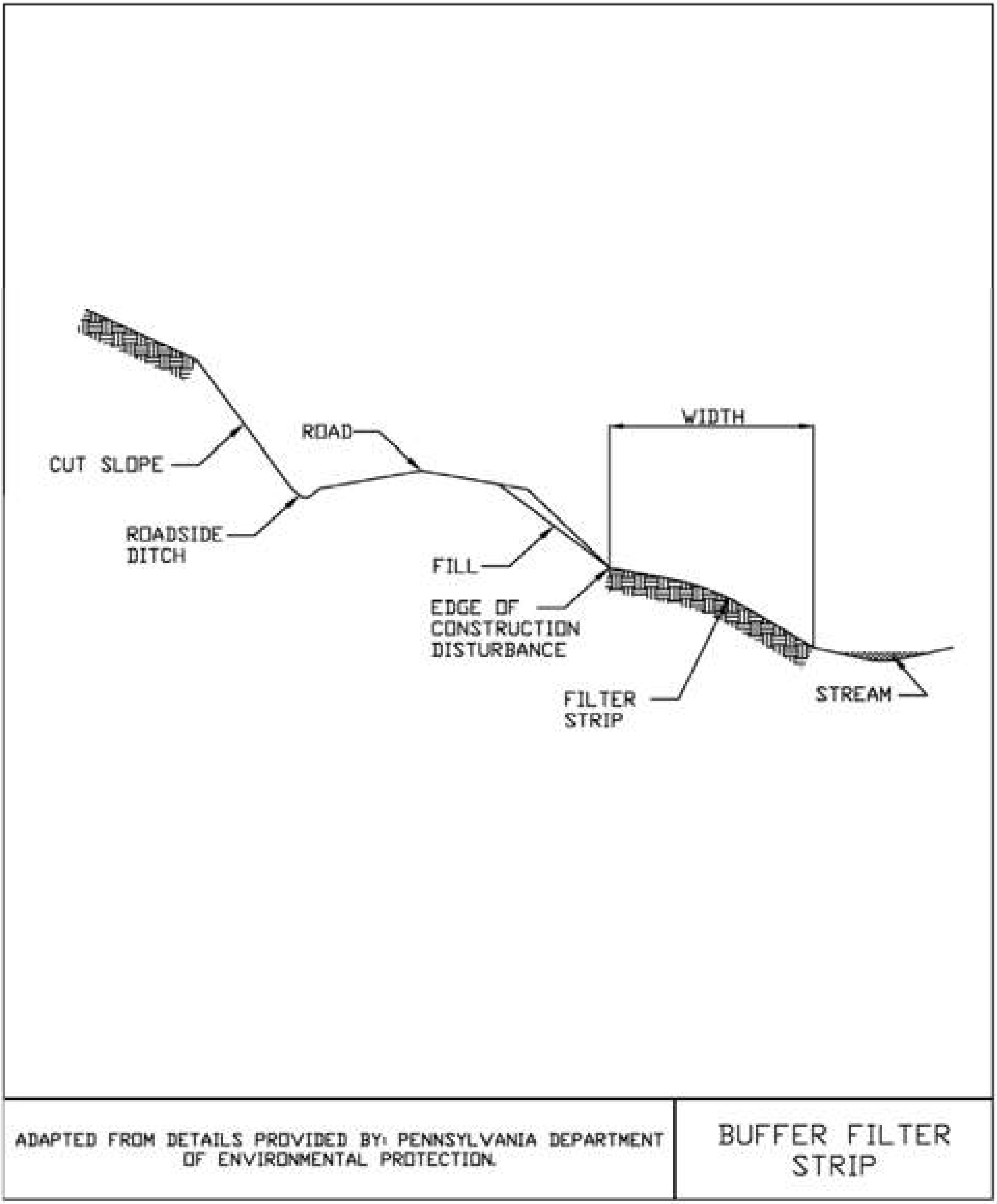
2. The minimum buffer filter strip width for stream protection shall be in accordance with the following table:

3. The minimum buffer filter strip width to protect paved areas during construction is 20 feet.

Maintenance

If at any time the width of the buffer filter strip has been reduced by sediment deposition to half its original width or concentrated flow has developed, suitable additional practices should be installed. The erosion and sediment control plan shall include these details.

Figure 5.1
Buffer Filter Strip



ADAPTED FROM DETAILS PROVIDED BY: PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION.

BUFFER FILTER STRIP

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.

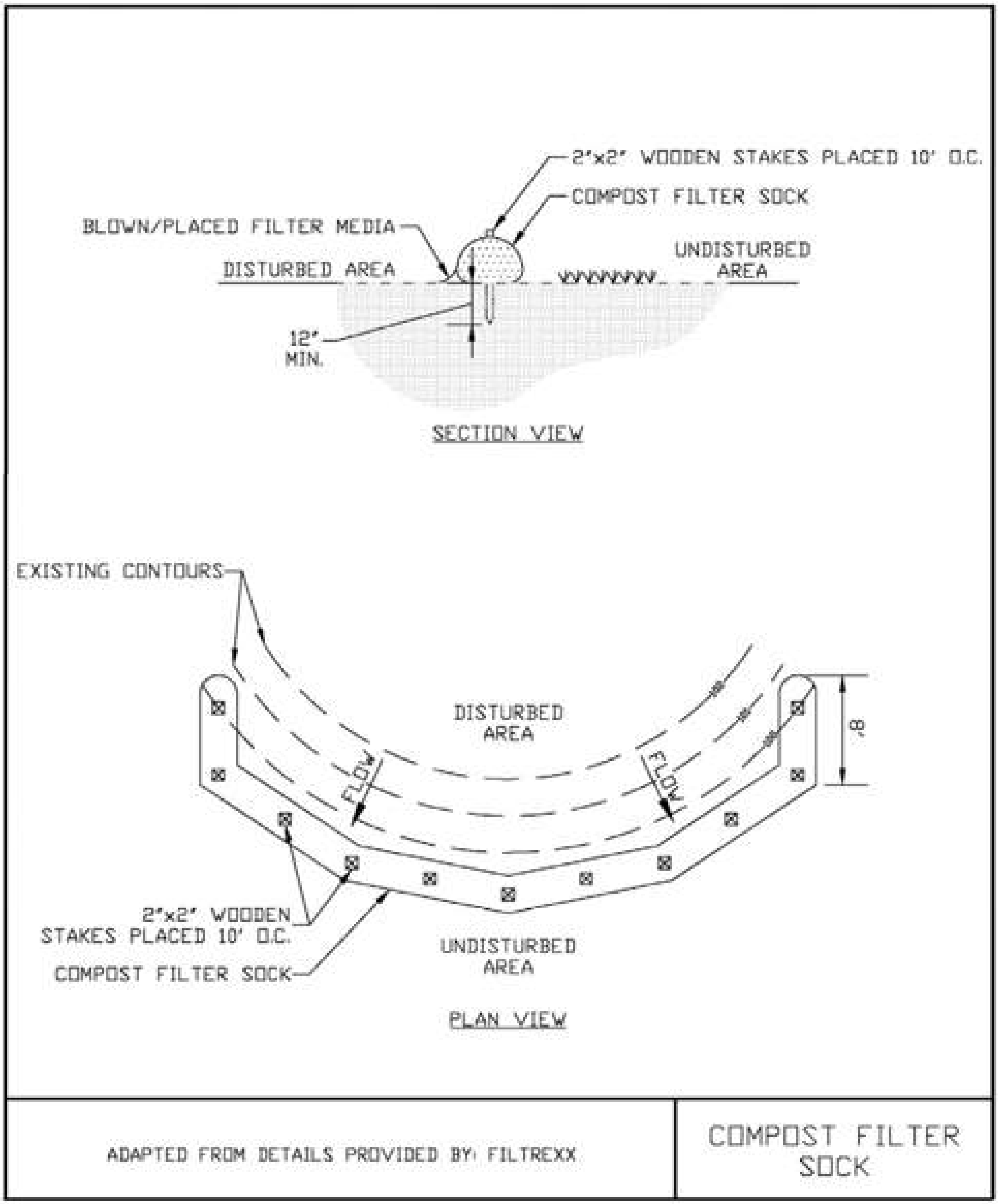
Table 5.1 - Compost Sock Fabric Minimum Specifications Table

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



ADAPTED FROM DETAILS PROVIDED BY: FILTREXX

STANDARD AND SPECIFICATIONS FOR GEOTEXTILE FILTER BAG

Definition & Scope

A **temporary** portable device through which sediment laden water is pumped to trap and retain sediment prior to its discharge to drainageways or off-site.

Condition Where Practice Applies

On sites where space is limited such as urban construction or linear projects (e.g. roads and utility work) where rights-of-way are limited and larger de-silting practices are impractical.

Design Criteria

1. Location - The portable filter bag should be located to minimize interference with construction activities and pedestrian traffic. It should also be placed in a location that is vegetated, relatively level, and provides for ease of access by heavy equipment, cleanout, disposal of trapped sediment, and proper release of filtered water.

   The filter bag shall also be placed at least 50 feet from all wetlands, streams or other surface waters.

2. Size - Geotextile filter bag shall be sized in accordance with the manufacturers recommendations based on the pump discharge rate.

Materials and Installation

1. The geotextile material will have the following attributes:

Minimum Grab Tensile Strength	200 lbs.
Minimum Grab Tensile Elongation	50 %
Minimum Trapezoid Tear Strength	80 lbs.
Mullen Burst Strength	380 psi
Minimum Puncture Strength	130 lbs
Apparent Opening Size	40 - 80 US sieve
Minimum UV Resistance	70%
Minimum Flow Thru Rate	70 gpm/sq ft

2. The bag shall be sewn with a double needle machine using high strength thread, double stitched “Joe” type capable of minimum roll strength of 100 lbs/inch (ASTM D4884).

3. The geotextile filter bag shall have an opening large enough to accommodate a 4 inch diameter discharge hose with an attached strap to tie off the bag to the hose to prevent back flow.

4. The geotextile shall be placed on a gravel bed 2 inches thick, a straw mat 4 inches thick, or a vegetated filter strip to allow water to flow out of the bag in all directions.

Maintenance

1. The geotextile filter bag is considered full when remaining bag flow area has been reduced by 75%. At this point, it should be replaced with a new bag.

2. Disposal may be accomplished by removing the bag to an appropriate designated upland area, cut open, remove the geotextile for disposal, and spread sediment contents and seeded and mulched according to the vegetative plan.

STANDARD AND SPECIFICATIONS FOR SEDIMENT DIKE

Definition & Scope

A **temporary** earth dike with an excavated trench on the upslope toe placed across a slope to capture sediment laden flow from small disturbed drainage areas and allowing sediment to settle out by ponding.

Condition Where Practice Applies

This practice can be used on slopes and in areas where it is difficult to place and maintain silt fence. This practice acts as a smaller sediment trap for linear type applications. This practice will handle sheet and rill erosion for small tributary areas.

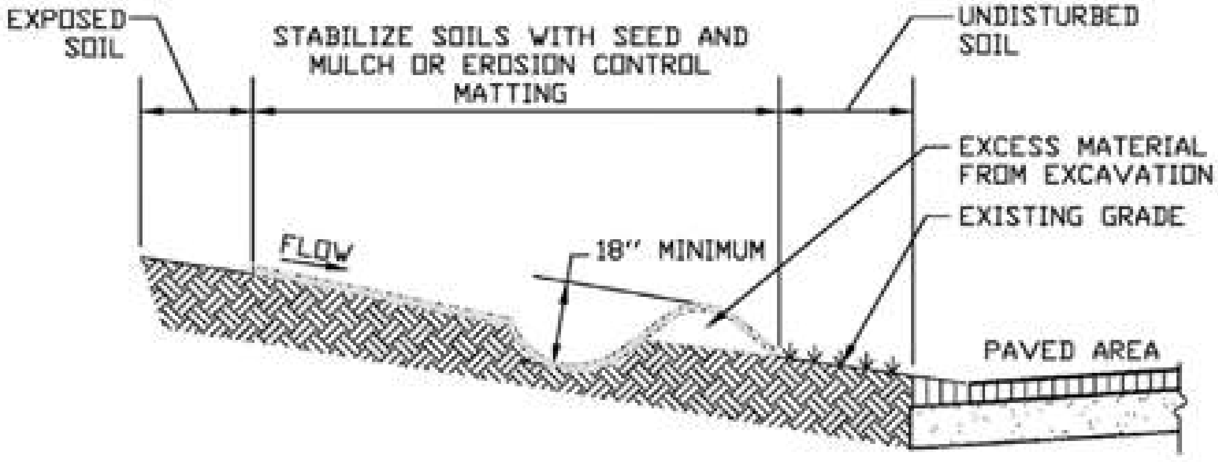
Design Criteria

1. The earth dike will be a maximum of 2 feet high with a 2 foot top width and 2:1 side slopes.
2. All earth fill will be placed on a stripped foundation, contain no stumps or woody material, and be compacted with the weight of the excavator bucket.
3. The interior capture trench will be a minimum 1.5 feet deep, 2 feet wide, with 1:1 side slopes and with a near level bottom. In areas where linear slopes exceed 4% the sediment dike system shall be segmented to maintain capture volume and ponding.
4. The system shall be used with a minimum 5 foot vegetated buffer on the down slope toe of the dike or an artificial buffer of erosion control matting.
5. The maximum ponding depth behind the dike shall be 1/2 the height of the constructed dike at its lowest elevation.
6. The ends of the dike system shall terminate with a 90º return of NYS DOT #1A crushed stone to filter any excess flow.
7. The maximum drainage area tributary to this practice shall not exceed 0.5 acres per 100 feet of dike, for slopes less than 10%. For slopes greater than 10%, the drainage area shall be 0.25 acres per 100 feet of dike.
8. The earthen dike shall be seeded and mulched to prevent erosion using an annual rye grass mixture at a rate of 1 lb. per 1, 000 square feet.

Maintenance

1. No traffic will be allowed on the dike.
2. Dike system will be inspected weekly and after each runoff event.
3. Sediment in the system will be removed when the interior trench has filled to 75% capacity.
4. Sediment will be disposed of on-site as specified in the Erosion and Sediment Control Plan.
5. Upon stabilization of the tributary drainage area, the trench will be filled, excess dike fill removed, and the area graded and stabilized in accordance with the Erosion and Sediment Control Plan.

Figure 5.23
Sediment Dike



CONSTRUCTION NOTES:

1. ALL EARTH FILL WILL BE PLACED ON A STRIPPED FOUNDATION, CONTAIN NO STUMPS OR WOODY MATERIAL, AND BE COMPACTED WITH THE WEIGHT OF THE EXCAVATOR BUCKET.

2. THE SYSTEM SHALL BE USED WITH A MINIMUM 5 FOOT VEGETATED BUFFER ON THE DOWN SLOPE TOE OF THE DIKE OR AN ARTIFICIAL BUFFER OF EROSION CONTROL MATTING.

3. THE ENDS OF THE DIKE SYSTEM SHALL TERMINATE WITH A 90 DEGREE RETURN OF NYS DOT #1A CRUSHED STONE TO FILTER ANY EXCESS FLOW.

4. THE EARTHEN DIKE SHALL BE SEEDED AND MULCHED TO PREVENT EROSION USING AN ANNUAL RYE GRASS MIXTURE AT A RATE OF 1 LB. PER 1,000 SQUARE FEET.

ADAPTED FROM DETAILS PROVIDED BY: KEN BARBER, BARBER ENGINEERING	SEDIMENT DIKE

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.

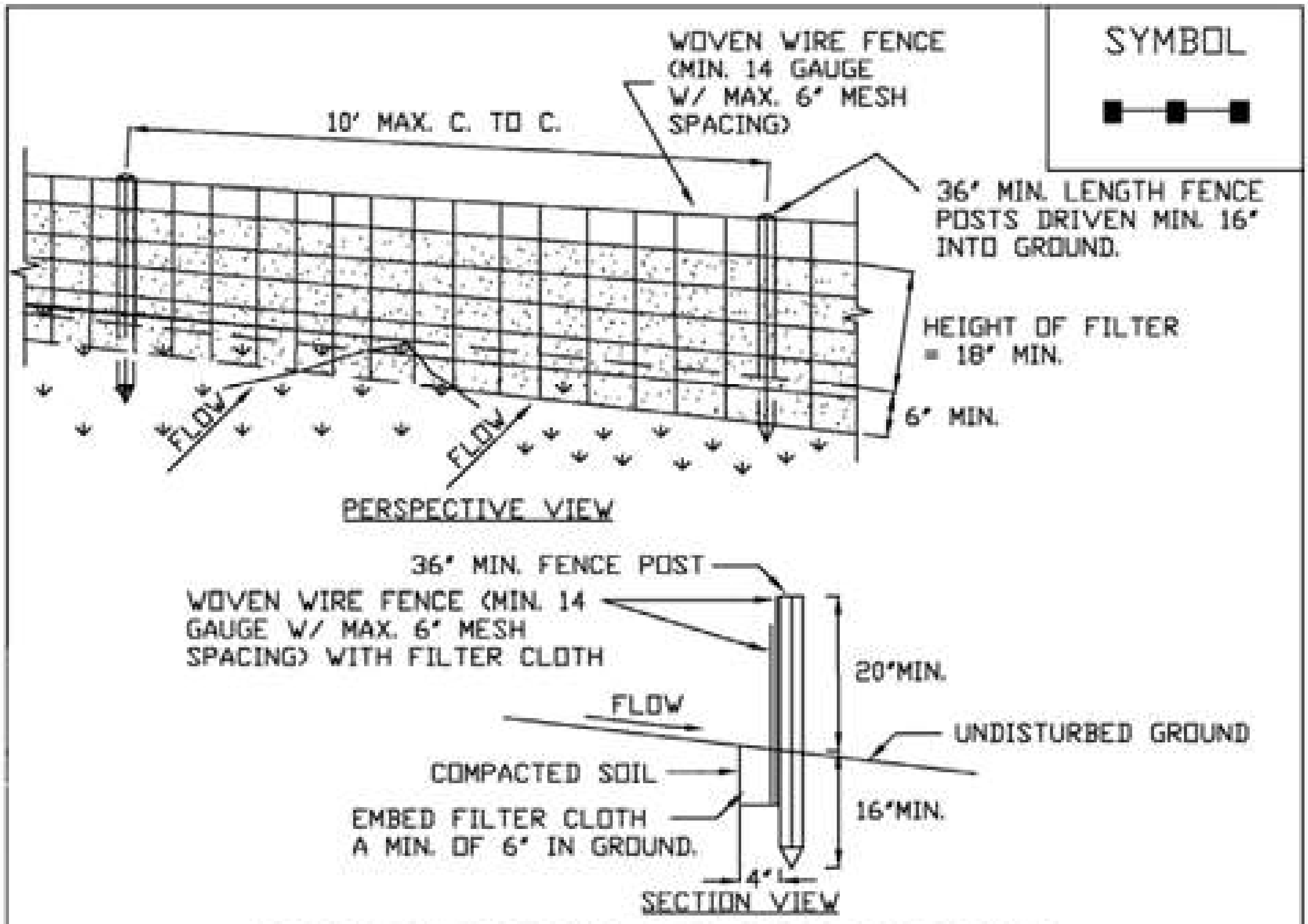
3. Wire Fence for reinforced silt fence: Wire fencing shall be a minimum 14 gage with a maximum 6 in. mesh opening, or as approved.

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 OVERLAPPED 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 STRAW BALE DIKE

Definition & Scope

A **temporary** barrier of straw, or similar material, used to intercept sediment laden runoff from small drainage areas of disturbed soil to reduce runoff velocity and effect deposition of the transported sediment load. Straw bale dikes have an estimated design life of three (3) months.

Condition Where Practice Applies

The straw bale dike is used where:

1. No other practice is feasible.
2. There is no concentration of water in a channel or other drainageway above the barrier.
3. Erosion would occur in the form of sheet erosion.
4. Length of slope above the straw bale dike does not exceed the following limits with the bale placed 10 feet from the toe of the slope:

Constructed Slope	Percent Slope	Slope Length (ft.)
2:1	50	25
3:1	33	50
4:1	25	75

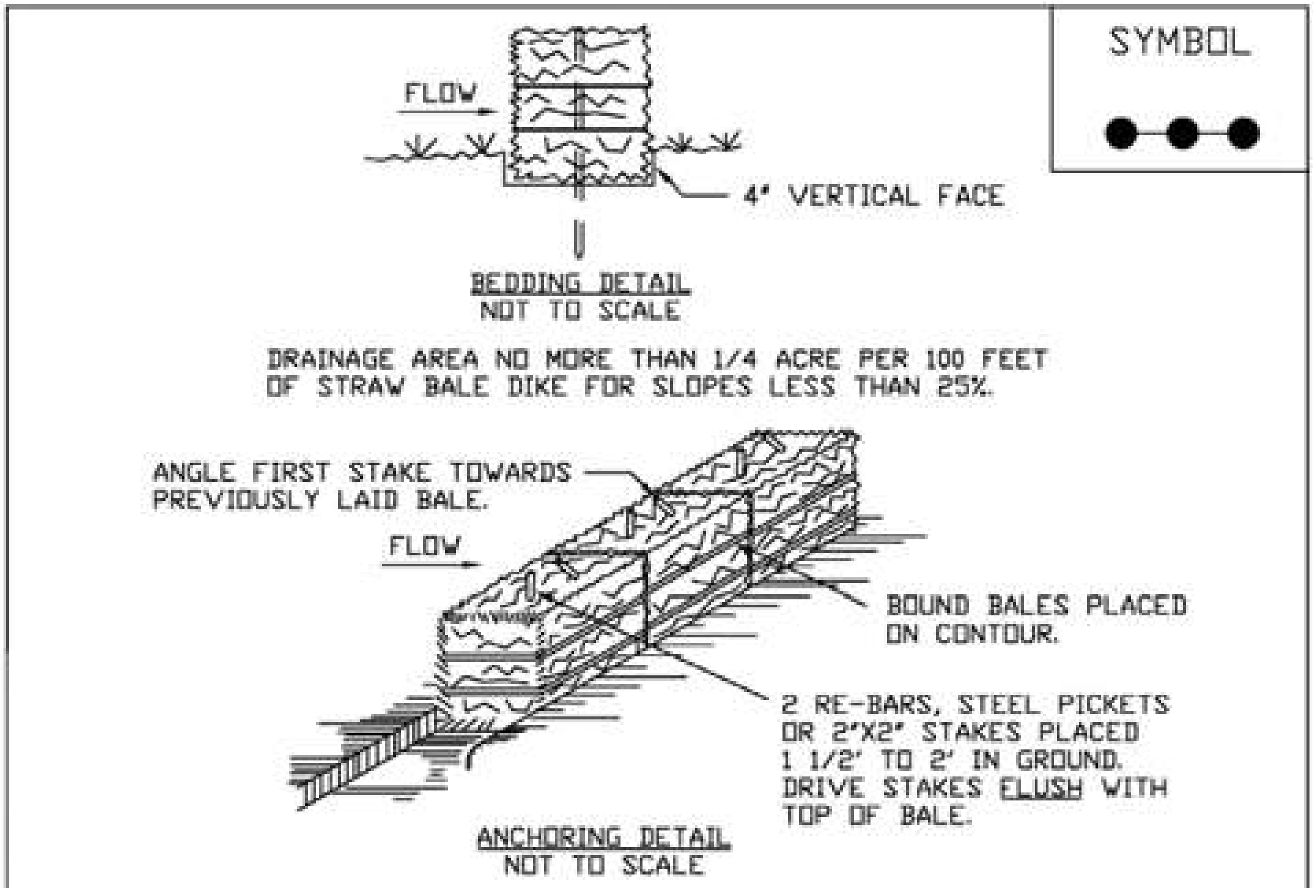
Where slope gradient changes through the drainage area, steepness refers to the steepest slope section contributing to the straw bale dike.

The practice may also be used for a single family lot if the slope is less than 15 percent. The contributing drainage areas in this instance shall be less than one quarter of an acre per 100 feet of dike and the length of slope above the dike shall be less than 100 feet.

Design Criteria

The above table is adequate, in general, for a one-inch rainfall event. Larger storms could cause failure of this practice. Use of this practice in sensitive areas for longer than one month should be specifically designed to store expected runoff. All bales shall be placed on the contour with cut edge of bale adhering to the ground. See Figure 5.34 on page 5.64 for details.

Figure 5.34
Straw Bale Dike



CONSTRUCTION SPECIFICATIONS

1. BALES SHALL BE PLACED AT THE TOE OF A SLOPE OR ON THE CONTOUR AND IN A ROW WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES.
2. EACH BALE SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF (4) INCHES, AND PLACED SO THE BINDINGS ARE HORIZONTAL.
3. BALES SHALL BE SECURELY ANCHORED IN PLACE BY EITHER TWO STAKES OR RE-BARS DRIVEN THROUGH THE BALE. THE FIRST STAKE IN EACH BALE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE AT AN ANGLE TO FORCE THE BALES TOGETHER. STAKES SHALL BE DRIVEN FLUSH WITH THE BALE.
4. INSPECTION SHALL BE FREQUENT AND REPAIR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
5. BALES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFULLNESS SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

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	STRAW BALE DIKE

Appendix H – Spill Cleanup and Reporting Guidance

- NYSDEC Technical Field Guidance: Spill Reporting and Initial Notification Requirements -

TECHNICAL

FIELD GUIDANCE

SPILL REPORTING AND INITIAL NOTIFICATION REQUIREMENTS

Spill Reporting and Initial Notification Requirements

GUIDANCE SUMMARY AT-A-GLANCE

- Reporting spills is a crucial first step in the response process.
- You should understand the spill reporting requirements to be able to inform the spillers of their responsibilities.
- Several different state, local, and federal laws and regulations require spillers to report petroleum and hazardous materials spills.
- The state and federal reporting requirements are summarized in Exhibit 1.1-1.
- Petroleum spills must be reported to DEC unless they meet all of the following criteria:
    - The spill is known to be less than 5 gallons; and
    - The spill is contained and under the control of the spiller; and
    - The spill has not and will not reach the State's water or any land; and
    - The spill is cleaned up within 2 hours of discovery.

  All reportable petroleum spills and most hazardous materials spills must be reported to DEC hotline (1-800-457-7362) within New York State; and (1-518 457-7362) from outside New York State. For spills not deemed reportable, it is strongly recommended that the facts concerning the incident be documented by the spiller and a record maintained for one year.
- Inform the spiller to report the spill to other federal or local authorities, if required.
- Report yourself those spills for which you are unable to locate the responsible spiller.
- Make note of other agencies' emergency response telephone numbers in case you require their on-scene assistance, or if the response is their responsibility and not BSPR's.

NOTES

1.1.1 Notification Requirements for Oil Spills and Hazardous Material Spills

Spillers are required under state law and under certain local and federal laws to report spills. These various requirements, summarized in Exhibit 1.1-1, often overlap; that is, a particular spill might be required to be reported under several laws or regulations and to several authorities. Under state law, all petroleum and most hazardous material spills must be reported to DEC Hotline (1-800-457-7362), within New York State, and to 1-518-457-7362 from outside New York State. Prompt reporting by spillers allows for a quick response, which may reduce the likelihood of any adverse impact to human health and the environment. Yo will often have to inform spillers of there responsibilities.

Although the spiller is responsible for reporting spills, other persons with knowledge of a spill, leak, or discharge is required to report the incident (see Appendices A and B). You will often have to inform spillers of their responsibilities. You may also have to report spills yourself in situations where the spiller is not known or cannot be located. However, it is the legal responsibility of the spiller to report spills to both state and other authorities.

BSPR personnel also are responsible for notifying other response agencies when the expertise or assistance of other agencies is needed. For example, the local fire department should be notified of spills that pose a potential explosion and/or fire hazard. If such a hazard is detected and the fire department has not been notified, call for their assistance immediately. Fire departments are trained and equipped to respond to these situations; you should not proceed with your response until the fire/safety hazard is eliminated. For more information on interagency coordination in emergency situations see Part 1, Section 3, Emergency Response.

Another important responsibility is notifying health department officials when a drinking water supply is found to be contaminated as a result of a spill. It will be the health department's responsibility to advise you on the health risk associated with any contamination.

Exhibits 1.1-1 and 1.1-2 list the state and federal requirements to report petroleum and hazardous substance spills, respectively. The charts describe the type of material covered, the applicable act or regulation, the agency that must be notified, what must be reported, and the person responsible for reporting. New York state also has a emergency notification network for spill situations (e.g., major chemical releases) that escalate beyond the capabilities of local and regional response agencies/authorities to provide adequate response. The New York State Emergency Management Office (SEMO) coordinates emergency response activities among local, state, and federal government organizations in these cases.

Exhibit 1.1-1

State and Federal Reporting Requirements for Petroleum Spills, Leaks, and Discharges

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Petroleum from any source	Navigation Law Article 12; 17 NYCRR 32.3 and 32.4	DEC Hotline 1-800-457-7362	The notification of a discharge must be immediate, but in no case later than two hours after discharge. 1. Name of person making report and his relationship to any person which might be responsible for causing the discharge. 2. Time and date of discharge. 3. Probable source of discharge. 4. The location of the discharge, both geographic and with respect to bodies of water. 5. Type of petroleum discharges. 6. Possible health or fire hazards resulting from the discharge. 7. Amount of petroleum discharged. 8. All actions that are being taken to clean up and remove the discharge. 9. The personnel presently on the scene. 10. Other government agencies that have been or will be notified.	Any person causing discharge of petroleum. Owner or person in actual or constructive control must notify DEC unless that person has adequate assurance that such notice has already been given.
All aboveground petroleum and underground storage facilities with a combined storage capacity of over 1100 gallons.	ECL §17-1007; 6 NYCRR §613.8	DEC Hotline 1-800-457-7362	1. Report spill incident within two hours of discovery. 2. Also when results of any inventory, record, test, or inspection shows a facility is leaking, that fact must be reported within two hours of discovery.	Any person with knowledge of a spill, leak, or discharge.
Petroleum contaminated with PCB.	Chemical Bulk Storage Act 6 NYCRR Parts 595, 596, 597	DEC Hotline 1-800-457-7362	Releases of a reportable quantity of PCB oil.	Owner or person in actual or constructive possession or control of the substance, or a person in contractual relationship, who inspects, tests, or repairs for owner.

Exhibit 1.1-1

State and Federal Reporting Requirements for Petroleum Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Any liquid (petroleum included) that if released would be likely to pollute lands or waters of the state.	ECL §17-1743	DEC Hotline 1-800-457-7362	Immediate notification that a spill, release, or discharge of any amount has occurred. Owner or person in actual or constructive possession or control of more than 1,100 gallons of the liquid.	
Petroleum Discharge in violation of §311(b)(3) of the Clean Water Act	40 CFR §110.10 (Clean Water Act)	1. National Response Center (NRC) 1-800-424-8802. 2. If not possible to notify NRC, notify Coast Guard or predesignated on-scene coordinator. 3. If not possible to notify either 1 or 2, reports may be made immediately to nearest Coast Guard units, provided NRC notified as soon as possible.	Immediate notification as soon as there is knowledge of an oil discharge that violates water quality standards or causes sheen on navigable waters. Procedures for notice are set forth in 33 CFR Part 153, Subpart B, and in the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, Subpart E.	Person in charge of vessel or on-shore or off-shore facility.
Petroleum, petroleum by-products or other dangerous liquid commodities that may create a hazardous or toxic condition spilled into navigable waters.	33 CFR 126.29 (Ports and Waters Safety Act)	Captain of the Port or District Commander	As soon as discharge occurs, owner or master of vessel must immediately report that a discharge has occurred.	Owner or master of vessel or owner or operator of the facility at which the discharge occurred.

Exhibit 1.1-1

State and Federal Reporting Requirements for Petroleum Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Petroleum or hazardous substance from a vessel, on-shore or off-shore facility in violation of §311(b)(3) of the Clean Water Act.	33 CFR 153.203 (Clean Water Act)	1. NRC U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593; 1-800-424-8802. 2. Where direct reporting not practicable, reports may be made to the Coast Guard (District Offices), the 3rd and 9th district of the EPA regional office at 26 Federal Plaza, NY, NY 10278; 1-201-548-8730. 3. Where none of the above is possible, may contact nearest Coast Guard unit, provided NRC notified as soon as possible.	Any discharger shall immediately notify the NRC of such discharge.	Person in charge of vessel or facility.

Exhibit 1.1-2

State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Any hazardous substance pursuant to Article 37. Does not include petroleum.	Chemical Bulk Storage Act 6 NYCRR Parts 595, 596, 597; ECL 40-0113(d)	DEC Hotline 1-800-457-7362	Releases of a reportable quantity of a hazardous substance.	Owner or person in actual or constructive possession or control of the substance, or a person in contractual relationship, who inspects, tests, or repairs for owner.
Hazardous materials or substances as defined in 49 CFR §171.8 that are transported. (See federal reporting requirements.)	Transportation Law 14(f); 17 NYCRR 507.4(b)	Local fire department or police department or local municipality	Immediate notification must be given of incident in which any of the following occurs as a direct result of a spill of hazardous materials: 1. Person is killed. 2. Person receives injuries requiring hospitalization. 3. Estimated damage to carrier or other property exceeds $50,000. 4. Fire, breakage, spillage, or suspected contamination due to radioactive materials. 5. Fire, breakage, spillage, or suspected contamination involving etiologic agents. 6. Situation is such that, in the judgment of the carrier, a continuing danger to life or property exists at the scene of the incident.	All persons and carriers engaged in the transportation of hazardous materials.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Hazardous materials (wastes included) that are transported, whose carrier is involved in an accident.	Department of Transportation Regulations 49 CFR 171.15; 17 NYCRR Part 924; 17 NYCRR Part 507	1. U.S. Department of Transportation 1-800-424-8802 2. DEC Hotline 1-800-457-7362 3. Rail Carrier On-Duty 518-457-1046 Off-Duty 518-457-6164 4. Notify local police or fire department.	Notice should be given by telephone at the earliest practicable moment and should include: 1. Name of reporter. 2. Name and address of carrier represented by reporter. 3. Phone number where reporter can be contacted. 4. Date, time, and location of incident. 5. The extent of injuries, if any. 6. Classification, name and quantity of hazardous materials involved, if available. 7. Type of incident and nature of hazardous material involved and whether a continuing danger to life exists at scene. 8. Each carrier making this report must also make the report required by §171.16.	Each carrier that transports hazardous materials involves in an accident that causes any of the following as a direct result: 1. A person is killed 2. A person receives injuries requiring hospitalization 3. Estimated damage to carrier or other property exceeds $50,000 4. Fire, breakage, spillage, suspected or otherwise involving radioactive material. 5. Fire, breakage, spillage, suspected contamination involving etiologic agents. 6. Situation is such that carrier thinks it should be reported in accordance with paragraph b.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges
(continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Reportable quantity of a hazardous substance into navigable waters or adjoining shorelines. Substances are listed in 40 CFR 302.4.	Department of Transportation Regulations 49 CFR §171.16 as authorized by the Hazardous Materials Transportation Act	U.S. Coast Guard National Response Center (NRC), 1-800-424-8802 or 1-202-267-2675	As soon as person in charge becomes aware of a spill incident, he must notify NRC and provide the following information: 1. The information required by 49 CFR §171.15 (see above). 2. Name of shipper of hazardous substance. 3. Quantity of hazardous substance discharged, if known. 4. If person in charge is incapacitated, carrier shall make the notification. 5. Estimate of quantity of hazardous substance removed from the scene and the manner of disposition of any unremoved hazardous substance shall be entered in Part (H) of the report required by 49 CFR 171.16 (see above).	Person in charge of aircraft, vessel, transport vehicle, or facility. Must inform NRC directly, or indirectly through carrier.
Reportable quantity of a hazardous substance from vessel, on-shore or off-shore facility. Substances and requirements specified in 40 CFR §117.3.	40 CFR §117.21 as authorized under the FWPCA	NRC 1-800-424-8802. If not practicable report may be made to the Coast Guard (3rd or 9th Districts) District Offices or to EPA, designated On-Scene Coordinator, Region II, 26 Federal Plaza, NY, NY 10278; 1-201-548-8730	Immediate notification is required.	Person in charge of vessel, or on-shore or off-shore facility

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Facilities where a hazardous chemical is produced, used, or stored, and there is a reportable quantity of any extremely hazardous substance as set out in Appendix A to 40 CFR 355 or a CERCLA hazardous substance as specified in 40 CFR 302.4. (This section does not apply to a release that does not go beyond the facility, that emanates from a facility that is federally permitted, is continuous as defined under §103(f) of CERCLA or to any release exempt from CERCLA §103(a) reporting under §101(22) of CERCLA.)	40 CFR 355.40 (SARA) Releases of CERCLA Hazardous Substances are subject to release reporting requirements of CERCLA §103, codified at 40 CFR Part 302, in addition to being subject to the requirements of this Part.	Community emergency coordinator for the local emergency planning committee of any area likely to be affected and the State Emergency Response Commission of any state likely to be affected by the release. If there is no local emergency planning commission notification shall be made to relevant local emergency response personnel.	Immediately notify agencies at left and provide the following information when available: 1. Chemical name or identity of any substance involved in the release. 2. Indication of whether the substance is an extremely hazardous substance. 3. An estimate of the quantity released. 4. Time and duration of release. 5. Medium or media into which the release occurred. 6. Known health risks associated with emergency and where appropriate advice regarding medical attention for those exposed. 7. Proper precautions/actions that should be taken, including evacuation. 8. Names and telephone numbers of person to be contacted for further information. As soon as practicable after release, followup notification by providing the following information: 1. Actions taken to respond to and contain the release. 2. Health risks. 3. Advice on medical attention for exposed individuals.	Owner or operator of facility

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Hazardous liquids transported in pipelines, a release of which results in any circumstances as set out in 195.50(a) through (f). Also any incident that results in circumstances listed in 195.52(g).	49 CFR 195.50, 195.52 and 195.54 (Hazardous Liquid Pipeline Safety Act).	NRC, 1-800-424-8802	Notice must be given at the earliest practicable moment and the following information provided: 1. Name and address of the operator. 2. Name and telephone number of the reporter. 3. Location of the failure. 4. The time of the failure. 5. The fatalities and personal injuries, if any. 6. All other significant facts known by the operator that are relevant to the cause of the failure or extent of the damages.	Operator of system.
Hazardous wastes in transport	40 CFR §263.30(a) (RCRA)	1. Local authorities 2. If required by 49 CFR 171.15, notify the NRC at 1-800-424-8802 or 1-202-426-2675 3. Report in writing to Director of Hazardous Materials Regulations, Materials Transportation Bureau, Department of Transportation, Washington, DC 20590	Notification must be immediate. For discharge of hazardous waste by air, rail, highway, or water, the transporter must: 1. Give notice as in 49 CFR 161.15 (if applicable). 2. Report in writing as in 49 CFR 171.16. Wastes transporter (bulk shipment) must give same notice as required by 33 CFR 153.20.	Transporter by air, rail, highway, or water.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Vinyl Chloride from any manual vent valve, or polyvinyl chloride plants	Clean Air Act 40 CFR 61.64	Administrator of EPA	Within 10 days of any discharge from any manual vent valve, report must be made, in writing, and the following information provided: 1. Source, nature and cause of the discharge 2. Date and time of the discharge 3. Approximate total vinyl chloride loss during discharge 4. Method used for determining loss 5. Action taken to prevent the discharge 6. Measures adopted to prevent future discharges.	Owner or operator of plant.
Radioactive Materials	6 NYCRR §380.7	Commissioner of DEC	1. Notify immediately by telephone when concentration, averaged over a 24-hour period, exceeds or threatens to exceed 5000 times the limits set forth in Schedule 2 of 380.9 (in uncontrolled areas). 2. Notify within 24 hours by telephone when concentration, averaged over 24- hour period, exceeds or threatens to exceed 500 times the limits set forth in Schedule 2 above (in uncontrolled areas). 3. Report within 30 days the concentration and quantity of radioactive material involved, the cause of the discharge, and corrective steps taken or planned to ensure no recurrence of the discharge.	Operator of the radiation installation.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Low Level radioactive wastes in transport. Any suspected or actual uncontrolled releases.	6 NYCRR 381.16 ECL §27-0305 Waste Transporter Permits	DEC and Department of Health	Immediate notification.	Transporter

TECHNICAL

FIELD GUIDANCE

SPILL REPORTING AND INITIAL NOTIFICATION ENFORCEMENT OF SPILLER RESPONSIBILITY

NOTES

Spill Reporting and Initial Notification -
Enforcement of Spiller Responsibility

GUIDANCE SUMMARY-AT-A-GLANCE

Use the "Notification Procedures Checklist" (Exhibit 1.1-3) to document conversations with the responsible party or potentially responsible party (PRP/RP) concerning his or her clean-up responsibilities.

The steps to follow when you inform the PRP/RP of his or her legal responsibility are:

-- Give your name and identify yourself as a DEC employee;

-- Inform them that they have been identified as the party responsible for the spill;

-- Inform PRP/Rps of their liability for all clean-up and removal costs. (If necessary, cite Section 181 of the Navigation Law);

-- Ask PRP/Rps "point blank" if they will accept responsibility for the cleanup; and

-- If the PRP/RP does not accept responsibility, or does not admit to being the PRP/RP, inform him or her that DEC will conduct the cleanup and send the bill to whoever is the PRP/RP. Also inform them that a DEC-conducted cleanup could be more costly than a PRP/RP-conducted cleanup, and that the PRP/RP could face interest charges and penalties for refusing to clean up the spill.

If the PRP/RP accepts responsibility for the cleanup:

(1) Send the PRP/RP a "Spiller Responsibility Letter" (Exhibit 1.1-5) and an "Acceptance of Financial Responsibility Form" (Exhibit 1.1-6) and

(2) Send the PRP/RP an "Option Letter," which should outline the options available to the PRP/RP to clean up the spill. See Exhibit 1.1-4 for a summary of how and when to use these forms and what they may include.

1.1.2 Spill Reporting and Initial Notification - Enforcement of Spiller Responsibility

This section provides guidance on those steps you take to inform responsible parties or potentially responsible parties (PRP/Rps) or spillers of their responsibility under state law for cleaning up spills. This guidance applies to all contacts (by phone, by mail, or in person) you have with Rps throughout the response process concerning their fulfillment of this legal responsibility. The possible consequences of an RP's refusal or inability to conduct the spill response are also discussed.

1. State Law and Policy

Under Article 12 of the Navigation Law and Article 71 of the Environmental Conservation law (ECL), those parties responsible for a petroleum release are liable for all costs associated with cleaning up the spill as well as third party damages (see Introduction-A for more information). Section 181 of the Navigation Law states:

> *Any person who has discharged petroleum shall be strictly liable, without regard to fault, for all cleanup and removal costs and all direct damages, no matter by whom sustained as defined in this section.*

There are two ways by which PRP/RPs can pay for the costs associated with cleanups. First, the PRP/RP can reimburse the state for site investigation, clean-up, and remediation costs incurred by the State Oil Spill Fund or federal Leaking Underground Storage Tank (LUST) Trust Fund. Second, the PRP/RP can assume full responsibility for the cleanup from the beginning and bear all costs throughout the clean-up process. It is DEC's policy to make every effort to have PRP/RPs pay for cleanups from the outset.[1]

To achieve PRP/RP-directed and PRP/RP-financed cleanups, your responsibilities are to: (1) identify the PRP/RP(s), (2) inform them of their legal responsibilities for the spill, and (3) ensure that they carry out these responsibilities. All investigations of spills and PRP/RPs should be pursued vigorously and without prejudice. Use to your advantage the argument that having the PRP/RP assume responsibility for clean-up costs benefits both DEC and the spiller. It saves DEC the expense of cost-recovery procedures. It also allows the PRP/RP to be more involved in clean-up decisions (e.g., choosing their clean-up contractors) and, more significantly, it usually results in lower clean-up costs. Because the PRP/RP is responsible for all indirect costs incurred if DEC conducts the cleanup, the spiller will pay for the DEC contractor's clean-up work, as well as the supervision costs incurred by DEC, any third-party claims associated with the spill, and any punitive fines levied.

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[1] Spillers are not only responsible for assuming the costs of a cleanup, but also can be subject to a $25,000 per day fine for not paying the clean-up costs (among other violations). The Navigation Law provides for these penalties in Section 192, which states:

> Any person who knowingly gives or causes to be given any false information as a part of, or in response to, any claim made pursuant to this article for cleanup and removal costs, direct or indirect damages resulting from a discharge, or who otherwise violates any of the provisions of this article or any rule promulgated thereunder or who fails to comply with any duty created by this article shall be liable to a penalty of not more than twenty-five thousand dollars for each offense in court of competent jurisdiction. If the violation is of a continuing nature each day during which it continues shall constitute an additional, separate, and distinct offense. (emphasis added)

2. Notification Process

Part 1, Section 4, of this manual discusses the process of identifying the PRP/RP as part of the spill investigation for a particular site. Once you identify the PRP/RP, follow the guidance provided below for informing the PRP/RP of his or her responsibilities for spill cleanup. If you are uncertain about who the PRP/RP is, apply the procedures outlined below with all suspected RPs until the responsible party or parties are identified.

a. Informing RPs of Their Responsibility at the Spill Scene

It is important to inform PRP/RPs of their legal responsibility to clean up a spill as soon as possible. When you arrive at a spill site, you should immediately inform the representative of any PRP/RP of their liability under the Navigation Law and the Environmental Conservation Law. In doing so, follow the steps covered in the "Notification Procedures Checklist" (Exhibit 1.1-3).

Document completion of the notification steps, and identify your contact(s).

> Although you should be firm and direct in informing the PRP/RP of their responsibility, you should make every attempt to avoid an adversarial relationship with the RP. The full cooperation of the PRP/RP will result in a more efficient and effective cleanup.

b. Informing Spillers of Their Responsibility in Writing

You should send three different letters to the PRP/RP to inform them of their responsibility (see Exhibit 1.1-4, "Notification Forms Summary"). If a site response was initiated and you are able to confirm the spill visually, the "Spiller Responsibility Letter" (Exhibit 1.1-5) along with an "Acceptance of Financial Responsibility Form" (Exhibit 1.1-6) should be sent as soon as possible. In addition, an "Option Letter" that informs the PRP/RP of their possible options for addressing a spill should be sent. These letters should be kept as part of the Corrective Action Plan (CAP) (see Part 1, Section 5, "Corrective Action Plans.")

Exhibit 1.1-3
Notification Procedures Checklist

Completed	Step	Date	Contact(s)
____________	1. Give your name and identify yourself as a DEC employee.		
____________	2. Inform the PRP/RP that he/she has been identified as the party responsible for the spill.		
____________	3. Inform PRP/RPs of their responsibility to pay for all clean-up costs. (As necessary, cite Section 181 of the Navigation Law or Article 71 of the ECL.)		
____________	4. Ask PRP/RPs "point blank" if they will accept responsibility for the cleanup. Response: ______________________________ ______________________________ ______________________________ ______________________________ _________________________		
____________	5. If the PRP/RP does not accept responsibility, or does not admit to being the spiller, inform him/her that DEC will conduct the cleanup and send the bill to whoever is the spiller.		
____________	6. If the PRP/RP does not accept responsibility also inform him or her that a DEC-conducted cleanup could be more costly than a spiller-conducted cleanup, and that the spiller could face interest charges and a fine for refusing to pay for the billed clean-up costs.		

Exhibit 1-A-4

Notification Forms Summary
(Send Forms by Certified Mail)

Notification Form	When and How to Use	Information to be Included
Spiller Responsibility Letter	Send by certified mail to PRP/RP for confirmed spill.	# Spill location; # Spiller's responsibility under the Navigation Law; # Penalties that can be levied if the spiller does not cooperate; and # Deadline for spiller to begin containment and removal of the spill.
Acceptance of Spiller Responsibility Form	Send by certified mail to PRP/RP for confirmed spill.	# Request for spiller's signature acknowledging his or her acceptance of responsibility for the spill cleanup.
Option Letter	Send by certified mail to PRP/RP for confirmed or suspected release (e.g., failed tightness test).	# Spill number; # Date spill was discovered or reported; # Exact location of the spill; # Authority of Article 12 of the Navigation Act; and # Penalties for noncompliance.

Exhibit 1.1-5

Spiller Responsibility Letter

[Date]

[Addressee]
[Address]

Dear [   ]:

This is to inform you that as a result of investigation by our Department, we consider you responsible for Petroleum Spill Number __________, dated _______, at ___________________________. Under Article 12 of the Navigation Law, Section 192, any person who discharges petroleum without a permit and fails to promptly clean up such prohibited discharge may be subject to a penalty of up to $25,000 a day.

Containment and removal of this spill must be initiated within _____ hours.

Your failure to initiate timely spill cleanup and removal, in addition to the penalty stated above, will result in your being billed for all actual costs incurred by New York State as set forth in Section 181 of the Navigation Law. These costs include cleanup and removal, all direct and indirect damages, including damages incurred by third parties.

Sincerely,

Regional Spill Engineer
Region

Exhibit 1.1-6
Acceptance of Spiller Responsibility Letter

[Date]

SPILL #_________

ACCEPTANCE OF FINANCIAL RESPONSIBILITY

___________________________, hereby assumes responsibility for containment and
(Name of Company and Person)

cleanup of _______________ discharged from_______________________
(Substance) (Source)

on _______, and recognizes that the determination of the adequacy and propriety of
(Date)

the containment and cleanup operation continues to rest with the New York State

Department of Environmental Conservation On-Scene Coordinator.

____
(Authorized Signature and Title)

____
(Name and Title Printed)

____
(Address of Company)

____
(Date and Time)

____
(Witness)

NOTES

The "Spiller Responsibility Letter" informs spillers of their responsibility under the Navigation Law and explains the penalties that can be levied if the spiller does not cooperate. It should be sent to the spiller or suspected spiller as soon as a petroleum spill has been confirmed. The letter notifies the spiller that he or she is required to initiate containment and removal of the spill within a period of time you specify.

There are at least three factors you should consider when specifying a deadline in this letter:

The size and nature of the spill;

The proximity of the spill to, or its possible effects on, water supplies (surface or ground water), nearby homes and other structures, and/or sensitive environmental areas; and The possible environmental, safety, and/or human health effects of delaying containment and removal.

The "Acceptance of Spiller Responsibility Form" requires the spiller's signature acknowledging his or her responsibility for containment and cleanup of the spill. This form and the "Spiller Responsibility Letter" should be sent by certified mail.

The "Option Letter" outlines the possible options available to the PRP/RP for cleanup of the spill. The contents of this letter can vary somewhat depending on how the release was discovered (e.g., through a complaint or a failed tightness test), the extent and type of spill, and the policies and procedures of your regional office. There is, however, some information that should appear in every "Option Letter." All "Option Letters" should contain the following: spill number, date the spill was discovered, and exact location of the spill. In addition, the letter should cite the response authority provided DEC by Article 12 of the Navigation Act and describe the penalties for noncompliance.

Each "Option Letter" should outline clearly the options open to the PRP/RP to address the spill and the information you wish submitted, and may also specify certain deadlines for taking action. However, it is up to you to determine the particular options, information requirements, and dates you include in the letter. Depending on the circumstances, you may list in your letter one or several options from which the PRP/RP can choose. For example, when an UST fails an initial tank test the following options could be included:

Conduct separate integrity tests on the piping and the tanks in order to verify the release source within the tank system.

Remove the "non-tight" tank and either remove and dispose of all contaminated soils, or install monitoring wells.

- Install monitoring wells and abandon the "non-tight" tank in-place.
- Remove the tank within 30 days, according to the requirements for tank removal (outline these requirements in the letter).

The "Option Letter" should always be sent by certified mail. In addition, you should have the PRP/RP inform you as soon as possible about the option(s) he or she has chosen.

Several examples of possible "Option Letters" are included as Exhibits 1.1-7 through 1.1-12. These are provided as examples only; you should use "Option Letters" developed by your own office, or develop your own.

Exhibit 1.1-7 is a sample option letter to an PRP/RP for removal of contaminated soil from an UST release. Note that this option letter includes: (a) specific requirements for removal of the contaminated soil; (b) dates for when the removal must be completed, and (c) requirements for the PRP/RP to forward to DEC copies of the landfill disposal receipt and ample test results. The additional sample option letters apply to the following situations: when an UST has failed an initial tightness test (Exhibit 1.1-8), when an UST fails an isolation tank test (Exhibit 1.1-9), when an UST fails a Petro-tite Systems Test (Exhibit 1.1-10), and ground-water contamination cleanup (Exhibit 1.1-11).

3. Dealing with Uncooperative Spillers

There are generally two ways in which an PRP/RP may fail to fulfill his or her legal responsibilities for spill cleanup: (1) a PRP/RP may refuse from the beginning to accept responsibility, or (2) an PRP/RP may fail to conduct a cleanup in the manner, or in as timely a fashion, as agreed upon with the DEC. If a PRP/RP refuses to cooperate from the outset, try again to change the RP's mind. Send additional notices of spiller responsibility (Exhibit 1.1-12) and/or initiate phone conversations with PRP/RPs to inform them again of the consequences of not cooperating (i.e., higher clean-up costs and possible penalties). If a party claims not to be the PRP/RP, you should inform them of your reasons for believing they are the PRP/RP under the Navigation Law.

If a PRP/RP agrees to conduct and pay for the cleanup and then does not proceed in the manner agreed upon or as quickly as agreed upon, you should inform the PRP/RP immediately that you are dissatisfied with the progress of the cleanup and that DEC is considering taking it over. There are no hard-and-fast rules for deciding when you should take over a cleanup. If possible, you should always work toward having the PRP/RP continue the cleanup in the agreed-upon manner. Attempt to determine why the cleanup is not proceeding as planned and consider means of helping the PRP/RP-directed cleanup get back on track.

Exhibit 1.1-7

Sample Option Letter:
Soil Cleanup Spill

[Date]

[Addressee]
[Address]

Dear [ ]:

This letter is to confirm your - (site meeting) (telephone conversation) with
_____________ of this Department on ___________________________,
(Name) (day) (date) (year)
in regards to the above-mentioned spill site. This site involves ____________________________
(explanation)

The following items were discussed and agreed upon:

1. All contaminated material must be removed and stored on site until it can be properly disposed of at a properly permitted landfill.

2. All contaminated material must be sampled for ____
_____________________________________. The results must be
(analyses)
negative for the material to be considered non-hazardous oily debris. You must contact your selected sanitary landfill to verify the sample analyses that they require for disposal.

3. A hauler with a Part 364 permit must be used to haul the contaminated soil to your selected landfill.

4. Please notify this Department after the work is completed but prior to any backfilling of the spill area so that an inspection of the excavation may be made.

5. Please forward to us a copy of the landfill disposal receipt and the sample results.

A schedule for this work is required by _______________________________.
(day) (date) (year)
Cleanup must be performed by no later than ______________________________.
(day) (date) (year)

If you have any questions, please feel free to contact ____________________________________
(Name)
at 847-4590. Your cooperation will be appreciated.

Very truly yours,

Senior Sanitary Engineer

Exhibit 1.1-8

Sample Option Letter:
Initial Tank Failure

[Date]

[Addressee]
[Address]

Dear [ ]:

This Department received notification on ______________________that (a)
(day) (date) (year)
_______________________tank(s) failed its (their) tank test performed by
(gallons) (product stored)
_____________. On _________, Mr._____________of this Department
(contractor) (date) (name)
discussed with __________ that one of the following options must be done concerning this tank.
(person)

OPTION 1:
1. The tank is to be immediately isolated from the piping and is to be retested. If the tank tests tight, it may remain in service.
2. The lines are to be repaired, if necessary, and retested by a state-approved method. Exposed piping may be air tested.
3. A copy of any test results are to be sent to this office.

OPTION 2: If the tank fails the retest, or if you decide not to retest, the following must now be done:
1. All product must be immediately removed from the tank.
2. The tank itself must be removed within thirty days. A Petroleum Bulk Storage form must be submitted to this Department prior to tank removal.
3. The interior surface of the tank must be cleaned, and all sludge and residue generated by this process must be properly disposed. The tank must be cut open to allow for this work and to ensure proper ventilation of the tank interior.
4. All safety precautions regarding the opening, cleaning and entering of the tank must be followed. The interior atmosphere of the tank may be explosive and proper procedures must be followed.
5. Once the tank has been cleaned out, it may be disposed as scrap.

Mr._______must be notified when you have a firm date for retesting or removal. Please note, we must be present when this tank is removed to determine if any groundwater or soil contamination exists. If groundwater or soil contamination is found, further remedial work will be required.

If you have any questions, please contact________ at 847-4590. Your cooperation will be appreciated.

Sincerely,

[ ]

Exhibit 1.1-9

Sample Option Letter:
Retest Failure, Tank Removal

[Date]

[Addressee]
[Address]

Dear [ ]:

On____________________, a ______gallon _______________, underground store storage tank at the
(day) (date) (year) (#) (material)
above-mentioned address failed a system tank test. On____________________, this tank failed an isolation tank test.
(day) (date) (year)
Since the tank failed the retest, the following must now be done:

1. All product must be immediately removed from the tank.

2. The tank itself must be removed within thirty days. A Petroleum Bulk Storage form (enclosed) must be submitted to this Department prior to tank removal.

3. The interior surface of the tank must be cleaned, and all sludge and residue generated by this process must be properly disposed. The tank must be cut open to allow for this work and to ensure proper ventilation of the tank interior.

4. All safety precautions regarding the opening, cleaning and entering of the tank must be followed. The interior atmosphere of the tank may be explosive and proper procedures must be followed.

5. Once the tank has been cleaned out, it may be disposed as scrap.

____________________of this Department must be notified when you have a firm
(Name)
date for removal. We must be present when this tank is removed to determine if any groundwater or soil contamination exists. If groundwater or soil contamination is found, further remedial work will be required.

For your use, enclosed is a list of contractors that are known by this Department to do this type of work. This list is by no means complete. Any contractor may be used by you for this work.

If you have any questions, please feel free to call ________________________at 847-4590.
(Name)
Your cooperation will be appreciated.

Sincerely,

[ ]

Exhibit 1.1-10

Sample Option Letter:
Failed Tank Test

[Date]

CERTIFIED - RETURN RECEIPT REQUESTED

[Addressee]
[Address]

RE: Spill No.

Gentlemen:

This office has been informed by______(Name)___that __(tank)__ failed a Petrotite systems test. In accordance with Article 12 of the New York State Navigation Law, I must determine if there has been any harm to the lands or the groundwater of the State. In order for me to make this determination, you have three options:

1. Prove that it was not a leaking tank by removing all the piping from the tank and separately Petrotite test the tank. If the tank passes the Petrotite test, it is a piping leak. The tank may then be abandoned or the piping can be repaired, attached to the tank, and the system Petrotite tested.

2. Excavate and remove the tank in the presence of a representative from this office so that an inspection of the tank and the soil can be made. If the tank is sound, and there is no evidence of product loss, nothing further need be done. If there is a problem, proceed as in 3 below.

3. Abandon the tank in-place and install several four (4) inch diameter PVC site wells extending five (5) feet into the groundwater with a screen length of ten (10) feet, with slot size of .020 inches. The exact location and number of wells will be determined by a representative from this office. These wells will be checked for a period of twelve months by New York State, and if there is no evidence of product for that period, the spill will be removed from our listing. If free or dissolved product appears, cleanup must begin immediately.

If cleanup does not begin by__(Date)__ by the responsible party, the State will begin the cleanup and bill the responsible party.

Sincerely,

[ ]

Exhibit 1.1-11

Sample Option Letter:
Ground-water Cleanup

[Date]

[Addressee]
[Address]

Dear [ ]:

This letter is to confirm your (site meeting) (telephone conversation) with _ (Name) _ of this Department on (day) (date) (year) _. Groundwater at this spill site is contaminated with (free floating oil) (dissolved oil components). The following items were discussed and agreed upon:

1. (#) additional four-inch monitoring wells will be installed at the agreed upon locations. A sketch of a typical monitoring well is enclosed for your use.

2. One recovery well will be installed to recover oil product. Groundwater must be pumped to depress the groundwater table. The groundwater must be pumped to an oil-water separator tank. Accumulated oil may be recovered from the well by bailing or by a second pump. A second type of recovery well pumps both oil and water to a separator tank. Oil from the tank is then recovered. You should check with your contractor to determine the best method for the recovery well. Groundwater must be pumped to depress the groundwater table.

3. The discharge water must be sampled for (Contaminates) . Dependent upon the sampling results, it may be discharged with a SPDES permit to _ (Name) _. The water must at all times be sheenless. An air stripper or a carbon filter may be necessary for the discharge water.

4. All collected oil must be properly disposed. Copies of receipts indicating the disposal site must be forwarded to this office.

It was also agreed that these actions be completed by _ (Date) _. Should you have any questions, please do not hesitate to contact _ (Name) _ at 847-4590. Your cooperation will be appreciated.

Sincerely,

[ ]

Exhibit 1.1-12

Sample Option Letter:
Soil Disposal, Soil Still On Site

[Date]

[Addressee]
[Address]

Dear [ ]:

A recent inspection by ___(Name)_______ of this office indicated that the contaminated soil at your facility still remains on site. We are requesting this oil be removed by __(day)__(date)__(year)__ to an acceptable landfill. Please send a copy of the disposal receipt to this office.

If you cannot remove the soil by that date, please contact this office immediately. If you do not contact this office and the soil still remains on site past ___(Date)__, DEC will have the soil removed from your site. You will then be billed for the costs of removal and disposal as well any relevant penalties.

If you have any questions, please feel free to contact __(Name)_________ at 847-4590. Your cooperation will be appreciated.

Very truly yours,

Senior Sanitary Engineer

NOTES

If all efforts to encourage a PRP/RP to continue the cleanup fail, send a certified letter (Exhibit 1.1-13) notifying them that their actions have been unsatisfactory and that DEC will assume responsibility for the cleanup. This letter again informs the PRP/RP of his or her liability for all costs incurred by DEC during its cleanup.

Exhibit 1.1-13

Unsatisfactory Cleanup Notice Letter

[Date]

CERTIFIED MAIL SPILL #

[Addressee]
[Address]

Dear Sir:

My letter of _(Date)___ notified you of New York State's interest in a pollution incident for which you are presently considered responsible.

You are hereby given notice that your actions to remove the pollutant and mitigate its effects have been evaluated as unsatisfactory. Effective __(Date)___, the New York State Department of Environmental Conservation will conduct all cleanup activities under the authority of Article 12 of the Navigation Law. Removal will be effected in accordance with the regulations of the Department of Environmental Conservation. You will be billed for all actual costs incurred by New York State as set forth in Section 181 of the Navigation Law, as well as interest and penalties.

Should you require further information concerning this matter, contact: ____(Name)___
.

Sincerely,

[ ]

Received and Acknowledged

______________________ ____________ ___________
Time Date

TECHNICAL

FIELD GUIDANCE

SPILL REPORTING AND INITIAL NOTIFICATIONS - ACCESS AND RIGHT-OF-ENTRY

Spill Reporting and Initial Notifications - Access and Right-of-Entry

GUIDANCE SUMMARY AT-A-GLANCE

- Section 178 of the Navigation Law gives you the authority to enter private property to investigate or clean up a suspected spill.

- In general, you should inform the property owner of your right to enter onto private property and obtain consent from the owner. This consent can be either written or verbal.

- Detailed information and procedures for access and right-of-entry is considered confidential for spill responders. This information is contained in Appendix L, and is marked confidential.

1.1.3 Access and Right-of-Entry

This section addresses the right of NYSDEC personnel to enter private property on which a spill has occurred or is suspected, for the purpose of investigating, containing, and/or cleaning up the spill. Detailed information and procedures of access and right-of-entry are considered confidential. Therefore, this information can be found in Appendix L, including your legal rights to enter property and the procedures to follow to ensure that no charges of trespassing are brought against the Department.

1. State Law and Policy

You have the authority, under the Navigation Law, to enter property to investigate or clean up a real or suspected spill. Specifically, Section 178 of the Navigation Law states:

> *The department is hereby authorized to enter and inspect any property or premises for the purpose of inspecting facilities and investigating either actual or suspected sources of discharges or violation of this article or any rule or regulations promulgated pursuant to this article. The department is further authorized to enter on property or premises in order to assist in the cleanup or removal of the discharge. Any information relating to secret processes or methods of manufacture shall be kept confidential.*

In any emergency or non-emergency, you must possess information supporting a reasonable belief to suspect that a spill has occurred or is occurring, or that the spill is impacting the premises for which access is sought. A reasonable belief may be based on a report of a spill or visual observation. For example, if a gasoline station operator reports an unexpected loss of product from his underground storage tanks that are located near private household wells, you might want to investigate those wells and check the water.

Although you have the authority to enter the premises, *it is always advisable to obtain the consent of the property owner or his or her agent before entering the property.* This consent can be either written or verbal. Obtaining this consent may help avoid civil or criminal charges for trespass being logged. In cases where the owner/agent is not available or not ascertainable, entry should be made.